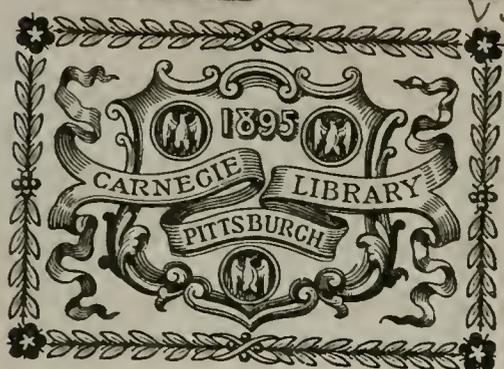




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With this issue the Electric Railway Review becomes a weekly publication. The reasons for the change are not far to seek. Firstly, a weekly journal is more in

The Weekly Electric Railway Review. line with the spirit of the times than a monthly and one of the chief excuses that we have for existence is that we are, or want to be, up to date. Secondly, we have

heard from a number of subscribers and other patrons, to the effect that, while the Review as a monthly was a most excellent paper and commanded the highest respect, it would be better as a weekly, and would have a much wider influence. Thirdly, we have the working organization to produce what we believe will be a first class weekly paper. Typographically it will be unchanged from the monthly. It will average about thirty-two pages of reading matter per issue; although more than this will be published whenever emergencies call for more. The subscription price will be two dollars per year and we believe the reader will get full value for his money. Old subscribers will receive the weekly to the expiration of their present subscriptions.

In a recent discussion of rotary converter substation apparatus at a meeting of the Western Society of Engineers in Chicago, it was stated by an engineer connected with the Chicago Edison Company that within the next six months rotary converters of a vertical type will be ready for operation. Owing to the limited headroom

Vertical Rotary Converters. In many of this company's substations, some of which are located in the basements of office buildings, a rotary converter of the vertical type would be very desirable. In the new design the shaft will be large in diameter and stationary, thus differing from the shaft of a vertical steam turbine. The revolving apparatus will be supported from the upper end of the shaft or pedestal, much like an umbrella. The first machines under construction will be of 2,000 kilowatts capacity, weighing 25 per cent less than usual for machines of like capacity. One of the desirable features of the new type of machine is that the brush ring will stand in a horizontal plane, and it will thus be possible to build a platform around

it so that all brushes will be equally accessible. The announcement of such a radical change in the design of the rotary converter as is demanded by limited headroom seems to emphasize the fact that the possibilities of substation improvement are by no means exhausted.

The Rapid Transit Railroad Commission of New York has given an illuminating example of what can be done by laymen to confound the operating official. It appears that the people who are enjoying the freedom, fresh air and lower rents above One Hundred and Thirty-seventh street did not think that these blessings compensated

for the extra time consumed in getting down-town in the subway under the stupidly impartial plan of falling in line behind the intermediate trains on the single down-town track between One Hundred and Thirty-second street station and Ninety-sixth street. It happened that the city had built a third or middle track extending from One Hundred and Thirty-seventh street down part way towards Ninety-sixth street, which was not being used for operation, and the minority of subway travelers living above One Hundred and Thirty-seventh street conceived the idea of appealing to the commission to compel the operating company to use this track for express trains down town in the morning and up-town in the evening. This would enable them to get ahead of some of the cars containing the amiable majority of residents living below One Hundred and Thirty-seventh street and to insinuate themselves into the single-track line again at a point farther down-town. They would thus get some such advantage as comes to persons who have sufficient aggressiveness to get to a ticket window without troubling themselves to fall in line, and the cars in line behind would suffer a corresponding delay. In this case the notable thing was that the commission not only winked at the plan but commanded it to be put in operation, although the operating officers explained that it would create another point of danger for the dispatcher to watch at the place where the express trains returned to the local track, and this point would be a particular source of apprehension because of the down grade from there to Ninety-

sixth street and the existence of only signal block termination between this junction and Ninety-sixth street, where the express trains switch again to the regular express tracks. Since this plan was put in effect it appears that the operating company still persists in being impartial and passengers on the express cars complain that they are sometimes stalled on the new third track waiting for a sufficient gap in the procession of piebald local cars to enable them to slip into line.

From time to time papers are presented in engineering societies discussing the relative merits of the many devices and construction schemes for lessening the ever-troublesome lightning troubles. There is hardly one of these discussions but that emphasizes the well-known fact that in order to protect the line from lightning dis-

charges advantage should be taken of the common characteristic of such discharges to move in straight paths. Thus it is recommended that no kinks or bends should be placed in the ground lines from lightning arresters. While these facts seem to be generally understood it is nevertheless true that many installations for both low and high-tension feeders are so arranged that if the kicking coil were ineffective the least reactive path from the outside feeder line to the interior of the building would be by the way of the wire carrying the dynamic current. This ineffective condition is brought about by the apparent lack of care in fixing the relative positions of the lightning equipment and the switching apparatus. Such details can best be taken care of in the preliminary design of the station building, and especially if it be for line entrances to a substation can the arrangement of the lightning arresters and the switching apparatus best be placed by using a wire tower. It is an easy matter to bring the high-tension wires into such a tower and across it to connect directly with the lightning arresters whose ground wires can pass straight down the tower wall to the earth. With an arrangement of this sort the connection for the dynamic current can be taken off by a tap making a curve such as will afford the sharpest angle in the path of the dynamic current. This doubling-back of the current wire calls into play the same principles that have been satisfactorily used on some foreign high-tension transmission lines, that is, carrying the transmission lines by the substations without curves in the wires to lightning arrester houses and making the taps to the building entrances at right or acute angles opposing the flow of the lightning discharge.

In a recent legal case in Arkansas the supreme court held as a correct declaration of law an instruction containing the statement, "A regulation forbidding passengers to stand upon the front platform is a reasonable and proper one. It is the duty of a passenger who is standing on the platform to go inside of the car when re-

quested to do so by a person in charge of the car, if there is standing room inside, although there are no vacant seats. And if a passenger refuses to comply with such request when there is room inside the car which can conveniently be reached, the servant of the company may lawfully eject him from the car." With regard to thus defining the term "ejected from the car" it is interesting to note that there were several of this electric railway company's cars standing at a station waiting to be loaded with passengers returning from a picnic, and while so waiting the plaintiff entered one of the cars. He became involved in a controversy with the conductor, then, without having paid his fare on the car, voluntarily left it to go upon the street where the conductor was standing, in order to maintain his contention. There the conductor informed him that he could not ride on his car, directing him to take passage on another car. With regard

to this the court held that the passenger was not denied the right to ride upon the defendant's car and was not, therefore, ejected therefrom. The court also said that where there is a train of cars for passengers, all of equal and sufficient accommodations, a passenger has no right to insist upon riding on any particular car.

NEW YORK TRANSPORTATION AND THE NEW GOVERNOR.

In his inaugural message to the legislature of the state of New York Governor Hughes recommends somewhat radical changes in the administration of the state's interests in public service corporations, notably in relation to transportation matters in greater New York. While the recommendation has reference also to the commission on gas and electricity, its chief effect if put into the form of a law would be upon the transportation interests, since it contemplates the abolition of the present board of rapid transit commissioners—which has served the public uncommonly well—and the establishment of a single board having jurisdiction over both interests. The governor expresses the opinion that there is no need of two separate commissions to deal with these subjects since similar principles are applicable to the decision of questions now within the jurisdiction of the two existing commissions and because in some cases the same questions are presented for the decision of both, there being some corporations subject to co-ordinate jurisdiction.

It should be noted, also, that the governor recommends a similar disposition of the bodies acting in similar capacities for the state. These state boards he would also consolidate, giving to one board jurisdiction over transportation matters, gas and electricity in the state outside of New York City, and to another board supervisory control over like matters in the city exclusively.

Whether or not such action at the present time is desirable is an open question. So far as the state outside of greater New York is concerned, the effect of such action should not be serious. The main difficulty is suggested in the message itself, in which it is recognized that "the problem of transportation in Greater New York demands special, prompt and comprehensive treatment." It is questionable if this would be secured by dethroning the present board of rapid transit commissioners, which, as before intimated, has performed its arduous duties with uncommon efficiency and zeal, just at the moment when it has outlined a comprehensive system of internal communication and by its completed work has given abundant evidence of its desire and ability to carry its plans to full fruition. Nor is it quite worthy of the great cause involved that the chief executive should base his reference to the necessity of means for securing better service upon existing lines upon, primarily, the fact that "in some portions of the city antiquated horse-cars may still be seen, giving picturesque emphasis to the disregard of the public convenience." It is true that non-electric and gasolineless power is employed in a few instances in hauling cars on crosstown lines on Manhattan Island; it is also true, or was two or three years ago, that mules were used in shifting cars on certain tracks of the Pennsylvania Railroad inside of Broad street station; and steam railroading had many years the start of transportation by electric power. It is trivial to cite instances in which expediency plays so conspicuous a part and in which the rights of the public are so little neglected.

That the operation of all railways within Greater New York should be under the supervision of one board will as a general proposition be unquestioned. Some difficulty may arise at the point where the authority of the proposed state and the proposed city boards meet, but doubtless this can be suitably regulated, since it is proposed that each board shall receive its authority from the state.

It is apparent that the new executive has prepared trou-

ble for the membership of the present legislature. He has placed dynamite under certain political structures which his economic sense points out as sufficiently dilapidated for removal in view of the more utilitarian structures which he desires to rear. The only thing to be feared is as to the zeal of the "contractor" to demolish more rapidly than he can rebuild in view of possible "labor troubles" among those who must do the actual work.

ELECTRIC RAILWAY EQUIPMENT IN 1907.

A very brief survey of the equipment available for electric railway service at the beginning of another new year is sufficient to convince the most skeptical operating man that no commercial transportation proposition need go by default for the lack of suitable apparatus to handle the business. It is not too much to say that the physical equipment necessary to maintain any speed specified up to a maximum of 100 miles per hour, can now be produced on contract guarantees. The wisdom of such selections of equipment is a matter of expert engineering, but the tools are at hand for the creation and shaping of every variety of transportation equipment from the urban system to the high-speed electrified network of steam trunk lines.

The production of the widest variety of electric railway machinery is now largely a matter of dollars and cents, but the selection of the most suitable apparatus for a given set of conditions is still a problem requiring careful analysis and step-by-step reasoning. In the field of power generation it is still a mooted point whether the gas engine, the steam turbine or the reciprocating engine is best suited for specific cases. The choice between the direct-current and the single-phase motor for interurban service is by no means settled practice as yet. The scientific proportioning of feeders to commercial traffic conditions, the design of durable track for heavy service, the best methods of fireproofing rolling stock and street railway buildings,—these and many other engineering problems need to be solved over and over again under divers conditions if progress is to continue.

It is remarkable how soon the standard equipment of railway service is superseded by new apparatus, even after two full decades of electric traction. Only six or seven years ago railway motors of the direct-current type had apparently reached such a high stage of development that little improvement could be foreseen, but as the lessons of operating experience were brought home in the maintenance expenses of rolling stock, more substantial construction was demanded and some of the best-known motors of that day have been set aside for machines of greater durability, increased armature and axle-bearing surface, larger commutators, three-point suspension gear cases and oil and waste lubricated bearings. Increase in weight has been merely nominal. The use of oil and waste lubrication in place of grease has been one of the most important improvements in railway motors in recent years, and it has resulted in a noteworthy increase in mileage with reduced maintenance expense.

Multiple-unit control methods have been much improved mechanically of late and the small amount of energy required to operate such systems is a triumph in design. The tendency is entirely away from breaking heavy currents on the platform in hand controllers which may short circuit and result in heavy damage suits by frightened passengers. Automatic acceleration is coming to be as favorably regarded on the street track as on the reserved right of way. In the power plant the gas engine is making a record for itself in economy; the alternating current steam turbine unit has "shown its mettle" on the score of operating simplicity and economy, particularly when using superheated steam, and the direct current steam turbine unit bids fair to be a useful adjunct of the motive power department as soon as the problems incidental to its construction can be settled.

Although it is difficult to forecast the development of equipment to be expected in the next year, it is safe to assume that reduced cost of operation and maintenance will be the chief objects sought by designers. First cost grows less and less important as the long-run economy becomes appreciated. This is particularly true in times as prosperous as the present. There is always an object in improving the mechanical strength of railway material, exposed as it is in so many cases to severe shocks and strains. Long after the electrical efficiency of a piece of machinery has been carried high up the line towards the practicable limit it remains possible to improve the mechanical structure. Increased facility of handling, greater ease of inspection and repair, more rugged design, less superfluous materials, better regulation and larger overload capacity are some of the desirable features in which we may expect the equipment of 1907 to surpass that of previous years. Along with these improvements it is to be hoped will go more careful records and analyses of repair costs and service performance on the part of operating companies. Only on the basis of such records can progress be given the most economical direction.

ROLLING STOCK ORDERED IN 1906.

Elsewhere in this issue is to be found a detailed statement of the equipment ordered by the electric railways of the United States, Canada and Mexico, which is effective testimony of the importance of electric traction interests as compared with those of the older and more assuming steam railways. The figures show that during 1906 contracts were placed for 6,104 cars and 23 electric locomotives, the cars including 851 for freight service. The balance of 5,253 cars were for passenger service which compares most favorably with the figures taken from *The Railway Age* showing orders placed by the steam roads calling for 3,402 cars for passenger equipment. In other words the electric railways ordered nearly 2,000 cars or 57.3 per cent more for passenger equipment than the steam lines. In view of the fact that the figures for the steam roads are probably even more complete than those of the electric railways they are impressive.

The cars ordered by the electric roads for passenger service include 3,730 cars for city service, 1,204 for interurban service and 319 to run on elevated lines. The number of cars of all kinds ordered to be built in company shops is 638 or 10.4 per cent. These figures and those showing 851 cars for freight service or 13.8 per cent are particularly interesting as indicating the extent to which the electric lines are devoting their attention to freight traffic and to the manner in which shops are being equipped to make the roads entirely independent of contract builders. The figures available showing equipment ordered by steam lines indicate that of the freight cars ordered to be built in company shops, the approximate total of all cars ordered for construction in company shops, was only 9.2 per cent. That is, the electric lines are, if anything, better equipped to care for their wants than the older steam lines.

Unfortunately, figures showing orders in previous years are not available for comparison, but assuming that the figures of American Street Railway Investments, which show the cars added to equipment of electric railways in 1905 to be 3,905 are fairly indicative of the orders placed during that year, the past year has seen an exceptional increase in equipment building activity by the electric lines. Taking the figures of the same authority there were on the lines of electric railways in the United States and Canada at the close of 1905 a total of 52,418 cars. The addition of 6,104 cars in 1906 represents an increase of 7.4 per cent.

At the close of the year ending June 1, 1905, the total mileage of electric lines in the United States and Canada was 34,106 and it is safe to assume that the addition of about 3,500 miles will give a reasonably accurate total at the close

of 1906 of approximately 37,600 miles. The figures of total equipment at the close of 1906 showing 88,577 cars indicate, therefore, that there are more than two cars to every mile of electrically operated track in the United States and Canada.

The figures tell their own story of the activity of electric traction lines during the past year, an activity which it is safe to say with respect to electric lines is without a parallel and which makes a showing that compares most favorably with that of the steam lines at the time of their greatest growth. How the permanence of the two works will compare is yet to be determined.

LOW STREET RAILWAY FARES IN CLEVELAND.

The Cleveland Electric Railway Company, which operates 236 miles of surface railways in the urban district of Cleveland, has just made a voluntary reduction in the rate of ticket fare to 3½ cents. The cash fare will remain at 5 cents but it is clear that it will seldom be paid except by visitors to Cleveland and residents who rarely use the street cars and there can be little doubt that from 90 to 95 per cent of the travel will be by those who use the seven-for-a-quarter tickets. Accompanying the reduction there is an extension of transfer privileges on the cross-town lines so that there can be no exception to the statement that Cleveland now has the lowest street railway fares, where the service available is considered, of any city in the world. The rates are absolutely lower than in any American city that is as large as Cleveland.

By this reduction the Cleveland Electric Railway puts in force as fully as it can without the legislative permission, which under the direction of Mayor Johnson, the city council still withholds, the terms of the offer on which the company is seeking a renewal of its rights to serve the public on the city streets. In other words the company has decided to afford its patrons a chance to test the merits of the consideration which, in addition to the surrender of existing rights, that although expiring at different dates from the year 1908 to 1929, have still an average life of from seven to eight years, it offers in exchange for a blanket grant running for twenty years and thus really amounting to a twelve-year extension of its rights. It is evidently the theory of the company that the users of the street cars will be so impressed with the convenience and desirability of the 3½-cent tickets and the more liberal transfers that the public sentiment created will force Mayor Johnson and his political associates to forego their own street railway plans and to deal with belated fairness with the old company. To an outsider this seems a most desirable result. The settlement of the prolonged and spectacular controversy over street railway fares and ownership which has long interfered with the development of Cleveland's facilities for urban transportation seems of the first importance and there is apparently no good reason for leaving it unsettled when an agreement can be made on the basis of the lowest fares in the world.

Hitherto Mayor Johnson has stood as a rock against the public demand for immediate settlement, but recent developments may have had the effect of decreasing his opposition. The disclosure of the extent of his financial interest in the Forest City Railway Company, the rival line which he promoted and for which he secured numerous franchise grants, has undoubtedly lessened his local prestige. The position of the old company has also been vastly strengthened by a series of favorable judicial decisions which have not only kept its officially favored rival from reaching the coveted terminal in the center of the city but have also indicated an early judicial determination that all of its alleged franchises are void and of no effect on account of Mayor Johnson's financial interest in them. It has already been held, in a carefully reasoned and thoroughly convincing opinion over-

ruling a demurrer, that if such a financial interest exists it utterly vitiates every franchise procured by the mayor and as Mayor Johnson has publicly admitted the facts necessary to establish the existence of such an interest it is merely a matter of weeks before the grants are declared invalid. Indeed, in evident anticipation of such a determination in the courts, the mayor's associates have organized a new corporation in which it is claimed that he has no interest, but as this corporation has very plainly inherited the mayor's extreme favor it is hardly likely that it will be judicially regarded as more than a very transparent subterfuge. Probably it was only formed in order to avoid a public admission of defeat pending negotiations for a settlement with the old company. The fact that the mayor's company is operating cars over five or six miles of streets at considerable daily loss which will continue at least as long as the legal situation remains unchanged is perhaps the strongest indication that a settlement will not be as obstinately opposed by Mayor Johnson as it has been since he was elected in 1901.

The fact is that there has been no time since the accession of the present management to the control of the companies consolidated in July, 1903, that lower fares were prevented by anything except the will of Mayor Johnson. Working in the ostensible interest of municipal ownership of Cleveland's street railways, a thing impossible under the laws of Ohio, and using the battle cry of "low fares" with 3-cent fares as the alleged object in view, Mayor Johnson has persistently stood in the way of a reduction by the old company, which is the only company that is in a shape to render the services wanted by the people of Cleveland, and his only real influence upon the situation has been to bring about a state of confusion, inconvenience and turmoil. If, as some of his critics assert, his real purpose was to harass and annoy the old company until he could purchase it for himself at a very low figure, he could not have worked more injury to the city and its interests.

The question whether, with American rates of wages and under American conditions, a street railway can be operated successfully on the basis of 3½-cent fares is one to which experience affords no adequate response. On a large scale, it has never before been attempted. The task which such figures devolve upon operating officers is a heavy one and only far-sighted and skilful operating officers can solve it—if it can be solved at all. How much help will come from the extra stimulation of traffic incident to the low rates and how much that stimulation will progress from year to year as the low fares affect the distribution of population within the urban district are now food for speculation rather than calculation. Street railway men will watch with profound interest the consequences of the low rates just inaugurated in Cleveland, if they are continued by the adoption of a proper agreement with the city, and will learn much from the results there. The results will also be watched by many who are not street railway men, who will want to know the influence of very low street railway charges upon the growth of cities and on their social and moral development.

Seeing San Antonio.

Visitors to San Antonio will have an opportunity to see all the points of interest in that city hereafter at a fair price, as the San Antonio Traction Company has solved the problem there of sightseeing by putting into service the first tourists' observation car which has ever been run in the south. The car, which has a seating capacity of 50 passengers, starts twice a day from the Alamo Plaza, in the center of the city, and with a guide to point out and explain all the points of interest as they are passed, runs for 35 miles over the traction company's lines, making a trip which with two short stop-overs, consumes four hours.—Southwestern Electrician.

STATISTICS OF ELECTRIC RAILWAY EQUIPMENT ORDERED IN 1906.

We present herewith a detailed statement of equipment ordered by the electric railways of the United States, Canada and Mexico during 1906, which we believe is the most complete list of the sort ever published. The figures are compiled from official sources and from the regular weekly records of the Electric Railway Review, and while necessarily incomplete in certain respects, as is the case with any lengthy detailed statistical statement, are as nearly accurate as it is possible to make them in the time available for their compilation. It will be well to bear in mind that the figures represent orders placed for equipment during the year just closed and not equipment delivered by the builders. The figures include both equipment built in contract and in company shops.

Unfortunately there are no figures for the previous year available, and hence it is impossible to state with any de-

gree of certainty, though it is more than possible, that the total of orders placed during 1906 was the largest in history, but the figures are at least effective testimony of the growth and importance of the electric traction field. For purposes of general interest the total has been divided into five classes, for which the figures are as follows:

Cars for city service.....	3,730
Cars for interurban service.....	1,204
Cars for elevated service.....	319
Freight cars	851
Electric locomotives	23
Total.....	6,127

Of the total, 638 cars or locomotives, or over 10 per cent, were built in company shops—evidence of the manner in which the electric railways are equipping their shops so as to be independently situated.

ELECTRIC EQUIPMENT ORDERED IN 1906.

Purchaser	No.	Class	Length	Serv.	Trucks	Builders	Purchaser	No.	Class	Length	Serv.	Trucks	Builders
Alton Gr. & St. L. Trac.	6		36-0	City	D. T.	American Car	Chattanooga Railways Co.	2					Brill
Anderson Trac. Co.	1	Comb.	50-0	Int.	D. T.	Brill	Chicago & Joliet Elec. Ry.	5	Pass.	38-0	Int.	D. T.	Brill
American Ry.	10	2 Pass.	50-0	Int.	D. T.	Brill	Chicago & Southern Trac.	10	Pass.	52-0	Int.	D. T.	St. Louis
Anniston Electric & Gas Co.	4	Closed.				Southern Car	Chicago City Ry.	50	Pass.	45-9	City	D. T.	American Car
Ardmore & Llanerch St. Ry.	4	2 Open.	45-3	Int.	D. T.	Brill	Chicago Un. Trac.	100	Pass.	40-0	City	D. T.	St. Louis
Athens Elec. Ry.	2	Open.				American Car	Chillicothe Elec. R. R. Lt. & Pwr. Co.	4	Semi-Conv.	30-1	City	S. T.	Brill
Augusta & Aiken Elec. Co.	6	Pass.				Brill	Choctaw Ry. & Lt.	2	Flat	60,000			Inter-State Car
Aurora Elgin & Chicago	9	Pass.	54-0	Int.	D. T.	Niles		1	Box	50,000			Inter-State Car
Benton Harbor St. Joe Ry. & Lt.	4	Pass.				Brill	Cinn. Newp. & Cov. Lt. & Trac. Co.	10	Pass.	31-0	City	S. T.	St. Louis
Binghamton Ry.	4	Closed	31-5	City	S. T.	Stephenson	Cincinnati Northern Trac.	20	Open				Cincinnati
Birm. Ry. Lt. & Pwr.	12	Pass.	42-0	City	D. T.	Co's Shops		15	Closed				Cincinnati
Boise & Interurban	1	Buffet	54-0	Int.	D. T.	Niles		10			Int.		Cincinnati
Boston & Northern St. Ry.	40	Semi-Conv.	45-10			Brill		3	Exp.				Cincinnati
Boston & Worces.	6	Semi-Conv.				Brill	Cleveland & Sharon Elec. Ry.	6			Int.		Kuhlman
Boston Elevated Ry.	45	Pass.		Elev.		Pressed Steel		2	Comb.				Kuhlman
Bristol & Plainville Tram. Co.	1	Open	32-0	Single		Wason		2	Box				Kuhlman
British Col. Elec.	17	Pass.				Co's Shops	Clev. & So. W. Trac. Co.	3	Pass. & Bag.	51-0	Int.	D. T.	Niles
Brooklyn Rapid Transit	50	Semi-Conv.				Jewett		7	Pass.	45-0	Int.	D. T.	Niles
Butte Elec. Ry. Co.	1	Open	37-0	City	D. T.	Co's Shops	Cleveland Painesville & Eastern.	6			Int.		Jewett
Calo Elec. & Trac. Co.	4	Pass.	30-8	City	S. T.	American Car	Coeur d'Alene & Spokane Ry.	2	Bag. & Pass.	56-0	Int.	D. T.	Brill
California St. Car R. It.	20	Cable				J. Hammond & Co.		4	Pass.	56-0	Int.	D. T.	Brill
Carden Interstate Ry.	10	1 Exp. & Bag	48-0	Int.	D. T.	Brill		2	Parlor	54-0	Int.	D. T.	Brill
Capital Traction Co.	25	Semi-Conv.	39-6	City	D. T.	Cincinnati		1	Loco.	45-0	Int.	D. T.	Brill
Cent. Cal. Trac. Co.	2	Hart				Rodger B. East		30	Flat	80,000			Fitz-Hugh Luther
Central Penn. Trac.	5	Pass.	32-0	City	D. T.	J. Hamd & Co.		25	Box	80,000			Fitz-Hugh Luther
Charleston Con. Ry. Gas & Elec.	4	Pass.	33-0	City	D. T.	St. Louis		10	Stock	60,000			Fitz-Hugh Luther
Chattanooga Trac. Co.	1	Exp.	50-0	Int.	D. T.	Niles	Columbus Delaware & Marion	2	Parlor		Int.		Niles
	4	Open	50-0	Int.	D. T.	Niles	Columbus New Albany & Johns. Trac. Co.	1	Comb.	50-0			Jewett
	1	Closed	50-0	Int.	D. T.	Niles		1	Semi-Conv.	50-0			Jewett
	1	Exp.	50-0	Int.	D. T.	Niles	Columbus Newark & Zanes. Elec.	1			Int.		Cincinnati
	1	Closed	50-0	Int.	D. T.	Niles		5	Closed	31-0	City	S. T.	Jewett
	1	Exp.	50-0	Int.	D. T.	Niles	Columbus R. R. Columbus St. Ry. & Lt. Co.	10	Open				St. Louis
	1	Closed	50-0	Int.	D. T.	Niles		10					Kuhlman
	1	Exp.	50-0	Int.	D. T.	Niles		8	Semi-Conv.	30-0	City	S. T.	Brill
	1	Closed	50-0	Int.	D. T.	Niles		5	Semi-Conv.	40-0	City		Brill
	1	Exp.	50-0	Int.	D. T.	Niles		5	Freight	40-0	Int.	D. T.	Brill
	1	Closed	50-0	Int.	D. T.	Niles		3	Open	34-0			Brill
	1	Exp.	50-0	Int.	D. T.	Niles		2	Open				Cincinnati
	1	Closed	50-0	Int.	D. T.	Niles		10	Closed	41-0			Cincinnati
	1	Exp.	50-0	Int.	D. T.	Niles		3	Closed	30-0			Cincinnati
	1	Closed	50-0	Int.	D. T.	Niles		38	Closed				Wason
	1	Exp.	50-0	Int.	D. T.	Niles		2	Flat				Wason
	1	Closed	50-0	Int.	D. T.	Niles		3	Open	34-0	Both	D. T.	Brill
	1	Exp.	50-0	Int.	D. T.	Niles		1	Bag & Exp.	46-0	Int.	D. T.	Brill
	1	Closed	50-0	Int.	D. T.	Niles		1	Express	50-0			Niles
	1	Exp.	50-0	Int.	D. T.	Niles		6	Closed				Co's Shops
	1	Closed	50-0	Int.	D. T.	Niles		12	Pass.				Washer Bros.
	1	Exp.	50-0	Int.	D. T.	Niles		2	Observ.				Washer Bros.
	1	Closed	50-0	Int.	D. T.	Niles		18	Trail				Washer Bros.
	1	Exp.	50-0	Int.	D. T.	Niles		30	Car Bodies				Washer Bros.
	1	Closed	50-0	Int.	D. T.	Niles		1	Parlor	61-10	Spd	D. T.	D. H. R. Shops
	1	Exp.	50-0	Int.	D. T.	Niles		3	Pass.	51-7 1/2	Int.	D. T.	Cincinnati
	1	Closed	50-0	Int.	D. T.	Niles		7	Pass.	52-7 1/2	Int.	D. T.	Cincinnati
	1	Exp.	50-0	Int.	D. T.	Niles		3	Exp.	50-0	Int.	D. T.	St. Louis
	1	Closed	50-0	Int.	D. T.	Niles		6	Pass.	34-9	City	S. T.	Cincinnati
	1	Exp.	50-0	Int.	D. T.	Niles		12	Pass.	31-9	City	S. T.	Co's Shops

ELECTRIC EQUIPMENT ORDERED IN 1906.—Continued.

Purchaser	No.	Class	Length	Serv.	Trucks	Builders	Purchaser	No.	Class	Length	Serv.	Trucks	Builders
Detroit Ulfed Ry.	10	Box	32-0	Int.	D. T.	Am. C. & F. Co.	Indpls. Columbus & So. Trac.	3	Comb.	50-0	Int.	D. T.	Niles
Douglas St. Ry.	3	Comb.	40-0	City	D. T.	Kuhlman	Indpls. Crawford & Western	8	Pass.	57-8	Int.	D. T.	Jewett
Dunkirk & Fredonia	4	Pass.	31-0	Int.	D. T.	Cincinnati	Indpls. Newcastle & Tol.	2	Exp.	50	Int.	D. T.	Jewett
Dunkirk St. Ry.	4	Pass.	31-0	Int.	D. T.	Cincinnati	Indpls. Newcastle & Tol.	8	Pass.	60-8	Int.	D. T.	Jewett
East Liverpool Lt. & Trac.	10	Pass.		Int.	D. T.	Kuhlman	Indpls. Newcastle & Tol.	2	Exp.	50-0	Int.	D. T.	Jewett
East St. Louis & Suburban	6	Pass.	34-0	City	D. T.	American Car	Indpls. Trac. & Term. Co.	30	Closed	50-0	Int.	D. T.	Cincinnati
Easton & Washington Trac.	5	Pass.		City	S. T.	Wason	Indpls. Trac. & Term. Co.	20	Open		Int.	D. T.	Cincinnati
Easton Transit Co.	7	Pass.	30-5	City	S. T.	Brill	Inland Empire	15	Pass.		Int.	D. T.	St. Louis
Electric Co., Guadalajara	32	Pass.	30-0	City	S. T.	McGuire-Cum'gs	International Ry.	12	Flat	43-5	City	D. T.	Pressed Steel
Elgin & Belvidere Elec. Co.	8	Pass.	47-1	Int.	D. T.	St. Louis	Jackson & Sub. St. Ry.	150	Pass.	45-9	City	D. T.	Kuhlman
Elgin Aurora & So. Elmira Water Lt. & R. R.	2	Pass.	45-0	Int.	D. T.	Niles	Jackson Elec. Ry. Lt. & Pwr. Co.	11	Open		Int.	D. T.	American Car
Erie R. R.	2	Pass.	45-0	Int.	D. T.	St. Louis	Johnstown Pass. Ry.	8	Semi-Conv.		Int.	D. T.	American Car
Erie Elec. Motor Co.	13	Pass.	40-0	City	D. T.	Cincinnati	Joliet Plainfield & Aurora	6	Closed		Int.	D. T.	Kuhlman
Evansville & East-ern Elec.	5	Pass.		Int.	D. T.	American Car	Joliet Plainfield & Aurora	6	Open		Int.	D. T.	Kuhlman
Evansville & Mt. Vernon Elec. Ry.	3	Pass.	46-0	Int.	D. T.	St. Louis	Joliet Plainfield & Aurora	10	Car Bodies		Int.	D. T.	St. Louis
Evansville Elec. Ry.	1	Bag.	44-0	Int.	D. T.	St. Louis	Kankakee Elec. Ry.	2	Comb.	49-0	Int.	D. T.	American Car
Evansville Suburban & Newb.	10	Closed	31-8	City	S. T.	Cincinnati	Ks. C. & Westport Belt	4	Trail.	49-0	Int.	D. T.	American Car
Fairmont & Clarks- Burg Trac. Co.	6	Semi-Conv.	50-0	Int.	D. T.	Jewett	Ks. C. & Westport Belt	8	Pass.	31-0	City	S. T.	St. Louis
Forest City Ry.	4	Flat	50.000	Int.	D. T.	Hicks L. & C. Wks.	Kansas Cy.-West-ern Ry. Co.	1	D. C. Loco.		Int.	D. T.	Am. Loco. Co.
Fort Smith Lt. & Trac. Co.	6	Open	30-0	City	S. T.	American Car	Kenosha Elec. Ry.	4	Pass.	52-0	Int.	D. T.	American Car
Ft. Wayne & Spring- Ry.	1	Exp.	50-0	Int.	D. T.	Niles	Key West Elec. Co.	6	Pass. S. & B.	48-7	Int.	D. T.	St. Louis
Ft. Wayne & Wab. Val. Trac.	5	Pass. B. & S.	55-0	Int.	D. T.	Cincinnati	Knoxville Ry. & Lt.	2	Exp.	46-6	Int.	D. T.	McGuire-Cum'gs
Frankfort & Ver- sailles Trac.	7	Semi-Conv.		Int.	D. T.	Cincinnati	Kokomo, Marion & West. Trac. Co.	2	Open	31-0	City	S. T.	Stone & Webster
Fresno Traction Co.	2	Exp.	50-0	Int.	D. T.	Cincinnati	Kokomo, Marion & West. Trac. Co.	10	Pass.	32-9	City	S. T.	St. Louis
Galesburg & Kew- Galt Prest. & Hesp.	7	Pass.	61-6	Int.	D. T.	Cincinnati	Kokomo, Marion & West. Trac. Co.	3	Pass.	45-2	City	D. T.	Brill
Galveston Elec. Co.	3	Open	37-8	Both	D. T.	American Car	Lake Erie Bowling Green & Napoleon	2	Open	37-8 1/2	City	D. T.	Cincinnati
Georgia Ry. & Elec. Co.	25	Pass.	31-6	City	S. T.	Co.'s Shops	Lake Erie Bowling Green & Napoleon	2	Open	29-9 1/2	City	S. T.	Cincinnati
Goffs Falls Litch- field & Hud.	6	Closed		Int.	D. T.	Niles	Lake Erie Bowling Green & Napoleon	2	Closed	30-8	City	S. T.	Cincinnati
Groton & Stoning- ton St. R. R. Co.	2	Pass.	42-8	Int.	D. T.	Niles	Lancaster & East-ern St. Ry.	4	Pass.		Int.	D. T.	Jewett
Hamburg Ry.	12	Pass.	40-0	City	D. T.	Kuhlman	Lewiston Brunswick & Bath	10	Pass. B. & S.	50-0	Int.	D. T.	Jewett
Hartford & Spring- field St. Ry.	2	Closed		Int.	D. T.	Wason	Lewiston Brunswick & Bath	5	Pass. & Bag.	51-0	Int.	D. T.	Niles
Helena Lt. & Ry. Co.	3	Pass.	31-2	Both	S. T.	Jewett	Lima & Toledo Trac. Co.	3	Semi-Conv.		Int.	D. T.	Brill
Hoboken Shore Rd. Houston Elec. Co.	1	Loco.		Int.	D. T.	Baldwin	Lima & Toledo Trac. Co.	10	Pass.	55-0	Int.	D. T.	Cincinnati
Hudson Companies.	20	Semi-Conv.		Int.	D. T.	American Car	Lima & Toledo Trac. Co.	1	Pass.	62-0	Int.	D. T.	Cincinnati
Hutchinson Int. Ry. Co.	40	Pass.		Int.	D. T.	Am. C. & F. Co.	Lima & Toledo Trac. Co.	2	Exp.	50-0	Int.	D. T.	Cincinnati
Illinois Trac. Sys.	10	Pass.		Int.	D. T.	Pressed Steel	Lima & Toledo Trac. Co.	2	Work	45-0	Int.	D. T.	Cincinnati
Ind. Columbus & Eastern	5	Semi-Conv.	30-0	City	S. T.	American Car	Lincoln Trac. Co.	8	Conv.	30-7	City	S. T.	American Car
Ind. Union Trac. Co.	2	D. C. Locos.		Int.	D. T.	Am. Loco. Co.	London St. Ry.	5	Pass.		Int.	D. T.	Ottawa
Indianapolis & East- ern Ry.	10	Pass.		Int.	D. T.	Am. Loco. Co.	Lorain St. Ry. Co.	5	Semi-con.	48-6	Both	D. T.	Kuhlman
Indianapolis & West- ern Ry.	10	Pass.		Int.	D. T.	Am. Loco. Co.	Los Ang. & Red.	10	Flat	80.000	Int.	D. T.	Co.'s Shops
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Los Angeles Ry.	10	Pass.		Int.	D. T.	Co.'s Shops
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Louisville Ry.	100	Comb.		Int.	D. T.	St. Louis
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Louisville Ry.	30	Pass.		Int.	D. T.	St. Louis
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Macon Ry. & L. Co.	6	Semi-conv.	30-1	City	S. T.	Brill
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Macon Ry. & L. Co.	4	Semi-conv.	37-5	City	D. T.	Brill
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Madison & Int. Trac. Co.	8	Semi-Conv.		Int.	D. T.	American Car
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Mahoning & Shen- ango Ry. & Lt. Marion Bluffton & E. Trac. Co.	24	Pass.		Int.	D. T.	Niles
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Mahoning & Shen- ango Ry. & Lt. Marion Bluffton & E. Trac. Co.	1	Work	45-0	Int.	D. T.	Niles
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Mahoning & Shen- ango Ry. & Lt. Marion Bluffton & E. Trac. Co.	1	Exp. & Bag.	45-0	Int.	D. T.	Cincinnati
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Mahoning & Shen- ango Ry. & Lt. Marion Bluffton & E. Trac. Co.	5	Pass.	45-0	Int.	D. T.	Cincinnati
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Medical Lake Sub. Line	1	Pass.		Int.	D. T.	Brill
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Medical Lake Sub. Line	4	Trail.		Int.	D. T.	Brill
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Memphis St. Ry.	20	Semi-Conv.		Int.	D. T.	Brill
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Memphis St. Ry.	5	Semi-Conv.		Int.	D. T.	American Car
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Meridian Lt. & Ry. Metropolitan St. Ry. Co.	45	Pass.	46-5 1/2	City	D. T.	St. Louis
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Meridian Lt. & Ry. Metropolitan St. Ry. Co.	5	Pass.	46-5 1/2	City	D. T.	American Car
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Metropolitan West Side Ry.	50	Pass.		Elevated	D. T.	Pullman
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Metropolitan West Side Ry.	2	Pass.	45-0	Int.	D. T.	Niles
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Mich. United Ry.	12	Open		Int.	D. T.	St. Louis
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Mich. United Ry.	20	Open		Int.	D. T.	St. Louis
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Mich. United Ry.	10	Semi-Conv.	31-0	Int.	D. T.	St. Louis
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Milwaukee Elec. Ry. & Lt. Co.	100	Pass.		Int.	D. T.	St. Louis
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Milwaukee No. Ry.	8	Pass.	51-0	Int.	D. T.	Niles
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Milwaukee No. Ry.	8	Pass.	41-0	City	D. T.	Niles
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Mobile Lt. & R. R. Co.	6	Semi-Conv.	30-3	City	S. T.	American Car
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Mobile Lt. & R. R. Co.	6	Semi-Conv.	41-2	City	D. T.	American Car
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Montreal St. Ry.	100	Semi-Conv.		Int.	D. T.	Co.'s Shops
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Montreal St. Ry.	10	Pass.		Int.	D. T.	Canada Car
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Montreal St. Ry.	10	Pass.		Int.	D. T.	Pressed Steel
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Montreal St. Ry.	50	Pay-as-you-enter		Int.	D. T.	Ottawa
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Montreal St. Ry.	10	Semi-Conv.	42-1	City	D. T.	Brill
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Nash. Ry. & Lt. Co. N. J. & Hudson Riv. Ry. & Ferry N. O. Ry. & Lt. Co. New York Cent. & Hud. Riv.	8	Closed		Int.	D. T.	Stephenson
	10	Pass.		Int.	D. T.	Am. Loco. Co.	Nash. Ry. & Lt. Co. N. J. & Hudson Riv. Ry. & Ferry N. O. Ry. & Lt. Co. New York Cent. & Hud. Riv.	25	Semi-Conv.		Int.	D. T.	American Car
	10	Pass.		Int.	D. T.	Am. Loco. Co.	New York City Ry. No. Ala. Trac. Co. No. Elec. Ry.	55	Trail.	60-0	Sub.	D. T.	St. Louis
	10	Pass.		Int.	D. T.	Am. Loco. Co.	New York City Ry. No. Ala. Trac. Co. No. Elec. Ry.	6	B. M. & Ex.	80-0	Sub.	D. T.	St. Louis
	10	Pass.		Int.	D. T.	Am. Loco. Co.	New York City Ry. No. Ala. Trac. Co. No. Elec. Ry.	43	Closed	37-2	City	D. T.	Brill
	10	Pass.		Int.	D. T.	Am. Loco. Co.	New York City Ry. No. Ala. Trac. Co. No. Elec. Ry.	3	Closed	29-0	City	S. T.	American Car
	10	Pass.		Int.	D. T.	Am. Loco. Co.	New York City Ry. No. Ala. Trac. Co. No. Elec. Ry.	3	Comb. Pass.	56-0	Int.	D. T.	Niles
	10	Pass.		Int.	D. T.	Am. Loco. Co.	New York City Ry. No. Ala. Trac. Co. No. Elec. Ry.	3	Trail.		Int.	D. T.	Niles
	10	Pass.		Int.	D. T.	Am. Loco. Co.	New York City Ry. No. Ala. Trac. Co. No. Elec. Ry.	2	Comb.	56-0	Int.	D. T.	Co.'s Shops
	10	Pass.		Int.	D. T.	Am. Loco. Co.	New York City Ry. No. Ala. Trac. Co. No. Elec. Ry.	4	Trail.		Int.	D. T.	Co.'s Shops
	10	Pass.		Int.	D. T.	Am. Loco. Co.	New York City Ry. No. Ala. Trac. Co. No. Elec. Ry.	2	Loco.	30-0	Int.	D. T.	Co.'s Shops
	10	Pass.		Int.	D. T.	Am. Loco. Co.	New York City Ry. No. Ala. Trac. Co. No. Elec. Ry.	2	Exp.	50-0	Int.	D. T.	Co.'s Shops

ELECTRIC EQUIPMENT ORDERED IN 1906.—Continued.

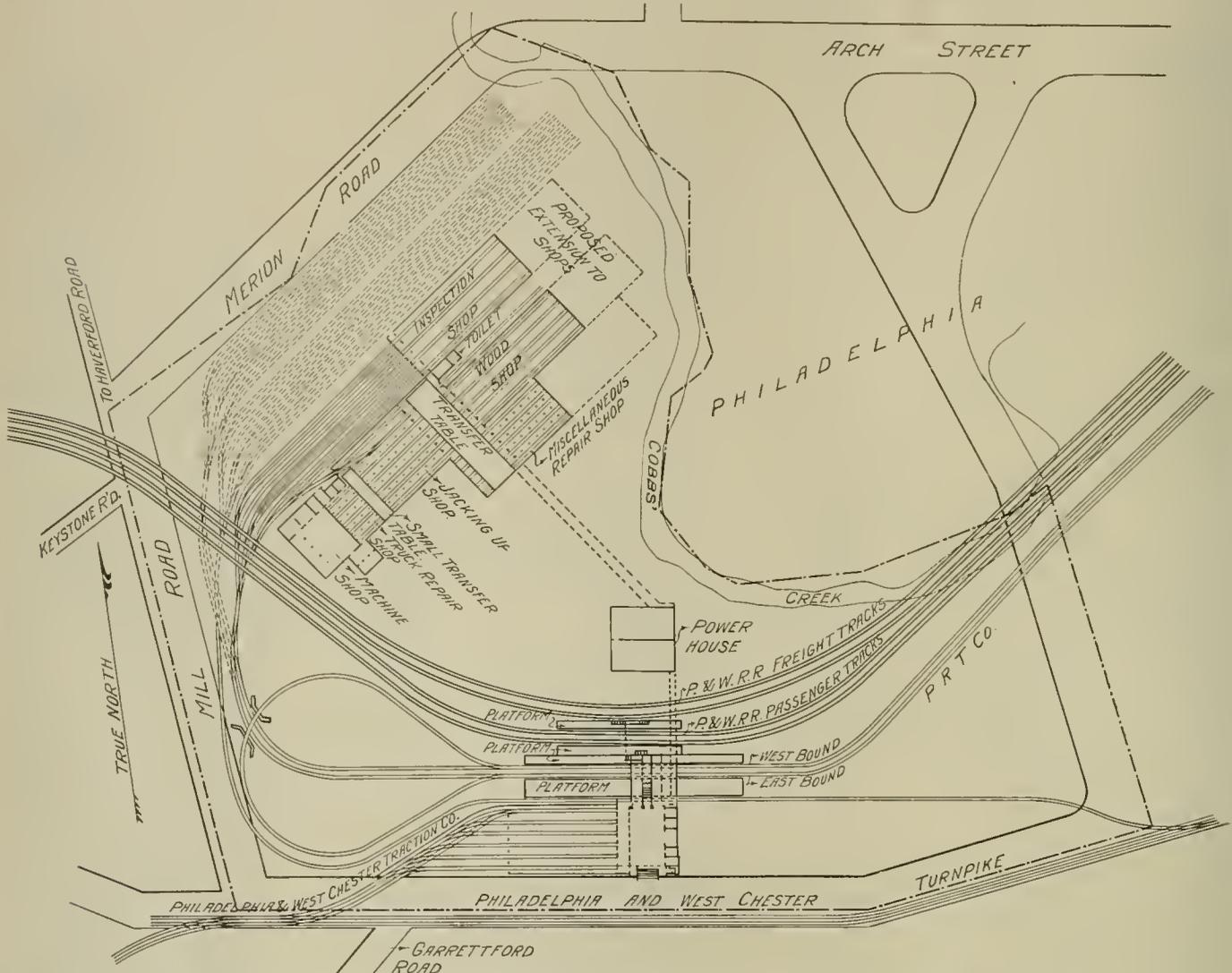
Purchaser	No.	Class	Length	Serv.	Trucks	Bullders	Purchaser	No.	Class	Length	Serv.	Trucks	Bullders
No. Elec. Co.	200	Flat	80,000			Fitz-Hugh Luther	S. W. Mis. R. R.	8	Pass.	42-0	Int.	D. T.	Co.'s Shops
	50	Box	80,000			Fitz-Hugh Luther		1	Frt.	34-0		D. T.	Co.'s Shops
	50	Hart				Rodger Ballast	S. W. Traction Co.	6	Pass.				Ottawa
Nor. Ohio Trac. & Lt. Co.	10			Int.		Cincinnati	Spokane & Inland	18	Pass.				Brill
N. W. Elevated	34	Pass.	Elevated			D. T. Jewett		6	Exp.				Brill
Norwich & Westery	1	Bag. & Frt.				Southern Car		40	Flat	60,000		Am. C. & F. Co.	
	8	Pass.				Southern Car		30	Box	80,000		Am. C. & F. Co.	
Ocean Shore Ry.	10	Comb.	50-0	Int.		D. T. W. L. Hol. & Co.		25	Pass.	80,000	City		St. Louis
	30	Comb.	60-0	Int.		D. T. W. L. Hol. & Co.		30	Flat	80,000		Fitz-Hugh Luther	
	3	Loco.	36-0	Int.		D. T. W. L. Hol. & Co.		25	Box	80,000		Fitz-Hugh Luther	
Ohio Trac. Co.	12	Pass.	45-0	Both		D. T. Cincinnati	Stockton Elec. R.R.	3	Caboose	80,000			Seattle Car Co.
Okla. City Ry.	4	Pass.	40-0			St. Louis	Stroudsburg & Water Gap St. Ry.	18	Pass.	36-0	City	D. T.	Am. C. & F. Co. St. Louis
Old Colony St. Ry.	40	Pass.				Brill		2	Semi-Conv.		Int.	D. T.	Brill
	1					St. Louis		1	Flat				Brill
Olean St. Ry. Co.	6	Pass.	41-8	Both		D. T. Cincinnati	Syracuse L. Shore & Northern	6	Open	42-0	Int.	D. T.	St. Louis
	6	Pass.	41-8	Both		D. T. Brill		1	Work	53-0	Int.	D. T.	Niles
	1	Sm. & Frt.		Both		D. T. Brill		1	Bag. & Ex.	53-0	Int.	D. T.	Niles
Omaha & Council Bluffs St. Ry.	25	Closed	40-0	City		D. T. American Car	Syracuse Rapid Tran. Ry.	10	Pass.	45-0	City	D. T.	Kuhlman
Omaha Lincoln & Beatrice	1	Ex. & Pass.	44-9	Sub.		D. T. St. Louis	Tacoma Ry. & Pwr.	50	Flat & Box				Co.'s Shops
	1	Pass.	44-9	Sub.		D. T. St. Louis		1	Pass.				Co.'s Shops
	1	Semi-Conv.	31-8	Sub.		S. T. St. Louis		2	Loco.				Co.'s Shops
Oregon Water Pwr. & Ry.	18	Trall.				Co.'s Shops	Tama & Tol. Elec. Ry. & Lt. Co.	2	Trall.				McGuire-Cummings
	6	Pass.				D. T. Co.'s Shops		1	Pass. & Bag.				McGuire-Cummings
Oswego Trac. Co.	2	Pass.	30-0	City		S. T. Brill	Terre Haute Trac. & Lt. Co.	10	Closed				American Car
Ottawa Elec. Ry.	6	Open				Ottawa		1	Closed		Int.		Cincinnati
	3	Mall				Ottawa		8	Closed				Jewett
Ottumwa Trac. & Lt. Co.	5	Open	30-0	City		S. T. American Car	Toledo & Inda. Ry.	4	Pass.	52-0	Int.		Jewett
	3	Closed	30-0	City		S. T. American Car		10	Box	40-0	Int.		Co.'s Shops
Owensboro City R. P. Co.	20	Freight	15-0			S. T. Co.'s Shops		1	Loco.		Int.		Co.'s Shops
Pacific Elec. Ry.	52	Pass.	48-0	Int.		D. T. St. Louis	Toledo Port Clinton & Lakeside	1	Exp.	50-0	Int.	D. T.	Niles
Paducah Trac. Co.	4	Semi-Conv.	38-0	City		D. T. American Car		2	Comb. Pass.	50-0	Int.	D. T.	Niles
Pensacola Elec. Term. Ry.	1	Exp.				Jewett	Topeka Ry. Co.	4	Closed	31-6	City	S. T.	American Car
	1	Frt.				Jewett	Toronto Ry. Co.	6	Closed	40-0	City	D. T.	Co.'s Shops
	2	Closed				American Car		6	Closed	60-0	Int.	D. T.	Co.'s Shops
	10	Semi-Conv.	45-0	City		D. T. Jewett		1	Exp.	45-0	Int.	D. T.	Co.'s Shops
People's Ry.	10	Semi-Conv.	45-0	City		D. T. Jewett		1	Flat	40-0	City	D. T.	Co.'s Shops
Phil. & Garrettford St. Ry.	3		45-3	Int.		D. T. Brill		1	Supply	35-0	City	S. T.	Co.'s Shops
Phlla. & W. Chester Trac.	7		48-6	Int.		D. T. Jewett		6	Conv.-as-you-enter	36-0	City	D. T.	Co.'s Shops
Phlla. & Western	22	Pass.	51-4	Sub.		D. T. St. Louis	Tri-City Rys.	70	Conv.	40-0	City	D. T.	Co.'s Shops
	2	Exp.	51-4	Sub.		D. T. St. Louis		3	Closed	42-0	City	D. T.	Co.'s Shops
	1	Const.	50-0	Sub.		D. T. St. Louis	Trinidad Elec. R. R.	30	Closed	31-0	City	S. T.	Co.'s Shops
Phlla. Rapid Transit	150			Elev.		D. T. Brill	Twin City Rapid Transit Co.	2	Pass.	31-8	City	S. T.	St. Louis
	40			Elev. & Subway		D. T. Pressed Steel	Union St. Ry.	50	Pass.				Co.'s Shops
Pittsb. & Butler St. Ry.	10			Int.		Niles		6	Vestib.	42-0	City	D. T. J. M. Jones' Sons	
Pittsburg & Westmoreland Ry.	4			Int.		McGuire-Cummings		1	Bag. & Ex.	45-0	Int.	D. T. J. M. Jones' Sons	
Pitts. Ry. & Lt. Co.	6					D. T. St. Louis		1	Bag. & Ex.	31-0	Int.	D. T. Brill	
Portland Ry.	4			Sub.		Co.'s Shops		1	Mall	26-0	Int.	S. T. Co.'s Shops	
	2	Trall.				Co.'s Shops	Union Ry. Co.	25	Closed				Brill
	12	Pass.				Co.'s Shops		25	Open				Brill
Poughkeepsie City & Wap. Falls	12	Semi-Conv.		City		S. T. Brill		50	Trall.				Brill
	6	10-Bench Open		City		S. T. American Car	United Rys. & Elec. Co.	100	Semi-Con.	41-10	Both	D. T.	Brill
	1	Semi-Conv.		Int.		D. T. Brill	United R. R. of San Francisco	50	Pass.				Brill
Public Serv. Corp.	96	Semi-Conv.				Brill		12			Int.		St. Louis
Puget Sound Elec. Ry.	30	Flat				Co.'s Shops	United Trac. Co.	350			City	D. T.	Co.'s Shops
	1	Loco.				Co.'s Shops	Utah Lt. & Ry. Co.	5	Pass.	28-0	City	D. T.	St. Louis
	2	Pass.				Co.'s Shops		1	Loco.	23-0	City	D. T. West. Elec. & Mf.	
Quebec Ry Lt. & Pwr. Co.	25	Flat				Rathbun Co.	Utica & Mohawk Valley	15			Int.		Brill
	3	Pass.	50-0			Ottawa	Vincennes Trac. & Lt. Co.	2	Open	38-0	City	D. T.	American Car
Rhode Island Co.	71	Open	37-8 1/2			Cincinnati	Va. Pass. & Pwr.	20	Semi-Conv.				Brill
	34	Closed	35-7			Cincinnati	Wash. Alex. & Mt. Vernon	7	Pass.				Brill
Rhode Island Co.	112	Open	37-9	Both		D. T. Cincinnati		7	Trall.				Brill
	34	Closed	35-7	Both		D. T. Cincinnati	Washington Rys. & Elec. Co.	1	Loco.		Sub.	S. T. Baldwin-West.	
Richmond & Chesapeake Bay	4	Pass.	54-5	Int.		D. T. St. Louis		40	Closed	39-6	City	D. T.	St. Louis
Roanoke Ry. & Elec. Co.	1					Brill	Washington Water Power Co.	15	Semi-Conv.				Brill
Rochester Ity. Co.	40	Semi-Conv.	45-0	City		D. T. Kuhlman		1	Pass. Sm. & Bg.		Int.	D. T.	Brill
Rockford & Int. Ry. Co.	4	Trall.	32-0	City		S. T. St. Louis		1	Trall.		Int.	D. T.	Brill
	4	Closed	32-4	City		S. T. Co.'s Shops	West Jer. & Sea.	18	Couch				Brill
	6	Open	32-0	City		S. T. St. Louis		22	Car bodies				Am. C. & F.
Rock Isl. So. R. R.	3		52-0	Int.		D. T. St. Louis		22	Car bodies				Wason
	1	Exp.	45-0	Int.		D. T. St. Louis		6	Baggage				Wason
Rocky Brd. Brook & E. Windsor	2	Closed				Wason	Westchester Kennett & W. Ity.	1	Car body				Am. C. & F. Co.
St. John Ry. Co.	6	Pass.				Ottawa	Whitcom Co. Ry. & Lt. Co.	2	Semi-Conv.	47-0	City	D. T.	St. Louis
Salisbury & Spencer Ry.	2	Semi-Conv.	31-9	City		S. T. Southern Car	Wheeling Trac. Co.	1	Exp.				Niles
San Ant. Trac. Co.	4	Semi-Conv.	37-5	City		D. T. American Car		5	Semi-Conv.	40-0	City	D. T.	Kuhlman
San Diego Elec. Ry.	4			Int.		Co.'s Shops	Windsor Essex & L. S. R. R.	5	Pass.				Ottawa
San Fran. Oakland & San Jose	10	Pass.				Co.'s Shops		6		40-0	City	D. T. Tor. Ry. Co.'s Sh.	
Savannah Elec. Co.	8	Semi-Conv.	40-0	City		D. T. Stephenson		6		40-0	City	D. T.	Ottawa
	4	Trall.	40-0	Sub.		D. T. Co.'s Shops	Winnipeg Elec. Ry.	10		40-0	City	D. T.	Co.'s Shops
Schenectady Ity. Co.	6	Closed	41-10	Int.		D. T. St. Louis		4		40-0			S. T. McGuire-Cum'g's
	6	Closed	40-4	City		D. T. St. Louis	Winona Interurban	1	Library	50-0			D. T. Cincinnati
Seattle Elec. Ry.	18	Flat	50,000			Hicks L. & C. Wks	Worc. Poly Inst.						
Shawnee Trac. Co.	3					St. Louis	Youngtown & So. Ity.	5			Int.		Niles
	4	Open				St. Louis		9			Int.		Jewett
	4	Closed				St. Louis	Zanesville & B. E. Ry.						
Sloux City Tr. Co.	4	Pass.	40-3/4	City		D. T. Co.'s Shops	Zanesville Ry. Lt. Pwr. Co.	4			Int.		Cincinnati
South Covington & Cin. St. Ity.	10	Conv.				St. Louis	Total Electric Equipment	6,127					
South Side Elev.	4	Coal				D. T. Am. C. & F. Co.							

MARKET STREET TERMINAL, PHILADELPHIA.

In the Street Railway Review of September 15, 1905, brief reference was made to the joint terminal station to be located at the western terminus of the Philadelphia Rapid Transit Company's elevated line at Market and Sixty-ninth streets and to be used by the elevated lines of the Philadelphia Rapid Transit Company, by the Philadelphia & Westchester Traction Company and by the Philadelphia & Western Railroad. At a point 690 feet west of the western limit of the city of Philadelphia at Sixty-third street, the elevated, by an easy curve, reaches the private right of way of the company

Westchester pike along which extends the present line of the Philadelphia & Westchester Traction Company, the latter ending at Sixty-third street.

The main portion of the Philadelphia Rapid Transit Company's section of the building, which is the southeast corner, containing the main waiting room, has a front of 97 feet and a depth of 117 feet, with an extension at the rear of this 75 feet wide and 79 feet long, reaching over one emergency and two main passenger tracks and two platforms of the Philadelphia Rapid Transit Company. The platforms for this line are 350 feet long. Elevated cars will pass under the rear portion of the station from the east and discharge passengers



Market Street Terminal, Philadelphia—General Plan Showing Arrangement of Tracks and Buildings.

and passes on to the new terminal station, three-quarters of a mile beyond, as a double-track surface line.

Arrangement of Buildings and Tracks.

The station, a building of Flemish bond brick with terra cotta trimmings, which is approaching completion, consists at present of two parts, one built by the Philadelphia Rapid Transit Company and the other built by a subsidiary company of the Philadelphia & Westchester Traction Company. An addition to the present station with communication to the waiting room thereof will be added to the northern end of the present building by the Philadelphia & Western Railroad, the tracks of which pass through the Philadelphia Rapid Transit Company's terminal property about midway between the station building and the new shops.

The two parts of the present building are practically one, but each section was built by the company to occupy it. The station building faces the south on the Philadelphia &

at the north platform, from which they can reach the main waiting room exits above by means of a stairway. These exits on the west will lead to the Philadelphia & Westchester Traction Company trains and on the south to the street, or passengers arriving on the north platform may transfer to the platforms of the Philadelphia & Western Railroad. After discharging passengers the trains of the Rapid Transit Company proceed around a loop of 150 feet radius west of the platforms and return to the south side of the station platform to receive eastbound passengers. The main tracks continue in a direct line through the center of the loop and curve from the point of crossing with the loop tracks, continuing thence to the shops of the company. The loop track is gradually elevated to a sufficient height to avoid a crossing at grade at the intersection with the storage yard tracks. The loop is partially encircled by a second track leading from the storage yard to the station, extending under the station as

an emergency track upon which one or two extra trains ready for service will usually stand and from which freight may be unloaded at the basement level; and thence continuing as a switch track connection with the tracks of the Philadelphia & Westchester on the turnpike. It has been arranged that cars from the surface lines of the Philadelphia Rapid Transit Company shall proceed to the shops of the company over the Philadelphia & Westchester track from Sixty-third street and thence over this switch line. Reference to the general plan

of reinforced concrete consisting of slabs 8 inches thick supported on reinforced concrete girders and posts. The posts are 2 feet 6 inches square and are spaced 18 feet apart transversely and longitudinally. Where the platform passes under the building the columns are carried above the platform as circular reinforced concrete posts 20 inches in diameter, serving to support the arches over the tracks. The top of the arch is 16 feet and the platforms 3½ feet above the rail. The north or unloading platform is 15 feet wide and



Market Street Terminal, Philadelphia—Artist's Sketch of Building Now Under Construction.

makes evident the convenience with which cars may be taken out or returned to service at this terminal.

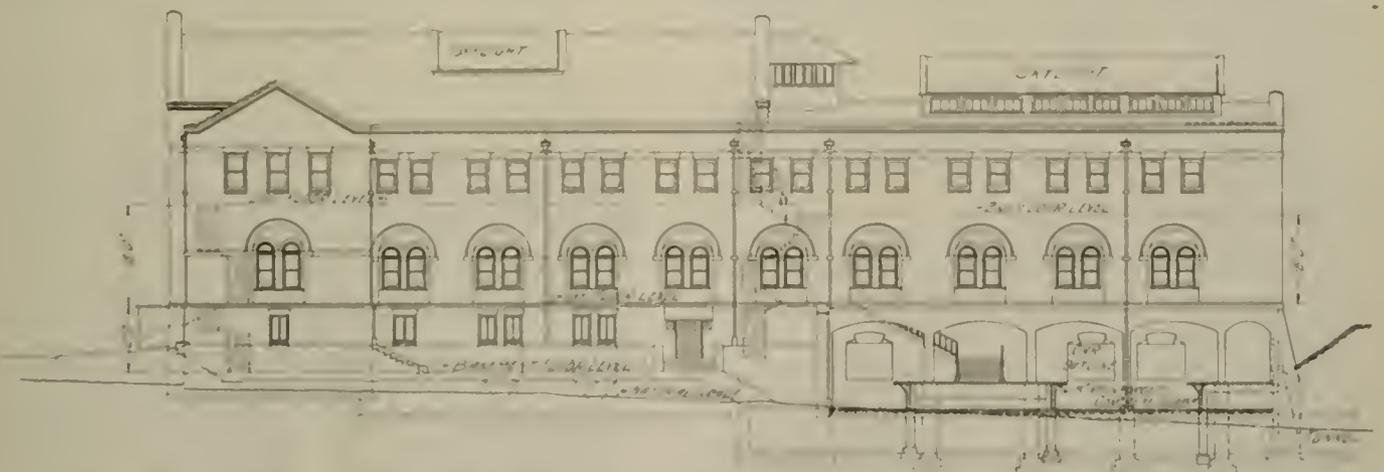
Building Details.

Entrance to the waiting room of the station on the first floor is through a handsome vestibule at the south end. The waiting room is 84 by 59 feet. Along its east side there are some small offices for the use of the personnel and retiring rooms for the public on the ground floor, while a balcony on the second floor serves another tier of offices on the east and south sides. On the west side of the waiting room are exits leading to a lobby 40 feet wide, extending the length of the room. The waiting room of the Philadelphia Rapid Transit Company will be used in common by all passengers. At the north end of the Rapid Transit waiting room are three passages, one admitting to stairs leading downward over the

the eastbound or loading platform, which also serves the emergency track and receives the stairway from the waiting room above, has a total width of 33 feet.

The Philadelphia & Westchester Traction Company's section of the building has a south frontage on the Philadelphia & Westchester turnpike of 172 feet and extends 117 feet back from the street. A portion of the east end, 54 feet wide, is two stories in height, with the upper floors to be devoted to office purposes.

The arrangement of the tracks in this portion of the station differs from that of the Rapid Transit Company's section, as this is a stub-end terminal while that of the Rapid Transit Company is a loop terminal. Five parallel tracks are provided in the station. These enter the building at approximately the waiting room level by means of an inclined



Market Street Terminal, Philadelphia—East Elevation Showing Platform Arrangement for Philadelphia Rapid Transit Trains.

emergency track to the eastbound platform and one giving exit from the westbound platform. The third is a corridor giving access to rooms for the accommodation of the trainmen and also will connect with the building to be erected by the Philadelphia & Western Railroad. Offices for the sale of tickets are placed in the waiting room on each side of the passage leading to the loading platform. The second floor of this portion of the building is to be occupied by offices, a room for the general use of the men, receiving room, etc.

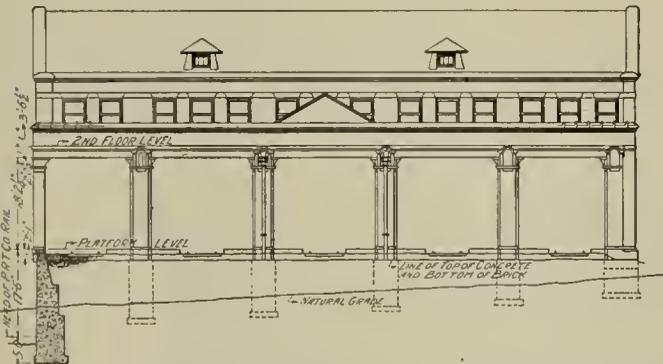
The Philadelphia Rapid Transit Company's platforms are

embankment supported by a concrete retaining wall between the property of the Westchester company and the tracks of the Philadelphia Rapid Transit Company. The Westchester company's terminal is served by a ladder arrangement of tracks. The track on the north side has a pit which can be used for the convenient inspection of cars. The loading tracks are 155 feet long excepting the one on the south side, which is only 128 feet. The platforms, of reinforced concrete, extend between the tracks a few inches above the level of the rail. Down the center of each of the four middle platforms,

which are 15 feet 5 3/4 inches wide, a fence will run the entire length of the trainshed, and a similar fence will extend from wall to wall along the west side of the 40-foot lobby previously mentioned. Double sliding gates will be provided in the latter fence at the end of each platform, so that passengers may be excluded from all platform sections excepting that leading to the train that they intend to take. The important advantages of this arrangement are: When the train enters the station the center platform fence prevents confusion between passengers being discharged and those taking a train on the other side of the platform. Passengers may be discharged on one side of a train, the doors on the opposite side of the train opened and a waiting crowd admitted at once from the other platform, thus separating the loading from the unloading platform and effecting an important saving of time and preventing confusion.

The trainshed has a flat reinforced concrete roof with a large skylight in the center. The supports for the trainshed are round iron columns filled with concrete and resting on concrete piers 4 feet 6 inches square placed below the platforms and spaced from 14 feet 6 inches to 17 feet apart, rows 19 feet 6 inches apart—the width necessary to accommodate a single track between two platforms. The north wall of the building is a continuation of the concrete retaining wall. This wall is designed to support 20-foot reinforced concrete girders 2 feet thick and 4 inches in diameter under the inspection pit and extending to the columns.

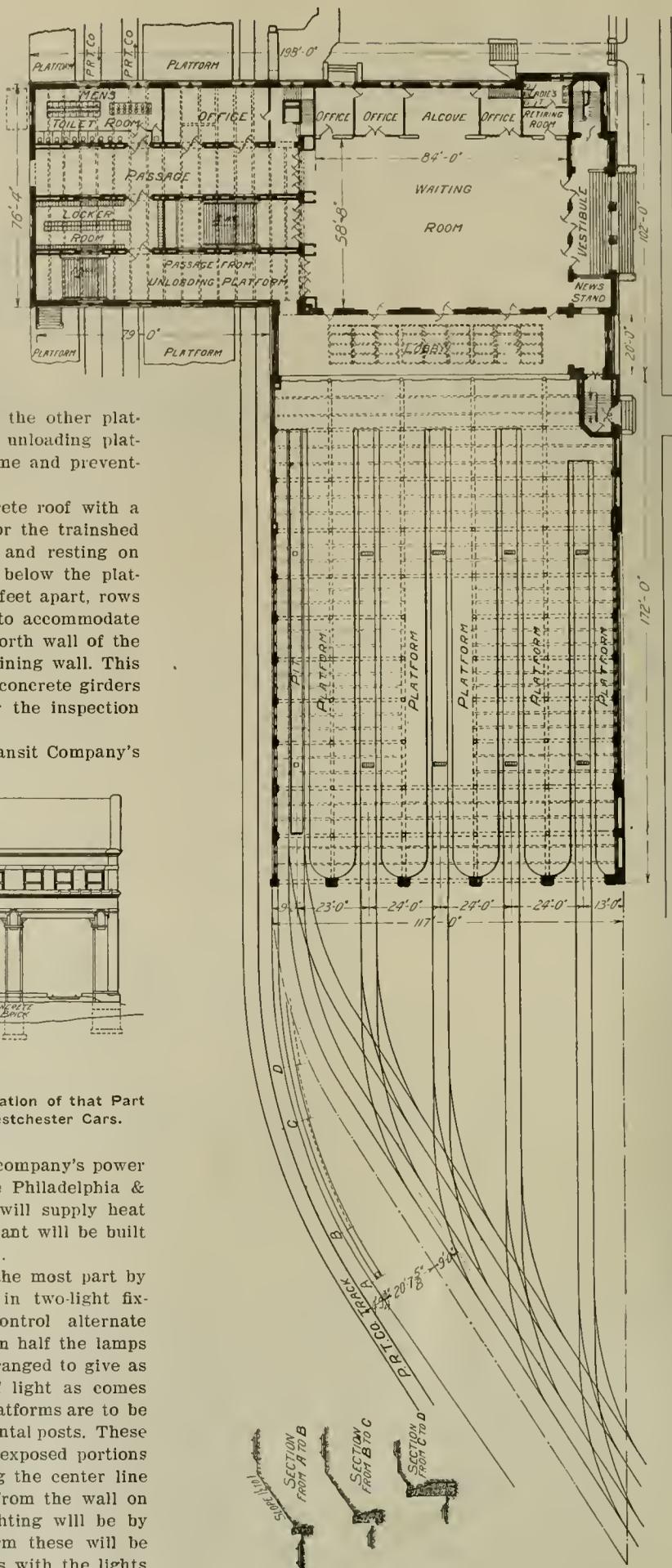
The lighting and heating of the Rapid Transit Company's



Market Street Terminal, Philadelphia—West Elevation of that Part of Terminal to be Used by Philadelphia & Westchester Cars.

portion of the station will be done from the company's power house, which is being built just north of the Philadelphia & Western Railroad right of way, and which will supply heat and light for the shops also. The heating plant will be built after the Warren & Webster vacuum system.

The station building will be lighted for the most part by 16-candlepower incandescent lights, chiefly in two-light fixtures, so wired that the switches will control alternate lights, giving even distribution of lights when half the lamps are in service. The ceiling lamps will be arranged to give as nearly as possible the same distribution of light as comes through the skylights in the day time. The platforms are to be lighted by arc lamps suspended from ornamental posts. These lights are spaced about 50 feet apart on the exposed portions of the platform, there being five lights along the center line of the double platform and five suspended from the wall on the single platform. Under the arches lighting will be by incandescent lamps. On the double platform these will be arranged in three rows of three-light fixtures with the lights



Market Street Terminal, Philadelphia—First-Floor Plan of Station.

spaced about 18 feet apart longitudinally. On the single platform there will be two rows similarly spaced. Arc lamps also will be used in the men's room on the second floor directly behind the main waiting room area. Here six lamps will be suspended from the roof trusses. The newel post lights will be attractive six-light fixtures or candelabra. The offices in the building will be equipped with a generous supply of wall sockets for desk lights, electric fans, etc.

The power station will be 100 feet square and will be

RECENT DEVELOPMENTS IN THE CLEVELAND STREET RAILWAY CONTROVERSY.

Following the decision of Judge Phillips, as reported in the last number of the Review, overruling the demurrer of the Municipal Traction Company in the so-called "blanket injunction" or "personal interest" case, and sustaining the right of the Cleveland Electric Railway Company to attack the former's franchises on the ground that Mayor John-



Market Street Terminal, Philadelphia—General View Showing Construction Work in Progress.

equipped with four boilers and two direct-connected engines driving direct-current generators. An interesting engineering feature of this building is the 150-foot circular stack of reinforced concrete. This stack will be 7 feet in diameter with a double shell for a height of 50 feet. The outside walls are 6 inches thick; there is an air space of 4-inches and the single shell is 5 inches thick. The stack is reinforced with steel T-bars and is being built by the Weber Steel-Concrete Chimney Company of Chicago. It is probable that an arrangement will be made whereby the station to be built by the Philadelphia & Western Railroad will be lighted from the power

son was financially interested in the company through guaranteeing its obligations, Councilman Hirstius, on December 10 introduced into the council a resolution calling for a list of the stockholders of the Forest City and Municipal companies. The resolution was passed by the council, but it was announced that both companies had anticipated it by filing their lists before the meeting convened. An examination of the lists showed that no city councilman or prominent city official held any stock directly in either company. The Municipal Traction Company's stock is held by five men, Du Pont, Howe, Stage, Wiebenson and Gref.

On December 14 the Low Fare Railway Company, of Cleveland, was incorporated at Columbus, with \$250,000 capital stock, by W. B. Colver, secretary of the Municipal Traction Company, and others, and it was generally believed that its intention was to take over any new franchises to be granted to the Municipal Traction Company in order to prevent their being involved in the "personal interest" litigation. This belief was confirmed on December 17 when the Municipal Traction Company presented at the council meeting a communication transferring to the Low Fare company its entire interest in a bid for a franchise around the Erie street cemetery, which was then pending, and which was thereupon granted to the Low Fare company. Another franchise was passed granting to W. B. Colver a franchise in East Seventy-First street, between Woodland avenue S. E. and Quincy avenue S. E. The Low Fare company also applied for another franchise for a line connecting with the present Municipal Traction lines, including a loop around the south side of the Public Square. The object of the company was explained after the meeting by F. C. Howe, a director of the Municipal Traction Company as follows:

"The Low Fare Railway Company is simply an anchor to windward for the three-cent fare movement in Cleveland. Even were the courts to declare all the franchises of the Forest City Railway Company to be invalid the city council could immediately grant the Low Fare Railway Company franchises over these routes as extensions. The consents filed with the city clerk did not specify consent to the Forest City Railway Company, but to the building of a street railroad. They would apply upon such extensions."

The "personal interest" suit of the Cleveland Electric



Market Street Terminal, Philadelphia—View of Subway to Philadelphia Rapid Transit Shops.

house of the Philadelphia Rapid Transit Company, but the Philadelphia & Westchester Traction Company will light its section of the building from its own current supply.

The Pittsburg Railways Company has recently tried the experiment of reserving cars for smokers. On the express trains to East Liberty the trailers on every other train are designated by a signal reading "Smoker." If the practice proves a success it will be extended so that the privilege may be enjoyed throughout the city

against the Municipal Traction and the city was called in Judge Phillip's court on December 17, but on the motion of attorneys for the former was continued until January 7. City Solicitor Baker had previously filed the city's answer, in which it was denied that the city had had any knowledge of the arrangement by which Mayor Johnson had guaranteed the company's obligations.

On December 19 the Cleveland Electric heard of a plan of the Municipal company to attempt to lay a crossing at midnight over the former's tracks at Detroit avenue and West Twenty-Eighth street and its attorneys immediately applied for an injunction. Judge Beacom did not grant the injunction, but accepted the promise of the Municipal Traction attorneys that no immediate attempt would be made to lay the crossing. Instead of laying the crossing the officials assembled workmen at midnight to erect poles and wires and instal switches in Superior avenue and on December 20 began operating cars over the tracks owned by the city on the Superior avenue viaduct. One of the company's grants had made Superior avenue "free territory," to be used jointly by both companies and it was the intention to run these cars in to the Public Square, but the Cleveland Electric attorneys, on the ground that the grants were invalid, secured from Judge Phillips a temporary restraining order. On December 24 Judge Phillips refused to dissolve the temporary injunction and in so doing foreshadowed the ultimate decision in the financial interest suit. The Municipal Traction Company's rights in Superior avenue are based on ordinances passed in September and October, 1906, permitting joint use of the Cleveland Electric tracks and fixing the amount of compensation therefor. Judge Phillips held that Mayor Johnson had admitted and that testimony had shown that he was financially interested in the company at the time he approved those ordinances and that it would be an abuse of the discretion of the court to refuse a temporary restraining order unless there appeared to be a probability of the order being refused on final hearing.

On the same day the Cleveland Press, which had guaranteed some of the Municipal Traction stock jointly with Mayor Johnson, announced that a new guarantee contract had been drawn relieving the mayor of all responsibility and that he was no longer interested in the company.

On Wednesday night, December 26, the Municipal Traction Company made another effort to reach the Public Square. The court having enjoined the use of the Cleveland Electric tracks it was decided to lay a temporary track on the surface of the pavement in Superior avenue. After the council meeting Wednesday night a permit was quietly secured from the board of public service and men and teams were suddenly brought forth from various secluded spots and put to work laying track and stringing wires on the side of the street from the end of the city's tracks on the Superior avenue viaduct, to the Public Square. The rails were laid on steel ties. As the tops of the rails were 5 inches above the pavement the space between the rails was decked over with planks, so that teams could use the track. The span wires were attached in advance to the poles, which were set in barrels filled with slag and cinders. Wagons loaded with stone were set alongside the poles and the poles were nailed to the sides of the wagons.

The work was stopped about 3 o'clock in the morning by an injunction secured by a property holder, after about a block of track had been laid.

On December 28 the city council granted the company a permit to lay the temporary track in Superior avenue, which had been stopped, but on Wednesday, January 2, Judge Beacom continued the temporary injunction, holding that the permits of the city council and the board of public service were unlawful. The injunction also requires the removal of the track already laid and will hold until the decision of the "personal interest" suit.

On Monday, December 31, the council granted the Low Fare company a franchise for a line on Sunner avenue connecting the proposed Superior street line with the Forest City main line. The next day Judge Ford, of the common pleas court, issued an injunction restraining the company from doing any work before Friday noon.

On Monday the Cleveland Electric company began selling seven tickets for a quarter with double transfers on cross-town lines for the purpose of demonstrating the meaning of the company's proposition already submitted to the city council, which the company stands ready to carry out.

THE ROTARY CONVERTER SUBSTATION.

On December 21 Mr. R. F. Schuchardt delivered an address before the Western Society of Engineers, Chicago, Ill., on "The Rotary Converter Substation." The speaker discussed very thoroughly the fundamental theories and constructional details of the rotary converter and its necessary auxiliaries as found in railway and lighting substations. During the address many lantern slides were exhibited by the way of illustration and interior views of substations of the Chicago Edison and the Commonwealth Electric companies, with which the speaker is connected, were presented.

After this very thorough treatment of the rotary-converter substation considered electrically, Mr. Ernest F. Smith, superintendent of substations for the same companies, was called upon. He discussed the mechanical side of substation operation and included in his remarks the following:

Brush Economy.

The question of brush economy is one of extreme importance, especially when considered in connection with the operation of a large system, such as that of the Chicago Edison and Commonwealth Electric companies. In these systems there are in operation about 70 rotary converters and when we consider that the cost of a complete set of brushes for a rotary converter ranges from \$40 for a 500-kw. machine to \$180 for a 2,000-kw. machine, which means that the cost of brushes only of the converters in operation in the system mentioned is slightly in excess of \$4,000, it will readily be seen that brush economy is quite an important subject.

This matter has been given a good deal of careful study and by careful attention to systematic maintenance of brushes, commutators, and collector rings, the life of a set of direct-current brushes has been increased until it is from four to five years at the present time. This figure includes wearing out and destruction of brushes from all causes, including the wear on commutator, sanding, cracking due to vibrations, explosions due to rapid expansion and burning off of pigtails or unsweating of pigtail caps due to poor contact or defective distribution of load between brushes.

Considering wear and loss due to sanding only, the life of a direct-current brush is equivalent to about eight years, and considering wear only the life would be about 10 years for an alternating-current copper brush and 20 years for a carbon brush. It will thus be seen that, considering 20 years as the maximum possible life and four years as the actual life obtained in practice, that the percentage of life in the Edison and Commonwealth systems is about 25 per cent. This is considered to be comparatively high.

Setting Brushes.

There are 430 brushes on a 2,000-kw. machine and 112 on a 500-kw. machine, necessitating constant care and attention in order to keep them in prime condition. The matter of properly setting the brushes is of the utmost importance. The brush-holder studs on the direct-current side should be accurately and equally spaced all around the commutator and a line of brushes of a given polarity across the commutator should be absolutely parallel with the commutator bars. The positive brushes on the alternate positive studs should be staggered with reference to each other, so as to cover the entire commutator surface, instead of allowing the brushes of a given polarity to track and form grooves.

Experience indicates that a carbon brush tension of about 1½ pounds per square inch gives most satisfactory service and contributes to the life of the brush and commutator. The copper brushes on the alternating-current side give very satisfactory results when the tension is from 1½ pounds with a 500-kw. to 2 pounds with a 1,000 or 2,000-kw. unit. The current density in the contact surface of the ro-

tary-converter brushes in use in the system referred to ranges from 27.6 amperes per square inch for a 500-kw. rotary to 33.3 amperes per square inch for 2,000-kw. rotary on the direct-current end and from 50 to 57 amperes per square inch for the laminated copper brushes on the alternating-current end.

The equivalent of one complete row of carbon brushes is treated with dynamo oil and distributed in the brush holders throughout the commutator in such a manner as to bear on the entire commutator surface. This is for the purpose of effectively lubricating the commutator, thereby reducing friction and noise in operation. The method of treatment consists of immersing the carbon brushes in boiling oil for a period of about an hour, after which they are removed and dried at a temperature of 200 or 300 degrees F. for a period of half an hour or more. The commutator surface is frequently wiped with a clean piece of cheesecloth, and when the machine is about to be shut down and is well heated up a piece of cheese-cloth bearing a trace of oil is wiped across the commutator, with a clean, dry piece of cheese-cloth bearing upon the commutator surface immediately back of the oiled cloth. This method of maintenance will keep the commutator and brush surfaces in good condition.

The alternating-current brushes are staggered on the ring, so as to get an even wear and it is found with good care that it is not necessary to retrim them or seriously disturb their adjustment more frequently than about once a year. They are then properly trimmed and beveled and replaced on the machine. A very light application of vaseline or machine oil from time to time, while the machine is in operation, will effectively prevent cutting of the ring or excessive wear on the copper brushes. This treatment will preserve the commutator and collector rings in good condition, requiring the turning down of the collectors at intervals of about five years, and turning of the direct-current commutators at intervals of from five to ten years. As the cost of turning down commutators and collector rings ranges from \$58 for a 500-kw. machine to \$110 for a 2,000-kw. machine, it will readily be seen that there is room for substantial saving by the proper care of these parts.

Oil Economy.

In connection with oil economy statistics show that the average consumption of oil for each machine in the system during the past year has been 3.2 gallons. This is equivalent to a life of four years for the oil. The temperature of the bearings is very closely observed with reference to the temperature of the surrounding air, and in all cases where the rise in temperature exceeds 15 degrees C. the oil is promptly filtered and replaced in the bearings. This will usually result in lowering the temperature. If the temperature still remains high the cause is further investigated and removed.

The average rise in temperature of all bearings in the Edison and Commonwealth systems at the present time is approximately 14 degrees C., the minimum being about 7 degrees C. A portable filter is used for the purpose of filtering oil and is sent from one substation to another as required.

Blowers.

It is extremely important that the condition of the blower equipment for the air-blast transformers and regulators be properly maintained at all times, as the shutting down of the blower would seriously affect the operation of the converter units at times of heavy load, and on account of the serious overheating of transformers and regulators which would follow, it would soon become necessary to shut down the main units if the air blast were not restored.

The screens used for cleaning the air are regularly inspected and washed and blown out and the ventilating ducts of the transformers and regulators are thoroughly blown out and cleaned from once to twice a week.

Starting and Synchronizing.

In connection with the operation of such substations, accurate synchronizing is about the most important specific operation required to be performed in a substation. Any serious inaccuracy in performing this operation will result in fracturing the castings of the potential regulator, or if there is no regulator used in connection with the unit, the armature conductors of the converter are likely to be drawn out of their slots or the transformer structure seriously strained.

In connection with the regular shutting down of rotary converters which are normally started from the direct-current end, it is extremely important that the field circuit of the converter should be left closed until the machine stops rotating. This is necessary in order to thoroughly de-

magnetize the transformer cores and it is partially true in connection with diametrically connected units.

Under certain conditions the converter may stop with the direct-current brushes resting on the commutator bars which are connected to the same armature conductors to which the collector rings are connected, which are in turn connected to the terminals of a given transformer coil. This places this transformer coil in short circuit with the armature windings of the converter. If this transformer coil has previously been demagnetized, its impedance will be sufficient, upon throwing the starting current into the armature of the converter, to prevent an undue amount of current from passing through the transformer instead of through the armature of the converter, and the machine will start. However, if the transformer had not previously been demagnetized and the field circuit had been opened at a time when the magnetization of the transformer coil was at a maximum in the same direction as would be caused by the passage of the starting current through the transformer coil, then there would be practically no impedance and the practical equivalent of a short circuit would be connected to the direct-current brushes of the converter, thus rendering it impossible to start the machine. In this case the brushes should be lifted from the alternating-current rings, and the transformer momentarily connected to the high-tension line, thus changing its magnetic state to a more favorable condition.

Starting After a Shut-Down.

In connection with starting up the system after a general shutdown, if the shutdown has been of such long duration as to result in fully discharging the storage batteries, thereby leaving many of the substations without an adequate source of supply for starting from the direct-current end in the regular way, the procedure employed in some of the large systems is to start a large group of converters from a turbine or prime mover from rest with low-frequency, low-voltage, multi-phase currents. The field circuits and direct-current switches of the converters are left open and the unit is connected on the alternating-current side only. A direct-current voltmeter is connected to the direct-current terminals of the machine and as soon as the turbine begins to rotate slowly, slight vibrations of the voltmeter needle will be observed. This action will continue, gradually increasing in amplitude until the rotary begins to turn. After the converter has made a few complete revolutions the voltmeter needle will have discontinued vibrating, and if the field circuit has not been closed at the proper instant, will have taken up a fixed position either above or below zero, indicating correct or incorrect polarity. The field circuit should be closed as the needle is swinging past zero in the direction of correct polarity, thus locking the converter into synchronism with the generator and insuring correct polarity if the operator is skilful in performing the operation.

The power factor is adjusted to unity by means of the field rheostat and as soon as the converter potential is equal to the system potential, the direct-current switches of the converters are closed and other converters are started from the direct-current side. They are then synchronized with the low-voltage, low-frequency line and other generators are synchronized under similar conditions at the power house. Another stage of acceleration then takes place and this action is repeated until the entire system load has been raised to the normal direct-current potential.

In our operating practice covering this emergency procedure machines of a rated capacity of 11,000 kw. have been thus started from rest and machines of additional capacity of 7,500 kw. were immediately started, receiving direct current from them, after which they were synchronized with the low-voltage, low-frequency lines. Additional machines of a rated capacity of 11,500 kw. were thrown onto the line merely as a drag, making a total of 30,000 kw. connected to one turbine when the final stage of acceleration was started. As the turbine used was one of the older units, it is believed that with a new unit of greater capacity a much larger load could be brought up from rest.

In some of these trials the time required to perform all operations from the time the converter started turning until the second converter had been started with direct current received from the first and synchronized and cut in with the low-voltage, low-frequency line, was as low as 30 seconds. The average time, however, is considerably higher.

The time required to start machines from direct current and under regular conditions ranges from about 51 seconds for a 500 kw. machine to about 1½ minutes with a 1,000 kw. machine, not including time required for regulator operation. It is not often necessary to operate the regulator after a shutdown, but in case it should become so, under extreme

conditions necessitating running from the neutral point, the time for a 500-kw. machine would be about 1 minute and 50 seconds, and for a 1,000-kw. converter about 2 minutes and 27 seconds.

NEW ENGLAND STREET RAILWAY CLUB.

The December meeting of the New England Street Railway Club was held at the American House, Boston, on the evening of December 27. President Paul Winsor was in the chair and the speaker of the evening was Mr. Jacob B. Struble of the Union Switch & Signal Company, Swissvale, Pa., his subject being "Railway Signaling."

Mr. Struble classified all signals as visual or audible, stating that form and color are the main division of visual signals with respect to their essential characteristics. The semaphore is the type of visual signal in widest use and in practically all cases a horizontal inclination of the arm stands for the danger position and the downward inclination for safety. Recently an upward inclination of the arm has been favored somewhat for a clear indication. It has been found difficult to secure distinctive colors enough for night indications. The well-defined conspicuous form of the semaphore arm is perhaps its most striking advantage. Various forms of disc signals were also discussed. These were said to be of questionable value for very high-speed service on account of their possible obscuration by snow and reflected sunlight. The latter cause tends to make disc signals better for night than for day work. Home and distant signals were then fully explained by the speaker.

A brief reference was made to the staff system and its value for single-track service emphasized. The Fontaine system of time spacing was instanced and comment was offered upon the fields of the telegraph block and manual lock and block systems. The former depends upon the absence of mistakes and is weak in this respect. The track-circuit automatic block system is probably the best of signaling methods. Mr. Struble described the function of the track circuit at some length and emphasized its ability to give danger indications in case any part of the equipment fails. In all automatic signals gravity should be used to return the signal to the danger position.

The automatic signal reduces the cost of operation through its lessening of the wages account. Discussing cab signals the speaker stated that the future of these is extremely difficult to predict, because thus far they do not seem to work out well in practice. Even if the mechanical and electrical problems of the cab signal could be solved a difficulty remains on account of the division of the motorman or engineer's attention between the cab signal and the track ahead. Attention cannot well be divided between the signal and the roadbed without neglecting one or the other. Mr. Struble pointed out that there is not as yet any system which interlocks both train and signal, though on the Boston and New York rapid transit systems the trains are automatically stopped in case they are run past danger signals. The derail is too drastic a means of protection except at certain crossings.

A brief description was given of the use of alternating-current block signals in track circuits carrying direct-current power in the rails. Mr. Struble closed his paper with a short discussion of the interurban signaling situation. No entirely satisfactory system of interurban signaling has thus far been produced, in his opinion. The fact that the rails are often covered with dirt on account of highway locations, is troublesome in the operation and maintenance of first-class track circuits. On many lines the use of single tracks and sidings with cars operating in both directions on close intervals, makes it exceedingly difficult to instal a successful automatic signal. Signals satisfactory in many particulars can be had, but it is difficult to find any single scheme capable of counting in and out double or triple headers in each direction,

through a block. The increase of traffic on railways has led to the organization of regular signal engineering departments on many systems and a more general appreciation of the art of signaling is everywhere becoming apparent.

Following the reading of Mr. Struble's paper a general discussion of signal work was held. Among the speakers were Messrs. H. C. Page of the Springfield (Mass.) system; General Superintendent Lee of the Boston & Maine Railroad; M. C. Brush of Newton; E. P. Shaw, Jr., of the Boston & Worcester Street Railway; Inspector of Signals Smith of the Boston Elevated Railway, and C. E. Potter of New Bedford. The meeting closed at 9:30 p. m.

CONTROVERSY OVER T-RAILS IN COLUMBUS.

The question of whether the interurban railway systems entering Columbus, O., will be allowed to lay T-rails in the city, or will be compelled to put up with the grooved rails will probably now be settled in the courts of the state. This is the result of a controversy caused by an attempt on the part of the city engineer to compel the Indiana Columbus & Eastern Traction Company to replace its T-rails on McDowell street, an unimproved street, with grooved rails so that the city can proceed with a paving contract.

The matter was threshed out in two open meetings, before the board of public service, in which the railway interests were represented by several business and improvement associations of the city and J. L. Adams, general manager of the western division of the Indiana Columbus & Eastern, and the advocates of the grooved rail, by City Civil Engineer Maetzel and Frederick L. Ford, city engineer of Hartford, Conn., who was brought to Columbus by a Columbus newspaper to furnish expert information regarding rails and the grooved rail in particular. At the close of the second meeting Mr. Adams handed a written statement to the secretary of the board of public service, which announced that his company refused absolutely to replace the T-rail on McDowell street with grooved rails. This means that the whole proposition will probably go into the courts for settlement and will undoubtedly be carried through to the supreme court.

Motives back of the attempt to force the grooved rail onto the interurban system on streets where it has succeeded in getting the T-rails, are said to be political and personal, while business men and associations of the city who have the best interests of the city at heart are in favor of allowing the traction company to put in the special T-rail that admits of paving up flush with a special paving block. They recognize that the future development of the interurban systems which have proved of great financial benefit to the business interests of the city, depends largely upon the attitude of the city administration on the T-rail proposition.

Fast limited passenger service from Zanesville to Indianapolis has been planned by the Indiana Columbus & Eastern Traction Company and to make such service safe the company will be obliged to put on heavier cars with the standard depth of flange on the wheels and these flanges can not be operated over grooved rails. Thus the T-rail controversy is not only an important one to the city of Columbus, but effects improvements and the character of passenger and freight service all over the Schoepf system in Indiana and Ohio.

The company not only agrees to do its part in improving and paving the streets and putting in the special paving blocks next to the T-rail, but it agrees to put up a million-dollar terminal passenger station and make other improvements in Columbus, if its plans are not blocked by the city insisting on the grooved rail.

Officials of the Indiana Columbus & Eastern believe they will win out in the fight should it be taken into the courts, because they are already using the T-rail on the street in question and the board of public service has given the com-

pany permission to lay this form of rail on several other streets of the city.

POWER HOUSE OF THE HUDSON TUNNEL SYSTEM.

Construction work is now in progress on a new power house which will generate current for operating the cars through the several tunnels of the Hudson Companies under the Hudson river between New York and New Jersey, and also current for operating passenger elevators and lighting the new terminal office building in New York city. This tunnel work was described in detail in the *Electric Railway Review*, November, 1906, page 593. The power station will be located in Jersey City on a block bounded by Washington, Green, Bay and First streets. The building will have a length of 230 feet from north to south and a width of 200 feet. The height from sidewalk to top of monitors will be 105 feet.

The interior of the structure comprises a boiler house and an operating and electrical room. The latter room extends the entire length of the building and will contain, on the north side, galleries for controlling the generating machinery and the local substation in the power house. The electrical generating plant will comprise two 3,000-kw. turbo-generators and three 6,000-kw. turbo-generators, a total generating capacity of 24,000 kw. or 32,409 hp. The immediate installation will aggregate 18,000-kw. capacity, but the structure is designed for an ultimate generating capacity of 36,000 kw.

The building with its facade of selected red brick and with doors and window frames of metal, will be as thoroughly fireproof as it is possible to build. In the windows wired glass will be used. A skylight with copper-covered metal work will run the entire length of the building.

Coal will be received at the eastern end of the boiler house and elevated from the yards to distributing conveyors which will carry it to several coal bunkers located in the top of the building. These bunkers will have a storage capacity of 5,000 tons. From here the fuel will be fed by gravity and automatic stokers to the furnaces on the ground floor.

The boiler house was designed to accommodate 16 water-tube boilers each having 9,000 square feet of effective heating surface, or 9,000 hp. as customarily rated. It is thought that these boiler units are larger than any heretofore used in this country. The boiler settings will be encased in steel and all openings in these casings will be made airtight. This type of construction will require details new to American boiler practice. The boilers will be fitted with superheaters and all piping and valves will be designed for use with superheated steam. For each 6,000 kw. of generating capacity there will be provided four boilers and for each set of four boilers one chimney; thus the plant will be developed on a sectional basis.

The chimneys are to be of heavy steel plates lined with nine inches of brick supported in sections, so that any portion of the lining may be renewed or repaired without disturbing other sections. The inside diameter of each chimney will be 10 feet 6 inches and it will rise to a point 175 feet above the street level. The bases of the chimneys will be supported on steel columns to permit of added space in the boiler rooms. The turbo-generators will be of the vertical shaft type and the plant will be equipped with apparatus assuring the maximum reliability and economy of production.

The tunnel trains, which will run as far north as Herald Square, as far east as Astor Place and as far west as Newark, will be operated by current from this new station. The tunnels along the various lines on both sides of the Hudson river will be lighted by current from the Jersey City power house.

The general design of the power plant, including the mechanical equipment, has been in charge of Mr. J. Van Vleck, and the electrical equipment has been designed by Mr. L. B. Stillwell. The power-house superstructure was designed by Robins & Oakman, architects, New York city.

EQUIPMENT OF THE TEXAS TRACTION COMPANY.

Contracts have been let by the Texas Traction Company for the equipment of a 65-mile electric road between Dallas and Sherman, Tex. The new line will parallel the Missouri Kansas & Texas road between the two cities and will be one of the longest electric roads in the state. While the apparatus is standard direct-current throughout, the equipment, in some respects, presents features of interest.

The country through which the new line will run is flat and rolling, there being no grades exceeding one per cent and a maximum curvature of but three degrees. A private right of way has been established by the company. The run between Dallas and Sherman will be made in 2 hours and 30 minutes. This schedule includes a 15-minute run within the city limits of Dallas, where the cars must necessarily be operated at lower speeds. While the main traffic will be of an express nature, stops have been provided about every two miles to take care of the local travel.

Fifteen car equipments will be provided for the first schedules. These will be of the standard interurban type, each 50 feet long, equipped with four GE-73 (75 horsepower) standard direct-current motors and the Sprague-General Electric type M system of multiple-unit control. Each car will be further provided with General Electric airbrakes and compressors.

Power for the new road will be generated by steam at McKinney, a town located about midway between Dallas and Sherman. The main power station equipment will include two 1,000-kilowatt Curtis steam turbo-generators working under a steam pressure of 150 pounds at the throttle with 125 degrees of superheat. The turbines will operate condensing. Current will be generated at 2,200 volts and 25 cycles and stepped up for transmission to 19,100 volts. For exciting the fields, two 35-kilowatt generator sets will be provided. The three-phase current from each of the turbo-generators will be transformed in a set of three 330-kilowatt, air-blast transformers, with one spare transformer as a reserve. To supply air for cooling, duplicate blower sets will be furnished, one set being driven by an induction motor, the other by a direct-current motor. Each blower will have a capacity of 10,000 cubic feet.

Six substations will be provided, including one at the main station and a portable equipment. The portable substation comprises a special car containing a 300-kilowatt rotary converter, air-blast transformer and suitable switching apparatus for cutting into the transmission system wherever necessary. This equipment renders unnecessary the duplication of rotary converters at the fixed substations, as it can be shifted to various parts of the line and used as an emergency station or auxiliary in case of need. Each of the regular substations will be equipped with a 300-kilowatt, 600-volt rotary converter with the necessary switchboards, oil-cooled transformers, and lightning arresters. The substations will be interconnected by high tension transmission lines, operated initially at 19,100 volts. Eventually, however, a transmission potential of 33,000 volts will probably be used, and for this purpose taps will be provided for Y-connection of the transformers. With the few exceptions noted the new line follows, in general, the standard direct-current practice of the General Electric Company.

J. F. Strickland is president of the Texas Traction Company and E. A. Jones chief engineer, both of Dallas, Tex., where the offices of the company are located.

INTERURBAN MAP OF THE CENTRAL STATES.

(WITH INSET.)

The map of the Central States, issued as a supplement to this number of the Electric Railway Review, when compared with a similar one published by the Street Railway Review a year ago, affords an interesting basis for studying the progress in interurban railway construction in the year 1906. During the past year there have been opened to traffic a comparatively large number of new interurban roads, but perhaps even more mileage has been built as extensions of already operating lines. Elsewhere in this issue appear statistics showing the rolling stock purchased during the year and used for these new lines and as additions to existing equipment.

This new map, for which we are indebted to The Arnold Company, Chicago, is thought to be complete. However, should there be errors the Review will be grateful for any information that will assist in making its reference files more complete.

CHICAGO TRACTION SITUATION.

Although the Chicago traction ordinances are still in the hands of the local transportation committee the situation has progressed rapidly since the last issue of the Review. The Chicago City Railway ordinance is now ready to be reported to the city council and unless further cause for delay arises will be submitted at the next meeting. The ordinance for the Chicago Union Traction Company, which is the same as the other except in a few details where changes are necessary on account of the difference in locality and the internal financial complications in the company, is now in the hands of the committee receiving the finishing touches.

The principal points of difficulty in the Chicago City ordinance, which also applied generally to the Union Traction Company, were cleared up at a conference between the representatives of the city and the companies on December 15. It was then agreed that in the event of purchase by the city, the valuation of the companies' property, both tangible and intangible, shall be \$50,000,000, which represents a compromise between the companies' figures of approximately \$74,000,000, and the city's experts' estimate of about \$46,000,000. Of this amount \$29,000,000 is apportioned to the Chicago Union Traction and \$21,000,000 to the City Railway. It was also agreed that in the division of profits 55 per cent of the net receipts shall go to the city and 45 to the companies. The companies are to be allowed 5 per cent interest on the money secured for reconstruction and 5 per cent brokerage on this money; also a 10 per cent contractor's profit on the work of reconstruction. During the three-year rehabilitation period 70 per cent of the gross receipts is to be set aside for operating expenses, the remainder of this amount, after payment of operating expenses, to be applied on renewals. After the rehabilitation period 6 per cent of the gross receipts is to be set aside for renewals. It was also decided to appoint Bion J. Arnold chief engineer of the board of supervising engineers, at a salary of \$30,000 a year. Although no contract has been signed it is understood that he will accept. The selection of Mr. Arnold to supervise the work of rehabilitation has met with unanimous approval, on account of his familiarity with the situation through his services as consulting engineer for the city throughout the entire process of the negotiations and because of the universal confidence in his integrity and his high professional standing.

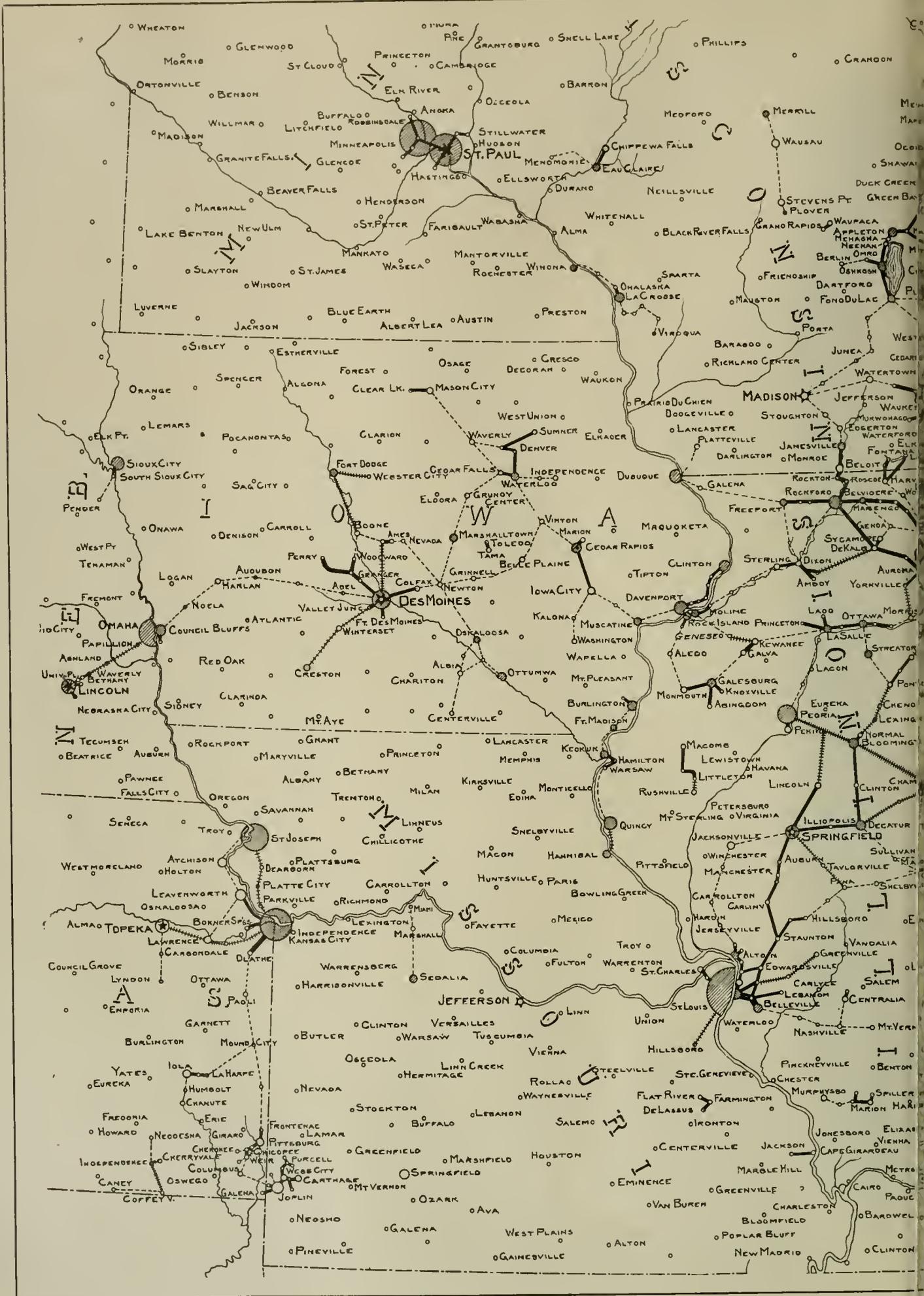
The situation in regard to the Union Traction ordinance is complicated by the internal financial relations between the company and its underlying companies. On December 19 John M. Harlan, representing Judge Grosscup, the referee in the Union Traction litigation, asked the local transportation committee to strike out the clause in the Chicago City

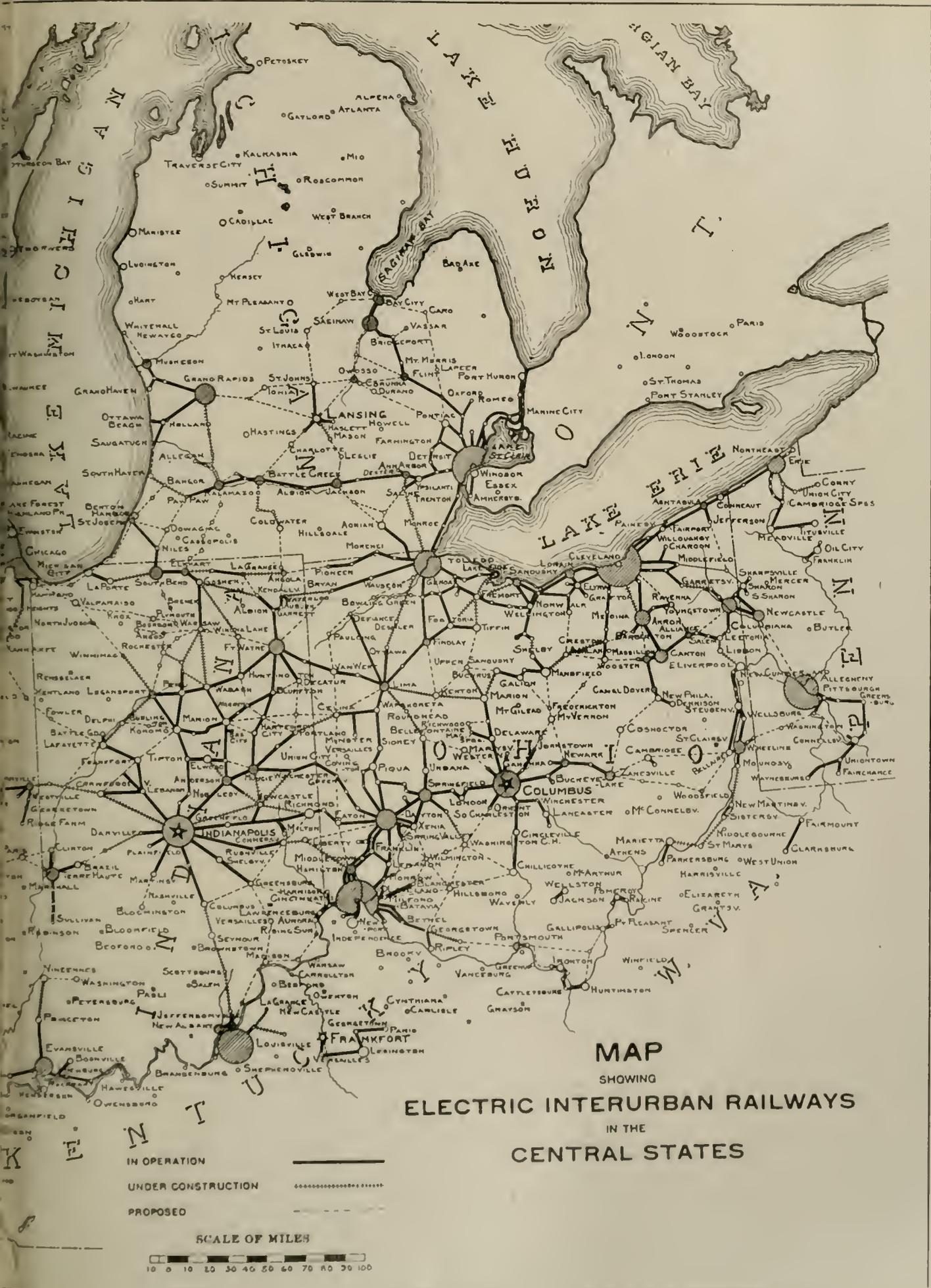
ordinance providing for the extension of that company to the north and west sides in the event of failure of the Union Traction Company to accept the ordinance, and to delay the settlement until the internal difficulties of the Union Traction could be removed and both ordinances be passed at once. Walter L. Fisher, city traction counsel, at once delivered an ultimatum that the Union Traction should get its affairs in such shape as to come to an immediate settlement or the City Railway would be empowered to take over its territory. The Union Traction Company replied that it would endeavor to come to an agreement at once and in no way delay the settlement.

While the Chicago newspapers and the people were congratulating themselves on the prospects of immediate settlement and consequent improved service, Mayor Dunne suddenly announced that he would insist on the ordinances being submitted to a referendum vote of the people at the April election before being submitted to the council. He stated that during his campaign for the mayoralty last spring he had repeatedly promised that all important measures relating to the traction situation should be submitted to the people for a decision, and that the city council had also put itself on record to the same effect. This unexpected announcement by the mayor met with an overwhelming protest from all quarters. In order to secure a referendum vote it is first necessary to secure a petition signed by a large number of names and in case such a petition could not be completed in time for the April election the whole matter would have to be postponed for another year or two. Civic bodies and merchants' leagues as well as individuals vied with each other in passing resolutions and writing protests to the newspapers, demanding an immediate settlement of almost any kind that would pave the way for a speedy elimination of the present intolerable service conditions. The Chicago Tribune even instituted a postal card ballot on the referendum question and the incomplete returns have shown a large majority in favor of immediate passage of the ordinance. A majority of the aldermen have also expressed themselves as opposed to any delay.

A meeting between the city's representatives and the eastern financiers controlling the Union Traction was held at Atlantic City last week and on his return to Chicago Walter L. Fisher announced that the main points had been settled. The company guaranteed to acquire a perfect title to the north and west side lines, to be delivered to the city in event of purchase, and that in the reorganization both minority and majority stockholders should be treated alike. The company also agreed to a single fare with universal transfers to the lines of the Consolidated Traction Company and to take care of the operating agreement with that company. It also agreed to build new tunnels at Washington and La Salle streets and to lower the Van Buren street tunnel. The ordinance is to run to the Chicago Railways Company, which is to reorganize the Union Traction, with Frederick H. Rawson at the head.

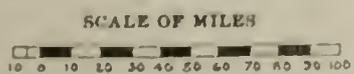
The City Railway ordinance was to have been reported on Wednesday night, but as it was being gone over for the last time by the committee in the afternoon, Attorney David K. Tone, representing the Chicago Federation of Labor and the Municipal Ownership League, appeared and attempted to show that the ordinance was full of flaws. He claimed that the City Railway under its charter could not extend to the Union Traction territory and that the charter could not be so amended; that the ordinance is practically a perpetual grant; that in the event of purchase at the end of 20 years the city or another company must pay for the value of the unexpired franchises at present, and that no company would be willing to pay such an exorbitant price. These, with various other objections, were all answered by Mr. Fisher and the mayor, but it was decided to hold the matter over another week.





MAP
 SHOWING
ELECTRIC INTERURBAN RAILWAYS
 IN THE
CENTRAL STATES

IN OPERATION —————
 UNDER CONSTRUCTION - - - - -
 PROPOSED

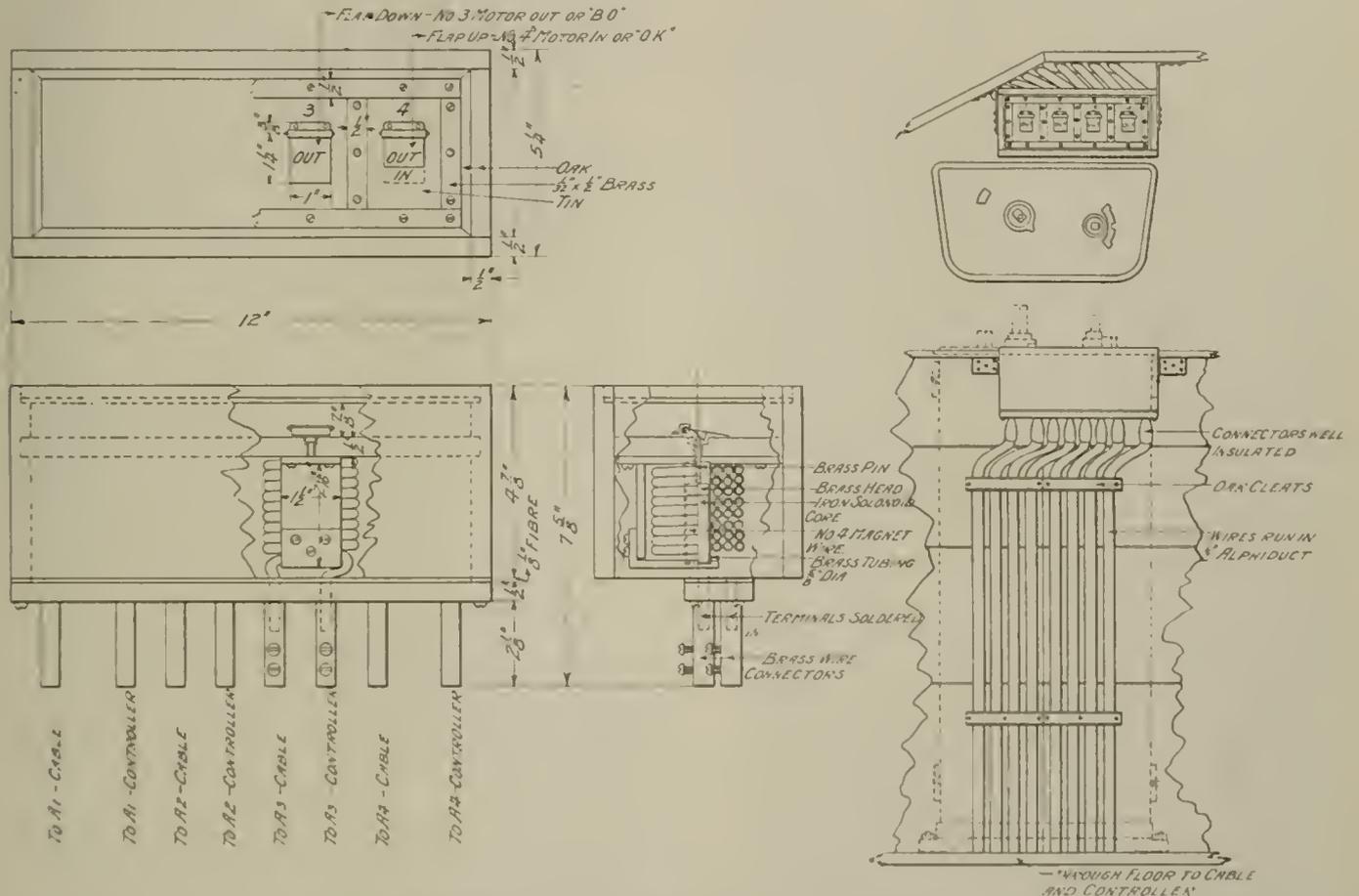


MOTOR-OUT INDICATORS.

On a car equipped with four motors it frequently happens that from such causes as sticking brushes, broken connections in the armature or fields, etc., one of the motors gives out. While such failures will incapacitate a particular motor, this condition may not actually cripple the car, and in frequent cases the other motor of the pair may run for some time, perhaps all day, carrying double its regular load. In this way the operating motor may receive a strain and become damaged more or less in proportion to the length of time it is run with an idle mate. To provide against this condition and afford a continuous indication of the presence of current in motor leads, the "motor-

coil is connected with the A-2 binding post of the controller. Similar connections are made for the other coils in the indicator.

When the controller handle is moved and current is fed to the motors it first enters the solenoid and, the circuit being closed through the controller cable and motor, the indicator coil is magnetized, lifting the core to the center. As this core lifts, the pin in it lifts in turn the flap above, thus showing the word "In" which appears under the space normally covered by the flap. Thus the motorman knows that the particular motor circuit in series with this coil is in operative condition. If from any cause the circuit is open the coil will not act and the flap will remain at rest, showing the word "Out" on its face. The motormen are in-



Sketch Showing Detail Design of Motor-Out Indicator.

out indicator shown in detail by the accompanying illustration is used with four-motor equipments by the Denver City Tramway Company and is being placed on all of one class of cars owned by this company.

The active parts of the indicator are encased in a neat box of oak, 5 1/4 by 12 by 4 7/8 inches, outside dimension. This box has a glass top and is divided into two compartments; an upper one for the indicating flaps, which are similar to annunciator drops, and a lower one for housing the coils and delicate parts. As will be noted by reference to the illustration there are four coils or solenoids, one for each motor. These coils consist of about 30 turns of No. 4 wire wound in two layers on a brass tube 5/8 inch in diameter. Inside the brass tube is a movable iron core with a brass head and pin which, when at rest, is below the center of the coil. Each solenoid is directly in series with its respective motor. Lead A-1 is taken from the cable and connected with one side of the No. 1 coil, the A-1 binding post in the controller connecting with the other side of this coil; lead A-2 is run to coil 2 and the other terminal of this

constructed that when a flap fails to rise after two or three trials they should cut out the inoperative pair of motors, using the cut out switch in the controller box as usual.

This ingenious device for continuous inspection of motor equipments has been found to be a satisfactory supplement to the usual methods of inspection. The "motor-out" indicator boxes are placed at the back of and about flush with the tops of the controllers, so that they are constantly under the observation of the motorman.

High Voltage Third Rail Line in California.

The Central California Traction Company is building an interurban line from Stockton to Lodi, Cal., a distance of 15 miles, which will be operated by direct current delivered through an under-running third rail at a pressure of 1,200 volts. The General Electric Company is furnishing the electrical equipment and until the contract is completed in June, 1907, the line will be operated temporarily with 400 volt equipment. E. P. Hilborn, of Stockton, Cal., is general manager.

A NEW GOVERNOR ON NEW YORK PUBLIC UTILITIES.

In his inaugural message to the New York legislature Governor Hughes devotes considerable space to the matter of transportation interests and public service corporations in the state at large and in Greater New York. The following are extracts from the message:

Public Service Corporations.

Proper means for the regulation of the operations of railroad corporations should be supplied. For want of it, pernicious favoritism has been practiced. Secret rebates have been allowed, and there have been unjust discriminations in rates and in furnishing facilities for transportation. Those who have sought to monopolize trade have thus been enabled to crush competition and to grow in wealth and power by crowding out their rivals who have been deprived of access to markets upon equal terms.

These abuses are not to be tolerated. Congress has legislated upon the subject with reference to interstate commerce, where naturally the evil has been most prominent. But domestic commerce must be regulated by the state, and the state should exercise its power to secure impartial treatment to shippers and the maintenance of reasonable rates. There is also need of regulation and strict supervision to insure adequate service and due regard for the convenience and safety of the public. The most practicable way of attaining these ends is for the legislature to confer proper power upon a subordinate administrative body.

We have now a board of railroad commissioners of five members. It is charged specifically with important duties. The execution of mortgages and the increase or reduction of capital stock are subject to its approval, its certificate that public convenience and necessity require the construction of a projected railroad is required before construction can be begun, and it deals with changes in highway grade crossings and various other matters in a definite way.

The law also provides that the board "shall have general supervision of all railroads and shall examine the same and keep informed as to their condition and the manner in which they are operated for the security and accommodation of the public and their compliance with the provisions of their charters and of law." If in the judgment of the board it appears "that any change of the rates of fare for transporting freight or passengers or in the mode of operating the road or conducting its business is reasonable and expedient, in order to promote the security, convenience and accommodation of the public," it may after notice and hearing fix a time within which the changes shall be made.

But the action of the board in the exercise of this general power of supervision amounts to a recommendation. If its direction is not complied with, the law provides that the matter shall be presented to the attorney general for his consideration and action, and shall be reported to the legislature. So, if it appears that any railroad corporation has violated the law or unjustly discriminates in its charges, and the wrongful conduct is continued after notice, the matter is to be brought to the attention of the attorney general, "who shall take such proceedings thereon as may be necessary for the protection of the public interests."

The present scheme of regulation is inadequate. There is a lack of precision in the definition of the powers of the board and an absence of suitable means to compel compliance with its decisions. No penalties are provided for disobedience to orders of the board made within its proper authority. Nor is the board authorized to institute and conduct legal proceedings for the purpose of enforcing its requirements.

It is also provided that the expenses of the commission shall be borne by the railroad corporations upon the apportionment of the controller. This plan of reimbursing the state is wholly indefensible. The supervision of railroads is in the interest of all the people and should be borne by the people as any other expense of administration. Such a board should be established in public confidence as an independent governmental body receiving no support from the railroads save as they are duly taxed for the general support of the government.

We have also a commission of gas and electricity with broad powers with reference to corporations engaged in supplying gas and electric current.

New Railroad Commission with More Power.

It is my judgment that there is no need of two separate commissions to deal with these subjects. There are now corporations which are subject to the jurisdiction of both commissions, and in some cases the same questions are pre-

sented for the decision of both. Similar principles are applicable to the decision in many cases within the jurisdiction of each and harmony of administration would be promoted by having a single body. It is plainly in the interest of economic administration in order to avoid the unnecessary multiplication of officers and clerical force that there should be but one commission. In the two boards we have now eight commissioners. A board of less than this number would answer both purposes.

I therefore recommend that the present board of railroad commissioners and the commission of gas and electricity be abolished and that a new commission be constituted, with powers of regulation and supervision, within constitutional limits, of the corporations now subject to the existing commissions. The commission should have all the powers possessed by the present commissions and such additional powers as may be needed to insure proper management and operation. Its powers should be clearly defined and should embrace the power to act upon its own initiative as well as upon complaint; to pass upon the issue of stocks and bonds; to examine properties, books, and accounts; to require detailed reports in prescribed form; to prescribe reasonable rates; to require adequate and impartial service; to provide for the safety of employes and for the protection of the public, and generally to direct whatever may be necessary or proper to safeguard the public interests and to secure the fulfillment of the public obligations of the corporations under its supervision. Provision should be made for suitable inspection so that the commission may be advised as to all matters within its purview and be in a position to take action on behalf of the people without the formal institution of proceedings by complainants. A prescribed quorum should be entitled to decide all questions, and any one commissioner should be empowered to make examinations and investigations, and the proceedings and decisions of one, when approved by the board, should stand as its proceedings and decisions.

The corporation guilty of disobedience to its orders, and all officers and other persons responsible for such disobedience, should be visited with appropriate penalties. The commission should also be entitled to institute legal proceedings for the enforcement of its orders, and all such proceedings should be expedited by suitable preference in all the courts of the state. The legislature should thus provide, within its constitutional power, adequate means for the entirely just and impartial regulation of these important public enterprises.

Reform in Transit Conditions Here.

The problem of transportation in the territory of Greater New York demands special, prompt, and comprehensive treatment. The configuration of Manhattan Island and the concentration of business at its lower end, together with the rapid growth of population, have produced an extraordinary congestion. All the existing lines—surface, elevated, and subway—are overburdened, and the people suffer in mind, body, and estate. The worst congestion is found at the Brooklyn bridge, due to the convergence at that point of the Brooklyn traffic. The people of Brooklyn who do business in Manhattan are subjected morning and night not only to exasperating inconvenience, but to such maltreatment and indignities incident to their disgraceful herding that relief in the most practicable manner should be afforded them at the earliest possible moment.

Not only are new facilities needed, which should be planned with reference both to immediate and future needs, but there is urgent necessity for more strict supervision to secure better service on existing lines. In some portions of the city antiquated horse cars may still be seen, giving picturesque emphasis to the disregard of the public convenience. Overcapitalization and the improvident creation of guaranties and fixed charges to suit the exigencies of successive combinations entered into for the purpose of monopolizing the traffic have produced their natural results. There are such unjust burdens upon earnings and the tendency constantly to effect economies at the expense of proper service is so strong that it is imperative that the people shall have vigilant representatives clothed with ample authority to compel the corporations to perform their public duty.

In 1891 the legislature, for the purpose of providing for the development of additional transit facilities, passed the so-called Rapid Transit act. It constituted a board of rapid transit commissioners, who were named in the statute. Numerous amendments have been made and additional powers conferred. The statute contains important provisions with reference to construction by the city. Through the accretions of years it has become cumbersome and extremely complicated. It needs revision. Pursuant to the provisions

of this act the present subways have been constructed and plans have been made for further construction. By a recent amendment the board is authorized, with the consent of the board of estimate and apportionment of the city, to grant rights and franchises and to make contracts with reference to the construction and operation of the parts within the city of inter-state trunk lines.

Would Abolish Rapid Transit Board.

We have thus in the city of New York an anomalous condition. Two boards created by the legislature are exercising powers of the greatest importance with reference to transportation. The board of rapid transit commissioners is dealing with the question of new facilities and is empowered to make contracts for construction and operation. It is also dealing with the question of the construction of trunk lines into or across the city. The state board of railroad commissioners has general jurisdiction over the railroads of the state, and has supervisory powers over the surface lines and the elevated roads in the city. It does not exercise jurisdiction over the subways, as these were constructed under the rapid transit act. But while the powers of supervision are divided, the interests in control of the surface, elevated, and subway lines are now united in a single corporation.

This situation should be met by a comprehensive plan. All the operations of railroad companies in the territory of greater New York should be under the supervision of one board. And the board that is to have the power to supervise generally these operations should have the power of initiating plans and of making contracts for the construction and operation of new lines. Instead of two boards dealing with different phases of the same problem, there should be one board empowered to deal with it in its entirety. As such a board would exercise important state powers of control and regulation, it should be a state board, and should be composed of men familiar with conditions in the territory affected. In my judgment it would not be advisable to put all these matters under the control either of the present board of railroad commissioners or of the new commission which I have proposed to take its place. The urgent need of an increase in transportation facilities, and the unique conditions existing in Greater New York, justify the creation of a separate board to deal with the entire matter of transportation in that part of the state.

I recommend that the board of rapid transit commissioners be abolished and that a new board be created, to have all the powers now exercised by the rapid transit board, and also to have powers with reference to operations within the territory of greater New York—or if deemed advisable, within a wider district embracing the adjoining counties into which certain lines of the surface railroads extend—similar to the powers which I have suggested should be conferred upon the new commission for the rest of the state. There would thus be included the regulation of gas and electric corporations. Provision should be made for the retention by the board of estimate and apportionment of the city, of all the powers, including powers of approval, which it now enjoys.

The commission proposed for the state generally should have jurisdiction over all traffic between points within the city of New York and points elsewhere in the state. It is believed that in this manner the whole question of transportation, and of gas and electric service in the territory of greater New York can be dealt with in an intelligent and efficient manner, and that to the fullest extent possible the just requirements of that great community may be satisfied.

Airbrakes Versus Handbrakes.

The average difference in the cost of operating an electric car furnished with handbrakes and one equipped with airbrakes, on roads running through large cities where frequent stops are necessary, has been proven by actual tests with Christensen brakes to be between 10 and 15 per cent. These figures, furnished by the manufacturer, are based upon current consumption. The saving in current by the use of the airbrake is due to the fact that the powerful and instantaneous action of the brake renders it possible to leave the brakeshoe clear of the wheel, even when newly adjusted, and allow the motorman to run in "full release," except when he has occasion to stop or check the car; whereas, with the handbrake the shoes must not only be adjusted tight, but within city limits the motorman must keep the brake dragging, in order that he may stop quickly enough to avoid collisions. It is evident that, in addition to the economy of power, there is also a large saving in brakeshoes and labor incidental to their adjustment.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B.

PRESUMPTION OF NEGLIGENCE FROM FALLING OF TROLLEY POLE UPON PERSON WAITING TO BOARD CAR.

Cincinnati Traction Co. v. Holzenkamp (Ohio), 78 N. E. Rep. 529. June 26, 1906.

Proof of the falling of a trolley pole from an electric car, when it stopped at a usual stopping place, upon a person standing there for the purpose of getting upon the car, the supreme court of Ohio holds raises the presumption of negligence on the part of the traction company, and, unless rebutted, the party injured is entitled to recover damages.

DUTY OF CONDUCTOR TO SEE THAT PASSENGER HAS REASONABLY SAFE SEAT OR TO CONTROL RUNNING OF CAR ACCORDING TO DANGER TO ONE INSECURELY SEATED.

Van Horn v. St. Louis Transit Co. (Mo.), 95 S. W. Rep. 326. June 19, 1906.

While the upright stanchion to which the pivot was fastened upon which the back of a seat in an open summer car turned would be on the outside of, and afford protection to, a passenger occupying an ordinary position on the end of the seat, there was evidence in this case that a woman, owing to the cramped half-sitting position she occupied from the seat not being large enough to accommodate six occupants or two of them appropriating a larger share of the seat than necessary, had not the advantage of the protection afforded by the stanchion, but was compelled to sit with her back thereto, with nothing on the outside to protect her or prevent her falling off. The supreme court of Missouri, division No. 2, says that it was the conductor's duty to see that she had a seat reasonably safe and secure, and knowing, as he must have known, her position to be unsafe, it was his duty to control the running of the car with a degree of care proportioned to the danger to which she was exposed by reason of her insecure position on the seat.

FACTS AND RULES DEEMED ESTABLISHED IN CONNECTION WITH OPERATION OF ELECTRIC STREET RAILWAYS AS TO FARES, TRANSFERS AND DUTIES OF CONDUCTORS—RULE REQUIRING EXPULSION FOR REFUSAL TO PAY FARE OR PRODUCE PROPER TICKET IS REASONABLE—TRANSFER TICKET CONCLUSIVE—REMEDY OF PASSENGER GIVEN WRONG TICKET—DAMAGES RECOVERABLE FOR ATTEMPTED EXPULSION.

Norton v. Consolidated Railway Co. (Conn.), 63 Atl. Rep. 1087. June 5, 1906.

There are certain facts and established rules connected with the operation of electric street railways, which in these days are familiar to every person of ordinary intelligence who has occasion to ride on them, and which, the supreme court of errors of Connecticut says, are to be regarded in determining what the real contract of carriage is in a case like the present one—an action to recover damages for the alleged tort of the defendant's servant in attempting to forcibly eject the plaintiff from the car after he had produced an improper transfer ticket and refused to pay fare. Among them are, that the mere payment of the ordinary fare in a street car does not, of itself, as upon a steam railroad, indicate the destination of the passenger, nor suggest that he desires transportation by another line and upon another car; that a passenger upon one line desiring to be transferred to another, operated by the same company, must pay his cash fare on the first car; that upon such payment he will be carried, in that car, to the point of transfer to the second line, that before leaving the first car he must obtain from the conductor of it a ticket indicating upon its face his right to take passage upon a car of the second line; that as to the conductor on the second car, the person receiving such transfer ticket enters that car

like all other passengers taking the car at that point, and will not be permitted to ride unless he either pays his fare or presents a proper transfer; that it is the office of the conductor of the second car to determine the right of the passenger to ride upon that car, and that upon the presentation of a transfer ticket, the ticket itself is the only evidence of such right which the conductor can properly accept.

A rule requiring the expulsion from a car of a passenger who refuses either to pay his fare or produce a ticket showing his right to ride on such car is a reasonable one. In ascertaining whether the plaintiff was entitled to ride on the second car, it was not the duty of the conductor of that car to accept the statement made to him by the plaintiff that the mistake in his transfer was the fault of the conductor of the first car. As between the second conductor and the plaintiff, the transfer ticket was conclusive as to the latter's right to be carried as a transferred passenger upon his car.

In the court's opinion, the facts showed that the real contract of the defendant was to carry the plaintiff, upon the first car, to the proper point of transfer to the second line; to furnish him a proper transfer ticket to entitle him to a passage on a car of the second line; and to carry him upon that line, upon the presentment of such transfer or the payment of his fare to the conductor of the second car. Through the carelessness of its servant, in not giving the plaintiff the transfer ticket which he asked for, the defendant failed to perform its contract. For such breach of contract the plaintiff would have been entitled to compensation for the loss or injury, had there been any, which necessarily followed from the defendant's failure to furnish him a proper transfer ticket. His remedy for such breach of contract was not to refuse to pay his fare, and to forcibly resist being expelled from the car. As the transfer ticket which he presented did not even purport to authorize him to ride on a car of the line he boarded, the conductor of that car, notwithstanding his explanation of the mistake, was justified in refusing to accept it, and in requiring him to pay his fare or leave the car, and after the demands made by the conductor, it became the plaintiff's duty to either pay his fare or peaceably leave the car.

The court's conclusion is that the plaintiff, having by his own wrongful conduct invited the use of force, could not complain of the use by the defendant of reasonable force in the attempt to remove him from the car. It was error to hold that he was entitled to substantial damages, and the case was remanded for the assessment of nominal damages.

ANY TRACTION COMPANY AUTHORIZED BY STATUTE TO TAKE ANY EXISTING STREET RAILWAY WITH CONSENT OF OWNER, LESSEE, OR OPERATOR, AND OPERATE IT WITHOUT REGARD TO WHETHER ITS PREDECESSOR WAS CLOTHED WITH POWERS AND FRANCHISES—POWERS OF COMPANY AFTER EXPIRATION OF TERM LIMITED IN ITS CHARTER.

Mayor, etc., of Jersey City v. North Jersey Street Railway Co. (N. J. Sup.), 63 Atl. Rep. 906. June 11, 1906.

By the first section of the New Jersey act to authorize the formation of traction companies passed in 1893, it is enacted that any company incorporated under it "shall have power to enter upon any street or highway upon which any street railway or other railway operated as a street railway, is now or may hereafter be constructed (with the consent of the owner or owners, lessee or lessees of such railway, or of the person or persons operating the same), and * * * maintain and operate such railway." The second section declares that every company incorporated under the act shall have, in addition to numerous powers, privileges, and

franchises therein specified, "all other powers necessary to the performance of its duties and the exercise of its privileges imposed or conferred by this act."

When it is remembered that the primary object in incorporating street railway companies is, not the financial benefit to be obtained by their incorporators and their successors from the operation of the railways constructed by them, but the furnishing to the public of a cheap and easy means of intramural transportation, the purpose of those provisions of the act of 1893 which have been referred to, the supreme court of New Jersey says, seems apparent; and that is to prevent, as far as possible, the people from being deprived of the benefit which comes to them from the use of these public utilities, by the financial or other inability of the owners or operators of them to continue their operation.

The statute, the court continues, does not contemplate that the right of a corporation, organized under it, to maintain and operate a street railway shall depend upon the existence or nonexistence of such right in its predecessor in ownership or possession. It deals not only with railways which are owned and operated by corporations de jure (of right), having powers and franchises which are efficient to enable them to operate their roads, but with railways which are owned or operated by corporations which never had a de jure existence, and by those whose right to the enjoyment of the powers and franchises originally bestowed upon them has been terminated by efflux of time or otherwise. It deals with the railway as an existing thing, rather than with the question of the rights and powers of the corporation having possession of it. It authorizes a traction company organized under it to take possession of any existing street railway, or railway operated as a street railway, provided it obtains the consent of the party who owns, leases or operates it, and it confers upon such traction company all the powers and franchises necessary for the proper maintenance and operation of the railway after it has acquired its possession, without regard to whether or not its predecessor was clothed with powers and franchises. In a word all that a traction company organized under the act of 1893 needs to acquire from its predecessor, whether that predecessor operates the railway as owner, or as lessee, or by bare right of possession, is its consent. Its power to maintain and operate the railway is derived, not from its predecessor, but from the statute itself.

The expiration of the term limited in its charter, the court further says, did not absolutely destroy the corporate existence of the Jersey City & Bergen Railroad Co. That still remained to it by express statutory provision for the purpose of enabling it to settle and close its affairs and to dispose of and convey its property. At the time when it leased its railway to the Consolidated Traction Co., therefore, it had power to consent that the latter company should take possession of its railway and maintain and operate it. Its assignment to the Consolidated Traction Co. of the powers, privileges, and franchises which had been conferred upon it by the legislature was not requisite to enable the latter company [incorporated under the act of 1893] to maintain and operate the railway; and the fact that the assignment was fruitless, because such powers, privileges, and franchises had already ceased to exist, could not, of course, deprive the latter company of its powers, privileges, and franchises, conferred upon it by direct legislative grant. When the Consolidated Traction Co. acquired possession of the railway, therefore, it was clothed with full power to maintain and operate it; and when it, in turn, leased the railway to the defendant's company, that company, which was also incorporated under the traction act of 1893, was clothed with like power by direct grant from the legislature.

PIPING AND POWER STATION SYSTEMS—XXV.

BY W. L. MORRIS, M. E.

Figure 234-(H5-1) shows a very satisfactory construction with pipe connections entirely outside of the frame, thus avoiding the possibility of their being strained against the frame of the engine. As shown they are also exposed to view which is advantageous in case of leaks. The water can be diverted over the surface of the journal either by means of dividing partitions cast in the journal or by a pipe run into the journal and forming one of the connections. The regulating valve should be on the inlet branch, the outlet being free to atmosphere and discharging into a funnel that may readily be seen and tested by the operator. To allow the greatest possible flexibility the supports for the piping should be well away from the journal. The discharge

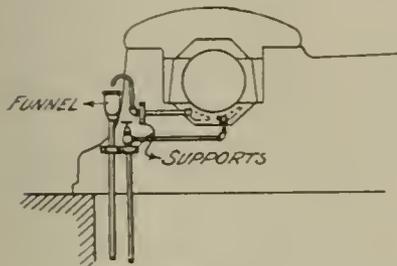


Figure 234—(H5-1).

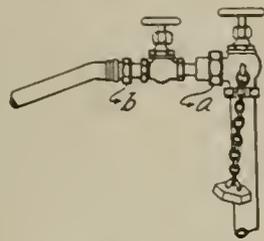


Figure 235—(H8-1).

should be carried to a height slightly above the journal, thus insuring that the bearing will at all times be full of water.

It may appear that the funnel, exposed pipe, etc., as shown are crude and unsightly, but it should be remembered that the first consideration is utility and the latter, appearance. That which on its face shows usefulness and convenience if neatly constructed has every reason for being left exposed.

Low-Pressure Water to Dry-Vacuum Pump.

For continuous running it is absolutely necessary to cool the air cylinder of the dry-vacuum pump. Low-pressure water is used for this purpose. The temperature of the air pumped is generally about 120 degrees F., and if no air cooler is used and air is compressed from about 2 pounds absolute to 15 pounds it is thus reduced to about 1-7 of its former volume. The dry-vacuum pump will operate under rather high temperatures, thus permitting cooling water to be discharged at a temperature as high as 175 degrees F. The arrangement of pipes for cooling the journal, as shown in Figure 234, is also suitable for cooling an air-pump cylinder, using only the inlet valve to control the water and an open funnel to observe the quantity and temperature. The amount of cooling water necessary to reduce the temperature of the air cylinder of the dry-vacuum pump is quite small, being only about 1.5 per cent of that used for boiler feeding. The amount of water so used should be determined by observation of the condition of the pump at various temperatures of the cooling water.

One of the most frequent troubles with air cylinders is brought about by the admitting of oil to the cylinder, which, due to the high temperature, becomes burned onto the air-discharge valve.

Low-Pressure Water to Pump Priming Pipes.

A low-pressure water connection is always provided for priming fire pumps. This connection is not installed because such pumps are not capable of lifting water without priming, but because the pump priming pipes connected with the low-pressure water main enable the fire pump to discharge water and be in service for full duty in the least possible time. As the saving in time in priming feed and

ordinary service pumps is not as essential as with fire pumps they are seldom equipped with priming pipes. The piping arrangement shown in Figure 216-(F1-3) will be found satisfactory for the service pump. A fire pump should have a foot valve, also a priming connection between the suction and discharge valves at both ends of the pump and should also have priming connections to the suction line. By the use of these several details air may be removed from the pump before it is started. If priming water is not easily obtainable from a low-pressure line or from the pump discharge as shown in Figure 216, then a hose valve should be attached to the pump between the suction and discharge valves at all four ends of a double-acting pump. This detail can be satisfactorily arranged by connecting the four ends with piping and using check valves that open into the ends of the cylinders and a stop valve to control the water from the hose or pipe line.

If the fire pump has a foot valve it can easily be primed by delivering the priming water into the pump suction. This may put a part of the water ends into service and leave one or more ends out of service, which difficulty may often be observed with pumps that have been in operation for some time. The presence of water at the suction valve does not aid the end of the pump out of operation in taking its water. To enable the inoperative end to take water it is necessary to reduce the pressure in this end as far below the atmospheric point as the pressure on the water in the suction at the suction valve. This can only be accomplished by discharging to atmosphere the confined air, since the pump is able to discharge only a part of its air into the discharge pipe.

The usual method of freeing a pump of air is to close the valves in the discharge and open the vent over the discharge pump valve, thus allowing the contents of the cylinder to be discharged to atmosphere at a low pressure. All the air can in this way be discharged from the pump if the priming water is admitted between the suction and the discharge valves. Such an arrangement of valves requires a large air vent, and if a check valve is placed in the discharge line from the pump it will prevent the pressure coming back on the pump valve whenever the air relief is open.

The usual boiler-room operator is not sufficiently skilled to handle these priming arrangements unless they are quite simple. To free a pump of air when it is not fitted with priming pipes requires even more skill. Any operator should quickly learn to open the air vent and admit priming water if that is all that is required. It must not be inferred that priming pipes are mere conveniences, since there are many installations in which they are absolutely essential and with which if priming pipes were not supplied it would be necessary when priming to open the pump and fill it with water by using a hose, pail or similarly crude method, before the pump could be put into operation.

The use of priming connections with centrifugal pumps is indispensable, as has been explained under Class C-(F1). Generally speaking, the priming line to a pump has a diameter of about $\frac{1}{8}$ that of the pump suction.

Low-Pressure Water to Hose Connections.

There are generally three distinct hose systems for a power plant, but oftentimes one of these systems is made to serve for another. They are the fire service, the sprinkling and the regular low-pressure service as used for wetting down ashes, washing floors, etc. For the purpose of simplifying piping arrangements these three services should be divided into two systems that may, with safety and without causing serious difficulty, be changed from low to high pressure systems. Ordinarily one system should supply all the hose connections. The other system should be designed without by-passes or other means by which high pressure could be put on it. The only hose connections that

should take their supply from the low-pressure system should be those for wetting down ashes. This class of work is better served by using water under low head, thus avoiding the dust and spattering that would be caused by water of high velocity striking the ashes. As this advantage is too slight to call for a separate pipe line for wetting down ashes it will be advisable, if the fire line passes near the boiler front, to connect with it the hose for this service, controlling the pressure by valves at the hose connections.

If the low-pressure system is supplied from a tank there should be only such connections taken off this system as would be injured by high pressure, but to avoid running special lines and thus complicating the station pipe work it may be found advisable to make occasional hose connections with the high-pressure line. This method is particularly advantageous if these connections can be left unused during such times as the tank supply is limited, which would be occasioned when the pumps were temporarily used for some other service. Hose connections for floor washing would form one of these exceptions, but such work can be postponed until water is available.

A simple arrangement for floor washing is to use a small hose with a large coupling at the end for attaching to the fire connection. To avoid cutting the regular fire-service valves it is quite necessary that a separate valve for controlling the water should be attached to the regular hose valve. If a hose coupling of large size can be tapped out of the fire line and a nipple attached as shown by, a, in Figure 235-(H3-1) a very convenient connection is had. An alternate method would be had by screwing a small valve onto the larger valve and connecting the hose with the coupling, b.

Low-Pressure Water to Oil Filter and Tanks.

Low-pressure water service for washing purposes supplied with hand control is usually provided for the oil filter and tanks. A very satisfactory piping arrangement is had by running steam and low-pressure water pipes to an "ejector-T," having a valve in each line and a means for connecting the hose to the T. With such connections water can be supplied either hot for cleaning tanks or cold, as may be desired for general use. If water is required in any tank it can be supplied by hose or, in the case of precipitating gravity tanks, it may be admitted through pipe connections. Ordinarily the water required for this service does not exceed that which may be delivered through a ½-inch pipe.

Low-Pressure Water to Grease Extractor.

Only a small amount of water is required for grease extractors, the quantity being just sufficient to keep the baffle plate wet and amounting to about 5 per cent of the steam passing through the extractor. A water connection is essential for the successful operation of even the most efficient grease extractors. The water admitted to the separator is discharged together with the condensation, grease, etc., to an entrainer. This entrainer, for a vacuum separator, is designed to receive first, drips under vacuum, then, by a tilting mechanism to close the drip opening and open a steam connection so that the accumulated drips are blown out; it then closes the steam and opens the drip connections in turn, working in a manner somewhat similar to the action of a steam trap.

If the grease extractor is in series with the vacuum line to the condenser the spray water, even though lifting is necessary, may be taken from the condenser circulating water. This supply will be found somewhat more reliable than the low-pressure main and no pumping machinery will be required to insure its continuous operation. If the grease extractor forms a part of an atmospheric exhaust line it will be necessary to supply the spray water under a head greater than the exhaust pressure. In this case the drips

would be discharged through a steam trap or a U-shaped drip loop.

Low-Pressure Water to Cooling Boxes at Furnaces.

There are some makes of furnaces that require water cooling to prevent them from being burned. Such devices waste the heat taken up by the water, when it is discharged to the sewer, and they are a source of constant trouble. The manufacturers of station equipments call into use many methods for eliminating this troublesome detail. The reason for this choice is not that they can secure better results, but with a view to avoiding the serious loss and any interruption of operation that would be caused by a failure of the water supply. The customary method of regulating the supply to such devices is by maintaining full water pressure on the parts to be cooled and controlling the water with a discharge valve. If the heat in the furnace increases it is possible to generate steam and drive the water out of the water box unless the discharge opening be increased before the temperature is raised to the steaming point. Thus in the operation of such cooling systems the water must be wasted or a risk run of damaging the water box. By admitting water into a box which has attained a high temperature and driven out the water or in some other manner been without water for a short time, there is not only the danger of burning the water box, but a still greater one of cracking it. As a proof that much greater damage is caused by cracking than by burning many of the builders of this class of apparatus are now making water boxes of riveted boiler plate.

If a considerable supply of water is connected to a water box so arranged that the water can circulate in it relief will be had from much of the danger occasioned by interrupted water supply. The water in the tank, in case of approaching trouble, would become overheated and give a warning. A tank for this purpose, to permit of circulating water being at not less than 210 degrees in temperature, should be placed as high as possible. When the heater used is of the open type and the tank is placed at a high level the overflow may be discharged to the heater.

(To be continued.)

Chicago & Oak Park Elevated Switching Car.

Mr. Amos Sillers, master mechanic of the Chicago & Oak Park Elevated Railroad, has recently had built in the company's repair shops at Fortieth and Lake streets, Chicago, a very simple and efficient switching car, which in addition to performing a general switching service on the elevated lines and around the yards and shops is occasionally used as a work car. It consists of an ordinary 46-foot flat car body mounted on two Baldwin trucks of the type used on the company's passenger equipment, and reinforced with steel rails laid lengthwise and bolted to the floor sills.

At the rear end of the car is a motorman's cab occupying a floor space about 8 feet square and 8 feet 3 inches high. The cab has windows on all four sides, giving the motorman a clear view in all direction, and contains two controllers, one on each side. The rear truck is equipped with two G.E.-85 motors of 160-horsepower capacity each. The car is equipped with airbrakes and with both third-rail shoes and trolley, as the road has several miles of surface lines operated by trolley.

The Street Railway Young Men's Christian Association of Memphis, Tenn., has been in existence about a year and now has a membership of 386, equally divided between motormen and conductors. The average daily attendance at the well-equipped rooms in the car barns is 280. The association is contemplating fitting up a restaurant for the use of its members. One of the interesting features of the year, which drew an attendance of 600, was a home-talent entertainment at one of the railway company's park theaters.

News of the Week

Kokomo Marion & Western Discontinues Passes.—T. C. McReynolds, general manager of the Kokomo Marion & Western Traction Company, has announced that after January 1 free transportation will be issued only to employes.

American Street & Interurban Railway Association Proceedings.—Secretary B. V. Swenson has announced that it is expected to have the annual proceedings of the association printed and ready for distribution some time in January.

Interurban Station at Columbus.—The Indiana Columbus & Eastern Traction Company has purchased property on East Rich street in Columbus, O., which is to be ultimately used for the erection of an interurban station. The plans have not yet been completed.

West Chester Street Railway Abolishes Passes.—The West Chester Street Railway Company, of West Chester, Pa., has announced that beginning with the new year, it will issue no more free transportation, giving as a reason that the pass system is a burden on the company.

Executive Meeting Engineering Association.—President H. H. Adams of the American Street and Interurban Railway Engineering Association has called for a meeting of the executive committee to be held at the Manhattan Hotel, New York, on January 7, to consider the future work of the association.

Columbus Delaware & Marion Railway to Handle Express.—The Columbus Delaware & Marion Railway, which operates an interurban line from Columbus to Marion, O., has made a contract with the Wells-Fargo Express Company to handle its express business between those points. The express will be carried on combination cars during the day and a special express car will be run during the evening.

Quarterly Meeting New York Association.—The regular quarterly meeting of the Street Railway Association of the State of New York will be held at the Iroquois hotel, Buffalo, N. Y., at 10 a. m., on January 11. The subject of the meeting will be "Track and Roadway," and it is anticipated that several interesting papers will be read. Further notice of the meeting, giving the subjects of the papers, will be sent out later by the secretary, J. H. Pardee, Canandaigua, N. Y.

American Society of Mechanical Engineers.—At the annual meeting of the American Society of Mechanical Engineers, held in New York last month, the following officers were elected for the ensuing year: President, E. R. Hutton, of New York; vice-presidents, P. W. Gates, Chicago; Alexander Dow, Detroit; Walter M. McFarland, Washington, D. C.; Walter Laidlaw, Cincinnati; Frank G. Tallman, Cleveland; Frederick M. Prescott, Milwaukee; treasurer, W. H. Wiley, New York City.

Ohio Commission Rules Against Passes.—The Ohio railroad commission has issued a ruling in regard to free transportation, which applies to both steam and electric interurban railways. The ruling is that free passes or special rates for use entirely within the state can lawfully be issued only to such persons as ministers of the gospel, agents of incorporated colleges and charitable institutions when traveling on business, destitute and homeless persons, railroad officers and employes, and attendants in shipping live stock. The maximum penalty for violation is \$10,000.

Express Service in Indiana.—The Indiana Union Traction Company has inaugurated a special express service on all its lines independent of express companies. A general express business will be conducted by the company which will carry packages and parcels, night and day, at a greatly reduced rate. All cars except the limiteds will carry express and special attention will be paid to the delivery of all consigned goods. By adopting a general express service the traction company adds another important feature to its business and one which the people will be pleased with, as it will afford them quick service at nearly every hour in the day.

Pittsburg Railways Company Abandons Park Business.—James D. Callery, president of the Pittsburg Railways Company, has announced that the company has given up its park business. Calhoun and Oakwood parks have been sold for building purposes and Duquesne Garden, Kenneywood and Southern parks have been leased to A. S. McSwigan, A. F. Morgan and W. F. Homburger, all experienced park managers. Mr. McSwigan has had charge of the company's amusements and advertising since its organization five years ago, and will continue to be identified with the company. Under the management of the lessees Kenneywood and Southern parks will be greatly improved and several new features will be added.

Bridge Loop Terminal at End of Brooklyn Bridge.—The city of New York has acquired the property now occupied by the Staats-Zetting building and others, bounded by City Hall place, Park Row, Duane and Center streets, which is to be used as the terminal of the proposed elevated loop from the Manhattan end of the Brooklyn bridge, as authorized by the board of estimates on November 24. The loop is to be connected with the elevated tracks of the Brooklyn Rapid Transit Company and is expected to relieve greatly the congestion on the bridge. The terminal is to be but a temporary one, to relieve the present crush, and may be torn down and eliminated after the subway loop and new bridges are completed. Surface cars may be run out of the

loop in some fashion to ease the crush during rush hours. Work is to begin in about 60 days.

Clubhouses for Portland Street-Car Men.—The Portland (Ore.) Railway Company has announced that it will build four clubhouses for the use of its employes next year, each building to cost about \$10,000, and each one to be located near a car barn.

Manufacturers' Association Elects Officers.—Mr. James H. McGraw was re-elected president of the American Street & Interurban Railway Manufacturers' Association at a meeting of the executive committee held in New York on Friday, December 28. The committee elected other officers as follows: Vice-president, F. C. Randall of the Allis-Chalmers Company; treasurer, Joseph R. Ellicott of the Westinghouse Traction Brake Company; secretary, Mr. George Keegan of the Interborough Rapid Transit Company. Mr. Charles C. Peirce of the General Electric Company was unanimously chosen chairman of the entertainment committee for the next convention.

Electric Cars Must Stop at Steam Road Grade Crossings.—The Ohio railway commission has ruled that the duty of the electric lines is to stop the cars at all steam railroad crossings at grade. The ruling declares that the cars must stop not less than ten feet nor more than fifty feet from the crossing and must remain at a standstill until an officer of the car has gone entirely across the steam railroad tracks to ascertain whether there is any danger. The car is not permitted to start until signaled to do so by the officer of the company. The managers of the electric lines have been instructed to post this information in a conspicuous place in the cars of the company and in the shops of the electric lines and at the offices.

Interurbans Claim Discrimination by Steam Road.—Several of the interurban roads entering Toledo are complaining of an alleged discrimination in the matter of switching charges by the Toledo Railway & Terminal Company, a steam road, and it is probable that the Ohio railroad commission will be asked to investigate the matter. The tariff sheet of the Terminal company shows that the switching of interurban cars is charged at the rate of \$3 per car while the steam roads are charged only \$1 per car. As every interurban road entering Toledo necessarily crosses the tracks of the Terminal and as nearly all are engaged in the handling of freight they must depend on the Terminal for the transfer of freight cars from one road to the other, and the extra charge often amounts to a considerable sum.

Oklahoma Electric Railway & Gas Association.—A large number of representatives of the electrical and gas industries of Oklahoma met in the chamber of commerce, Oklahoma City, on December 13 and organized the Oklahoma Electric Railway & Gas Association. A constitution and by-laws were adopted and a large number of members was enrolled. Officers were elected as follows: President, F. H. Tidman, manager Oklahoma Gas & Electric Company, Oklahoma City; first vice-president, F. P. Stearns, Shawnee, Okla.; second vice-president, H. C. Stettinund, president Stettinund Electric Company, Chandler, Okla.; third vice-president, E. M. Cooper, Degnan & Co., Wilburton, I. T.; secretary, Charles W. Ford, general superintendent Oklahoma City Railway; treasurer, John H. Merrill, manager Choctaw Railway & Lighting Company, South McAlester, I. T.

Bridge Loop Commission Proposed for New York.—Mr. Edward C. Dowling, of Brooklyn, will introduce into the New York legislature at the coming session a bill which, if passed, will take out of the hands of the New York City rapid transit commission all authority in regard to the construction of an elevated loop between the Brooklyn and Williamsburg bridges. The bill provides for the appointment of the mayor of five persons, one of whom shall be a practical civil engineer, to be known as the "bridge loop commission." This commission is to be authorized to prepare plans for the construction of a two-track elevated railroad in Center street, the Bowers and Delancey street, connecting the terminals of the Williamsburg and Brooklyn bridges. The bill further authorizes the commission, with the approval of the board of estimate, to enter into contract with any company operating an elevated railroad in New York, for the use of the structure.

Annual Count of Brooklyn and Williamsburg Bridge Passengers.—The annual count of the passengers crossing the Williamsburg and Brooklyn bridges was recently completed for the bridge department of New York City by the Brooklyn Rapid Transit Company. The count was made by the company's agents and by conductors of its cars and of the cars of the Coney Island & Brooklyn system and extended from midnight December 12 until midnight December 13. The weather conditions on that day were inclement, so that the count is not entirely indicative of normal traffic. The day for counting was set well in advance and was taken as representative of the bridge traffic for the year. On the Brooklyn bridge 283,429 passengers were carried from Manhattan to Brooklyn in the 24 hours, while 207,153 passengers were carried in the opposite direction, making a total of 390,582 passengers who used the structure on December 12. Of the Manhattan bound passengers, 88,172 crossed the bridge from seven o'clock in the morning to eight thirty o'clock. In the evening rush hours (from five to seven o'clock) 86,618 passengers crossed the bridge towards Brooklyn on surface and cable cars. The Williamsburg bridge is being plied to make a respectable showing as a passenger carrier. On that same day and in the same hours the Brooklyn trolley route on the local bridge cars carried 4,271 passengers from Williamsburg to Manhattan and 51,721 passengers from Delancey street to Brooklyn a total of 96,492 passengers. These figures do not include the cars of the Metropolitan system which use the north

tracks, but do include all the lines of the Brooklyn Rapid Transit and Coney Island & Brooklyn systems.

Jurisdiction of State Commission Over City Lines.—Governor Davidson of Wisconsin is reported to have written in his forthcoming message to the legislature a demand for the enactment of a law providing for the regulation of street and interurban traction systems by the present existing state railroad rate commission. The commission has already before it some cases which involve the question of its authority in this regard and it assumes authority whenever the traffic complained of extends beyond the corporate limits of a municipality, but the governor proposes that the commission shall be given power to regulate the business of purely urban as well as interurban and steam railroads. The most urgent popular demand for such regulation comes from Milwaukee, where the people are demanding a reduction of fare from the customary five cents, for general transfer privileges and for the prevention of the collection of two fares when the passenger rides outside of the city limits.

Pension System for Employees in Washington.—A pension system, to take effect on January 1, has been established by the Washington Railway & Electric Company and allied companies for the purpose of pensioning employees who have attained the age of 70 years, those who for 20 years or more have been continuously in the service of the company, and those who become physically disqualified by reason of injuries received in the line of duty. The company has appropriated \$5,000 per annum to defray the expense of the system. A pension board will be created for the purpose of considering and passing upon all matters in connection with the system. The board will consist of not less than five nor more than seven members, who will be appointed by the president of the company, and will serve during his pleasure. Forty per cent per annum of the average annual wages for the ten years previous to retirement will be paid in monthly instalments to those who have served the company continuously for 35 years or more; 30 per cent for 30 to 35 years' service; 25 per cent for 25 to 30 years; and 20 per cent for 20 to 25 years. To be eligible for pensions employees must be members of the Washington Railway Relief Association.

Annual Meeting Central Electric Railway Association.—The annual meeting and election of officers, together with the first annual dinner, of the Central Electric Railway Association will be held Thursday, January 24, 1907, at the Claypool hotel, Indianapolis, Ind. The business meeting and election of officers of the association will take place at the morning session at 10:30 o'clock. At the afternoon session the following subjects will be discussed: 1. Cost of power for rental purposes. 2. Developing a demand for renting power; does it pay? 3. The model car for long travel. 4. Car lighting. 5. Handling of accidents and claims. Elaborate arrangements are being made by the railroad officials of Indianapolis to make this a red-letter day and one of great importance to the entire railway fraternity of the middle west. One of the features will be the massing at Indianapolis for exhibition the various types of interurban cars now in service; it is also desired that all private cars in the middle west be centered at Indianapolis for this date. Ample arrangements have been made by the Indianapolis Traction & Terminal Company under the supervision of Mr. J. J. Mahoney, superintendent of the company, to have all the cars massed in the center of the city on one of the side streets opposite the Claypool hotel. Many prominent electric railway men from all parts of the country have been invited to be present, and under the direction of Mr. Charles L. Henry as toastmaster the after-dinner program will be elaborate.

Metropolitan System to Discontinue Street Transfer Agents.—The Metropolitan Street Railway of New York City discontinued on January 1 the employment of street transfer agents, which have been stationed at important traffic corners. The change is also intended to prevent the issuing of two transfers, one on the car and another at a transfer point, and to simplify a system which is confusing to people not familiar with it. Mr. Oren Root, Jr., the general manager, is quoted as follows: "Although we have as many men stationed at the transfer points as is practicable they are not able to handle the crowds in the rush hours and while one carload of people is transferring the cars behind continue to back up and cause a very bad congestion. Take the transfer station at Astor place and Broadway. We have three men there, the largest number possible without running the risk of issuing transfers several times to the same person. They are not able to pass the crowd fast enough and as many as ten cars sometimes are waiting to get to the transfer corner. We have had police stationed there to handle the crowd, but it is not possible for them to do so. If the conductors issue the transfers we believe that the cars will not be stalled in this manner and that traffic will go on uninterrupted. Transfer agents are also continually engaged in disputes with persons who say they have just alighted from a car, when they have actually walked in back of it at the transfer point and mingled with the passengers. The agents are put in the best possible position for seeing all those who alight, but although they are many times sure that certain persons have not come from the cars they are not able to prove it and trouble ensues. Also, many persons who ride on the principal lines of the city get two transfers, one on the car and another at a transfer point. We have calculated that at a minimum 2,000 cases such as this occur daily. On the Broadway downtown line a man may get a transfer for Fourteenth street on the car and at Twenty-third street get off and get a transfer from the agent. This transfer he will trade for a newspaper or something of that sort and then continue his trip in Fourteenth street. In the course of a year this loss alone

amounts to many thousands of dollars. In addition to all this the double system is generally undesirable and causes confusion, especially in the case of people who are not familiar with the city. Many cases of this kind have come to our attention lately."

New York New Haven & Hartford Acquires Electric Railways.

Formal announcement was made on December 20 of the completion of the purchase by the New York New Haven & Hartford Railroad of the Rhode Island Securities Company and the Rhode Island Company, both of Providence, R. I. The Rhode Island Securities Company owns the stock of the Rhode Island Company which controls practically all of the electric railways of the state. Both were controlled by the United Gas Improvement Company of Philadelphia. At the same time the leasing of the Connecticut Railway & Lighting Company and the purchase of various other electric railway and power companies of the state was announced. The official statement, as given out from the office of President C. S. Mellen, follows: "The New Haven road has purchased the capital stock and all of the indebtedness of the Rhode Island Securities Company, paying therefor in debentures of the Providence Securities Company (a Connecticut corporation), bearing interest at 4 per cent and indorsed as to principal and interest by the New Haven road at par for said stock and indebtedness as of August 1, 1906, upon the payment by present holders of Rhode Island Securities Company stock of an assessment of \$10 in cash: a share.

"Upon the completion of this purchase today the directorate of the Rhode Island Company and the Rhode Island Securities Company has been changed by a majority of said directors resigning and representatives of the New Haven road being temporarily elected in their places pending the permanent reorganization of the directorate.

"In pursuance of the above, Mr. Mellen of the New Haven road has been elected president of the Rhode Island Company and the Rhode Island Securities Company. A. S. May has been elected treasurer and J. G. Parker secretary of both companies, these men occupying relatively the same positions with the New Haven company.

"At the same time a lease has been taken, practically in perpetuity, of the properties of the Connecticut Railway & Lighting Company in Connecticut, and possession has been given to the Consolidated Railway Company, the corporation which has been formed to handle the electric properties of the New Haven road.

"A purchase has also been made of the United Gas Improvement Company interests of all the capital stock of the Meriden Southington & Compounce Tramway Company, of the New Milford Power Company, and the Housatonic Power Company, and changes in the organizations of those companies have been perfected whereby the officers of the Consolidated Railway Company have been elected and the directorate of the companies changed so that a majority of the directors are now held in the interest of the Consolidated Railway Company.

"No immediate change is contemplated in the management of the properties or in the subordinate officers, everything will continue as before until the new owners become familiar with the property. The hope of the new holders is that by the expansion of the properties and development of facilities the same will become more valuable and justify the prices paid for their control.

"In connection with the Rhode Island purchase, Edward G. Buckland, the attorney, of New Haven, has been elected a vice-president of the New Haven road, with offices at Providence, and will more particularly represent the interests of the company in all its departments in that locality hereafter."

Announcement had previously been made of the purchase of the Ray system of lines in Rhode Island and Massachusetts, including the Woonsocket Street Railway, the Providence & Burrillville Street Railway, the Milford Attleboro & Woonsocket Street Railway and the Columbian Street Railway. The purchase of the Rhode Island Company, with its lines in Providence, Pawtucket and vicinity completes monopoly of the electric railway business of the state. The Rhode Island Company at its last report was capitalized at \$20,000,000 and represents about 300 miles of track. The entire system in Massachusetts, Rhode Island and Connecticut now comprises some 1,350 miles of single track, with estimated gross earnings of approximately \$15,000,000 a year, and with an estimated market value of stocks and bonds of about \$125,000,000.

This great system, with the exception of 50 or 60 miles, has been acquired during the past three years since Mr. Mellen became president of the road, and its further expansion to any great extent is precluded by geographical considerations. With the exception of a few small roads in Massachusetts there are no more electric roads which the New Haven would reasonably care to acquire and it now enjoys a complete electric monopoly in its territory.

According to a statement by Vice-president E. G. Buckland, Mr. A. T. Potter will retain his position as vice-president of the Rhode Island Company. Mr. A. E. Potter, general manager, will also be retained, with jurisdiction over the electric lines of the entire state. Marsden J. Perry, president of the Rhode Island Company, who is recognized as the foremost electric railway builder of the state, will no longer be identified with the company except as a director.

One of the most important features of the deal, which, as announced by Mr. Buckland, will be developed as soon as practicable, is that the New Haven road is now in an excellent position to carry out its long-cherished plan of freight distribution, by which freight cars may be switched onto the city streets at night and their contents delivered to business concerns at their doors. The plan also contemplates a similar service for passengers in the event of electrification on the main line.

Construction News

FRANCHISES.

Albany, N. Y.—The New York railroad commission has denied the application of the Rochester Corning & Elmira Traction Company for a certificate of necessity to construct an electric line from Rochester to Elmira, N. Y. In denying the application the board points out that the territory proposed to be benefited by the proposed electric line is already served by one or more steam roads, one of which (the Erie) is electrifying its system between Rochester and Elmira, and that under these circumstances it was unable to say that public convenience and necessity required the construction of the railroad.

Albany, N. Y.—The state railroad commission has granted a certificate of necessity to the Malone Fort Covington & Hopkins Point Railway for a road from Malone to Hopkins Point, in Franklin county, N. Y., 16 miles. The road is to be continued to Dundee, Quebec.

Chicago, Ill.—The city council has authorized the Chicago Union Traction Company to double track its line on Fortieth avenue between Taylor and West Madison streets. The company will at once lay a temporary track to care for the winter traffic and will rebuild it before August 1, 1907. It was agreed that this shall not be considered as a franchise extension.

Defiance, O.—Permission has been granted the Indiana Columbus & Eastern Traction Company to cross the Second street bridge over the Auglaize river, in order to extend the Columbus & Lake Michigan steam road, which is to be electrified into Defiance. A franchise in Defiance has already been granted.

Denville, N. J.—The Morris County Traction Company has been granted a 40-year franchise for a connecting line between Denville and Boonton, N. J. F. H. Alleman, of Morristown, N. J., is general manager.

Dunkirk, N. Y.—The New York railroad commission has granted a certificate of necessity to the Dunkirk Street Railway for a 3½-mile belt line in the city of Dunkirk, and to the Buffalo & Lackawanna Traction Company for a proposed line from Hamburg turnpike to Lafayette square in Buffalo. Both companies are a part of the Buffalo & Lake Erie Traction Company which will connect Buffalo, N. Y., with Erie, Pa.

Evanston, Ill.—The Chicago Evanston & North Shore Railway is applying for a 50-year franchise for a line through the town, agreeing to pay \$66,250 in annual instalments, beginning with \$250 a year and increasing at stated periods.

Findlay, O.—The Findlay-Marion Railway & Light Company has been granted a franchise over the county roads from Marion to Delaware, O.

Freeburg, Ill.—A 20-year franchise has been granted to the Belleville & Pinckneyville Traction Company, which proposes to build from Belleville to Pinckneyville, Ill., via Freeburg.

Lima, O.—The temporary injunction against the franchise recently granted by the city council to the Schoepf syndicate has been dissolved by the court, after a long controversy. The franchise, which is for 25 years, is for the line from Lima to Bellefontaine and it is stated that work will be commenced at once in Lima. This line connects at Lima with the syndicate's Lima & Toledo Traction Company, which is now in operation as far as Leipsic, and at Bellefontaine with lines owned by the same interests extending to Springfield, Dayton and Cincinnati.

Macon, Ga.—A 50-year franchise has been granted to the Macon American & Albany Electric Railway, entering the city at the intersection of Boundary and Elbert streets. Work is to begin in the city within 12 months and cars must be run to Ft. Valley within two years.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis.—This company is circulating petitions to secure a franchise from the township of Milwaukee for an extension of its Third street line. The Milwaukee-Northern Electric Railway recently got a franchise from this town in return for which it proposes to carry passengers for a three-cent fare.

Pittsburg, Pa.—The Monongahela Street Railway has applied for a franchise for either a single or double-track line on Frankstown avenue from the Penn township line to Oakwood street.

Puyallup, Wash.—The city council has granted a franchise to the Puget Sound Electric Railway for its proposed extension from Tacoma to Puyallup and Orting. General Manager W. S. Dimmock Tacoma, Wash., says that work is to begin immediately at the Puyallup end.

Seattle, Wash.—The city council has passed over the mayor's veto the franchise for the Seattle Electric Company over Second avenue, Denny Way, Third avenue, Roy, W. B. and other streets.

Sidney, Ia.—The city council has extended for three years the franchise granted some time ago to the Council Bluffs, Taylor & Southern Electric Railway. The company was also granted an electric light franchise.

Springfield, Ill.—The city council has granted a 50-year franchise to the Springfield & Southeastern Traction Company for an independent entrance to the city for its proposed line to Pana and Vandalia.

INCORPORATIONS.

Alabama Railway & Power Company.—Incorporated in Alabama to build either a steam or electric railway from Chattanooga, Tenn., to Birmingham, Ala. Capital stock \$100,000. Incorporators: H. T. Henderson, Durango, Cal.; C. L. Young, J. M. and J. H. Hill, Ft. Payne, Ala.; and J. P. Montgomery, of Asheville, Ala.

Amarillo Street Railway.—This company has applied for a charter in Texas to build 3 miles of street railway. Capital stock \$250,000. Incorporators: John L. Brock and C. C. Harris, of Decatur, Ala.; J. C. Paul, H. A. Noble, J. W. Crudgington, S. D. Wharton, W. E. Kirk, C. E. Pash and John K. Shifman, of Amarillo.

Asheville Rapid Transit Company.—Incorporated in North Carolina with power to build an electric railway to any point within 25 miles of Asheville. The immediate intention, however, is only to build to Overlook Park on Sunset Mountain and Weaverville. The company has acquired the Overlook Park & Loop Line Railway and will rebuild its line to the mountain. Capital stock, \$500,000. Incorporators: Charles E. Van Bibber, of Holden, Mass.; Thomas S. Rollins and John P. Arthur, of Asheville.

Cleveland & Indianapolis Interurban Railway.—Incorporated in Ohio to build an electric line from Norwalk, O., to Bluffton, Ind., passing through Tiffin, Findlay, Ottawa and Van Wert, O., and Decatur and Bluffton, Ind. The road will connect at Norwalk with the Lake Shore Electric and the Cleveland & Southwestern for Cleveland and at Bluffton with the lines of the Indiana Union Traction Company for Indianapolis. It is stated that financial arrangements have been made for the preliminary work and that Riggs & Sherman of Toledo have commenced surveys. Incorporators: C. F. Jackson, S. W. Owen and E. L. Young, of Norwalk; P. J. Poole, John P. Montgomery and W. S. Parker of Findlay.

Columbus Traction Company.—Incorporated at Columbus, O., with a capitalization of \$1,000,000 for the purpose of taking over the Central Market Street Railway system, of Columbus, under the terms recently agreed upon between officials of the Columbus Railway & Light Company and A. E. Locke, of Boston, who has been holding the property for the Schoepf syndicate. At the annual meeting of the Columbus Railway & Light Company on January 29, the stockholders will be asked to vote on the proposition of taking over the Columbus Traction Company property for operation on the same terms that it holds and operates the Columbus Railway Company and the Columbus Edison Company. The officers of the Columbus Traction Company were elected last week as follows: President, Butler Sheldon; first vice-president, secretary and treasurer, Frank T. Stewart, and second vice-president, George Hardy. These, with William K. Lanman and Hartford Stewart, constitute the board of directors.

Hanover & York Street Railway.—Incorporated in Pennsylvania for the purpose of building a trolley road beginning at the junction of West King street and Highland avenue, West York, and continuing on through West Manchester township to Bear station and Spring Grove. Capital stock, \$120,000. Incorporators: President, W. F. Bay Stewart; George H. Frazier, Philadelphia; Grier Hersh, York; George S. Schmidt, York; A. H. Hayward, York; David Young, Newark, N. J., and Thomas Newall, Philadelphia.

Evansville & Southern Indiana Traction Company.—Incorporated in Indiana with \$4,500,000 capital stock. The intentions of the company are not stated, although it is believed that it will ultimately build from Evansville, Ind.; to Louisville, Ky. Incorporators: Hugh J. McGowan, of Indianapolis; James and Charles Murdock and Henry Marshall, of Lafayette, Ind.; H. B. Smith, Hartford City, Ind.; L. G. Neely, Lima, O.; W. T. Durbin and Robert I. Todd, of Indianapolis; T. S. Kurtz and J. W. Van Dyke.

Indianapolis Crawfordsville & Danville Traction Company.—Incorporated in Indiana to build an electric railway from Crawfordsville, Ind., through Covington, and Veedersburg to Danville, Ill., to be operated in connection with the Indianapolis & Northwestern Traction Company, which has a road from Indianapolis to Crawfordsville. It is stated that several franchisees and some right of way has been secured. Capital stock \$600,000. Incorporators: John J. Appel, Robert I. Todd, T. B. McMath, Fletcher M. Durbin and W. F. Millholland, all associated with the McGowan syndicate.

Saginaw Owosso & Lansing Railway.—Incorporated under the general railway laws of Michigan to build an electric railway from Saginaw to Owosso and Lansing with branches to Alton and Durand. Capital stock \$600,000. Incorporators: J. L. King, Saratoga, N. Y.; F. S. Richard, Cleveland, O.; George B. Morley, of Saginaw, Mich.; Phil H. McMillan, George Black, Frank W. Eddy, Frank West, Charles W. Baird, Thomas E. Roeder, Charles B. Warren, William H. Cady and J. A. Thlek, of Detroit.

San Bernardino Urban Railway.—Incorporated in California to build an electric railway from San Bernardino to Rialto, Ontario, Riverside and Redlands, Cal. Capital stock \$1,000,000. Incorporators: H. B. Harris, Victor Smith, A. G. Kendall, O. L. Moorman and B. S. Draper.

Stauben Traction Company.—Incorporated in New York with headquarters at Hornell, to effect a consolidation of the Hornellville Electric Railway, Hornellsville & Canisteo Railway, Canisteo Valley Railway and Canisteo Jasper & Woodhill Railway. Capital stock \$750,000. Incorporators: Charles Adit of Hornell, J. W. Powell of Canisteo, and L. D. Whiting, of Jasper.

TRACK AND ROADWAY.

Evansville & Eastern Electric Railway.—It is reported that this line from Evansville to Rockport, Ind., 24 miles, is nearly ready for operation its entire distance. Track is laid practically into Rockport and the grading within the city is being completed. W. H. McCurdy, Evansville, Ind., president.

Ft. Wayne & Springfield Railway.—It is stated that it is hoped to have this road in operation between Springfield and Decatur this week. The power house at Decatur is ready for operation, the overhead wires have been tightened, and the roadbed is said to be in good condition. W. H. Fledderjohann, of Decatur, Ind., is president and general manager.

Kansas City St. Joseph & Excelsior Springs Electric Railway.—Work has been started on the construction of this company's \$2,000,000 bridge over the Missouri river near Kansas City. The line is to connect Kansas City and St. Joseph, Mo., 52 miles.

Lexington & Interurban Railway.—This company, which recently took over the property of the Winchester Railway Light & Ice Company, of Winchester, Ky., is rebuilding the track and roadway of the new acquisition and making many other improvements in the system. During the period of rebuilding the line no cars have been run, though it has been announced that a regular schedule would be resumed on January 1. The tracks are being laid with new 70-pound T-rails in crushed stone ballast. It is expected that the Winchester property will later serve as the eastern terminus of the interurban line that the company proposes to build between Lexington and Winchester.

Milwaukee, Wis.—Mayor Thomas L. Johnson of Cleveland, G. J. Kobusch of the St. Louis Car Company and Joseph Heim, a Kansas City brewer, are said to be planning to build a street car line in Milwaukee 60 miles long. Their plan is reported to be to connect all city parks, railroad stations and other places of importance with a system which will charge a fare of but 3 cents. Milwaukee capitalists are alleged to be ready to invest several hundred thousand dollars to assist the outsiders. A map has been prepared, showing that the routes contemplated will parallel many tracks of the Milwaukee Electric Railway & Light Company at distances of one to four blocks.

New York New Haven & Hartford Railroad.—Vice-president E. G. Buckland has given out a statement that it is the intention to operate fast electric trains between Providence and Boston as soon as the tunnel in Providence is completed, provided the electrification of the line between Stamford, Conn., and New York proves a success.

Northern Electric Company.—This company, which is building a line from Chico to Sacramento, Cal., 150 miles, and which has a line in operation as far as Oroville, 10 miles, will begin work some time in January on a line from Chico to Red Bluff, for which a location survey has been made. Work will begin at Red Bluff on account of the right of way situation. A. D. Schindler, general manager, Chico, Cal.

Springfield & Southeastern Traction Company.—Work on this line between Springfield and Pana, Ill., is to be started early in the spring at a point between Taylorville and Pana. The contract has been awarded to the G. R. Turner Construction Company, of New Orleans. Chief Engineer C. F. Terhune, of Taylorville, has completed surveys and all the franchises have been secured, including an independent entrance to Springfield. The capital stock is \$250,000, which is to be increased to \$2,250,000 at the next meeting of the directors. J. J. Finn, of Decatur, president; M. P. Vale, of Chicago, secretary.

Boston & Providence Electric Railway.—The Stone & Webster Engineering Corporation, of Boston, Mass., announces its intention of organizing a company under the above name to build an electric railway from Forest Hills to Seekonk, Mass., on the Massachusetts-Rhode Island state line, passing through Hyde Park, Dedham, Westwood, Norwood, Canton, Sharon, Foxborough, Mansfield, and Attleboro. Capital stock \$5,000,000. Directors: Russell Cobb, Concord, Mass.; H. Heustis Newton, Everett, Mass.; Frederick E. Snow, Boston; Frederick S. Pratt, Newton; James L. Richards, Newton.

Chicago Lake Shore & South Bend Railway.—J. B. Hanna, president, South Bend, Ind., writes that this road will extend from a connection with the Illinois Central Railroad at Kensington, Ill., through Hammond, Indiana Harbor, East Chicago, Gary, Michigan City and New Carlisle to South Bend, Ind., 78 miles. Franchises have been secured in all the towns and the entire right of way has been purchased. Surveys have been made for the entire distance and 15 miles, from South Bend to New Carlisle, has been graded. Grading is now in progress between New Carlisle and East Chicago and will continue throughout the winter, as will the tracklaying. About 2 miles of track have been laid. The United States Steel Corporation has the contract for the rails, 70-pound, and 10½ miles of steel and 30,000 ties have been distributed along the right of way. The Cleveland Construction Company has the contract for the grading, the power house, which is to be located at Michigan City, the substations and pole lines. The site for the power house has been purchased. Single-phase current will be used. The equipment for the power house and substations will be contracted for in January. The overhead construction will be of the single catenary type, suspended from center poles set in concrete. The sliding contact will be used instead of a trolley wheel. It is probable that the car house and shops may be located at Michigan City. John W. S. Reigle, of South Bend, is the chief engineer.

Denver City Tramway.—President William G. Evans has announced that this company has made a traffic agreement with the Colorado & Southern Railroad, which is electrifying its line between Boulder and Denver, Colo., whereby the latter will carry its passengers into the heart of Denver over the Tramway system. Mr. Evans also stated that plans are being made for 42 miles of extensions, including several lines and loops within the city, and lines to Globeville, Ft. Logan and Valverde, at a cost of about \$3,500,000.

East Liverpool Traction & Light Company.—This company has disposed of \$2,750,000 of its bonds for the construction of several extensions and over 2,000 men are to be set at work at once on the new line from Wellsville to Empire, O., 10 miles. The Ohio River Railways Company, a subsidiary property chartered under the laws of Pennsylvania, will build an extension to connect the Ohio lines of the East Liverpool Traction & Light Company with those of the Beaver Valley Traction Company at Vanport, Pa. J. C. Rothery, general manager, East Liverpool.

East River Tunnel, New York.—The shields in the north bore of the East River tunnel met on December 15 under the middle of the river and the engineers report that the two sections joined perfectly. This is the extension of the present Rapid Transit subway from the Battery to Joralemon street, Brooklyn, and which is being built by the New York Tunnel Company for the Rapid Transit Subway Construction Company, to which the city awarded the contract for the Brooklyn extension of the subway.

Ft. Dodge Des Moines & Southern Electric Railway.—Construction work on this line from Fort Dodge to Des Moines, Ia., has been discontinued until spring.

Galesburg & Kewanee Electric Railway.—The nine-mile interurban line connecting Kewanee and Galva, Ill., was recently opened for operation. W. H. Lyman, president, Kewanee, Ill.

Houston-Galveston Traction Company.—It is reported that the final route of this line which the Stone & Webster Engineering Corporation, of Boston, proposes to build between Houston and Galveston, Tex., has been located along the Harrisburg road from Houston to Harrisburg and parallel to the Galveston Houston & Henderson to Galveston.

Illinois Traction Company.—The first car was operated over the new Springfield-Lincoln division on December 15 and regular operation was begun on December 16.

Indianapolis Crawfordsville & Western Traction Company.—It is announced that it is hoped to run cars soon after the first of the year on this new line from Indianapolis to Crawfordsville, Ind., which is nearing completion. A large force of laborers is now at work and the track is laid from Indianapolis nearly to Crawfordsville. The poles have been set and wires are being strung. A. E. Reynolds, general manager, Indianapolis.

Lewiston Brunswick & Bath Street Railway.—It is reported that surveys have been made and plans nearly completed for an extension of the Sabattus branch of this road from Sabattus through Litchfield Corner to Gardiner, Me., there to connect with the line from Gardiner to Augusta. E. D. Reid, chief engineer, Lewiston, Me.

Lima Kenton & Marion Traction Company.—A contract has been let to the Lackawanna Steel Company, of Buffalo, N. Y., for 51 miles of steel rails for the proposed line from Lima to Marion, O. The company has secured options on the resort property at Magnetic Springs. Joseph A. Vandergrift, of New York, president.

Long Island Railroad.—Plans have been prepared for a new model station at Jamaica, L. I., and for the elimination of all grade crossings in and near the town. Twelve tracks will enter the station, eight tracks for through trains and four for suburban trains from New York. A thoroughfare running directly under the station platforms will be built and every platform will be reached by steps from below.

New York Subway.—The New York rapid transit commission has instructed Chief Engineer Rice to prepare plans for a double-deck subway, with the two lower tracks for express train service and the two upper tracks for local service, for the Lexington avenue subway route, one of the seven routes for which bids will be advertised some time in January. The route extends from the Bronx to Thirty-sixth street on Lexington avenue and on Thirty-sixth street west to Broadway. On Broadway from Thirty-sixth street to the Battery the four tracks will all be on the same level. The lower tracks are to be 35 feet below the surface. Mr. Rice says he will have the plans ready in three weeks.

Roanoke Railway & Electric Company.—The directors have authorized an expenditure of \$108,000 for various improvements, including considerable double tracking and paving, new cars, additional power equipment, and the first section of a new car house. R. D. Apperson, president, Lynchburg, Va.

Utah Light & Railway Company.—General Manager Joseph E. Wells has submitted plans for improvements during the coming year involving an expenditure of \$3,250,000, including reconstruction of tracks and extensions, power house with two 5,000-k.w. units and provision for a third similar unit, the placing of the wires underground in the paved district, material yards, trolley and feed wire reconstruction, 1,500-kv. motor generator, additional transformers, and 50 new cars.

Worcester Consolidated Street Railway.—This company's air line from Worcester to Leominster was opened for traffic on December 18.

POWER HOUSES AND SUBSTATIONS.

Brooklyn Rapid Transit Company.—This company is reported to have ordered from the Westinghouse Machine Company five Westinghouse-Parsons steam turbines of 10,000 kw. capacity each, and an equal number of electric generators from the Westinghouse Electric & Manufacturing Company, to be installed in the Kent avenue power house. The company has already contracted with the Westinghouse company for four 7,500-kw. turbines, of which two have been installed and an Allis-Chalmers 5,500-kw. turbine has also been installed.

Charleston & Summerville Electric Railway.—As announced the track and roadway work of this 27-mile line from Charleston to Summerville, S. C., is progressing rapidly. The power house near Charleston will be equipped with Snow gas engines and 6,600-volt single-phase electrical apparatus will be used. D. E. Baxter & Company, Incorporated, 27 William street, New York, has the complete contract covering the construction and equipment of the road ready for operation.

Chattanooga Railways.—The Ridgedale power house at Chattanooga, Tenn., is being remodeled and its capacity largely increased. Large new water-tube boilers are being installed and a new 800-kw. generator has just arrived. Several carloads of machinery are to be shipped. D. J. Duncan, general manager, Philadelphia, Pa.

Ft. Wayne & Wabash Valley Traction Company.—This company, it is reported, will expend \$50,000 in the enlargement of its power plant at Lafayette, Ind. An addition will be made to the building and enough new machinery will be installed to give the plant 2,200 horsepower. Work is to begin in a short time and the enlargement of the plant will be completed by the time that the Lafayette & Logansport traction line is ready for operation. The work on the grade for the line is progressing nicely at the Lafayette end of the road.

Georgia Railway & Electric Company.—This company has ordered and will shortly receive a Snow gas engine and dynamo of 3,000 horsepower capacity, which will be installed in the Devils street power house, Atlanta, Ga., as an auxiliary unit. To accommodate this engine the building has been enlarged by an extension 50 by 150 feet.

Jackson Electric Railway Light & Power Company.—This company's new power plant at Jackson, Miss., which has just been completed at a cost of \$125,000, was put in operation for the first time on December 15.

Lake Shore Electric Railway.—This company is building a new substation a short distance west of Cleveland.

North Midland Electric Railway.—It is reported that this company will enlarge its power plant at Stratford, Ont., at a cost of \$100,000.

Orange County Traction Company.—This company has purchased a tract of land in Newburg, N. Y., on which it will erect a large brick car barn and machine shops, which will accommodate all the company's rolling stock. Office, Newburg, N. Y.

Portsmouth (O.) Street Railroad & Light Company.—This company is preparing to install a 500-kw. Curtis steam turbine in its power house at New Boston, O. The increased power is needed to furnish current for the 4½-mile extension which is being made to the city lines. An additional turbine unit of 1,000-kw. capacity will be installed this year to care for the increasing demand made by manufacturers of the city for additional power.

Rapid River Light & Traction Company.—This company proposes to build a power plant on Rapid creek, at a cost of \$250,000. T. N. Blockhart, of Rapid City, S. D., is interested.

Roanoke Railway & Electric Company.—This company has recently installed in its power house at Roanoke, Va., a new 500-kw. General Electric railway generator, direct connected to a Corliss engine and a 500-kw. three-phase alternating current generator, direct connected to a McIntosh & Seymour vertical compound condensing engine. A Babcock & Wilcox 400-hp. boiler is now being installed which will increase the boiler capacity to 2,000 h. p. The above units will increase the generating capacity to 2,500 kw.

Rochester Railway & Light Company.—This company has filed plans for its new power station on Hastings street and Itavine avenue, Rochester, N. Y., which will be of reinforced concrete, to cost about \$57,000. Sellers & Ripley, Philadelphia, are the architects.

Scranton (Pa.) Railway.—This company is making preparations for the erection of a \$555,000 power house near Carlton street bridge on the Lackawanna river, in Scranton. The present power house will be converted into a repair shop. The company also expects to spend about \$150,000 for double tracking and improvements to its lines.

Texas Traction Company.—The General Electric Company has been awarded the contract for the electrical equipment of this line which is to run from Dallas to Sherman, Tex., 65 miles. The main power house will be located at McKinney and will be equipped with two 1,000-kw. Curtis steam turbo-generators. Current will be generated at 2,200 volts and 25 cycles and will be stepped up for transmission to 19,100 volts. Two 35-kw. motor-generator sets will be provided for exciting the fields. There will be six substations, including a portable one and one at the power house. Each substation will be equipped with a 300-kw., 600-volt rotary converter, oil-cooled transformers and the necessary switchboards and lightning arresters. J. F. Strickland, of Dallas, president

Personal Mention

Mr. E. E. Franklin, of Portland, Ore., has been appointed master mechanic of the Utah Light & Railway Company, at Salt Lake City, Utah.

Mr. Ira Schofield, heretofore master mechanic of the Toledo & Western Railway, at Sylvania, O., has been appointed superintendent of motive power.

Mr. C. W. Chase has resigned as secretary of the Mobile Light & Railroad Company, Mobile, Ala., to engage in other business in Leavenworth, Kan.

Mr. A. L. Lindner has resigned as general manager of the Citizens' Railway & Light Company, of Muscatine, Ia., which position he has held for three years.

Mr. D. M. Deininger, of Omaha, Neb., has been appointed auditor of the International Railway Company, of Buffalo, N. Y., succeeding Mr. A. C. Emmerleck, resigned on account of ill health.

Mr. C. C. Benson has been appointed general manager of the San Jose & Santa Clara Railway and the Santa Clara Interurban Railroad at San Jose, Cal., succeeding Richard Emory, deceased.

Mr. C. J. Franklin, who recently resigned as superintendent of the Tacoma Railway & Power Company, has been appointed general superintendent of the Portland (Ore.) Railway & Light Company.

Mr. T. K. Wells has resigned as superintendent of transportation of the Manila Electric Railway Company on account of ill health. Mr. Wells was formerly transportation manager of the Syracuse Rapid Transit Company.

Mr. Fenwick E. Lowe has been appointed superintendent of the St. Paul division of the Twin City Rapid Transit Company, succeeding Mr. C. C. Burdick, resigned. Heretofore Mr. Lowe has been chief clerk to the general manager.

Mr. G. E. Tracy, formerly master mechanic of the East St. Louis & Suburban Railway, has been appointed to a similar position with the Cleveland & Southwestern Traction Company, in charge of the shops now under construction at Elyria, O.

Mr. W. O. Woodward, formerly general passenger agent of the Indianapolis & Eastern Traction Company, has been appointed general passenger agent of the lines of the Indiana Columbus & Eastern Traction Company between Richmond, Ind., and Columbus, O.

Mr. D. Frederick Carver has resigned as general superintendent of the Rochester Railway Company, of Rochester, N. Y., and has been appointed assistant general manager of the Aurora Elgin & Chicago Railroad, with office at Wheaton, Ill., effective on January 1.

Mr. Charles F. Shelton has resigned as superintendent of the Ft. Wayne & Wabash Valley Traction Company, with office at Ft. Wayne, Ind. It is stated that no successor will be appointed but that Mr. Shelton's duties will be assumed by Mr. C. D. Emmons, general manager.

Mr. J. R. Harrigan, until recently general manager of the Canton-Akron Railway at Canton, O., has been appointed general manager of the Buffalo & Lake Erie Traction Company, of Buffalo, N. Y., a consolidation of the Sheehan-Mayer lines between Buffalo, N. Y., and Erie, Pa.

Mr. John H. Merrill, who resigned recently as secretary of the Central Electric Railway Association to become manager of the Choctaw Railway & Lighting Company, of South McAlester, I. T., has been elected treasurer of the newly organized Oklahoma Electric Railway and Gas Association.

Mr. J. D. Pope has been appointed chief electrical and mechanical engineer of the Lexington & Interurban Railway with headquarters at Lexington, Ky. Mr. Pope was formerly connected with electric railways in Virginia and other eastern states. He assumed his new duties on December 15.

Mr. Arthur B. Smith, assistant general passenger agent of the Northern Pacific Railway, with office at St. Paul, Minn., has been appointed traffic manager of the Consolidated Railway Company, of New Haven, Conn., which controls the electric railway system of the New York New Haven & Hartford Railroad.

Mr. James B. Luckey has resigned as secretary of the Washington (D. C.) Railway & Electric Company, to become secretary and business manager of the Street Railway Advertising Company of New York. Mr. Frederick J. Whitehead, heretofore secretary to the vice-president, has been elected to succeed Mr. Luckey.

Mr. A. Gadhbury has been appointed superintendent of the Montreal Street Railway the Montreal Park & Island Tramway the Montreal Terminal Railway and the Suburban Tramway & Power Company of Montreal, Que., succeeding the late L. Trudeau. Mr. Gadhbury has had practical charge of the operating department since Mr. Trudeau's illness last May.

Mr. S. L. Rhoades, chief claim agent of the Philadelphia Rapid Transit Company, has resigned to become general supervisor of claims of the Casualty Company of America at New York, N. Y. Mr. Rhoades has been associated with the claim department of the Rapid Transit company since 1888 and has been president of the American Street & Interurban Railway

Claim Agents' Association since its organization in 1905. Mr. Harry R. Goshorn, assistant claim agent, has been appointed chief claim agent to succeed Mr. Rhoades.

Mr. J. B. Ingersoll, heretofore assistant general manager and chief electrical engineer of the Spokane & Inland Railway and the Spokane Terminal Company, with office at Spokane, Wash., has been appointed general manager and chief electrical engineer. He succeeds Mr. F. A. Blackwell as general manager. Mr. Blackwell will remain as chairman of the board of the Spokane & Inland Empire Railroad system.

C. Loomis Allen, general manager of the Utica & Mohawk Valley Railway, the Rome City Street Railway and the Oneida Railway, has been elected vice-president and general manager of the Utica & Mohawk Valley Railway, the Rome City Street Railway, the Oneida Railway and the Syracuse Rapid Transit Railway, with office at Utica, N. Y., succeeding Mr. John J. Stanley, who has held that title since Mr. E. G. Connette resigned to go to Worcester. These appointments were made December 6 by the four companies interested. This places Mr. Allen in charge of the electric railway properties from Syracuse on the west to Little Falls on the east, including the electrification of the West Shore Railroad between Syracuse and Utica. Mr. Allen is a native of Syracuse and was educated at Alfred and Syracuse universities. He adopted civil engineering as a profession and was first employed with the Norfolk & Western Railway Company. In 1892 he went to Syracuse to engage in private practice as a civil engineer, being a member of the firm of Mather & Allen. In the spring of 1895 he was appointed civil engineer of the Syracuse system and had charge of the reconstruction of the track and overhead line on some 64 miles of road. Three years later he became assistant general manager and in February, 1899, he became general manager of this company. He left Syracuse on December 31, 1899, to accept the position of general manager of the Lorain Street Railway in Lorain, O., where he remained a year and a half. When the Andrews-Stanley interests acquired the property of the Utica & Mohawk Valley Railway Mr. Allen was offered and accepted the position of assistant general manager of that company with Mr. Stanley, and when Mr. Stanley, in May, 1902, returned to Cleveland Mr. Allen was made general manager of the Utica & Mohawk Valley Railroad and the Rome and Oneida properties. In 1904 Mr. Allen was president of the Street Railway Association of the state of New York.

Obituary.

J. W. Hartzell, promoter of the San Francisco Vallejo & Napa Valley Railroad, and who had long been identified with electric railway construction in California, died at Vallejo, Cal., on December 8, aged 67 years.

Nathaniel Pope Yeatman, secretary and treasurer of the Nashville Railway & Light Company since its reorganization in 1895 and prior to that time secretary and treasurer of the Nashville Street Railway and the Cumberland Electric Light & Power Company, died at his home in Nashville, Tenn., on December 19, aged 54 years.

George Franklin Wright, of the law firm of Wright & Baldwin, of Council Bluffs, Ia., and vice-president of the Omaha & Council Bluffs Railway & Bridge Company, died at his home in Council Bluffs on December 13, at the age of 73. Besides being prominent in his profession Mr. Wright had for many years been identified with various street railway enterprises. In 1863 with his associates, he organized and built the first street railway line in Council Bluffs, and was for a time president of the company. In 1886 with the same associates he organized the Omaha & Council Bluffs Railway & Bridge Company, operating the first electric railway in Iowa and Nebraska, now leased to the Omaha & Council Bluffs Street Railway, and in 1889 he was one of the organizers of the street railways of Ottawa, Ill.

Samuel Little, formerly president of the West End Street Railway, of Boston, Mass., died in Boston on December 21. Mr. Little was born at Hingham, Mass., on August 15, 1827, and completed his education at Hingham. He first became interested in street railways in 1872, when he aided in the organization and became treasurer of the Highland Street Railway, of Boston, when that road was later consolidated with the Middlesex Street Railway as the West End Street Railway. Mr. Little became a director of the consolidated company and in 1893 was made president, which position he held until his retirement from active business in 1900. The West End company is now leased to the Boston Elevated Railway Company. Mr. Little was well known as a business man and took an active part in public affairs.

General John M. Hood, formerly president and general manager of the Western Maryland, and since February, 1902, president of the United Railways & Electric Company of Baltimore, Md., died at his home in Baltimore on December 17 at the age of 63 years. He was born at Sykesville, Md., on April 5, 1843, and entered railway service in July, 1859, from which date to August, 1861, he was assistant engineer of the Delaware Railroad and the Eastern Shore Railroad. He was then for four years chief engineer of the Port Deposit Branch of the Philadelphia & Baltimore Central, and for one year engineer and superintendent of the last-named road. In April, 1870, he was appointed general superintendent of the Florida Railway, and from November, 1871, to April, 1873, was chief engineer of the Peach Bottom Railway. He then went to the Baltimore Philadelphia & New York as chief engineer, which position he held until he became vice-president and general superintendent of the Western Maryland on January 14, 1874. On March 24, 1874, he was made president and general manager of the latter road, which office he held until July 8, 1902.

Financial News

Augusta Winthrop & Gardiner Railway.—It is reported that an arrangement has been made by which this road is to be purchased by the syndicate headed by John R. Graham, of Bangor, Me., which owns the Lewiston Brunswick & Bath Street Railway and the Bangor Railway & Electric Company. Thomas J. Lynch is president. It is stated that if the deal is accomplished the syndicate has plans for the construction of 50 miles of new road next year, including a line from Augusta to Winslow, and one connecting with the Lewiston Brunswick & Bath at Sabattus.

Aurora Elgin & Chicago Railway.—The gross earnings for the month of November were \$96,722, compared with \$89,415 in 1905. Net earnings for the month were \$39,904 and surplus \$13,745, against \$37,835 and \$13,355 for November, 1905.

Buffalo & Lake Erie Traction Company.—This company, a consolidation of the Sheehan-Mayer roads between Buffalo and Erie, the Buffalo Dunkirk & Western Railroad, the Dunkirk & Fredonia Railroad and the Lake Erie Traction Company, has filed a mortgage for \$12,000,000 to the New York Trust Company.

Chicago, Ill.—The case of Lobdell against the city of Chicago, in which the plaintiff, said to represent the Chicago traction interests, questions the constitutionality of the Mueller law, providing for an issue of \$75,000,000 of certificates to enable the city to purchase the street railway system of the city, was submitted before the supreme court of Illinois at Springfield on December 22 and taken under advisement by the court. Harry P. Weber, who appeared for the plaintiff, argued that the ownership of street railways was not a municipal purpose; that the Mueller law was a local or special law; and that the certificates would constitute a debt of the city beyond the constitutional limit. Walter L. Fisher appeared for the city to defend the law.

Chicago-New York Electric Air Line Railroad (Portland, Me.)—This company, which is promoting an electric railway from Chicago to New York, has filed notice of an increase of its capital stock to \$5,000,000 to \$25,000,000.

Cincinnati Toledo & Detroit Short Line Railway.—The application of Ella Buxton, a stockholder, for the appointment of a receiver has been denied by Judge Kincaide, of the common pleas court at Toledo. The court found nothing in the evidence to sustain the charges of mismanagement.

Cleveland & Southwestern Railway.—The reorganization committee of the Cleveland & Southwestern Traction Company has decided upon a comprehensive merger of the three interurban properties controlled by the Pomeroy and Mandelbaum interests in northern Ohio and the plans have been approved by the directors. The merger will include 210 miles of single track and will bring lines reaching from Cleveland to Norwalk, Wooster, Wellington, Ashland, Mansfield, Galion and Bucyrus and including intermediate towns such as Elyria and Oberlin, into one large system. The roads involved are the Cleveland & Southwestern Traction Company, 135 miles; the Cleveland Ashland & Mansfield Traction Company, 43 miles now building, and the Ohio Central Traction Company, 29 miles. The new company will take the name of the Cleveland & Southwestern Railway Company. It will have \$10,000,000 capital stock, of which \$2,500,000 will be 5 per cent cumulative preferred and \$7,500,000 common. The authorized bond issue will be \$10,000,000. Of the above capital \$5,000,000 in bonds will be issued, together with \$2,400,000 in preferred and \$4,700,000 common stock, to take care of the exchange of securities in the present companies, and the balance of \$5,000,000 in bonds, \$100,000 in preferred and \$2,800,000 common stock will remain in the treasury for the purpose of acquiring new lines and improvements to the property.

Columbus Railway & Light Company.—It is expected that the annual report to be submitted at the annual meeting of the stockholders of the Columbus Railway & Light Company January 29 will show that the receipts of the Columbus Railway Company for the year have reached \$1,750,000. If the final results bear out the expectations, this will mean that the company will have to sell eight tickets for 25 cents instead of seven. There is a provision in the blanket franchise granted the company several years ago that when the receipts of the railway company in any one year have reached \$1,750,000 it shall sell eight tickets for 25 cents. The annual meeting of the Columbus Railway Company will be held on January 10, but all matters of importance will be referred to the meeting of the Columbus Railway & Light Company on January 29.

Evansville & Southern Indiana Traction Company.—This company, which has taken over the Evansville Princeton & Vincennes Interurban Railway, has elected the following officers: President, James Murdock, of Lafayette, Ind.; vice-president, Henry Smith, Hartford City, Ind.; secretary and treasurer, Charles Murdock, Lafayette; general manager, R. R. Smith.

Frontier Electric Railway.—The New York railroad commission has granted this company, which proposes to build an electric railway from Buffalo to Niagara Falls, N. Y., for the International Railway, of Buffalo, permission to increase its capital stock from \$300,000 to \$1,500,000, and to issue a mortgage of \$2,000,000.

Hudson & Manhattan Railroad.—This company has been formed as a consolidation of three companies which are building tunnels under the Hudson river between New York and Jersey City—the New York & Jersey Railroad Company, the Hudson & Manhattan Railroad Company and the Hoboken & Manhattan Railroad Com-

pany. The Hudson & Manhattan Railroad and the Hoboken & Manhattan Railroad were consolidated last week under the name of the Hoboken & Manhattan Company with a capital stock of \$38,500,000. It is now stated that this merger was only a preliminary step in the formation of the larger company. The Hudson & Manhattan Railroad Company will have a capital stock of \$50,000,000 of which \$10,000,000 will be five per cent non-cumulative preferred stock. The officers are Wm. G. McAdoo, president, Frederick B. Jennings, vice-president and C. W. King, secretary and treasurer, with offices in both New York and Jersey City.

Interborough-Metropolitan Company.—D. W. Burrows, of Chicago, has brought suit in the United States circuit court at New York asking to have declared void the formation of the Interborough-Metropolitan Company last January by the merger of the Interborough Rapid Transit Company, the Metropolitan Street Railway Company and the Metropolitan Securities Company. The plaintiff alleges that as a result of the consolidation his 1,400 shares of stock of the Metropolitan Securities Company became valueless.

Macon Americus & Albany Electric Railway.—The Interurban Construction Company and the Macon & Albany Securities Company have been organized and chosen headquarters in the Grand building, Macon, Ga. The Interurban Construction Company is headed by W. Jordan Masee, president. This company will have charge of the engineering for the proposed line between Macon, Americus and Albany. The Macon & Albany Securities Company, which will handle the finances, is headed by Nicholas J. Cruger, Albany, Ga., president.

Milwaukee Electric Railway & Light Company.—President John I. Beggs has given a sworn statement that the gross earnings for the 12 months ended on November 30, 1906, were \$3,494,838, of which \$546,722 was derived from the lighting business. The gross receipts of the subsidiary suburban company, the Milwaukee Light Heat & Traction Company, were \$694,180. The mileage of the Railway & Light company in Milwaukee, East Milwaukee, Whitefish Bay and Wauwatosa is given as 116.22 miles. The Traction company has 142 miles. The taxes on the two companies, 5 per cent of the gross receipts, were \$174,742 and \$34,709.

Pennsylvania & Maryland Street Railway.—The Somerset County Street Railway and the Pennsylvania & Maryland Street Railway, which was incorporated in July to build 30 miles of electric railway in Somerset county, Pa., have been consolidated under the name of the latter. Capital stock \$410,000.

Peoria Bloomington & Champaign Railway.—This company, a part of the Illinois Traction System, has filed a mortgage to the Central Trust Company, of Chicago, to secure an issue of \$3,000,000 30-year 5-per cent bonds, of Chicago, to secure an issue of \$3,000,000 line between Peoria and Champaign, Ill.

Rock River Traction Company.—The stockholders have authorized an issue of \$2,000,000 of bonds for the purpose of constructing an electric line from Sterling to Rock Island, Ill.; from Rock Island to Geneseo and Princeton; and from Sterling to Morrison, a total distance of 125 miles. F. E. Andrews, vice-president, Sterling, Ill.

Rome (Ga.) Railway & Light Company.—The directors of this company, a reorganization of the Rome Traction Company, have authorized an issue of \$500,000 30-year 5 per cent bonds, of which \$300,000 will be used to retire bonds of the old company and the remainder for improvements and extensions, including a line from Lindale to Boozeyville. S. S. Busch, Louisville, Ky., general manager.

Southwestern Traction Company.—It is rumored that the Detroit United Railway will absorb this company, which operates a line from London to St. Thomas, Ont., and is constructing extensions. F. G. Rumball, London, Ont., is president.

Springfield & Xenia Transit Company.—The receivership of this company was terminated on December 18 when the common pleas court at Springfield, O., affirmed the report of the receiver, Fred J. Green. The property was purchased some time ago by a committee of the bondholders. It is stated that a new company will be incorporated.

Stuebenville & East Liverpool Traction & Light Company.—This company has increased its capital stock from \$5,000 to \$3,800,000.

Toledo & Western Railway.—Judge R. W. Taylor, of the United States circuit court at Toledo, O., has confirmed the sale of the Toledo & Western Railway at auction to J. R. Nutt, of Cleveland for \$344,759.

United Railways of St. Louis. This company on January 1 formally took over the property of the St. Louis & Suburban Railway and that system is now operated as a part of the United Railways System, transfers being exchanged between the lines. General Manager Herbert McCulloch has had his jurisdiction extended over the Suburban system succeeding Julius H. Walsh, Jr. The Suburban stockholders receive 40,000 shares of United preferred stock. The United Railways now controls practically every street railway line in St. Louis and vicinity, including 473 miles of track and 1,600 cars. Its capital stock is \$45,000,000 and the bonds outstanding aggregate \$51,900,000. John L. Beggs, of Milwaukee, is president.

Western New York & Pennsylvania Traction Company.—A certificate has been filed showing that this company, recently incorporated in Pennsylvania with a capital stock of \$2,000,000, has effected a consolidation of the Olean (N. Y.) Street Railway and the Bradford (Pa.) Electric Street Railway. Wilson R. Page of Olean is president.

Manufactures and Supplies

ROLLING STOCK.

Marcellus & Otisco Lake Railway, Marcellus, N. Y., is in the market for a passenger coach.

Pennsylvania Railroad is reported in the market for 50 new cars for use on the West Jersey & Seashore Railroad.

American Railway, Philadelphia, has ordered ten double-truck cars from the Jewett Car Company.

Virginia Passenger & Power Company, Richmond, Va., is receiving the first of an order of 20 semi-convertible cars.

Middletown & Cecilton Railroad Company, Middletown, Del., expects to place orders for new equipment in February, 1907.

Toronto Railway, Toronto, Can., is reported to have ordered 15 new cars and to be in the market for 40 additional.

Toronto & York Radial Railway, Toronto, Ont., is having a number of cars built at the shops of the Toronto Railway Company.

Indianapolis & Louisville Traction Company, It is reported, will order three cars at an early date. John E. Greely, Jeffersonville, Ind., is interested.

Whatcom County Railway & Light Company, Bellingham, Wash., is in the market for two closed single truck cars 31 feet over all for city service.

Elmira Water Light & Railway Company will probably place orders for two 15-bench open cars for spring delivery and is rebuilding a number of its cars.

Inter-Urban Railway & Power Company, Hot Springs, Ark., expects to purchase during 1907 eight combination cars to be 55 feet over all for interurban service.

Indianapolis Columbus & Southern Traction Company, Columbus, Ind., has ordered 3 combination cars 50 feet long over all from the Niles Car & Manufacturing Company.

Winnipeg Electric Railway, Winnipeg, Can., has 25 new cars under construction. Ten of these are under construction at the company's shops and the balance in contract shops.

Owosso & Corunna Electric Company, Owosso, Mich., has been reported to be considering additional car equipment. We are advised that an order may be placed early in 1907.

Savannah Electric Company, Savannah, Ga., will build four open trailers, 40 feet long over all, for suburban service in its shops. The cars are to be equipped with two G. E. 67 motors each.

Indianapolis Newcastle & Toledo Electric Railway, Newcastle, Ind., has ordered 3 interurban coaches and 2 express cars from the Jewett Car Company. Electrical Installation Company, Monadnock block, Chicago, are engineers in charge of construction.

Indianapolis Crawfordsville & Western Traction Company, Indianapolis, Ind., has ordered eight double truck passenger cars 57 feet 8 inches over all for high-speed interurban service and also two 60-foot express cars. The cars are to be equipped with Baldwin trucks.

Lake Shore Electric Company, Cleveland, O., has 15 cars under order with the Niles Car & Manufacturing Company for February and March delivery. Ten of these will be 51-foot coaches with double trucks and live combination passenger and baggage cars of the same dimensions.

SHOPS AND SHOP EQUIPMENT.

British Columbia Electric Railway.—A contract has been let for the construction of additional car barns at Vancouver, B. C.

Indiana Union Traction Company.—A general contract for the new car barns and shops at Anderson, Ind., has been let to Sheperdson & Hawkins, of Anderson. The buildings are to be completed by July 1, 1907, at an estimated cost of \$160,000.

International Railway Company (Buffalo, N. Y.)—This company has decided to erect a brick car barn on Broadway near Bailey avenue in Buffalo. The building will be of brick, 660 feet long by 164 feet wide, and will have a capacity for 200 cars. Ground will be broken in the spring.

Los Angeles Railway.—This company is now building and expects to occupy about February 1 a large new car house on Avenue 28, Los Angeles, Cal. The building is of brick, 600 feet by 150 feet, containing 3,000 feet of track under cover with storage room for 250 cars. Two cross-over tracks make a connection with the main line of the Eagle Rock Valley division. H. E. Huntington, general manager, Los Angeles.

Omaha & Council Bluffs Street Railway.—It is reported that this company will build eight cars at its shops in Omaha and that if the experiment proves successful it will build additions to its shops, install new machinery and in the future build all its own cars.

Portsmouth (O.) Street Railroad & Light Company.—The company is planning for the construction of a car house and machine shop during the next year. It is expected the new buildings will occupy ground at the western terminus of the company's line, where a large tract of land is owned by the company.

TRADE NOTES.

Edward Morris Lara, who was until recently associate editor of the Electric Railway Review, has taken a position with Keuffel & Esser Company, New York, in the publicity department.

Missouri Central Railroad, New Florence, Mo., is in the market for immediate purchase of a short abandoned railroad of about seven or eight miles in length together with rails, ties and rolling stock. The company is also desirous of obtaining at once a dummy or gasoline engine capable of handling two or three cars of standard gauge.

Lunkenheimer Company of Cincinnati, Ohio, has purchased for its works there seven 60-cycle induction motors ranging in size from 7½ to 15 horsepower to be used in driving machinery for the manufacture of valves and other high grade engineering specialties. These motors will be built by Allis-Chalmers Company at its Cincinnati works.

Aaron Dean, Jr., heretofore resident manager of the western district of the Federal Railway Signal Company with headquarters at Chicago, has been made chief engineer of the Federal Railway Signal Company with headquarters at its works, Troy, N. Y., in place of P. G. Ten Eyck, who was recently appointed general manager of the company at Troy. W. W. Lavarack, assistant to the president, will succeed Mr. Dean with headquarters at Chicago in charge of the Western district of the company.

Frank H. Taylor, who has been elected a director and vice-president of the Yale & Towne Manufacturing Company, was born in Cincinnati, O., and was graduated from Haverford college. He later entered Harvard University from which he was also graduated, receiving the degree of A. B. with the class of 1877. In 1882 Mr. Taylor moved to Philadelphia where he assisted in the organization and became treasurer of the Belmont Iron Company of which he ultimately became president. In 1890 he accepted the position of manager of the Philadelphia branch of the Yale & Towne Manufacturing Company which position he retained for seven years. In 1897 he was appointed sales manager of the Westinghouse Electric & Manufacturing Company, serving in that position for three years, following which he was elected second vice-president of the company, resigning the position in April, 1906. As vice-president of the Yale & Towne Manufacturing Company Mr. Taylor's duties will relate to the manufacturing and sales departments of the business and will ultimately include many of the matters which have heretofore been handled by the president. The present official organization of the Yale & Towne Manufacturing Company, is as follows: President, Henry R. Towne; vice-presidents, Schuyler Merritt, Frank H. Taylor; treasurer, A. R. Erskine; general manager, Kirk Brown; general superintendent, Walter C. Allen.

J. W. Duntley, president of the Chicago Pneumatic Tool Company, Chicago, noted in the columns of this paper some time ago as sailing for Europe in behalf of the company, has just returned from a six-weeks' tour in that country. Mr. Duntley reports that the pneumatic tool business abroad has shown an increase during the past year of between 25 and 30 per cent over any previous year. The products of this company have been installed in the shops of practically all foreign railways as well as larger industrial institutions and government ship yards, enjoying a large per cent of the pneumatic tool business in foreign countries.

Edison Electric Company of Los Angeles, Cal., has ordered for its hydro-electric plant on the Kern river, at Edison, Cal., eight Allis-Chalmers direct-current motors with controllers and gearing equipments, to be used for operating 28-inch gate valves. The motors will be 120 volts, series wound, machines of the vertical shaft type, fully enclosed, and especially adapted to the service required. This company has installed on the Kern river at Caliente five 3,200-kilowatt Allis-Chalmers alternating current generators direct connected to Allis-Chalmers hydraulic turbines, forming one of the largest long distance transmission plants on the Coast.

Electric Service Supplies Company announces that it has secured in addition to its former territory, the states of Michigan, Ohio and Indiana for the complete line of Locke insulators manufactured by the Locke Insulator Manufacturing Company, of Victor, N. Y. This company has experimented with insulators under all conditions until it now believes that both the electrical and ceramic qualities of its product are as near perfection as possible. Particular attention has been given to the effect of atmospheric moisture and temperature on the efficiency of insulation at high voltages; to the development of neutral colored glazes as the least conspicuous for insulators, and in the matter of provid-

ing large factors of safety in designing supports and insulation for transmission lines.

D. E. Baxter & Co., Incorporated, 27 William street, New York, has placed an order with S. L. Benz, of Pittsburg, Pa., for 76,000 cross-ties to be 7 by 8 inches by 8 feet long and for 900 poles 30 feet in length and having a diameter of 7½ inches at the small end, for immediate delivery at Charleston, S. C.

Chase-Shawmut Company, Newburyport, Mass., reports an order from the Northern Electric Company, of Chico, Cal., for 138,855 of its Shawmut soldered rail bonds, which in connection with two previous orders makes the total number of bonds ordered by this company 243,355. The type of bonds used are a 400,000 circular mils Type A for the third rail and a 200,000 circular mils Type B B bond for the track. The installation of these bonds is being superintended by the Chase-Shawmut Company.

B. F. Sturtevant Company, Boston, Mass., reports rapidly increasing sales of enclosed forced lubrication engines. Among these may be mentioned C. H. Mears & Co., Chicago, Ill.; Old Dominion S. S. Company, Norfolk, Va.; Swedish Hospital & Nurses' Institute, Minneapolis, Minn.; Belmare Manufacturing Company, Canton, Pa.; Phoenix Woolen Company, Stafford, Conn.; Hoopes & Townsend Company, Hoopston, Pa.; Manufacturers' Furniture Exchange, Chicago, Ill.; Silver Brothers Iron Works Company, Salt Lake City, Utah; Burgess Mills, Pawtucket, R. I.; Narragansett Mills, Fall River, Mass.; U. S. Navy Yard, Washington, D. C.; Henry Steers, Inc., New York City; and G. H. Breyman & Bros., Boston, Mass.

Roberts & Abbott Company, engineers, Cleveland, O., has found it advisable, due to its increasing work in the west, to provide facilities for handling the work to better advantage by establishing an office at Chicago, and W. D. Ball, E. E., has been placed in charge of the work there with headquarters in the First National Bank building. Mr. Ball has been connected with a great deal of electrical and civil engineering work, principally for trolley railways and hydraulic plants and was one of the United States government's representatives at the Paris Exposition in 1900. The efforts of the Chicago office will be along the same lines on which the Roberts & Abbott Company has specialized, namely, interurban railways and hydraulic plants.

ADVERTISING LITERATURE.

The Arnold Company, 181 La Salle Street, Chicago, Ill.—Bulletin No. 16, descriptive of the Sedalia shops of the Missouri Pacific has recently been issued by this company.

J. H. Wagenhorst & Co., Youngstown, O.—An illustrated folder calls attention to electric blue printing machines manufactured by this company and presents a list of the more prominent users of the machines.

Nernst Lamp Company, Pittsburg, Pa.—An attractive little pamphlet describes the architecture of the New York terminal of the Pennsylvania and calls attention to the manner in which it is to be lighted.

Dayton Pneumatic Tool Company, Dayton, O.—A flat vest pocket lead pencil encased in celluloid with gold tipped ends and an eraser calls attention to the pneumatic hammers manufactured by this company.

Allis-Chalmers Company, Milwaukee, Wis.—Bulletin No. 1503 describes Allis-Chalmers direct-connected Reynolds-Corliss engines with a number of engravings from photographs showing complete engines and various parts.

Sprague Electric Company, New York.—Electric hoists and cranes are described in a 14-page leaflet with illustrations showing many combinations of its hoists, carriages and cranes. The pamphlet calls attention to Hoist Catalogue No. 220, which is a complete catalogue of the company's manufactures.

F. W. Bird & Son, East Walpole, Mass.—"First Expedition to Cuba" is the subject of a blotter in two colors which refers to a large order for Paroid roofing which has been received by the company to cover buildings at Newport News, Va., from which point the first expedition to Cuba recently started.

Newman Clock Company, Chicago.—As a souvenir of the recent street and interurban conventions at Columbus, this company is mailing a handsome half-tone panorama view of the Ohio state fair buildings suitable for framing, accompanied by another engraving showing the company's booth at the conventions.

Joseph Dixon Crucible Company, Jersey City, N. J.—"Air Compressor Lubrication" is the subject of a 24-page pamphlet issued by this company. It calls attention to the necessities of proper lubrication for air compressors, quoting a number of authorities, and then describes various methods of successful lubrication.

D & W Fuse Company, Providence, R. I.—Catalogue No. 12 of this company is a complete compendium of fuse material with all necessary information on cartridge fuses and safety devices for lighting, heating, power, railway, signal, telephone and telegraph circuits. It is a 90-page publication fully illustrated with engravings and complete with various tables.

Wellman-Seaver-Morgan Company, Cleveland, O.—This company is a stock company incorporated under the laws of Ohio for the purpose of transacting a general engineering and manufacturing business. A pamphlet issued by it calls attention to the general classes of work to which the company devotes attention and shows a number of interesting views of machinery and plants which have been designed and installed by it.



Frank H. Taylor.

"TRANSITE" ASBESTOS DOORS.

The great danger attending the handling of high-tension currents makes necessary some suitable provision for preventing persons coming into contact with the apparatus, as well as for protecting the latter from short circuits between adjacent parts. In modern transformer stations a very efficient and satisfactory method of protecting high-tension transformers and switches is to surround them with brick walls, in front of which movable doors made of "Transite" asbestos fireproof lumber are placed, as here shown. These doors are absolutely fireproof and will prevent danger to both persons and property.

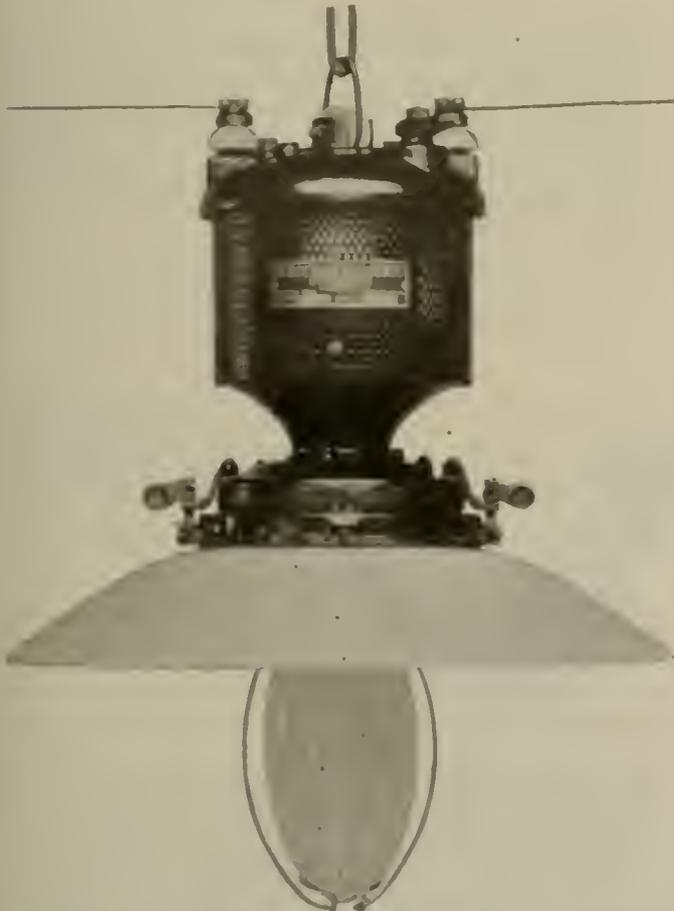
"Transite," which is manufactured by the H. W. Johns-Manville Company, of New York, is a fireproof sheathing, the basis of which is asbestos fiber. It is mechanically much stronger than ordinary asbestos board, and has a density which makes the finished material practically non-absorbent, and possessed of the very highest heat-resisting properties. It will stand much rougher usage than slate, being harder and tougher and not so brittle. This material is extensively used in various ways about electric light and power plants, owing to its high efficiency, durability and the fact that it is very easily worked, being cut, nailed or screwed, very much the same as ordinary lumber.



Asbestos Door.

NEW ARC LAMP FOR LOW CEILINGS.

The accompanying illustration is a view of a newly designed short lamp, adapted for 110 or 220 volts, direct current, which possesses many features of excellence in design, material and workmanship. The efforts of manufacturers to produce a lamp adapted to low ceilings have resulted heretofore in a lack of sym-



Arc Lamp for Low Ceilings

metry of design and compactness. In the new lamp which is now being sold by the Western Electric Company the overall length has been reduced to but 20 inches from the top of the lamp to the lower end of the enclosing globe. This feature of shortness is obtained without reducing the length of the carbon in any appreciable manner, thereby cutting down the life and under that given by an ordinary incandescent lamp. A life of 100 hours with each tripping is guaranteed. Instead of the large bulk case, this lamp is reason-

able of the use of indestructible windings and specially designed resistance units, is of very small dimensions and quite symmetrical in design.

Special attention has been paid in the construction of this lamp to secure adequate ventilation, while at the same time protecting the regulating mechanism from harmful accumulations of dust. Such lamps are often placed in basements and low rooms, such as boiler and engine rooms, where the heat is often excessive, and their design has been with special reference to such service. In the choice of materials for the different parts, only those that have been found best adapted for the purpose have been made use of, regardless of cost, and this fact, the manufacturers claim, combined with excellence of workmanship and care as to the accuracy of detail parts, has produced a lamp which can be relied upon for years of service with but little expense for maintenance.

It is found quite difficult in practice to apply any effective safeguards against injury to lamps of this type as ordinarily constructed, by the use of fuses, and it has frequently been found that lamps which were thought to be well protected have been practically destroyed by excess currents. In the new lamp, provision is made to preserve the lamp absolutely from injury, even where fuses are entirely omitted, and the lamp may stand with the arc short-circuited for hours without material injury and will be found ready for normal operation the moment proper conditions are restored.

250-VOLT INDICATING PLUG FUSE.

The D & W Fuse Company, Providence, R. I., has introduced a 250-volt plug cut-out fuse of the Edison type which embodies the merits of its cartridge type fuses, including the bullseye indicator. Heretofore the construction of the plug fuse has been such that it was impossible to determine whether the fuse had been blown without testing the circuits, but with the new type a blown fuse is detected at a glance by the appearance of the "bullseye" on the label.

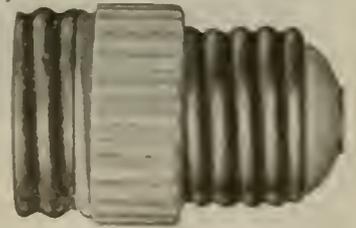


Figure 1.

Figure 1 gives a full-size side view of the fuse. Figure 2 is an end view showing the appearance of the label before the blowing of the fuse, and Figure 3 shows the same fuse blown, as indicated by the black spot in the bullseye.



Figure 2.



Figure 3.

The fuses may be renewed by returning to the factory, and have been approved by the National Board of Underwriters.

CHICAGO ELECTRICAL EXHIBITION.

The second annual electrical show of the Chicago Electrical Trades Exposition will be held at the Coliseum in Chicago, January 18-26. Every branch of the electrical field will be represented and it is expected that this will be one of the most complete exhibitions of electrical devices ever held in America, far surpassing both in the number of exhibitors and the number and variety of displays the successful exhibition of last year.

Managing Director Homer E. Niesz has announced the following special days: Monday, January 14, formal opening, Wednesday, Thursday and Friday, January 16, 17 and 18, annual convention of the Northwestern Electrical Association, with both afternoon and evening sessions, Thursday January 17, Ben Franklin Day, Friday, January 18, meeting of the Illuminating Engineering Society, Monday January 21, Telephone Day, Tuesday, January 22, Rejuvenation of the Sons of Love, Wednesday, January 23, Thomas A. Edison Day, Thursday, January 24, meeting of the American Electrical Stationers' Association.

One of the features of the show will be the "Electric Midway," for which the main floor of the Coliseum Annex will be divided into four small theaters. One of these will be devoted to new developments with static apparatus and high and low frequency current by Prof. W. J. Clark. Another theater will have a new electrical and mechanical creation called the "Aurora Research," which will show beautiful lighting effects, as arranged by Mr. Edgar Healy, of Chicago. In the third theater will be an electrical musical act. It is announced that a new storage battery which has just been perfected by Mr. Thomas A. Edison will be exhibited and demonstrated for the first time.

Thirty thousand square feet of space 30 per cent more than

last year—has been sold for general exhibits on the main floor of the Coliseum. Encouraged by the interest the trade and the public took in last year's show the exhibitors are planning to put more money and effort into their displays. The list of exhibitors numbers nearly 200.

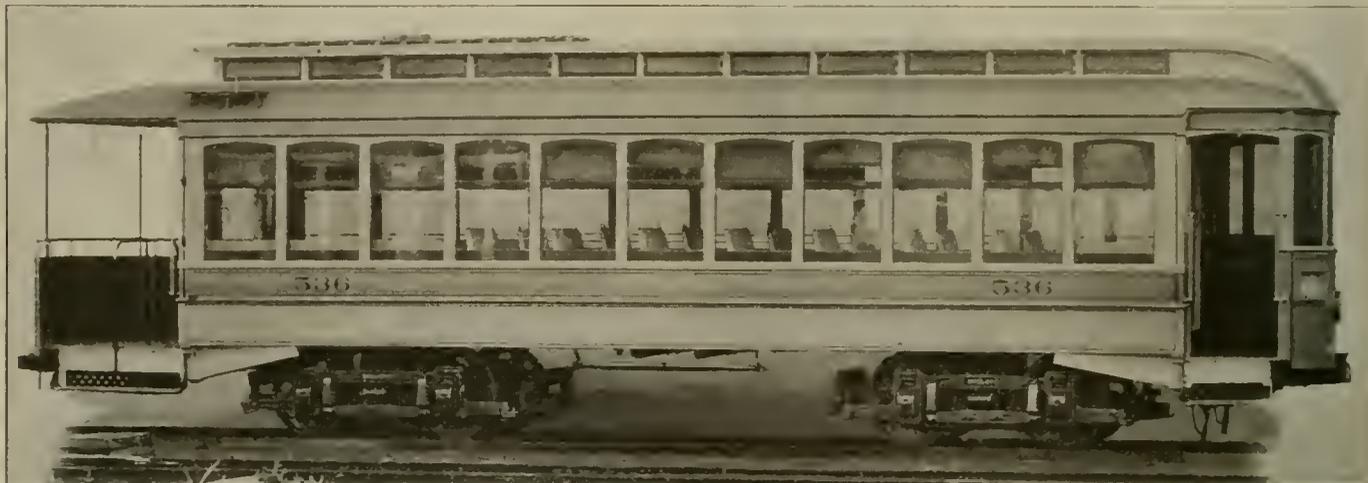
The Electric Railway Review will be represented at Space 6, Section D, and will be pleased to receive calls from any of its friends who are attending the exhibition. The more interesting exhibits include the following:

The Electric Service Supplies Company, Space No. 13, will exhibit the automotoneer and other patented devices together with lighting and railway materials and supplies.

The Ohio Brass Company, Space No. 7, Section D, will exhibit

NEW SEMI-CONVERTIBLE CARS FOR TOLEDO.

The illustration shows one of 20 cars which were recently delivered by the G. C. Kuhlman Car Company to the Toledo Railways & Light Company. The new cars are generally similar to the advance lot of 10 cars for this company shipped by the same builders at the beginning of last year. Their construction includes the Brill grooveless-post semi-convertible window system as well as other specialties. As will be noted from the two types of platforms these cars are for operation in one direction only. The front platform contains the motorman's compartment, which is formed by the conjunction of two hinged doors extending diagonally across the car. The entrance from the platform to the



Type of Semi-Convertible Car for Toledo.

overhead electric railway supplies, and a full line of rail bonds and third-rail insulators.

The Joseph Dixon Crucible Company, Space No. 4, Section A, will exhibit a full line of the Dixon graphite products and will entertain its visitors in the "laughing gallery," which was a feature of the exhibit at the Columbus convention of the American Street and Interurban Railway Association.

The Western Electric Company will show a very large and handsome watercolor view of its new 110-acre plant at Hawthorne, Ill. The exhibit will include American transformers, Thomas high-tension insulators, electro-insulating material, arc lamps and direct-current motors, with a series of alternating equipment in full operation.

At the exhibit of W. N. Matthews & Brother may be seen the Lima jack box. The boxes are to be installed on poles along the line of the railway and connected with the regular telephone wires. Each train crew is provided with a portable telephone and a plug which makes connection with the box so that the dispatcher may be reached quickly.

The engineering department of the National Electric Lamp Association will have an interesting exhibit of the latest achievements of electric lamp makers, including "Tantalum," "Tungsten," metallized and ordinary carbon filament lamps.

The Ft. Wayne Electric Company has installed a generating set of 150-kilowatt capacity to furnish all the electrical energy for exhibitors. The company's regular exhibit in Space No. 13 is a complete working demonstration of the series alternating-current arc-lighting system of 25-light capacity; also the company's standard line of wattmeters and prepayment devices.

The display of the Vulcan Electric Heating Company will include various small electric heating devices such as soldering tools, branding appliances and electric household appliances.

The Bishop Gutta Percha Company, New York, will show the same exhibit which received a gold medal at the Centennial Exposition in Philadelphia, in 1876, as well as several interesting electric devices for household purposes.

Central station men and owners of buildings requiring elevator service will be interested in the working single-phase electric motor shown by the Wagner Electric Manufacturing Company in Space 10, Section D. This company is also showing a novel little instrument which indicates the cost of operation of electric lamps, curling irons, chafing dishes, etc.

H. F. Vogel Contracting & Railway Supply Company has been incorporated in Missouri with a capital of \$5,000. The officers of the company are H. F. Vogel, president; Nic Le Grand, secretary and treasurer. The new organization succeeds H. F. Vogel & Co., whose offices are at 420 Rialto building, St. Louis.

passenger compartment is through a door of the Brill "semi-accelerator" pattern; its location at the side rather than in the center of the bulkhead makes access to the car more convenient for passengers. The platform is of the familiar "Detroit" type. The interior finish is cherry. The dimensions are: Length over end panels, 30 feet 8 inches; over vestibules, 40 feet 8 inches; width over sills including sheathing, 7 feet 11½ inches; over posts at belt, 8 feet 2 inches; height from floor to ceiling, 8 feet 4½ inches; from track to under side of sills, 2 feet 8¾ inches; size of side sills, 4 inches by 7¾ inches; end sills, 5¼ inches by 6¾ inches. The car bodies are mounted on the Brill No. 27-F1 truck with a wheel-base of 4 feet 6 inches.

THE CLARK SOLDERED RAIL BOND.

The illustration shows a new soldered rail bond patented by Mr. Walter G. Clark, of the Clark Electric & Manufacturing



The Clark Soldered Rail Bond.

Company. Although the desirability of using soldered rail bonds has long been recognized, serious difficulty has been met in soldering the bond properly to the rail and in the tendency of the bond to peel off, caused by the difference in the coefficients of expansion of the steel and copper. Mr. Clark, after many experiments, found that if the terminals were made sufficiently thin the copper would expand and contract without this tendency to peel. He also found that if the bond terminal were provided with openings for the admission of solder and the escape of gas, the solder would flow well between the rail and the bond terminal and unite the rail and the bond perfectly. As shown in the illustration Mr. Clark's bond is made with perforated terminals to permit the gases from the flux or soldering salts to escape and enable the solder to flow well under the bond. The terminals are also increased in area and reduced in thickness to a point where the expansion and contraction do not loosen them from the rail. This bond is manufactured by the Clark Electric & Manufacturing Company, 135 Broadway, New York.

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Last week we announced that the Electric Railway Review had become a weekly publication. This week we are pleased

to announce a change of address. The

New Offices for the Review. general offices of the Electric Railway Review will be moved this week to the eleventh floor of the new Patten building, 160 Harrison street, Chicago, where we shall have most commodious offices in which we shall always be glad to receive our friends.

The Wisconsin railroad commission is in a quandary as to how to deal with the electric railways. Under the Wisconsin

State Control of City Lines. law, as construed by the attorney general and by the commissioners, they have the power to regulate any street railway company whose lines pass beyond the limits

of the city in which it is operating. This right of regulation extends to the urban business of the company as well as to its business outside of the city limits. As a result the commission appears to have a right to regulate the entire business of a street railway where any of its lines extend beyond the city limits, but it has no control over a company whose lines are entirely within the limits of the city in which it is operating. In its last annual report to the governor the commission recommended that its jurisdiction be either increased or diminished so that it shall either have power over the business of all street railways operating in the state or that such power shall not extend to any of them. Other states are facing the same and other similar problems. In Ohio the commission is in some doubt as to its control over city lines. According to the law creating the commission, "street and electric railways engaged solely in the transportation of passengers within the limits of cities" are without its jurisdiction. A universal principle is at the root of the whole matter; the laws are always a little behind the times. But at the rate at which the electric railways are forcing themselves to the front it should not be long before the attention of the law-makers is suf-

ficiently attracted to the inconsistency of the present situation to effect the required changes.

A good method of handling what is frequently one of the most difficult features of association work destined to be performed by committees was pursued at a recent meeting of the executive committee of one of the railway associations. It was taken up in pursuance of a design to make some one definitely responsible for certain work. The plan consists simply in assigning to each member of an executive committee a certain portion of the work which it is expected will be performed by other individuals or committees outside the executive committee. In other words, a subject for a paper or a report is assigned to each member of the executive committee. It is his work to get the proper person or persons to produce the actual result. In case of negligence or failure he is placed in the unfortunate position of being obliged to explain his delinquency and this reflects upon his capacity as an executive officer. This appears to be a much better plan than that of using an executive committee solely for the purpose of unthinkingly ratifying the work of a president and secretary.

The paper on "Gas Engines" presented at the last meeting of the American Street and Interurban Railway Engineering Association by Paul Winsor of the Boston Elevated Railway, was so valuable a contribution to the somewhat meager literature of this subject, that those interested

Further Consideration of Gas Engines. in this form of prime mover will be glad to know that Mr. Winsor will follow at the next annual meeting with an account of the operation of gas engines during a longer period of use. This will be particularly valuable in the direction of accurate data, since Mr. Winsor has discovered that on account of the brief time for preparation some errors crept into his original paper. These will, however, be corrected in the printed proceedings of the meeting. The record of coal consumption is said to have been made to

appear too favorable to the gas engine and as this is one of the chief points of interest in the whole consideration the correction will be valuable as placing the facts on a basis of accuracy. A full year's experience, also, upon which Mr. Winsor will base his second paper, should furnish data upon which far more reliable conclusions may be predicated than was possible upon a limited experience of four weeks.

In the Electric Railway Review for August, 1905, some editorial consideration was given to the tenacity with which the "one-ride, one-fare" idea holds its place

Ten Cents for a

Ten-Cent Ride.

in the public mind with relation to electric railways. The case in point was the contention of citizens of the borough of Brooklyn that because a single system of railways had superseded the several lines formerly connecting Brooklyn and Coney Island, passengers should be carried by the Brooklyn Rapid Transit Company, the existing company, between these points for a single five-cent fare. In an attempt to enforce this demand, rioting occurred, hundreds of persons were injured and at least one life was lost as an indirect result of the disturbance. The contention has now been settled in the courts with such unanimity and definiteness that the incident may be considered closed and the citizens of Brooklyn will continue as before, but without rebate certificates, to pay for services rendered. But probably the most wholesome lesson that can be drawn from the whole circumstance is the folly of accepting as a finality upon which physical violence is justifiable the opinion of a petty judicial officer upon an incomplete statement of facts, which opinion could at best be classed only among obiter dicta—the whole trouble having arisen from a statement of Justice Gaynor that the Brooklyn Rapid Transit Company had no legal right to exact more than one five-cent fare for a ride to Coney Island and that persons resisting its collection would not be liable to arrest. The attitude of the railway company has been distinctly tolerant and was based upon a firm conviction of its moral and legal rights. Pending the decision of the case certificates have been issued to payers of the ten-cent fare which, in case of a decision against the company, would have been honored as rebates. These are now valuable only as waste paper unless they are preserved as mementos of one or two lessons such as have here been pointed out.

The valuable claims made for regenerative braking include the assertion that under no circumstances will it lock the car wheels; if the connections are out of order it cannot be moved; it is not dependent upon the continuity of the supply circuit and the more the regenerative feature is called into play the less will be the proportionate amount of current required for operation. Some official tests made last year showed that similar two-motor cars, one equipped with regenerative motors and one with series motors, each traveling 44.18 miles, showed a saving of 24 per cent in favor of the regenerative car. Other comparative tests showed percentages of 26.7 and 28.7, with exactly similar cars in actual service. In discussing this paper as read several operators using the regenerative system introduced points of interest. The fact that a car did not accelerate when it got over the brow of a hill was thought to be a strong point as regards safety, and when descending very steep hills the regenerative effect gave the motorman every confidence, as on descending the controller was not switched off, but kept on the running notches according to the speed required. The motors were found to have a slightly higher heating than the ordinary series parallel type. One road operating a considerable number of cars had not experienced any serious armature troubles and never a burnout. The adjust-

ment of brakes on the ordinary car had to be carried out on an average of once every day, but on the cars fitted with regenerative control, while they were examined every day, adjustments were necessary but about once a week. Considerable economy was shown in the matter of brakeshoes. The extra cost for a regenerative equipment over a standard type on a two-motor city car was stated as approximately \$200. While these advantages are striking ones it must yet be remembered that a motor for regenerative control has not gone through a serious process of design. All the motors considered by the author in obtaining the results described were series motors with the series coils changed for shunt coils.

An important topic to be presented for consideration at the next annual convention of the American Street and Inter-urban Railway Engineering Association, as determined upon at the meeting of the executive committee held in New York on January 7, is that of "Open versus Closed Terminals with Reference to Effect Upon Rolling Stock."

Outdoor or Indoor

Car Storage.

In the course of the informal discussion leading up to its definite assignment as a subject, it appeared that there is a well-founded belief that the amount of injury to rolling stock from exposure is more than enough to counterbalance a considerable investment in car barns; but there appear to be no definite data available. It is significant, however, that several companies which have heretofore stored equipment out of doors are now either building or preparing to build extensive barns, and the initial expense is undoubtedly warranted if the statement sometimes made that expenses of maintenance are doubled by outdoor storage has any foundation in fact. Another point worth considering in cold climates is the extra expense of bringing a "cold-storage" car up to a habitable temperature. Though figures on this are not available there must be a considerable extra expense from this cause alone which should influence in favor of ample car barn capacity.

When reading the description of the storekeeping methods of the Denver City Tramway Company, as presented in this issue, the question is brought to mind as to whether this system of accounting for stores is not too expensive. The advantages of such a complete system of keeping account of materials will not be denied, neither will the fact that one of the most essential requirements of any accounting system is to keep the condition of credits and debits well in hand. The system, as used in Denver, presents a very thorough method for obtaining such results. As regards the expense of maintaining a storekeeping department it is interesting to note that the cost of office work and handling and care of materials for the work described, has averaged but \$450 a month during the past ten months. This does not include the expense of the purchasing agent's department nor take into account the delivery of track materials on the work, but it does include the expense of weekly deliveries of stores to outlying barns and shops. For the same ten months the amount of materials purchased totaled \$450,000. It will thus be seen that the expense for handling the materials, together with the other desirable results as obtained in Denver, was but one per cent of the total amount of business handled by the department. As to the accuracy and completeness of this method of accounting for materials and stores it is said that during the past eight years the semi-annual inventories have each balanced within \$200 of the correct amounts, as shown on the auditor's books, and three such inventories had such a slight variation that they practically balanced and no adjustment was necessary in the auditor's office.

The Cost of Good

Storekeeping.

BLOCK SIGNALS ON CITY LINES.

The use of automatic block signals on electric railways has thus far been confined chiefly to single-track suburban or interurban lines, but there are cases where such signals are becoming valuable even for urban service. Of course, where the traffic is heavy and schedule speeds low, as in the immediate business districts of large cities, there is little advantage in the installation of block signals for the reason that cars follow one another so closely that the condition of the track ahead as far as it is clear, is easily seen by inspection. At no time is it desirable that the speed of cars in crowded streets should be so great that a stop cannot be made within a few car lengths at the outside. Double tracks are well-nigh universal in such localities and any attempt to divide the track into blocks would almost certainly result in paralysis of traffic.

Outside the business district, however, the conditions of operation are much different and a study of the residential and semi-residential routes often reveals an astonishing number of single-track spurs tapping thickly populated territory. Frequently these lines are run in streets too narrow for double tracks and the number of cars may be too small in the normal hours of the day to justify the double track even if the street be wide enough for it. In the rush hours the headway shortens to a point where careful operation is necessary to avoid collisions and if the topography of the route is unfavorable it may be well worth while to consider the use of automatic signals. A recent case of this kind occurred on a large city system where the headway on a residential spur track is 15 minutes throughout the day, except in the rush hours when it shortens to five minutes. Near the end of the route the track loops around a block joining the spur again about 500 feet from the last turnout on the line. Outward bound cars pass the junction of the loop and the spur before arriving at the end of the route via one side of the loop, and inward bound cars pass back to the line via the other side. Between the turnout and the junction, which is practically the same thing as between two adjacent turnouts on a single-track line, the street is so crooked and hilly that it is impossible to see far ahead of a car; and to increase the safety of the car movements and expedite traffic by reducing delays due to uncertainty as to the occupancy of the track, an automatic signal was installed near each end of the single-track section between the two passing points.

This signaling equipment is operated by the trolley as it passes under a special contact pan in leaving each turnout and it indicates by a red light that the block is occupied by a car moving against the outward or inward traffic, as the case may be, while a green bullseye indicates to the crew of the car following that a preceding car is still in the block, running in the same direction. When the block is clear no indication is given. The block is only about 400 feet long, but a personal inspection of the conditions convinces one that the signals are a necessity for safe operation.

From a detailed case like the above several points occur which can be applied in general to block signaling on urban lines. In a certain sense it is a misfortune for a city system to be obliged to introduce an added complication in operating on any of its divisions. By no means does every single-track spur require automatic block signals for its safe working. As long as the track is straight and the grade moderate, the schedules permitted by law in large cities seldom demand the installation of signals until one passes into the higher speed rural or remote suburban section of the line. Careful adherence to the timetable, the use of the telephone at turnouts when behind time and cautious approach to curves will do much to insure safe operation. The introduction of signaling rules on a city system where only a few signals are in service, opens another door for fallible

human nature to enter into disaster, so that a careful analysis must be made before it is decided essential to install signals of this kind.

It would seem important to include small semaphore indications with the bullseye signals, for the reason that it is difficult to identify the lamp signal in broad daylight, especially if the sun is shining full upon the lenses. After all, the cost of the protection is a small matter; the issue lies between increased safety with increased complication balanced against a very unfavorable track layout and increased danger because of irregular topography. Rules permitting cars to pass through its block two or more at a time, or after due waiting to proceed slowly in the face of a disarranged signal, should be most rigidly drawn and enforced.

A SIGNIFICANT TRANSFER DECISION IN BOSTON.

In connection with the transferring of passengers between elevated trains and surface cars in Boston at the Dudley street and Sullivan square terminal stations, an interesting point was recently brought before the Massachusetts railroad commission. Merchants owning stores in the immediate vicinity of these stations enjoyed a considerable transient business in the earlier days of the operation of the elevated lines, from the fact that passengers on certain lines entering or leaving the terminal, transferred between the elevated trains and the surface cars by means of checks, which permitted them to spend a short time on the street before resuming their journeys. Some months ago the check system was abolished by the railway company in favor of free bodily transfer between the lines of cars entering the terminals at the street level and the elevated trains, so that now if a passenger leaves the terminal enclosure on foot he cannot continue his trip without the payment of an extra fare.

The withdrawal of this transient trade and the failure of the privilege, or rather the difficulty of doing small errands between cars, led to a request on the part of representative merchants and citizens that the old arrangements be restored. After giving the matter a public hearing the commission decided in favor of the company, bringing out the point that while the petitioners appear to hold the theory that the Boston elevated owes them a duty to so transfer passengers that they may attend to business while waiting to take connecting cars, free transfer checks were never designed to give stopover privileges, but are issued solely for the purpose of enabling passengers to make a single journey between two points as nearly continuous as possible for one fare.

The board stated in its decision that the present arrangement for transferring passengers is a better way than that formerly in vogue as far as the legitimate use of the railway is concerned. Such incidental loss of business as may result to persons other than passengers from the abandonment of transfer checks at these points is declared not to be a grievance for which the board can provide a remedy. Passengers who so desire can freely take or leave the cars at these stations; if they wish to continue their journey for a single fare they are afforded a convenient way for doing it.

This decision is certainly a just one, for it recognizes the fundamental purpose of the free transfer and heads off any abuse of the privilege at the points in question. The business propriety of abutting tradesmen is a matter quite beyond the scope of any street railway, as far as it depends upon train privileges. On surface lines it is often possible and perfectly legitimate, incidentally, for a passenger to make a purchase while waiting for a connection, but only within the expiration limit of the transfer. Theoretically, at least, there should be the shortest possible gap between the two cars connecting, and the bridging over of the gap by a

transfer is a matter of identification rather than a stopover privilege. The abuse of transfers will probably continue as long as transfers are used, but every decision which broadly defines their scope is a welcome addition to reviewing precedents.

THE UNDER SIDE OF THE CAR.

An inspection of the under side of a modern high-powered car equipped with multiple-unit control, airbrakes, pneumatic doors and fireproof wiring and floor, leads one to the inevitable query whether we are not going too far away from the ideals of simplicity with respect to maintenance and repairs in our efforts to secure perfectly fireproof rolling stock. It is certainly a far cry from the days of the flexible cable wiring and self-contained platform controller to the present method of running leads in heavily armored pipes, packing contact switches, rheostats and pneumatic accessories into the limited space available beneath the car floor until it is exceedingly difficult to make rapid repairs on such a car, even over a pit.

The fitting together of the parts of a modern car is no small piece of work, and when this is complicated by a large amount of hand and machine tool work before the equipment can be installed, the cost of putting the car on the road becomes a matter of some concern. Certainly a modern fireproof car equipped for heavy rapid transit service comes pretty close to being a more intricate affair than a steam locomotive costing perhaps twice as much. In its erection hundreds of holes must be drilled and many hours of labor paid for in fishing wires through difficult passages and fitting armored conduit and piping into place.

The value of multiple-unit control, even for suburban work is not open to question. The increased platform space and consequent convenience of the cab, joined with the removal of large current-breaking arcs from the close proximity of the passengers and the possibility of train operation when traffic conditions require it, are advantages too great to be waived for a moment. We cannot possibly get along without the airbrake, and the electro-pneumatic brake promises results which are well-nigh perfection in rapid transit control. Pneumatically operated doors and steps are also likely to remain with us for a good while to come. Automatic acceleration is more and more in demand, and it is hard to see wherein any reduction can be made in the actual equipment of the modern car fitted with anything above 150 motor-horsepower. Whatever is done must be in the direction of finding other locations for the crowded machinery.

The moving of practically all the active equipment beneath the car floor is, of course, done for fire protection, and in the last analysis this is why the under side of the car is more crowded with apparatus than a modern battleship. Fireproof construction is vitally important, but it is a question if some of the relays, reversing switches, air valves and the like cannot be placed beneath the seats without extra hazard, if the heating equipment can go there. There is nothing sacred about the roof of a car as long as four or five feet of clear space exists between its top and the trolley wire. It is coming to be frequent practice to instal a main copper fuse on a panel upon the roof, and in some of the later equipments a control circuit switch is also placed on the roof for the purpose of cutting off current if the second trolley pole is not in its proper place.

Due regard must be given appearance in placing any equipment on or near the roof, but lightning arresters and choke coils are now being placed beside the monitors near the hoods without the least objection from the aesthetic standpoint. No one can look into the practical side of modern car design without realizing that the builder is "up against"

a hard proposition in fitting his equipment to the demands of the day and perhaps it will work out in the long run that very little simplification of the car bottom can be effected.

The matter is well worth studying, however, for ease of inspection and accessibility are almost fundamental necessities of economical operation. It would seem that the brushes and commutators of the motors ought to be accessible through a fireproof trap door without hauling the car over a pit, though it is admittedly difficult to design such a door. Cars for elevated and tunnel service need to be designed with much greater regard to their fireproof qualities than those for use in the open air on the streets. The location of wires in armored conduits has doubtless come to stay, and it is certainly a wise step, but it is taken at the cost of flexibility. Just how far rigid construction is desirable must be determined by experience alone.

COMMUNICATIONS.

Joint Electric and Steam Line Tariffs.

To the Editors:

I have just read the interesting item on "Joint Electric and Steam Line Tariff" in your November issue. Although this is doubtless the first joint tariff entered into in the central states, it may interest you to know that a similar arrangement has been entered into here in the northwest. A contract was made more than a year ago between the Coeur d'Alene & Spokane Electric Railway and the Spokane International Railway for interchange of both freight and passenger business, to take effect upon the completion of the latter road. The Spokane International was opened for traffic on November 1, 1906, but through a misunderstanding with eastern connections, the tariff was not made effective until November 20. The Spokane International Railway is a steam road 140 miles in length and gives the Canadian Pacific and the Soo Line an entrance into Spokane. The Coeur d'Alene & Spokane Electric Railway is part of the Inland Empire system, centering at Spokane.

The joint rates of the Coeur d'Alene & Spokane Railway give the merchants an additional line for shipments from eastern territory, and furnish another outlet for lumber to North Dakota and South Dakota, as well as other states east of the Missouri river. Low rates are made on lumber to Soo Line points in North Dakota in place of the sums of local rates to and from junctions of the Great Northern and Northern Pacific that have hitherto obtained. Additional contracts will be made with other transcontinental lines that now clearly see that electric railroads settle up sparsely settled sections of the country, and become the natural feeders rather than the competitors of the steam lines.

CHARLES E. FLAGG,

Spokane & Inland Empire R. R.

Spokane, Wash.

Annual Meeting, Western Society of Engineers.

The annual meeting and banquet of the Western Society of Engineers was held at the Mid-Day Club, Chicago, on January 8. At this meeting the following officers were elected; President, William L. Abbott; vice-presidents, Andrews Allen, E. N. Layfield and A. M. Talbot; treasurer, Albert Reichmann; trustee for three years, Willard A. Smith.

The report of the secretary showed that the organization now has a membership of 925, this being an increase of 96 during the past year.

The speaker of the evening was Mr. Bion J. Arnold, the retiring president of this society, who discussed the progress of electrifying steam roads in 1906. Mr. Arnold has been in close touch with many of the larger electrification projects. His address will be found on page 49 of this issue.

NEW CAR BARNs OF THE BROOKLYN RAPID TRANSIT COMPANY.

The Brooklyn Rapid Transit Company is completing new car barns at Ninth avenue and Twentieth street, Brooklyn, which will cost nearly \$800,000. As in the case of all the improvements which this company has under way, the ques-

entrance from Tenth avenue. The space between the two buildings is 50 feet wide, and the tracks from the Tenth avenue building are continued through two track openings into the basement of the Ninth avenue barns. These track openings are protected by steel doors, which remain closed, except when the tracks are in use.

The existence of the slope from Nineteenth to Twen-



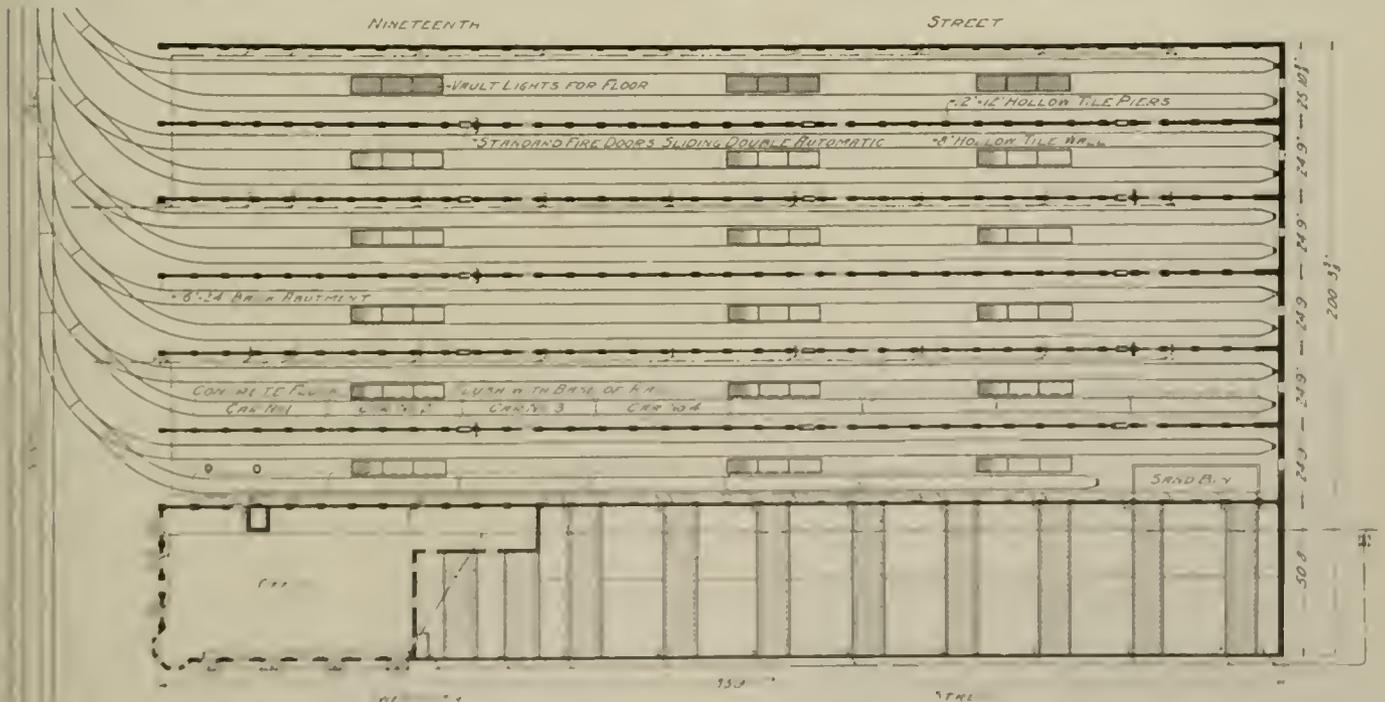
Brooklyn Rapid Transit Company—Interior of Repair Shops — Showing Inspection Pits.

Brooklyn Rapid Transit Company—Ninth Avenue Barns under Construction.

tion of fire risk has been given prominent attention, and for the purpose of greater safety, it was decided to build two separate structures instead of one.

The site selected for these barns sloped from the corner of Ninth avenue and Nineteenth street so that there was

tieth streets made it advisable to build the lower floor of the barns in terraces, each terrace giving space for four tracks. The last terrace, on the Twentieth street side of the Ninth avenue building, will be utilized for shops and inspection purposes, each of the four tracks to be equipped

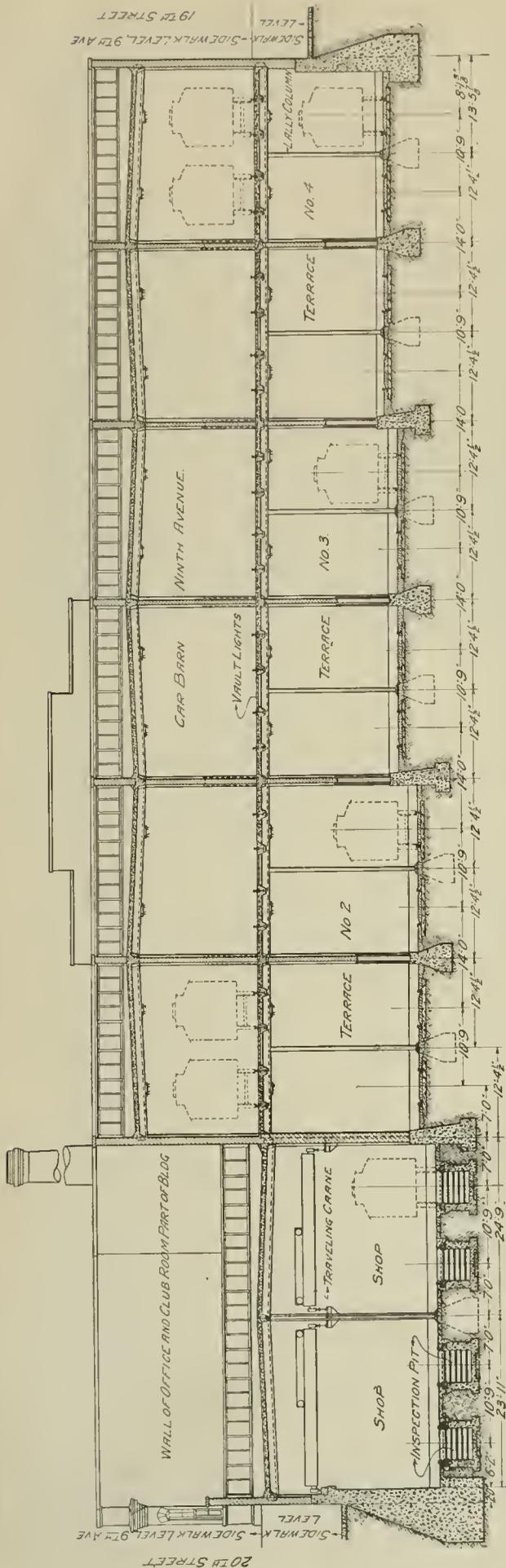


Brooklyn Rapid Transit Company—Floor Plan of Barns and Offices, Ninth and Tenth Avenues.

a considerable grade both from Ninth avenue to Tenth avenue, and from Nineteenth street to Twentieth street. It was therefore decided to excavate to make the Ninth avenue building a double-decked structure, with entrance to the second floor from the ground line at Ninth avenue. The Tenth avenue barn was made a single-story structure with

an inspection pit. Inspection pits will also be built under the corresponding tracks in the Tenth avenue building. The inspection pit tracks in both buildings will be served by a transfer table located in the area between the barns.

The buildings have an aggregate length of about 700



Brooklyn Rapid Transit Company—Cross-Section of Shops and Barns Showing Arrangement of Terraces.

feet, the Ninth avenue building being 359 feet long, and occupying a space between Nineteenth and Twentieth streets of about 200 feet. The lower deck of the Ninth avenue building has 16 parallel tracks, as has also the Tenth avenue building, and the upper deck of the Ninth avenue building has 12 tracks, giving space in the two buildings for 288 of the company's largest surface cars, as follows: Double-deck building; at the Ninth avenue level 94 cars, at the Tenth avenue level 94 cars, in the shop at the Tenth avenue level 20 cars; Tenth avenue building, at the Tenth avenue level, 60 cars; over the inspection pits, Tenth avenue level, 20 cars. This capacity is estimated for cars 42 feet 6 inches long.

As means of fire protection solid fire walls faced by tile and extending through the roof are being built lengthwise through both buildings between each pair of parallel tracks. As will be noted from the accompanying engravings, concrete has been employed for foundation walls, piers, inspection pits, floors and roof. In the Ninth avenue building the tracks on the second floor are laid on longitudinal girders in the reinforced concrete floor beam and supported by transverse steel girders. Vault lights are provided in the floor between each pair of tracks. The fire walls rest on concrete foundations or terrace walls, as the case may be, and consist of an 8-inch hollow tile wall and 12x12-inch hollow tile piers. They are fitted with standard National fire doors. The roof of the Ninth avenue barn and also of the machine shop, which is one story, is a reinforced concrete slab, with tar and slag finish. Skylights over each of the inclosed sections are provided, spaced 20 feet apart longitudinally. These skylights are protected by reinforced concrete combing 8 inches high at the high point of the roof. The 12-inch brick parapet walls are capped by blue-stone coping.

In finishing the interior all ceilings and walls will be painted with two coats of cold-water paint, and the walls will be finished with a dark wainscoting 4 feet high.

Each pair of tracks in the machine shop is provided with an overhead electric traveling crane running the entire length of the room, for the handling of car bodies and trucks.

The machine shop is equipped with a full complement of machinery and tools, and all drills, lathes and planes are independently driven by individual motors. At the west end of the shop a mezzanine gallery has been hung, in which are the office and locker rooms of the shop force and the branch offices of the mechanical department of the Brooklyn Rapid Transit Company. Occupying a part of the mezzanine and more of the ground floor of the southwest corner of the building are the quarters of the operating department of the division. The two departments are, however, entirely isolated in the structure, the shop men and the car crews only coming together in the club rooms, which are on the ground floor, along the Twentieth street side, immediately in the rear of the depot master's offices. The club is similar to the institution maintained by the company at East New York, and contains a large room devoted to pool and billiards, a bowling alley and lunch room. Heat is supplied by a steam plant in the building.

At the Columbus shops of the Indiana Columbus & Eastern Traction Company journal bearings are dressed by the use of a boring-bar rather than a lathe tool. The bar fits into the shop lathe centers and is provided with three adjustable cutting points. When a bearing is to be machined it is held in a pedestal resting on the bed of the lathe. The pedestal clamps the two parts of the bearing so that they are held together firmly and at the desired height. The boring-bar is then passed through the opening in the bearing and the chisels adjusted to take the proper cut. There are three chisels on the bar, the center one of which is used to dress the inside, and the other two for the ends of the bearing. By the use of this boring-bar it is possible to prepare bearings with much more accurate and uniform results than by the use of a lathe tool.

BRITISH ELECTRIC RAILWAY AFFAIRS.

(FROM OUR LONDON CORRESPONDENT.)

An ambitious scheme for controlling the electric supply of London is as vast in area as was covered by the recently withdrawn administrative county of London scheme. In the proposed bill to be introduced in the session of 1907 the power is sought to amalgamate 13 private companies operating in and about London. The amalgamation would be accomplished by means of a joint committee representing the companies. The committee would be endowed with all the powers of a business corporation. The area over which the "committee" seeks to operate in the supply of energy in bulk to companies or local authorities covers the county of London and numerous boroughs in Essex, Surrey, Kent and Middlesex. The committee also asks to be enabled to enter into agreement with the North Metropolitan Electric Supply Company, the Kent Electric Power Company, or any other body, for "mutual assistance or for combination." Provision is made for ultimate purchase by the London County Council or other authorized authority.

* * *

As one of the pioneer electric lines, the Central London Railway has had to pay rather heavily for some of its experience. The generating equipment, for instance, as installed at the Shepherd's Bush power station, is very much out of date in these days of universal adoption of the steam turbine for large electric power installations, although in this respect the London County Council is in a worse case, as there existed no justification for the use of reciprocating units at its Greenwich power house. The Central London's most costly experiment has, however, been in connection with its locomotives. When the line was first opened heavy electric locomotives were used to haul the trains, and these had to be abandoned within a short time, chiefly owing to the vibration in the neighborhood of the line, which threatened to lead to extensive litigation on the part of property owners and residents. In addition to the loss caused by so much valuable equipment being thus rendered useless, the company was obliged to go to the expense of equipping its cars with electric motors and control apparatus. A market has now been found for the discarded locomotives, two of which have been sold to the Metropolitan railway, which has been experimenting with them on the St. John's Wood line. The arrangement should be mutually satisfactory, since the Metropolitan will require a large number of electric locomotives on the final withdrawal of steam traction and will, presumably, obtain them at a lower price than would have to be paid for new stock.

Another economy affecting both the Great Western and Metropolitan companies will immediately result from the introduction of electric traction between Aldgate and Hammersmith, which has partially commenced. This service is maintained over a line partly belonging to the Metropolitan, partly to the Great Western and partly to the Hammersmith & City. The latter, a non-operating concern owning no rolling stock, has hitherto been worked by the two companies, each providing its own locomotives and trains. Dual services of this nature are naturally expensive to work, and it was very wisely decided not to build separate electric cars, but to run joint rolling stock instead, thereby diminishing both capital outlay and running expenses. A further saving in this service will be effected on the complete withdrawal of steam trains, which by enabling the time of the journey to be shortened will result in a smaller number of trains being required. In passing it may be mentioned that this is probably the first instance on record of joint rolling stock being employed on an electric railway. The obvious economy of the arrangement should lead to its further adoption where possible.

The demoralized condition of the electrical manufacturing industry in this country has its dangers for the consumer,

who may prematurely indulge in self-gratulation when observing the effect of competition upon price. That year after year with monotonous regularity there should be business carried out running into millions sterling without a penny of net profit must tend to increase the manufacturers' temptations to reduce costs at the expense of efficiency, and it is unquestionable that there are many generators and motors regularly sold which are falsely rated; that is to say, they do not contain sufficient materials to perform their nominal and specified duties. There appear to be two main types of customers for electrical apparatus: those who habitually order a 10-horsepower machine for work calculated to represent 7 or 8 horsepower, and those who order a similar machine and expect it to sustain a heavy overload. The former class unfairly favors the less scrupulous manufacturer, while the other class works equally obvious mischief. If practicable, it would be of great value to the whole industry to have some system of inspection equivalent to the practice in regard to weights and measures, with penalties for shortage in horsepower. For the commercial depression in this branch of manufacture, which is another question, there are only two possible remedies. Either we must witness the complete or partial closing of some of the larger works, or there must be formed an association for the avoidance of desperate competition.

* * *

The London Brighton & South Coast Railway Company announced some time ago that it intended to experiment with single-phase electric traction on the Peckham Rye to Battersea Park section of its system. The work is now nearly completed and will shortly be ready for trial. So far the announcement has made little or no impression on the public. Nevertheless, it is probable, in a high degree, that this experiment will open an epoch which will have a radical influence on the railway investments in which many of the public are interested. The disproportion between the real importance of this experiment and the interest taken in it by the railway investor is readily explained by the fact that electrical technicalities are not within the comprehension of the average man. Even a judge may be forgiven for ignorance of the mysteries of the "single-phase system." Yet it is quite possible to explain the commercial advantages of the new system of electric traction without appealing to the mysteries of electricity. So far our electrified railways, from the Northeastern down to the District, have followed the old familiar tramway model. They are "glorified tramways," the main difference being that, instead of the overhead trolley wire, they have had to use a much larger conductor, placed as "third rail," to carry the heavy currents required to move heavy trains. For tramways and suburban railways this system, in which continuous currents are used, has been wonderfully successful, but as a business proposition it is not as suitable for long-distance railway work. What tells against it is the complication and cost of the power transmission arrangements.

* * *

An important new project is contained in the proposal to construct a tunnel under the Thames between Greenwich and Purfleet, for which powers are to be sought in the next session of Parliament. The new tunnel is to be equipped for electric haulage and it is estimated to cost about 700,000 or 800,000 pounds sterling, including works, land and the necessary connecting railways and sidings. The line will be four and a half miles long. As chalk is the substance through which the tunnel would have to be pierced it is not anticipated that the work would be very arduous. The scheme has the support of the principal railway companies.

The Green Bay Traction Company is now building five new stations at its shops in Green Bay, Wis., which will be placed along the Kaukauna-Green Bay Interurban line for the accommodation of passengers. These resemble a regular passenger station, but on a miniature scale, and they will hold six or eight people at a time.

proper credit is given to the material and stores account and the bill is given a number and entered in a sales book, which carries the totals through to the end of the month. The pages of the sales book are 10½ by 16 inches and are ruled to receive the following data: Bill number, to whom sold, description of material, price, amount, total amount and the accounts to which credit should be given.

Each month a statement of all the business done by the storekeeping department for the past month is rendered to the auditor. This statement makes available the stores accounts distributed as to operating expense, construction expense, balance on hand, etc. When the information on this report has been checked by the auditor the storekeeping department balances its ledger. In this ledger all materials received are debited to the material and stores accounts and all disbursements are credited to the same account; thus the balance shows the stock on hand.

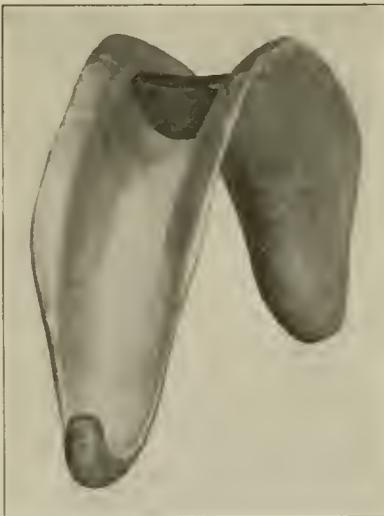
A special book is kept for recording the material used and the costs of articles manufactured in the company's shops. On the pages of this book are itemized the supplies drawn from the storekeeping department by the special requisition for shop jobs; the record for such jobs is kept on these pages until the job is completed, and then a special shop order exhibiting the number of the job is returned and the labor is added to the amount of the material used. It is thus possible to get net costs for the finished goods returned to the storeroom.

In order to have the material accounts exhibited in a simple form a journal or memorandum book is kept and cross entries made charging the accounts benefited by material unused and crediting the accounts from which the original material was drawn.

A SIMPLE SLEET CUTTER.

The accompanying illustration shows a sleet cutter designed by Mr. C. E. Atkinson, master mechanic of the Richmond, Ind., shops of the Indiana Columbus & Eastern Traction Company. This type of sleet cutter has been used for a year and is said to have worked very satisfactorily.

It will be noted that the device consists of a semi-circular brass shell with a removable and reversible copper lug. This lug has its flat sides tapered so they fit into a slot cut transversely in the center of the shell. When in use the shell fits into the groove around the trolley wheel and as so placed the lug is held firmly in its position. At one end of the shell, which is of cast brass, is a small projection designed to fit into a ⅜-inch hole in the trolley harp; the other end is provided with a hook around which the trolley rope may be looped, thus holding the shell and in turn the lug firmly in the groove of the trolley wheel and assuring that the hard copper lug will bear against the trolley wire. Other than its low cost, this form of sleet cutter has the advantage that it may quickly be attached to a trolley pole, and also that a supply of copper lugs may be carried by the car crew and on long runs inserted when necessary. Consisting as it does of only two parts, the first cost of the device is quite low.



Sleet Cutter with Removable Wearing Surface.

TIE PLATES, BRACED TIE PLATES AND TIE RODS.*

BY E. P. ROUNDEY, ENGINEER MAINTENANCE OF WAY, SYRACUSE RAPID TRANSIT RAILWAY COMPANY.

Our attention was first called to the inefficiency of braced tie plates as a means of holding girder rails to gauge, when the cars on several of the lines in Syracuse began to leave the tracks; and in every case we found the track in the neighborhood of the place of derailment to be from one-half to one inch wide gauge.

The track construction on these lines is as follows: Nine-inch half-groove rail, Lorain section 90-317, oak ties, 6 by 8 inches by 8 feet, six inches of coarse gravel ballast, and malleable iron brace plates every six feet. The concrete for the paving, which is both brick and asphalt, extends from the bottom of the tie to about four inches above it. The track has been down about ten years.

The derailments became so numerous a short time after putting some new heavy cars on the lines, that we decided to place tie rods in all of our tracks having the half-inch groove rail and brace plates.

When the track was opened for the tie rods we found the ties in fair condition, but many of the brace plates were bent backwards and others twisted away from the head of the rail, being practically of no use for holding the rails to gauge. The track had been gradually widening out under the small cars and when the large heavy cars were run, it took only a short time to widen the gauge until the track was unsafe.

Tie rods have now been placed in most of this track and we have had no more trouble with derailments. The great objection to brace plates, judging from our experience, is due to their being spiked to wooden ties. They are dependent for their efficiency on the holding power of the spike, and as the ties get old the continual tipping of the side-bearing rail loosens the spikes, and allows the brace plates to twist and become loose; they also cut into the ties as the ties decay, thus allowing the rail to tip outward. A great deal of care should be taken when putting on brace plates, as the spikers will often twist them when spiking and get a poor bearing under the head of the rail; crooked or uneven ties will also make trouble in getting a good job.

We have some steel brace plates on a piece of track which has been down for about three years and have had no trouble as yet, but the cars are small and 10 minutes apart.

When this track is to be paved we shall place the tie rods six feet apart in addition to the present brace plates. The use of brace plates would be advisable in laying track in an unpaved street, which would be paved in a few years, as a strong steel brace should hold the track when the ties are in good condition, and when the street is paved we shall put in the tie rods.

The objection to tie rods in an unpaved street is that, as the filling between the rails settles, the rods are exposed to wagon traffic and bent or broken. The theoretical objections to brace plates as compared with the tie rods are as follows: The brace plate depends for its efficiency on the condition of the tie, and braces each rail independently; if the braces on one side fail the gauge will widen; with the tie rod, if the rails get out of line, they will move together and maintain the gauge. On ordinary girder-rail track a half-inch or so wide gauge will not cause derailment of cars, but with the half-groove type, especially Lorain section 90-317, half-inch wide gauge trouble will occur much more frequently.

The lip on this rail is thin and narrow, and flattens down under wagon traffic, often breaking off in places. When a car comes to a place where the track is a half-inch or more wide gauge, the flanges of the wheels on one side get inside of the lip of the rail and when the track comes to gauge again the opposite wheels are forced over the head of the rail, causing derailment of the car.

With this type of rail to contend with, necessitating tight gauge for safety, tie rods are the best fastening. If a strong steel brace were used in connection with a steel tie, it should make an efficient device for holding the rails to gauge.

There is not much to be said in favor of the use of ordinary tie plates on rails in a paved street, as the concrete between the ties will support the rail, and keep it from cutting into the ties to any appreciable amount. However, the concrete in the older tracks in Syracuse does not seem to be of any use for holding the rails to gauge as spreading has occurred as stated.

*Presented before the Street Railway Association of the State of New York January 11, 1907, Buffalo, N. Y.

ENGINEERING ASSOCIATION EXECUTIVE COMMITTEE
MEETING.

A meeting of the executive committee of the American Street and Interurban Railway Engineering Association was held at the rooms of the Transportation Club, New York, on January 7. There were present, President H. H. Adams, superintendent of shops, the United Railway & Electric Company, Baltimore, Md.; Vice-President Fred G. Simmons, superintendent construction and maintenance of way, Milwaukee Electric Railway & Light Company, Milwaukee, Wis.; Secretary and Treasurer S. Walter Mower, general manager Southwestern Traction Company, London, Can.; F. H. Lincoln, assistant general manager, Philadelphia Rapid Transit Company, Philadelphia, Pa.; Fred N. Bushnell, chief engineer, Rhode Island Company, Providence, R. I.; W. T. Dougan, engineer maintenance of way, New York City Railway, New York; B. V. Swenson, secretary, American Street and Interurban Railway Association; H. W. Blake, Street Railway Journal; C. B. Fairchild, Jr., Electric Traction Weekly; and F. W. Lane, Electric Railway Review.

The report of the secretary and treasurer showed a balance of \$266 on hand. In relation to finances Secretary Swenson expressed the belief that the financial condition of the principal association would be such as to enable all work desired to be done by the affiliated associations to be carried out satisfactorily. In reference to committee work Mr. Simmons expressed the view that the work would be done better and more willingly if it were understood that the committee's expenses would be taken care of by the association.

In the consideration of subjects for papers for the next convention there was some discussion of the desirability of joint action between the Engineering and the Claim Agents' associations as to vital points in rolling stock design and construction that might have a bearing upon work of the claim agents. This was in line with the address of S. L. Rhoades of the Claim Agents' association at the Columbus convention. Several points were suggested to which the consideration of the two associations might advantageously be given jointly, such as with reference to car steps, folding running boards, gates, etc. President Adams suggested that the claim agents be asked to prepare a statement of points in which they would be particularly interested. Mr. Lincoln stated it was the practice of the claim department upon the road with which he is connected to send to him each month a list of such claims as had come up during the month and which were based upon mechanical defects. This statement gave the amount claimed and the particular cause and it was stated that these data were sufficient to enable each case to be followed up individually until the blame was located exactly where it belonged. The practice had resulted in a reduction of claims of nearly 75 per cent by removing the cause upon which the claim was based. The matter was summed up in the following resolution which was presented by Mr. Simmons and which was adopted:

Whereas, There are many mechanical details in connection with the construction and operation of electric railways which are of great importance to the claim agents of the various companies and regarding which they may desire to suggest alterations and improvements in present practice:

Therefore, Be It Resolved, that the executive committee of the Engineering Association hereby expresses to the Claim Agents' Association its desire that this matter be given consideration at its discretion and such suggestions made and such action taken as may seem desirable.

And Be It Further Resolved, that in the opinion of the executive committee of the Engineering Association this matter should come up for comprehensive consideration at a joint meeting of the associations during the 1907 convention.

The subject of "Shop Accounts," which was left in an unfinished state at the St. Louis convention was not definitely acted upon.

"Gas Engines," upon which a valuable paper was presented at the last convention by Mr. Paul Winsor, was retained upon the programme for the present year, with a view to having

the operation of the plant described by Mr. Winsor brought up to date. It was also decided to invite Mr. W. W. Cole, general manager of the Elmira Light & Water Power Company, Elmira, N. Y., to furnish a paper covering his experience with gas engines.

Upon the subject of "Steam Turbines" Mr. Lincoln was instructed to hold himself responsible for the preparation of a paper, and it was also suggested that it might be possible to secure a paper treating this subject from a historical point of view from Professor Storm Bull of the University of Wisconsin.

The method followed in the consideration of these subjects was that of holding a member of the executive committee responsible for the preparation of certain papers, whether prepared by himself or someone else at his request.

The committee on "Standardization" was continued from last year. Some changes were made in the composition of the committee, H. W. Blake and C. B. Fairchild, Jr., being appointed in place of Paul Winsor and F. H. Lincoln. As chairman of the committee on "Maintenance of Way" Mr. Simmons suggested the desirability of a paper on "Care of Roadbed and Right of Way on Interurban and Urban Lines," this to cover such subjects as oiling and sprinkling the roadbed, keeping poles and grounds in presentable condition, etc. It was also suggested that this topic be assigned to a sub-committee, which should endeavor to get in touch with all maintenance of way officials and obtain data in a form to be turned over to the "Standardization" committee. The "Maintenance of Way" committee is now composed of F. G. Simmons, chairman, Thomas K. Bell, Interstate Railways Company, Philadelphia, and C. A. Alderman, Cincinnati Traction Company.

"The Wear of Rails and Joints in New York City" was assigned to W. T. Dougan, engineer maintenance of way, New York City Railway, New York. In discussing this subject the matter of corrugation of rails was brought up and Secretary Swenson was requested to secure data from members of the association and others for publication in the proceedings.

"Concrete Ties" was also suggested as a subject and an endeavor will be made by the committee on "Maintenance of Way" to secure data.

"Control Apparatus," a subject carried over from last year, was assigned to a committee as follows: Chairman, J. S. Doyle, Interborough Rapid Transit Company, New York, George J. Smith, Kansas City Railway & Light Company, P. J. Callaghan, Pittsburg Railways Company.

"Maintenance and Inspection of Electrical Equipment" was assigned to a committee consisting of John Lindall, Boston Elevated, W. D. Wright, Rhode Island Company, Providence, R. I., E. T. Munger, Metropolitan West Side Elevated, Chicago, L. L. Smith, Schenectady Railway Company, Schenectady, N. Y.

President Adams expressed the view that the last-named subject should be handled with special reference to inspection on the mileage basis.

R. B. Stearns, Chicago & Milwaukee Electric Railroad, was appointed representative to the American association on the committee on "Insurance."

"Car Cleaning, From a Sanitary Point of View," was suggested but after consideration it was thought to be a transportation rather than an engineering subject and it was decided to suggest it to the committee on subjects of the American association.

"Open versus Closed Terminals, with Reference to Effect on Rolling Stock," was assigned to a committee consisting of E. W. Olds, Milwaukee Electric Railway & Light Company, Martin Schreiber, Public Service Corporation of New Jersey, and John Hanf, International Railway Company, Buffalo.

"Car Houses for Both Operating and Storage Purposes" was assigned to a committee consisting of F. N. Bushnell, Rhode Island Company, Providence, R. I., R. C. Taylor, Indiana Union Traction Company, Anderson, Ind., and Nelson

Graburn, Montreal Street Railway Company. It was decided with reference to this subject that the committee should not attempt to make recommendations but endeavor to secure as large a number as possible of typical plans of car houses and assemble them for convenient reference.

It was voted as the sense of the executive committee that at the annual convention the session should not be opened on Monday morning but that the first session should be at two o'clock p. m. on Monday.

QUARTERLY MEETING OF THE NEW YORK STATE ASSOCIATION.

The Street Railway Association of the State of New York held a quarterly meeting at the Iroquois Hotel, Buffalo, on January 11, 1907, convening at 10 a. m. There were about 50 members and guests present. Especially valuable papers were read treating the subject of "Track and Roadway."

In the discussion Mr. I. E. Matthews, chief engineer of track Rochester Railway Company, favored the use of nine-inch grooved rails laid on oak ties supported by concrete. He thought this type of structure was most satisfactory for the streets with heavy traffic, and that where traffic was light it might be well to use T-rail with a flange-way in the pavement adjacent to the rails. Mr. F. D. Jackson, roadmaster International Railway Company, favored the use of Carnegie steel ties embedded in concrete and supporting nine-inch girder rails.

Mr. E. P. Roundey, engineer of maintenance of way Syracuse Rapid Transit Railway Company, presented a paper on "Tie Plates, Braced Tie Plates and Tie Rods." This paper will be found on page 44 of this issue.

In discussing track substructures Mr. A. H. Stanley, Public Service Corporation of New Jersey, stated that in some instances concrete had failed and for this reason broken stone was favored. Other speakers favored the use of concrete with gravel instead of broken stone.

Mr. C. G. Reel, Kingston Consolidated Railroad Company, read a paper in which he presented strong arguments favoring T-rails. In the discussion of this paper many good reasons were advanced showing why T-rail is preferable to girder rail. Mr. T. W. Wilson, International Railway Company, Buffalo, did not favor the use of T-rail in streets where the traffic was especially heavy.

Papers were presented on various methods of making rail joints. Mr. P. N. Wilson, Rochester, presented a paper on "Electric Welding." In the discussion several opinions were favorable to the "thermit" process.

The members of the associations and guests were entertained at lunch by Messrs. H. J. Pierce and T. W. Wilson, of the International Railway Company.

NEW LINES NEAR LOUISVILLE.

The Louisville & Eastern Railroad Company, of Louisville, Ky., has recently completed the nine-mile extension of its lines from Beards to La Grange, Ky., and is now operating its cars through from Louisville, a distance of 27 miles, on one-hour headway.

A substation at Buckners and an addition 50 by 55 feet in floor area, to the power plant at Marcia have recently been built. The new installation at the power plant includes: Two 250-kw. direct current Westinghouse generators and one 300-kw. alternating-current generator, 200-kw. rotary converter, 450-hp. Buckeye engine and a 250-hp. Vogt Machine Company boiler. A 6,600-volt transmission line has been built between the power house and substation.

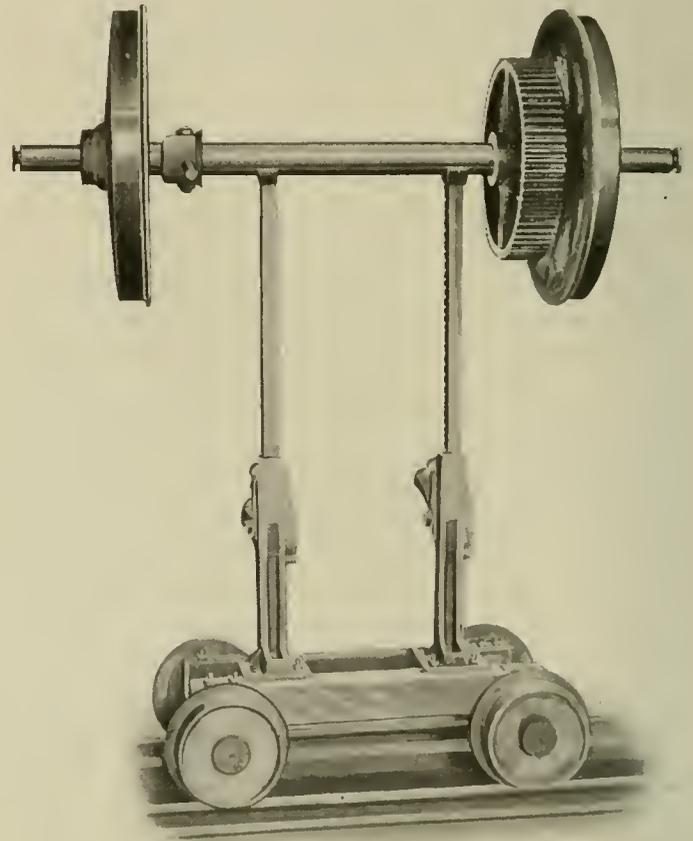
In view of proposed extensions of the railway the power house improvements are of a temporary nature. Before the Shelbyville division is completed, the contract for the grading of which has already been let, a new power plant will be

erected at a point more centrally located and where a better water supply may be had.

The Shelbyville division is a branch leaving the present line near Louisville and following the Shelbyville pike for a distance of 27 miles, passing through Middletown and Simpsonville. The route selected for the line is thickly settled. It is planned to use either the single-phase alternating current or the 1,200-volt direct-current system for operating this line.

A SIMPLE PIT JACK.

The pit jack shown in the accompanying illustration is probably about as simple a device as could be built for raising and lowering wheels under cars. This device, as used in the repair shop of the Hot Springs (Ark.) Street Railroad Company, consists of two track jacks bolted to parallel timbers resting on the axles of two pairs of small flanged wheels. The entire truck may easily be moved along a narrow-gauge track laid in a cross pit. Thus the jack



A Simple Pit Jack.

serves all the repair pits of the shop. The Barrett jacks as used have 47-inch rams so that there is considerable vertical movement possible.

When wheels are to be lowered the car is placed in position over a removable section of the repair-pit track. The axle is then made clear of the journal and motor bearings and the jacks raised until the wheel flanges are clear of the track rails. The removable sections of the pit-track rails are then shifted so that the jacks carrying the car wheels may be lowered until the wheels will clear the pit tracks. It is then a simple process to roll the truck carrying the wheels, along its own track until such a position is reached where the wheels may be lifted by an overhead crane or set upon planks across the pit and rolled onto the shop floor.

REGENERATIVE CONTROL.*

BY A. RAWORTH.

In using shunt motors for electric traction certain difficulties are encountered. Thus there is the difficulty of changing from series to parallel, or vice versa, which consists principally in the fact that the speed of the armature varies inversely as the strength of the field and directly as the voltage across the brushes. It is obvious, therefore, that in changing from series to parallel the field strength must be practically doubled, otherwise the moment the armature circuit is closed across 500 volts a violent attempt will be made by the motors to accelerate the car.

The operation of strengthening the field can be carried out fairly quickly, but not quite quickly enough, consequently it is necessary to insert some resistance in series with the armatures to check momentarily the rush of current due to the inexactitude of the field strength. This will be referred to later.

It is also necessary to insert some series field winding in series with each armature, for without this precaution the motors would not work in parallel.

It is also an essential condition that in breaking the current either when going out of series or when coming out

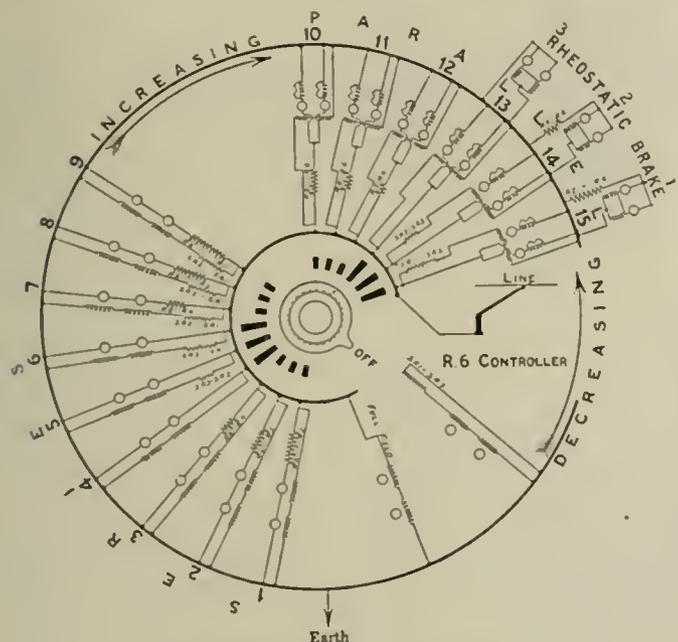
hour faster than the minimum reactive speed. On notches 7, 8 and 9, when the controller handle is being turned in a clockwise direction, the connections are exactly the same as on notch 6. Thus, when the circuit is opened preparatory to going into parallel, there is no resistance in the armature circuit. On notch 10 all the resistance in series with the shunt fields is cut out, thus giving the maximum field strength, the armatures are connected in parallel, each in series with its series field winding and resistance is inserted in the main circuit. A resistance is put in parallel with the series windings in order to shunt a portion of the current, therefore only so much current as will balance the load between the two armatures is allowed to pass through the series winding. On notches 11 and 12 the resistance in the main circuit is cut out in steps, and on notch 13 the armatures are in parallel across the full voltage, the field strength being at the maximum. On notches 14 and 15 resistance is inserted in steps in the shunt field circuit to attain the top speeds.

When the controller handle is turned in a counter-clockwise direction, the same combinations as when accelerating are made as far as notch 13, and the speed reduced from the maximum down to a speed which is only slightly more than double the maximum regenerating speed in series. But on notches 12, 11 and 10 the connections are exactly the same as on notch 13, and when the circuit is opened preparatory to going into series there is thus no resistance in series with the armatures. On notch 9 resistance is connected in series with the shunt field windings and the armatures are connected in series, in series with resistance. On notches 8 and 7 this resistance is cut out in steps until on notch 6 the armatures in series are connected across the full voltage. On notch 5 the resistance in series with the shunt fields is reduced, and on notch 4 it is cut out altogether. At this point the speed of the car has been reduced to the minimum regenerating speed. The handle is then shut off in the usual manner and the hand brake applied. But when moving the handle from notch 4 to the off position, the resistance which was inserted on notches 1, 2 and 3, when moving in a clockwise direction, is kept short-circuited, thus again providing for the opening of the circuit with the armatures connected across the full voltage. The rheostatic brake notches 1, 2 and 3 make connections similar to those used for the same purpose in ordinary controllers. But these notches in the controller coincide with the power notches 15, 14 and 13. This is effected as follows:

Notches 1, 2, 3, 10, 11 and 12 make connections as shown on the diagram when the controller handle is moving in a clockwise direction, but when the handle is turning in the opposite direction the resistance in series with the armatures is kept short-circuited.

The notches 7, 8 and 9 give connections as shown in the diagram when the handle is moving in a counter-clockwise direction, but the resistance in series with the armatures is kept short-circuited when the handle is moving in a clockwise direction.

Referring to Fig. 2, which is a development of the controller laid out in the usual way; finger 22 is connected direct to the trolley, and the six fingers immediately below it are connected to the resistance used in the armature circuit. When the controller cylinder connects the trolley finger 22 to one of these resistance fingers, the current flows through the resistance connected between that finger and the bottom one R. 6 and then through the armatures. For instance, on notch 1 finger 22 is connected to finger R. 2, the resistance in circuit is therefore R. 2 to R. 6. On notch 5 the finger 22 is connected to finger R. 6, the resistance is therefore short-circuited. Now contact ring X, is loose on the main cylinder, and is driven by a pin working in a slot, which enables the loose ring to lag between the main barrel by the space covered by three notches. When the controller is turned in a clockwise direction, the position of this slip-ring is as shown on the diagram, but if the controller is moved, say, to notch 6, and then back to the off position, the slip contact hangs back three notches behind the rest of the main cylinder and takes up the position shown in dotted lines. It will thus be seen that the resistance in circuit on notches 1, 2, 3, 10, 11 and 12 is short-circuited when the controller handle is being turned in a counter-clockwise direction. In the same manner the resistance in circuit on notches 7, 8 and 9 is short-circuited only when the handle is turned in a clockwise direction. Now notches 13, 14 and 15 are rheostatic brake notches when the barrel is turned past the off position. The finger 22 is disconnected from the trolley and connected to earth, and the series fields are reversed by the small brake cylinder on the left of the diagram. The resistance in circuit on the first notch is R. 2, R. 6, on the second notch, R. 4, R. 6; and on the third



Regenerative Control—Figure 1.

of parallel, there should be no resistance in circuit, otherwise there will be heavy flashes in the controller. In this respect shunt motors differ entirely from series motors, in combination with which latter resistances are necessary when opening the circuit.

The method by which the resistances are put in circuit before closing the armature circuit and taken out again before breaking the circuit will be described later on. Apart from this little difficulty, the operation of this controller is simplicity itself. The series of operations is shown in Fig. 1, which is a diagram showing the connections on each notch of a series parallel controller arranged for working two motors. Referring to this diagram, it will be seen that the shunt field circuit is first closed, then on the first notch the armatures are connected in series with resistance. The resistance is then cut out in steps and on notch No. 4 the armatures are in series across the full voltage, the shunt fields being fully excited. This notch gives a speed of from 3½ to 6 miles an hour, according to the type of motor used. But it is an advantage to have the minimum reactive speed as low as possible, both for the sake of economy in current due to the reduction of the rheostatic period and because it is the minimum speed at which the motors will return current to the line. On notches 5 and 6 resistance is inserted in the shunt field circuit with the object of increasing the speed, the speed on the sixth notch being 3 or 4 miles an

*Read before the Leeds (England) Local Section of the Institution of Electrical Engineers, November 22, 1906. Abstracted by The Electrician, London.

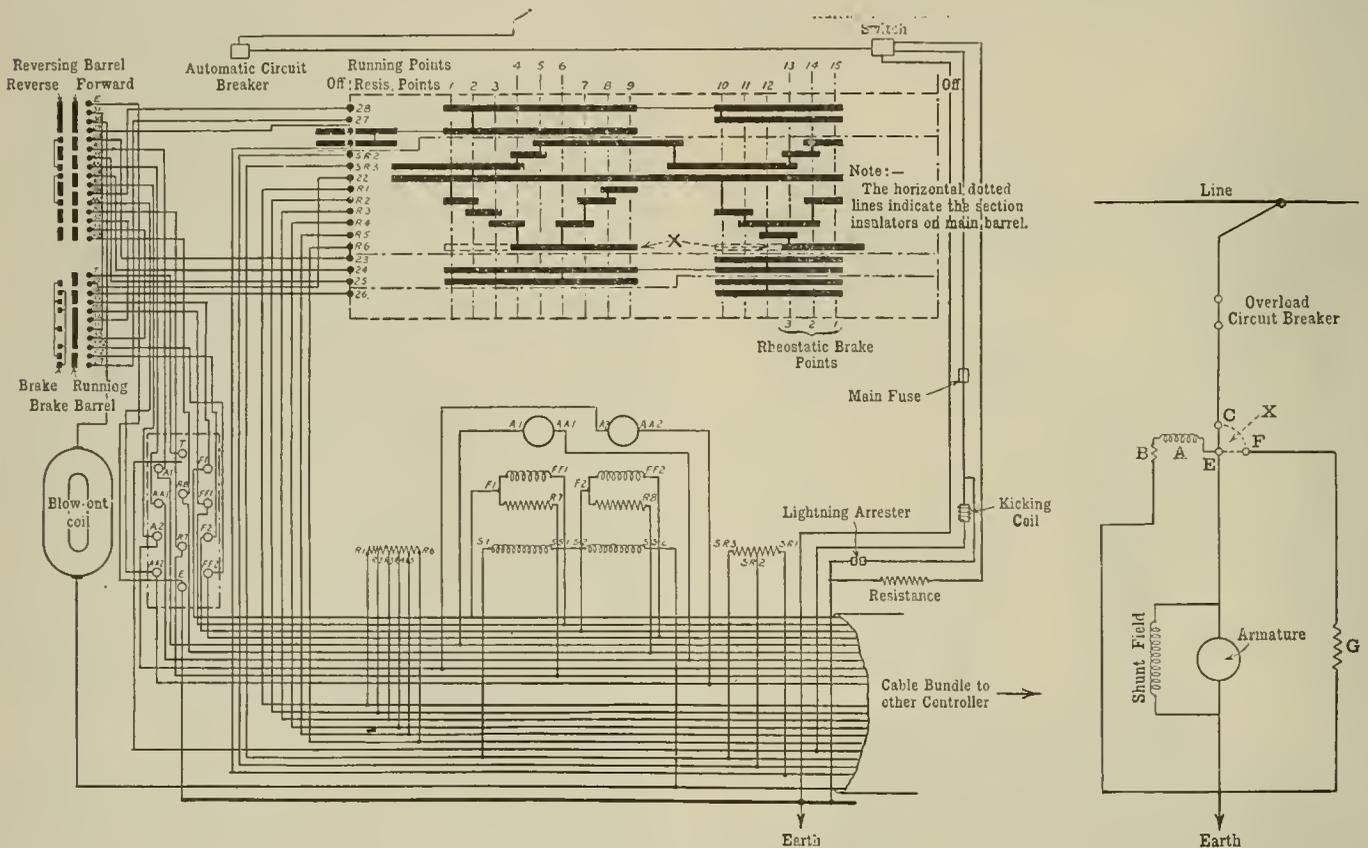
notch all resistance is short-circuited by contact X., which will be in the position indicated by dotted lines.

The present form of controller has only been in existence 12 months, but about 100 of them are working successfully. When the first experiments were made in 1903 the motors were connected permanently in series, the speed being regulated by the shunt field. This worked well on the level, but great difficulty was experienced in preventing drivers from climbing steep gradients with a weak field, which caused heavy flashing at the commutators. It was then recognized that the introduction of the series parallel system of control was necessary to make the regenerative system suitable to all conditions. The first scheme was to weaken the field until the armatures had attained a speed in series double the minimum reactive speed, then to open the armature circuit, double the shunt field strength, close the armature circuit again with the armatures in parallel, and then again weaken the shunt field to attain the necessary speed. For these experiments a box full of open switches was used. It was found that the armatures could be put into parallel only by making a considerable pause to allow the field to

braking. If a car were descending a grade, and from any cause were cut off from the source of supply, the braking effect would be immediately lost, also the driver in shutting off his controller might produce momentarily the combination of a strong field and a high speed, thus allowing the motors to generate a voltage which has destroyed a considerable number of lamps and not a few station voltmeters.

Both these troubles have, however, been cured, or rather prevented, by the device shown diagrammatically in Fig. 3. Suppose a car to be descending a gradient at, say, six miles an hour, and suppose also that while so doing the trolley comes off the wire, there is a tendency for the voltage across the motors to increase; directly this happens, the current in the coil A increases and trips the switch X, so establishing a circuit from contact E to F, and then the resistance C to earth.

In actual practice it is found that should the supply be interrupted as explained above, a car can be brought to a speed as low as two miles an hour by the ordinary movement of the controller handle, the regenerated current passing through the resistance C, instead of along the trolley



Regenerative Control—Figures 2 and 3.

increase, and then only on the level. To cure this the controller was arranged to insert a small resistance in the main circuit in order to give the shunt fields more time to increase. This arrangement worked well, and the motors could be switched into parallel on an 8 per cent gradient. It was then found that getting the armatures back into series was even more difficult than getting them into parallel, it being necessary to use more resistance in the armature circuit. This difficulty was, however, overcome in the first series parallel controller that was made on the circular plan. Many motors, however, will not work sparklessly in series with the field weakened sufficiently to produce double the minimum speed, and the controller has therefore been redesigned with three resistance notches for making the series parallel changes. Twelve months after the commencement of the experiments with series parallel working there were 14 cars running with series parallel control on the Yorkshire Woollen District Tramways, and they have never given any trouble.

It can be taken as a fact that any motor which is good when series wound is good also as a regenerative motor.

Safety and Economy.

One of the advantages of this system is that any notch corresponds to a definite speed, and that a car cannot accelerate beyond this and get out of hand. Until lately, however, there was one objection to the regenerative method of

wire. Thus the regenerative brake is not dependent for its action upon the continuity of the supply circuit.

There are four claims for the regenerative brake:

1. It cannot, under any circumstances whatever, or with any condition of the rails, lock the car wheels.
2. If it is out of order the car cannot be moved.
3. It is not dependent on the continuity of the supply circuit.
4. The more you use it the less it costs; in fact, it pays you to use it.

The saving in current varies according to the contour of the route, conditions of traffic, etc. On level lines it is small, but on hilly lines may be as much as 30 per cent. Copies of comparative current-consumption tests on cars on the lines of the Bristol Tramway & Carriage Company over about 44 miles, the South Metropolitan Tramways Company and the Devonport & District Tramways Company are given in the paper. In these three cases savings of 24, 26.7 and 28.7 per cent respectively are obtained. At Bristol and on the South Metropolitan company's lines at Penge the tests were made with special cars unloaded, but at Devonport the meter was fixed on cars running in service, the tests extending over about 54 miles.

A special point of interest in the Penge test is that the total current taken by the regenerative car, before deducting the regeneration, is 6.5 per cent less than the current taken by the series motor car.

THE PROGRESS OF ELECTRICAL EQUIPMENT OF STEAM ROADS.*

BY BION J. ARNOLD.

On a former occasion, in September, 1904, I said: "That electricity will be generally used on our main railway terminals, and ultimately on our main through lines for passenger and freight service, I am convinced, but I do not anticipate that it will always be adopted on the ground of economy in operation, neither do I anticipate that it will come rapidly, or through the voluntary acts of the owners of steam railroads, except in special instances."

Confirming the prediction which I then made, to the effect that the steam railroads would acquire the electric roads paralleling them, I call attention to the fact that according to published reports the New York Central & Hudson River Railroad Company has since then, in addition to practically completing its great electric terminal in New York City, either purchased outright or acquired indirectly the controlling interest in most of the Interurban roads paralleling its lines between Albany and Buffalo, and the New York New Haven & Hartford Railroad has recently acquired practically all the interurban roads which compete with it in its territory.

Projects Under Way.

The Erie Railroad is, in addition to its preparation for the electrification of its terminals in the vicinity of Jersey City, now equipping 34 miles of track extending southeast of Buffalo, thus retaining traffic which might have been taken from it by the construction of competing interurban lines. In like manner the Pennsylvania Railroad system, in addition to the electrification of its great terminal system in the vicinity of New York, is gradually electrifying the Long Island Railroad system. The New York New Haven & Hartford Railroad Company is also going to great expense in the electrification of its line from New York City to Stamford, Conn., a distance of 31 miles, with reasonable probability of gradual extension of electric traction over its system.

These few examples, together with the electrical operation of the great Simplon tunnel, by means of which the traveler will be carried from Switzerland into Italy without the annoyance due to obnoxious gases emitted from the steam locomotive, I believe are sufficiently impressive to emphasize the correctness of the lines of development outlined by me in 1904, involving, as they do, an expenditure of approximately \$100,000,000 for electrical equipment, and a collateral investment of some \$300,000,000 more.

In addition to these general types there are now under construction, or contemplated construction, many special installations adopted for various reasons, such, for instance, as the St. Clair tunnel of the Grand Trunk Railway system, extending from Port Huron, Michigan, to Sarnia, Ontario, wherein steam locomotives will soon be abandoned and trains operated electrically. The equipment of the Cascade division of the Great Northern Railway, over the Cascade mountains, a distance of about 100 miles, although not yet definitely decided, is another notable example of the contemplated application of electricity to steam roads. Its equipment would eliminate the use of steam locomotives now operating over a tortuous piece of road, and through a long and difficult tunnel. Electrification is also contemplated upon a division of the Southern Pacific Railway, through the Sierra Nevada mountains, for the purpose of eliminating the difficulties due to tunnel operation, and of increasing the capacity of the road, which is now limited by the size of the present steam locomotives.

New York Central & Hudson River Railroad Company.

The New York Central Railroad Company has recently put into operation, for passenger service, interurban trains running between New York City and Yonkers, a distance of 14 miles, and is now introducing electric locomotives into the terminal service for operation of its through trains, between the Grand Central terminal and Croton, 35 miles, and North White Plains, on the Harlem division, 29 miles, from New York.

The installation will, when completed, consist of two power stations of 30,000 kw. each, and eight substations which will supply and distribute electrical energy to about 400 miles of track within a radius of 40 miles from the city of New York. The type of locomotive for through train service has, by a long series of experiments, proven itself capable of doing the work for which it is intended. Thirty-five of these

machines are now ready for operation, and will be introduced as rapidly as men can be trained to operate them. Each locomotive weighs 100 tons, has a normal capacity of 2,200 hp. and a maximum capacity of 3,000 hp. and will run at speeds varying from 40 to 80 miles per hour, depending upon the weight of the trains, which will vary from 250 to 900 tons. Two or more locomotives can be coupled together for heavy train service, and operated upon the multiple-unit system in the same manner as the cars.

Two hundred steel motor cars will soon be placed in service, each equipped with 400 hp. of motor capacity, and so arranged that they can be run singly or in multiple, at will, although some are now used as trailers without motor equipments. Each motor car is 60 feet long over all, weighs 53 tons, seats 60 passengers, and is designed to run at a maximum speed of 52 miles per hour.

One power house, in which has been installed 20,000 kw. capacity in turbo-generators and the necessary auxiliaries, is now in service, and the energy is distributed to the trains by means of four substations, in which are placed storage battery auxiliaries for the purpose of regulating the load upon the power stations, and for reserve capacity in case of accident to any substation or power station. From the substations the energy is distributed to the trains by means of secondary copper feeders and the inverted, or under-contact, type of third rail.

Pennsylvania Railroad Company Tunnels.

Beginning at Bergen Hill in New Jersey, about 2.7 miles from the proposed New York City station, and almost directly in line with Thirty-third street on Manhattan Island, the plans of the Pennsylvania Railroad contemplate the construction of two tunnels, each 19 feet in diameter, parallel with each other, from Bergen Hill, through the Palisades, and under the Hudson river, thence under a portion of Manhattan Island to the terminal station located between Thirty-second and Thirty-fourth streets, and Seventh and Eighth avenues in New York City. From this terminal station eastward there will be four tunnels, each 23 feet in diameter, extending across the island under the East river to the terminal in Long Island City, where the tracks will come to the surface, and connect with the extensive yard contemplated by the Pennsylvania system at that point. Through these tunnels, which are about 14,000 feet in length, will be operated, by electric locomotives, all passenger service entering New York City, of the Pennsylvania Railroad, and probably a large amount of freight for the distribution yard at Long Island City. The suburban trains for interurban service passing through these tunnels will be operated on the multiple-unit system, and the electric locomotives will be, as in the case of the New York Central, similarly operated, when it is desired to couple them together.

Hudson & Manhattan Tunnels.

For the purpose of enabling the interurban and other steam roads entering Jersey City to enter the city of New York, there are now being constructed two other systems of tunnels, one under the name of the Hudson & Manhattan Railroad, and the other under the name of the New York & Jersey Railroad. The interests of both companies have recently been consolidated and now operate under the name of the former.

The two tunnels of the Hudson & Manhattan company extend from the foot of Exchange Place in Jersey City to a terminal at Church and Fulton streets in the island of Manhattan, a distance of about 9,000 feet. The tunnels of the New York & Jersey Railroad Company will extend from the foot of Fourteenth street in Jersey City to Morton street on Manhattan Island, a distance of about 5,000 ft.

It will be noticed that the tunnels of both of these companies are considerably smaller than those of the Pennsylvania company. They are constructed for the purpose of feeding the present subway of the Interborough company, consequently all cars entering these tunnels will have to be of the special small and low design now used by the Interborough company, a misfortune which it seems impossible now to overcome, as it will effectually prevent any of the through trains of the steam roads which now terminate at Jersey City entering Manhattan Island unless they come through tunnels of their own to be hereafter constructed.

In addition to the subways heretofore mentioned, to be used for the accommodation of steam railway traffic, there are to be four additional tunnels constructed under the East river, two by the New York & Long Island Railroad Company at Forty-second street, and two under the direction of the rapid transit commission, from the present terminal of the Interborough subway at the Battery to Foreman street in Brooklyn, connecting with the subway under construction

*Presented before the Western Society of Engineers, Chicago, Ill., on January 8, 1906.

to the Flatbush terminal of the Long Island Railroad Company.

It will thus be seen that when the tunnels which are now under construction are completed there will be six under the Hudson river, and eight under the East river, or fourteen in all.

Operation Details.

While certain experimental electric locomotives have been built for operation in the Pennsylvania tunnel, and it is probable that the third-rail, direct-current method of propulsion will be used, I do not understand that the type of locomotive or system of propulsion has been absolutely decided upon.

All cars which will operate through the tunnels of the Hudson & Manhattan company, and the New York & Jersey company will necessarily have to be of the type which will operate upon the direct-current third rail, such as is used in the operation of the Interborough company's subway.

The New York New Haven & Hartford has adopted the single-phase overhead-contact method of train propulsion, and is now engaged in installing and getting ready for operation the most extensive and elaborate single-phase system yet attempted, the outcome of which is being watched with great interest by railroad men.

This company is at present installing electric traction on its system between Woodlawn, where its tracks join those of the New York Central, and Stamford, Conn., 33 miles from New York. Between Woodlawn and Stamford the road will be equipped with overhead working conductor, operating with single-phase, 25-cycle current at 11,000 volts. From this conductor the current will be collected by means of under-contact sliding shoes, transformed to a pressure of about 450 volts by the transformers carried upon the locomotives, and used in the motors as alternating current. Each locomotive is designed to weigh 72 tons, has a nominal capacity of 1,000 hp. and is designed to make 26 to 45 miles per hour, with trains varying from 200 to 250 tons. Several of these locomotives have been delivered and are now being tried out upon the experimental tracks of the company, and it is expected that they will go into practical service as soon as the overhead work and power station equipment can be completed. The company will not at present use the multiple-unit system, but will operate its suburban trains by means of these electric locomotives, 30 of which have been ordered for this service. The overhead construction is divided in sections with suitable circuit breakers at the end of each section which will open automatically in case of a short circuit, or can be manually controlled by the towermen.

St. Clair Tunnel.

In order to eliminate the present objections regarding the use of steam locomotives in the St. Clair tunnel of the Grand Trunk Railway system, extending between Port Huron, Mich., and Sarnia, Ont., the officials of that company decided a little over a year ago to adopt the single-phase method of propulsion. The equipment will consist of six electric locomotives, weighing 120 tons each, having a normal capacity of 1,500 hp., capable of exerting a drawbar pull of 25,000 pounds, at a speed of 10 miles per hour, and a maximum speed for passenger train service of 35 miles per hour.

The power station, which is now well under construction, will contain two 1,250-kw. turbo-generators, either one of which will be capable of operating the tunnel up to its full capacity, the other being held in reserve.

Erie Railroad.

The Erie Railroad Company has a commission organized for the purpose of electrically equipping its lines, now running out of Jersey City, a total of about 250 miles, although it is contemplated that but 35 miles will be immediately equipped, viz.: the division extending from Jersey City to Greenwood Lake. In addition to its suburban lines in the vicinity of Jersey City and its terminal, the road now has under construction 34 miles of single track, known as the Rochester division. This division lies between Rochester, N. Y. and Avon, with a branch between Avon and Mt. Morris. The single-phase alternating-current system will be used, having a working pressure of 11,000 volts on the overhead conductor. The energy will be secured from Niagara Falls at a pressure of 60,000 volts. Six passenger coaches, 54 feet long, and seating 56 people, will be placed in service, each car weighing about 50 tons, and equipped with four 100-hp. motors. These cars will be capable of a maximum speed of from 45 to 50 miles per hour, and of hauling one trailer. While this extension of the Erie system is short, the company has under contemplation the electrical equipment of its entire suburban service surrounding Jersey City, which will

involve an expenditure of some \$15,000,000. Plans are now being formulated for this expenditure.

West Jersey & Seashore Road.

This is a recently electrified branch of the Pennsylvania from Camden, N. J., to Atlantic City, 65 miles. The equipment consists of a power house, 8 substations, and 71 miles of duplicate high-tension line. The service is ultimately to consist of three-car express trains running 60 miles per hour on a 15-minute headway, and local service at 10-minute intervals.

The equipment of this line was done in record-breaking time, the site for the power house having been chosen January 17, 1906, and on July 1st two boilers were under steam with a turbine and auxiliaries running, and car service on the line.

In the substations the line voltage is reduced and transformed from 33,000 volts three-phase, to 650 volts direct-current. Third-rail equipment was used, of Pennsylvania Railroad standard dimensions. These dimensions will satisfactorily operate with equipment of the Long Island Railroad and the Interborough system of Manhattan Island.

The rail is protected at stations and in yards. The cars for service on this line have a seating capacity of 58, are double vestibuled, and are well protected from fire risk. The cars are 55 feet 5½ inches long, and weigh, when fully equipped, 89,000 pounds, being heated and lighted electrically, and equipped with hand brakes and quick-service air brakes.

Southern Pacific Railway, San Francisco.

The Southern Pacific Railway system is making active preparations to change about 20 miles of local steam line for electric traction service. The line extends from the ferry terminal to Alameda and Oakland. Generator station is at Alameda point. The electrical equipment is built for 500 volts direct-current, with overhead trolley and utilizing present tracks. A year has been allowed for this work to be completed, after which time the electrification of the lines may possibly be extended. It is not the intention at present to do away with the steam locomotives, but these will be used to aid the electric service during the rush hours. It is stated that an appropriation of about \$1,250,000 has been made for this work.

West Shore Railroad.

An important piece of equipment for electrical operation is now under construction by the West Shore Railroad system between Utica and Syracuse, N. Y. The work in hand covers a distance of 44 miles, and the passenger schedule provides for limited trains in each direction, making the distance from terminal to terminal in 1 hour and 22 minutes.

Electric power will be furnished by the Hudson River Electric Power Company, which will deliver three-phase 60,000-volt current at the railway company's substation 7 miles west of Utica. There will be four substations located about 10½ miles apart. These will be identical in construction and each will be equipped with two 300-kw. rotaries and necessary apparatus for transforming 60,000 volt three-phase current to direct current for distribution to the rails at 600 volts. The transmission line towers will be of steel. There will be 391 of these towers with normal spacing of 480 feet. Most of the towers are 39 feet high, the highest being 63 feet. The line conductors will be located at the vertices of an equilateral triangle 7 ft. on a side. The third rail construction is the Wilgus under-running protected type. The company will operate 15 closed cars, 49 feet over the bumpers, each equipped with four 75-hp. motors per car, and multiple-unit control.

Spokane & Inland Railway Company.

This is a single-phase line between Spokane, Washington and neighboring cities, having a total mileage of 114. The capital invested in the project is approximately \$3,500,000. The service includes passenger, mail, express and car-load freight. The power is purchased from the Washington Water Power Company and is delivered to the railway company as three-phase 60-cycle current at a frequency-changing station 10 miles south of Spokane. This station has four frequency changers each of nominal 1,000 hp. capacity which convert the current to 25-cycle 2,200-volt single-phase current. For transmission to the substations this 2,200-volt current is stepped up to 45,000 volts and transmitted to 15 substations where it is stepped down to 6,600 volts for direct connection to the trolley circuits. The cars and locomotives operate on three different voltages at different parts of the line.

The cars are equipped with four 100-hp. alternating-current motors. The locomotives use the same type of

motors but have a capacity of 150 hp. each. Both the locomotives and coaches may be operated on the multiple-unit system. The locomotives are capable of handling seven standard freight cars, fully loaded, at 30 miles per hour, on level track. The locomotives weigh 49 tons each and have a length over the bumpers of 29 feet.

European Work.

Some recent installations may be of interest. Progress is being made on the tunnel work under the Seine for additional lines to the Paris Metropolitan Railway.

The project for the tunnel under the English channel between Calais and Dover has acquired a new interest and is a subject under much discussion. The proposed tunnel would be 18 feet in diameter, the submarine portion being 24 miles in length with approaches 6 miles in length and of course would be operated electrically. This tunnel is designed to carry the rolling stock of the principal European railroad companies.

The Simplon Tunnel Locomotive.

The locomotives are designed to allow two normal running speeds which are obtained by the proper switching of the circuit. Power used is from 3,000-volt three-phase 15-cycle circuits and provides the two standard speeds of 25 and 40 miles per hour. They are designed to pull a total load of 440 tons including the locomotive, this condition to hold good even with reduction of line pressure as low as 2,700 volts.

A trolley is mounted on the roof at each end of the locomotive and works against the overhead wire, the design of this trolley being a special feature of this locomotive. The lower parts have the form of a parallelogram which can be raised or lowered by air pressure. The upper arm which carries the trolley contact is made very short and light and has a limited motion to either side.

Conclusions.

From what has been said it can be seen that rapid progress is being made in the application of electricity to steam railroads. Some installations have been made on account of the economy in operation to be effected, and the increased earning capacity to be gained, while others have been made under public pressure.

With the completion of the work now under construction by the New York Central and the New York New Haven & Hartford Railroad companies the steam locomotive will disappear forever from the island of Manhattan, and its surrounding territory.

From an examination of the map of the business district of Chicago, bounded by Sixteenth street, Halsted, Chicago avenue and the lake, it will be seen that 23 per cent of this area is occupied by the tracks of steam railway companies. In view of the present state of the art of electric railroading the right to vitiate the air of our congested districts by the emission of large quantities of carbon dioxide from the stacks of numerous locomotives is as questionable as the right to foul the air by the stanches from our stockyards. As there is now a possibility of the removal of these yards from our midst, is it unreasonable to hope that all of the steam railroad companies, through the wise foresight of their officers, may help to purify and beautify the city, by assisting the general movement now under way by our progressive, civic bodies for this purpose? In my judgment, at least one, and probably three of the companies now operating in the city of Chicago can afford to and would profit by the electrical operation of their suburban trains.

Women Street Car Conductors.

The most remarkable feature of the Valparaiso street car system is its conductors; they are women, writes a correspondent of the *Los Angeles Times*. The sex is also employed in like capacity in Santiago and all the other cities of Chile that have horse or electric trams. This practice sprang into being at the time of the revolution of 1891, when men and money were scarce and women plentiful. Having apparently given satisfaction to their employers during the intervening years, they are still retained. To a foreigner if is an interesting sight to observe the streetcar girl, to note how capably she manages her car, and the quiet, business-like way in which she goes through the routine of collecting fares, giving change, discharging passengers and seeing that the rule regarding the number admitted is not broken.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B.

Little Rock Railway & Electric Co. v. Goerner (Ark.), 95 S. W. Rep. 1007. July 23, 1906.

A street railway, the supreme court of Arkansas says, may make and enforce reasonable rules to facilitate its business, and to protect itself from fraud and imposition. So long as these rules are not inconsistent with the rights of the public to transportation over the company's road, and do not impose unnecessary and unreasonable burdens upon them, they will be enforced.

EXPENSE OF REMEDYING DEFECT COMPETENT EVIDENCE RELATIVE TO WANT OF CARE.

Haskell v. Manchester Street Railway (N. H.), 64 Atl. Rep. 186. June 5, 1906.

The amount of expenditure required to have remedied the defect from which the plaintiff received her injury, the supreme court of New Hampshire says, had some tendency to show whether the defendant was guilty of a want of care in not making repairs before the accident. The evidence was competent.

DUTY TO TOBACCO USER STANDING IN VESTIBULE AS REQUIRED.

Goodloe v. Metropolitan Street Railway Co. (Mo. App.), 96 S. W. Rep. 482. July 2, 1906. Rehearing denied Oct. 1, 1906.

The Kansas City court of appeals says that counsel for the defendant appeared to think that the plaintiff was at fault in choosing to stand in the vestibule instead of seating himself in the car. The defendant did not raise the issue of contributory negligence in its answer, and therefore that issue was not in the case. But had it been presented, the fact suggested would not have sufficed to make the plaintiff's conduct an issue for the consideration of the jury. The plaintiff had the right to indulge in the use of tobacco during the transportation, and was riding in the part of the car provided by the defendant for such passengers. The defendant impliedly invited him to be there if he chose, and in no manner was relieved from the performance of the duty it owed him as a passenger by his acceptance of the invitation.

MOTORMAN AND CONDUCTOR ON ONE CAR FELLOW SERVANTS OF THOSE ON ANOTHER CAR FAILING TO TURN ON BLOCK LIGHTS—SUFFICIENCY OF SINGLE-BLOCK SYSTEM.

Berg v. Seattle, Renton & Southern Railway Co. (Wash.), 87 Pac. Rep. 34, Sept. 24, 1906.

On a portion of a single-track electric street railway between two streets 1,665 feet apart where there were sidings and none between, a single-block block-light system was constructed, consisting of five poles about an equal distance apart, on each of which poles were two red incandescent electric lights, those on the north sides of the poles being turned on by a rope or lever at the south end, while those on the south sides would be turned on at the north end of the block, the lights being for use in the night-time and foggy weather, and the motormen on all cars being required to turn the lights on when entering the block and the next car back being required to turn the lights off, it being the duty of the conductors to see that the motormen turned the lights on and off. The supreme court of Washington holds that the motorman and conductor on one car entering the block from one end were fellow servants of the motorman and conductor on a car entering it at about the same time at the other end, so that the company would not be liable to the motorman of the first-mentioned car for injuries sustained in a collision caused by the failure of the motorman and conductor of the other car to turn the lights on. And the motorman of the first-mentioned car having testified that, if the motorman on the other (south bound) car had turned his lights south when he entered upon the block, the

accident could not have occurred, because in that event the witness would have seen the lights and remained at the end of the block or returned to that point, the court holds that this indicated that the system was sufficient for the purposes for which it was intended, and was reasonably safe, which was all that was required.

RUNNING OF CAR WITHOUT LIGHT FROM TROLLEY POLE HAVING LEFT WIRE.

Higgins v. St. Louis & Suburban Railway Co. (Mo.), 95 S. W. Rep. 863. June 19, 1906.

An electric car collided with a wagon after dark of a November evening. The evidence showed that the light upon the car went out at a point about 250 feet back, by the trolley pole leaving the trolley wire, by which the car was divested both of light and motive power. How this happened to be done was not explained by the evidence. Whether this failure to have the light was the negligence of the defendant's agents whilst running, conducting, or managing the car, or of some independent cause was not made to appear from the evidence. All that did appear was that the trolley pole left the wire, and that the conductor immediately tried to replace it. Under these circumstances the supreme court of Missouri, division No. 1, concludes that there was not sufficient evidence to sustain the ground of alleged negligence of failure to have a light upon the car. Moreover, the court says that it cannot conclude that because the streets and crossings mentioned were within the corporate limits of a large city that they were such as would require a reduced rate of speed in approaching them even without lights upon a car.

LIABILITY FOR OBSTRUCTING FLOW OF WATER OF COMPANY BUILDING ROAD AND ITS SUCCESSOR—DUTY OF LATTER TO EXAMINE ROADBED AND TRACK TO SEE THAT THERE ARE THE REQUIRED OPENINGS.

Ft. Smith Light & Traction Co. v. Soard (Ark.), 96 S. W. Rep. 121. June 18, 1906.

A company which was this traction company's predecessor, and required by city ordinance to construct its tracks with suitable bridges, drains, or pipes at all gutters, so as to permit the flow of water under the same, built its roadbed across a depression or drain which crossed the street, without putting in a culvert or drain for the water to pass through, thus forcing more water to pass under a nearby existing bridge over a creek, where it also partially obstructed the creek by placing a bent under the bridge, with the supports resting in the bed of the creek. Having altered the flow of water in that way, it became the duty of such first company, the supreme court of Arkansas says, to see that this creek should not become further obstructed, and the contention that it was guilty of no wrong in this respect could not be sustained.

The contention that this traction company could not be held responsible for the injury from thus obstructing the flow of water and causing it to back up and enter a store, in the absence of notice that the solid roadbed and the bent under the bridge obstructed the water and were nuisances, because this traction company did not construct the roadbed or erect the posts and bent under the bridge, the court also does not consider sound, the ordinance under which the road was constructed requiring of the company constructing it, "its successors and assigns," that the roadbed should be constructed and maintained with suitable bridges, drains and pipes to permit the flow of water under the same. When it purchased this railway and took charge of it, this traction company, the court says, assumed the burden of complying with this ordinance. It could not escape by saying that it had no notice. It was its duty to exercise ordinary care in examining its roadbed and track, and in seeing that it had the required openings, and that such openings or drains

as were already there were not allowed to become filled up and obstructed, so that the water could not pass through. If it failed to exercise due diligence in this respect it was guilty of negligence, and must pay the damages caused by such negligence.

NO LIABILITY FOR NEGLIGENCE OF VOLUNTEER ASSISTING EMPLOYEE OF AN INDEPENDENT CONTRACTOR FOR FIREWORKS AT AMUSEMENT PARK.

Noggle et al. v. Carlisle & Mt. Holly Railway Co. (Pa.), 64 Atl. Rep. 547. May 14, 1906.

The defendant company contracted with a dealer for an exhibition of fireworks in a park on the line of its railway. By the terms of its agreement the dealer was to select the fireworks from his stock, to have them exploded, and to make the best display that could be made for the price agreed upon. The company procured extra policemen for the occasion to preserve order in the park, but it did not reserve nor exercise any supervision or control of the exhibition, which was placed by the dealer in the exclusive charge of a competent employee. During the course of the exhibition a piece known as a "flowerpot" failed to explode, and the father of the man in charge, who was assisting him merely as a volunteer, handed it to a boy 12 years old and told him to take it away and have a good time with it. He took it some distance from the crowd, touched a lighted match to it, and was injured by its explosion. A verdict was directed for the defendant. The supreme court of Pennsylvania affirms the judgment in the company's favor. It says that the company properly policed the park, provided a suitable place for the exhibition, and placed it in charge of a competent person. The negligence that caused the injury was that of a volunteer assisting the employee of an independent contractor. For this the company was not answerable.

NO LIABILITY FOR INJURY TO INEXPERIENCED WOMAN WITH INFANT IN ARMS FALLING BETWEEN PLATFORMS OF CARS ON ELEVATED ROAD—REQUEST TO "MOVE QUICKLY" NOT UNREASONABLE—NO DUTY TO WARN OR ASSIST SUCH A ONE—CARE REQUIRED OF HER.

Hawes v. Boston Elevated Railway Co. (Mass.), 78 N. E. Rep. 480. June 20, 1906.

The plaintiff, with an infant in her arms, had got on the platform of a car of one of the trains of the elevated railway, and was in the act of entering the door when the brakeman spoke up sharply and said: "Smoking car, madam; you can't go in there; cross over into the front car, and move quickly." In attempting to obey him she fell between the platforms of the cars and was injured. The space between the two platforms at its narrowest part was 7 inches and 11 inches wide in its widest part, the ends of the platforms being so constructed that both curved away from each other. The supreme judicial court of Massachusetts sees no evidence of negligence on the part of the defendant. It says that there was nothing to show that the space between the cars could have been made any less or that the ends of the platforms could have been made any different. The defendant was not bound to warn the plaintiff of the space between the cars, or to assist her in crossing from one to the other and the brakeman's request to move quickly was not, in view of the nature of the defendant's business, an unreasonable one. Whether the plaintiff was in the exercise of due care need not be decided. But it would seem that for her to step from one car to the other without looking down was hardly consistent with the exercise of due care on her part. The infant in her arms and her own inexperience and weakness would seem to have called for the exercise of more care, instead of serving as an excuse for the exercise of less care.

PIPING & POWER STATION SYSTEMS.--XXVI.

BY W. L. MORRIS, M. E.

The arrangement as shown in Figure 236-(H11-1) has an outside water-circulating tank and an admission valve, a, discharging water through a syphon-T, thus bringing about a forced circulation when the valve is open. It is desirable to place the storage tank as high as possible, thus increasing the velocity for circulation and raising the overnow, b, to a height sufficient for discharging into the open heater. To insure the water passing over the entire surface of the water box the tube, c, is attached to the end of the inlet

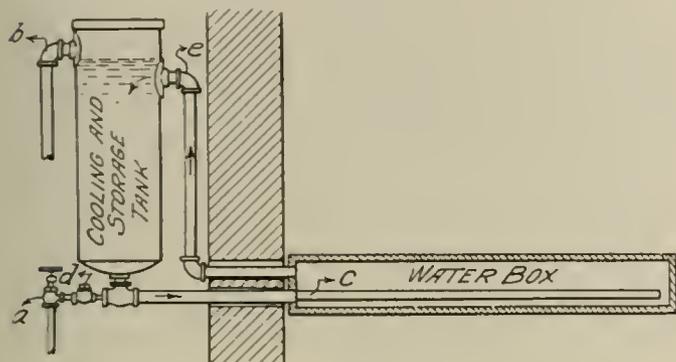


Figure 236--(H11-1).

pipe. To permit of free circulation the connections from the tank to the water box should be of large size and arranged in as direct a line as possible. To prevent the possibility of water wasting away through the supply pipe, if for any reason the pressure on it should drop below that at the inlet pipe, a check valve, d, should be placed in the inlet pipe. With connections as shown when the water becomes very hot it will boil in the tank and give sufficient warning to the operator so that he may know when to alter the set of the valve, a, and prevent any damage. To allow for the boiling away of part of the water without lowering its upper surface below the inlet, the connection, e, should be made lower than the outlet, b. Unless this precaution is taken when the water level is lowered below e, circulation through the water box will be entirely stopped.

It may be advisable to consider the merits of some of the devices using fire tile in place of water-cooled boxes and designed to do the same work. The water-cooled parts are used to save the expense of fire tile destroyed by the high temperatures to which they are subjected. In many cases it costs more to maintain the water-cooled part than to replace the tile, but as a means of comparison note may be taken of the heat wasted with the water box. (This is the usual method of comparison.)

For a water box in a 500-horsepower boiler, lying close to the grates and away from the direct flame, taking water at about 50 degrees and discharging at 200 degrees, about two gallons of water per minute are required. This change in temperature requires an expenditure of 280 B. t. u. per minute and assuming that the boiler is in service 80 per cent of a year's time, the total for the year would be 117,731,100 B. t. u., or at 33,395 B. t. u. per hour this will be equivalent to 3,535 horsepower hours. If 5 pounds of coal are used per boiler-horsepower hour this would represent 17,675 pounds of coal, costing about \$16. The tile required would ordinarily cost about three dollars, and the setting a like amount, thus making it possible to renew the fire tile three times a year without any excess cost over that for the heat lost in the wasted water. This argument does not take into consideration the cost of pumping the water nor for maintaining the water-cooled device.

It is often found that attempts to save repairs are more

expensive than the cost for the repairs themselves. This has been found to be the case with supported flat arches made of tile and designed with ventilation space to prevent the support from being burned.

It has been found by experience that it is economical to have a self-supporting igniting arch in a boiler furnace. Such arches are free from metal supports and their temperature may become very high, in fact much higher than the melting point of iron. These arches bring about such a saving of fuel as to economically permit of the renewal of the arch every six months and then save money when compared with the ventilating type of construction.

Small losses in a power plant are not easily noticeable, and in fact are quite difficult to measure. If only 1/10 of a pound of the steam generated by each pound of coal is sacrificed this loss will amount to about 1.5 per cent. With a 500-horsepower boiler, which would burn about 7,500 tons of coal per year, this percentage of loss would approximate with coal at \$2 per ton, \$225 per year per boiler. A great difficulty in station operation is the fact that everybody can see when a dollar is spent, but nobody can see the effect of saving ten times this amount by careful operation. Money spent for coal is looked upon as a necessary expenditure, but that spent for renewals and repairs is usually viewed as an unnecessary charge brought about by careless management or defective apparatus.

Low-Pressure Water from Economizer to Heating System.

In many power plants hot water serves best for heating service. If there is available an abundance of exhaust steam it will probably be good practice to use it for heating the water in a large heater. For a condensing plant the heating problem becomes somewhat more difficult. A heating system should be under low pressure. This precludes the use of water taken direct from the boiler.

The higher the pressure carried by a condensing plant the more suitable would be the use of low-pressure economizers; with the lower pressures the strains in the economizers would be comparatively small and a supply of water suitable for heating would be available.

In Figure 237-(H12-1) is shown an economizer arranged for operation at low pressure. With this arrangement pump No. 1 serves to keep the economizer under pressure and discharge hot water either to feed pump No. 2 or circulating pump No. 3. By closing valves a and b, the heating system is entirely shut off from the economizer.

If the quantity of water passing through an economizer

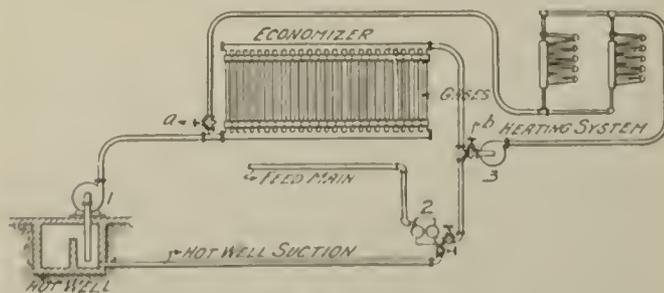


Figure 237--(H12-1).

is considerable the temperature of the flue gases and the water will be lowered. In ordinary practice an economizer delivers to water passing through it about 1/6 as many heat units as the boilers, or, in other words, it has about 1/6 the capacity of the boiler equipment. By increasing the quantity of water passing through the economizer the temperature of the gases is lowered, thus increasing the capacity of the economizer to possibly 1/4 that of the boiler plant. In other words, an economizer equipment for 1,000-horsepower boiler capacity will raise the water for heating purposes to

a temperature approximating that which would be done with 250-horsepower capacity of independent hot-water heaters.

It will not be found advisable to use over 10 per cent of the total capacity of the boilers for heating purposes, as there will be times when only part of the boilers are in operation, and by using water from the economizer for boiler feeding the supply capacity for the heating system will also be decreased. With large power plants, say of 5,000 boiler-horsepower capacity, only about 3 per cent of the output will be required for heating, possibly 150 horsepower, and this duty can readily be performed by the economizer with no perceptible change in water or flue-gas temperatures. The efficiency of a heating system so arranged would even be higher than that of a steam plant not having a heating system in connection with its economizers, since the arrangement as suggested would utilize heat that otherwise would be wasted.

Low-Pressure Water to Plumbing Fixtures.

In nearly all power plants both hot and cold water are required for the plumbing fixtures and, therefore, a low-pressure supply is necessary for this service. The light float valves furnished with water closets, basin cocks, etc., are only suitable for low pressures of about 20 pounds. These valves operate well on much lower pressures, but under such conditions for pressures of about five pounds, require somewhat larger lines.

If a low-pressure water tank forms a part of the power plant piping system the cold-water service should be taken from this supply. Water would then be available for closets and washbowls, even though the pumps were in use for other service. If only a small quantity of low-pressure water is required, say 500 gallons per day, it may be advisable to use city water if it is available. It must also be remembered that as the quantity of water required is reduced the size and cost of the necessary storage tank and its supports are also reduced in direct proportion. For supplying such small tanks the feed pump may be shut off from the boilers long enough to allow the tank to be filled once a day.

To determine whether a tank or city main supply should be used it is necessary to estimate the yearly cost of city water as compared with the cost of raising water to a supply tank, taking into account interest and depreciation and noting what saving there is with one system as against the other. If the saving is small it is always better practice to eliminate any equipment that requires attendance, repairs, etc. This may lead to a decision in favor of city water. It should be remembered in estimating the quantity of water used that one is apt to disregard waste caused by apparatus out of order.

The supply of hot water to plumbing fixtures is usually a difficult detail to arrange. This subject is discussed under Class D10, "Branches to Hot-Water Plumbing Fixtures," and in Class A31, "Steam for Heating Purposes."

Generally speaking, there are available three systems for supplying hot water to plumbing fixtures. The first uses feedwater of high pressure and temperature, requiring high-pressure valves and fittings. The second uses hot feedwater with a reducing valve and standard low-pressure plumbing fixtures. The third employs a steam water-heater using water from a low-pressure main with standard low-pressure plumbing fixtures.

If the plumbing contract is let before this subject has been given sufficient consideration the fittings supplied will undoubtedly be of the low-pressure type and, therefore, the hot-water supply must be under low pressure. Many misfits in power station piping systems are brought about from this cause of ordering parts which in themselves may have commendable qualities, but which fail to conform to the requirements of the other parts of the general station system.

In the ordinary power plant there are only a few hot-water taps required, and for this reason it is better to take the trouble at the time of building to secure high-pressure valves than to afterward be burdened with the care of automatic devices required by low-pressure hot-water systems.

Low-Pressure Water to Separate Buildings.

If the location of the power plant under consideration is such that it is advisable to furnish warm water to car shops, offices or similar nearby buildings, it will be found quite objectionable to take this supply from the feed mains since they should be left for boiler feeding with the least possible number of unnecessary connections. If a comparatively large quantity of water is required for outside feeding another supply should be arranged, designed for low pressure. If there is an abundance of exhaust steam the simplest way would be to take low-pressure cold water from the regular low-pressure system and allow it to pass through a small exhaust heater used especially for this purpose. If the exhaust steam is less than that condensed by the boiler feedwater heater then this independent heater should be placed ahead of the feedwater heater, thus first raising the temperature of the water in it to about 210 degrees, even though the feedwater heater may not raise the temperature of its water above 150 degrees or less. If all the exhaust steam is condensed in heating the feedwater then the live steam heater shown in Figure 132-(A32-2) is quite as economical as an exhaust heater.

If it is necessary to pipe both live steam and low-pressure cold water for a considerable distance to the outside buildings where hot water is also required, and if the steam is always turned on and the exhaust is condensed for feedwater, then the use of a live steam water-heater would be the more economical method of furnishing hot water. Thus less water would be

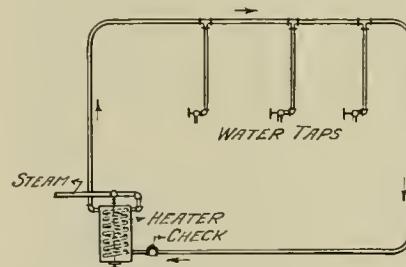


Figure 238-(H14-1).

the cold water in the pipes when it is desired to get the warm water. The live steam heater has another advantage in that the temperature can be regulated and that all the condensation may be delivered to the water-heater by taking steam from the bottom of a drip pocket. This practice will save drips which otherwise might be wasted to the sewer.

If the plant is operated with the engines exhausting to atmosphere then all these small savings gained by using a live steam heater are of no consequence because such heat secured from the exhaust is obtained without any expenditure for fuel.

If it is necessary to place the steam water-heater in an outlying building it may be found advisable to lay out the hot-water piping on the loop system. This will keep the water in circulation so that it will be warm throughout all the piping. Figure 238-(H14-1) shows such an arrangement of piping from which hot water may be instantly drawn without drawing off the water in the main.

(To be continued.)

A meeting of the general committee in charge of arrangements for the great electrical exposition which is to be held at Niagara Falls in 1908 was recently held in that city and the general opinion expressed by members of the committee was that the success of the project was assured. An important step was taken in the appointment of subcommittees to arrange details. These committees will meet in the near future for the purpose of forming a permanent organization.

News of the Week

Plans to Relieve Brooklyn Bridge Congestion.

Bridge Commissioner Stevenson on January 4 submitted to the board of estimate the report of the special commission of engineers appointed to devise a way of relieving the Brooklyn bridge crush in the shortest possible time. The commission consisted of Prof. William H. Burr, William Barclay Parsons and Ira A. McCormack. The report was accompanied by a letter from Mr. Stevenson approving the report and asking the board to authorize the issue of \$3,250,000 of corporate stock of the city for the purpose of carrying out the plans.

The outline of the report, as given in Mr. Stevenson's letter is as follows:

"I submit herewith a plan showing the proposed reconstruction and enlargement of the present Manhattan terminal of the Brooklyn bridge, and also a plan for carrying trolley cars over Sands street on the Brooklyn side of the bridge. The general scheme is to transfer the present trolley car stands on the bridge by means of a subway connection to sub-surface stands west of Park Row on property recently acquired by the city, thus making it possible to provide eight pockets in the space occupied by the present terminal building, for the seven lines of elevated trains now crossing the bridge. For quick relief it is proposed to extend the structure across Park Row, which can be built in six months from the time of letting the contract. This temporary structure must of necessity be removed before the permanent plan is carried to completion. The operating company assures me that this will permit it to operate six-car elevated trains without change at Brooklyn. When the station as proposed is completed it will be possible to run trains on the bridge at the rate of 15 miles an hour on a headway of 45 seconds, thus increasing the capacity of the bridge in the rush hours about 25 per cent. The plans submitted provide for a possible connection between the bridges by subway or elevated loop."

The board postponed consideration of the report for a week.

The rapid transit commission after its meeting on January 8 sent a letter to the board of estimate recommending the building of a subway loop, connecting the Williamsburg and Manhattan bridges, running down Centre street to a point near the Brooklyn bridge and thence down William street to the financial district. The route is almost like the proposed McDonald plan, submitted on December 27. The commission believes that this system can be built for \$12,500,000, exclusive of the cost of real estate, and that it can be completed by the time the Manhattan bridge is in operation, in 1909. The further important suggestion is made that the line built over this route would be very attractive to a lessee, and that it could profitably carry passengers for a three-cent fare. If the board of estimate concurs in this recommendation, the plans for the system will be hurried forward, so that practical work can be got under way at an early day. Chief Engineer Rice has already begun on the plans. The commission took no action with reference to the proposed elevated loop between the bridges.

Cleveland Traction Developments.

The long-expected decision of the United States supreme court in the Cleveland Central avenue franchise case was handed down on Monday, January 7, by Justice R. W. Peckham. The court decided that the Cleveland Electric Railway Company's franchise in Central avenue, S. E., Quincy avenue, S. E., and East Ninth street, expired on March 22, 1905, and that the Forest City Railway Company's franchise over the same streets, granted in 1904 as a renewal of the former grant to the old company, was invalid. This decision, which it was hoped would clear up many important points of the spectacular controversy over the right to furnish transportation facilities to the people of Cleveland, leaves the situation exactly where it was before. The case had been appealed from the decision of Judge R. W. Taylor, of the United States circuit court of the northern district of Ohio.

In 1904 the city council granted a franchise to the Forest City Railway over the streets named, which were already occupied by the Cleveland Electric Company, which claimed that its franchise was perpetual, or at least good until 1913. The old company applied to Judge Taylor for an injunction restraining the low-fare company from making use of its franchise and the city from removing or confiscating the tracks. Judge Taylor, in granting the injunction, said that the Cleveland Electric franchise expired on March 22, 1905, and that the Forest City franchise was invalid because it had been granted as a renewal of the old franchise. On October 31, 1906, the supreme court granted a temporary injunction pending the final decision, restraining the city from stopping the Cleveland Electric cars on East Ninth street. The case was argued on November 12 and 13.

The Cleveland Electric Company based its principal claim on the point that the language of various extension ordinances had treated its lines as a complete system and that the life of the entire system had thereby been extended co-extensively with the life of the longest franchise of any of its constituent parts. This claim the court denied. The court declared that the lines were not shown to have been of necessity operated as one and the same system and that it manifestly was not the intent of the city council to treat of them as such. Therefore the court holds that the franchise over the streets named in Central avenue, S. E. and Quincy avenue, S. E. expired in 1905. Furthermore, refusing the extension of the franchise for the city, the court holds that

neither the Forest City company nor the city has rights in the property of the Cleveland Electric now in the streets.

The Cleveland Electric company is still operating cars over the streets in question, which are among the most important in the city, and immediately upon report of the decision sent a communication to the city council stating its intention of bidding for new franchises. In July, 1906, the company agreed to reimburse the city in case it was finally decided it had no rights in the streets.

At a meeting of the city council on January 10 the Cleveland Electric company presented an offer to continue to operate the lines on which its franchises had expired on a three-cent fare basis, from now until the advertisement and sale of new franchises over those streets. If the receipts of the company for those lines show any surplus the excess is to go to the city. The company has also shown a readiness to come to an agreement at once in regard to the compensation to be paid for the use of the streets since the franchises expired.

Chicago Traction Situation.

Although the demand on all sides for an immediate settlement of the traction controversy has become more insistent each day, from both individuals and civic organizations, the ordinances have not yet been reported to the city council. A new ordinance, under the name of the Chicago Railways Company, which is to take over the lines controlled by the Chicago Union Traction Company, has been submitted. This draft guarantees to furnish a perfect title to the property in case of purchase by the city and contains the other agreements made between Mr. Walter L. Fisher, city traction counsel, and the company's representatives at Atlantic City two weeks ago.

Mayor Dunne is still persistently holding out for a referendum vote before the ordinances are finally passed, and on Monday, January 7, sent a message to the city council asking it to re-adopt the Foreman resolution of October 16, 1905, which declared it to be the sense of the council that the procedure in dealing with any ordinance for the settlement of the Chicago street railway question should provide for a referendum. After an exhaustive discussion by the council a motion to adopt the resolution under suspension of rules was lost by a vote of 40 to 26, many aldermen who had been considered among the mayor's following on the traction question voting against it.

On the day following this defeat of his plans at the hands of the city council the mayor had published in several newspapers an open letter addressed to the citizens of Chicago asking them to co-operate with him in preparing a referendum petition, which requires the signatures of 25 per cent of the registered voters, or \$6,000 names, before February 1. He said that if private citizens, organizations or newspapers would not do so, he would personally circulate a petition among the voters, asking the election commissioners to place upon the ballots the question as to whether the ordinances should be passed.

On January 7 the Chicago City Railroad Company was incorporated by T. E. Mitten, John P. Wilson and Edward Morris, with \$100,000 capital stock. Mr. Mitten, who is president of the Chicago City Railway Company, is named as president. Objection has been made that the ordinance provides for the extension of the Chicago City Railway to the north and west sides in event of failure of the Union Traction Company to accept the ordinance, although the South Side company's charter does not provide for such an extension. The new incorporation gives the company the right to operate in any part of the city and thus removes the objection. Mr. Fisher has drafted a new section of the ordinance, providing for the manner of the extension to the north and west sides if such a procedure should be necessary.

Since the first of the year books have been kept by the Chicago Union Traction and Chicago City Railway companies to show the amounts the city would receive from the net receipts on the basis of the plan provided for in the ordinance, making the city a partner in the business. As provided in the ordinances, 65 per cent of the net earnings have been credited to the city and 45 per cent to the companies.

The city's share for the first seven days of the year amounted to \$311,322 from the Chicago City Railway Company, and \$13,693 from the Chicago Union Traction Company, a total of \$35,015, or \$3,645 a day. This average maintained for a year would mean \$1,330,425 income to the city. Opponents of the proposed ordinance have contended that under the plan of dividing net receipts there would be nothing left as the city's share of profits.

At a meeting of the local transportation committee on January 19 both ordinances were presented in complete form by Mr. Fisher. Mr. Fisher also presented a new plan, which had been agreed to by the companies, that the ordinances should be reported to the council as soon as possible, probably at its next meeting on January 14, but should not be acted upon until February 4. This plan would allow the required time for getting up the referendum petition and would involve an amendment to the ordinance making their validity conditional on a vote in their favor at the April election, in case the petition receives the required number of signatures. Mr. Fisher also called attention to amendments whereby the partnership contract between the city and the companies is made to date from February 1 instead of January 1, shifting the dates for possible acquisition of the property by the city from January 1 and July 1 to February 1 and August 1. The committee accepted the following amendments: A clause strengthening the right of the city to build a subway system regardless of the provision under which the companies will be required to advance part of the cost, a provision that in case the Mueller law is held invalid the city can purchase and operate

under authority subsequently acquired; all rights of the companies cease when the city or its licensee purchases and the licensee acquires only the rights the council may grant at that time; all mortgages on the property must have the consent of the city; either the city or the companies may apply to the courts for the removal of any engineer on the supervising commission for fraud, corruption, or incompetence; in the event of a failure on the part of the Union Traction interests to accept their ordinance the City Railway will extend its lines to the west side and to the north side under the authority of the City Railroad Company.

Ten-Cent Fare Contention Sustained.

In a decision handed down on January 8 the court of appeals of the state of New York confirms the right of the Brooklyn Rapid Transit Company to charge 10 cents fare on its Coney Island lines. The troubles leading up to the submission of the case to the courts were set forth in the Electric Railway Review for August, 1905, together with a statement from President Winter giving the railroad company's side of the case. The decision of the court was unanimous and on account of the importance of the principle involved considerable extracts from it are given as follows:

"It is true that the defendant was incorporated as a street surface railroad; that it has constructed, owns and operates a street surface road within the city of Brooklyn, and in case it leases, operates any other street surface railroad within that city it must furnish transportation over such leased connecting road for one fare, but such is not the case we have under consideration.

"The roads which it has leased and is operating which are involved in this case are not street surface railroads but are elevated and steam surface roads. The contention on the part of the state is that the defendant's powers were limited to the operation of street surface roads, and that when it undertook to lease and operate elevated and steam surface roads they were brought within the provisions of sections 101 and 104 (street surface railroad provision), and that those sections should be construed as applicable thereto. We are of the opinion that this contention cannot be adopted.

"While the defendant was organized as a street surface railroad and was incorporated as stated, the general railroad law has authorized and empowered it to lease the elevated and steam surface railroads in question.

"We think it apparent, therefore, that when the legislature authorized the defendant to lease and operate the elevated and steam surface roads in question it not only became empowered and authorized, but it was also its duty to operate such roads in accordance with the requirements of their respective charters.

"Having had cast upon it the duty and obligation to operate such roads in accordance with the requirements of their charters and the statute applicable thereto, as such lessee, it became entitled to all of the privileges and benefits authorized by their charters and the statute, unless such roads are brought within the meaning of the sections referred to in Article IV, in which the defendant is limited to the charge of but one fare. We think that they are not. As we construe those sections they have reference to street surface railroads and no others.

"A corporation operating a street surface railroad is prohibited from charging more than fare for one continuous ride from any point on its road, or on any road, line or branch operated by it or under its contract, to any other point thereof or any connecting branch thereof, within the limits of any incorporated city or village, if the right to construct such branch or extension shall have been acquired under the provision of such chapter or of this article.

"This provision has reference to street surface railroads, railroads which were constructed under the provisions of such chapter or of this article, distinctly referring to those roads which were constructed under the provisions of the statute pertaining to street surface railroads. Nor do we think that the defendant in dispensing with steam as a motive power and substituting electricity affected the situation or changed its right so far as the question of fares are concerned. Such change has been authorized under general laws, and by complying with the requirements of the statute with reference thereto it may be lawfully made.

"The reasons that control the legislative mind in adopting this statute may not be important. It is quite possible, however, that the fact that the cost of the construction of elevated roads being many times greater than of street surface railroads was one of the reasons why it did not see fit to place them upon the same footing as to fares. Whether the elevated and steam surface roads in a city should be placed upon the same basis with street surface railroads with reference to fares and the transfer of passengers, is a question for the determination of the legislature and not for the courts."

Officers' Pension Fund.—The Montreal Street Railway Company is studying the subject of pension funds with a view to establishing such a fund for officers.

Increased Transfer Privileges in Philadelphia.—The Philadelphia Rapid Transit Company, in response to a request of the Northwest Business Men's Association, recently announced that it has decided to establish 12 new transfer points in the northwestern part of the city and that the new plan would be put into operation as soon as the transfers could be printed.

Proposed Change in Indianapolis-Ft. Wayne Route.—It is announced that a change will soon be made in the routing of the through limited cars from Indianapolis to Ft. Wayne over the Indiana Union Traction Company's lines and those of the Ft. Wayne & Wabash Valley. At present the route is via the Ft. Wayne

& Wabash Valley from Peru to Ft. Wayne. Under the new plan the cars will use the Indiana Union tracks from Indianapolis to Bluffton via Anderson and Muncie, and the Ft. Wayne & Wabash Valley from Bluffton to Ft. Wayne. The new route would reduce the mileage from 135 to 122 miles.

Bill for Ten-Hour Day.—At the instance of the Albany Street Railway Employees' Association a bill is to be introduced into the New York legislature at the next session which will provide for a maximum working day of 10 hours, and a five-minute layover at the end of each run. There is already a law restricting the length of the working day to ten hours in cities of over 100,000 population.

Limited Service Between Dayton and Indianapolis.—On January 1 the Indiana Columbus & Eastern Traction Company instituted new limited service between Indianapolis, Ind., and Dayton, O., by way of Richmond, Ind. Limited cars leave Dayton at 9 a. m. and 2 p. m., arriving at Indianapolis at 1 p. m. and 6 p. m. Cars leave Indianapolis at 8:55 a. m. and 3:55 p. m., arriving in Dayton at 12:55 and 7:55 p. m. In addition to these through limited cars, the car leaving Dayton at 7 p. m. will connect at Richmond with an Indianapolis car, making the distance in the same time and arriving at Indianapolis at 11 p. m.

Report of Low-Fare Project for Milwaukee Denied.—The report that Mayor Johnson of Cleveland, George K. Kobusch of the St. Louis Car Company, and Joseph Hein of Kansas City are interested in a project to build a low-fare street railway system in Milwaukee, which was published in the Review last week, has been denied by the persons interested. Mayor Becker, of Milwaukee, who has been carrying on a campaign against the public service corporations in that city, in denying any knowledge of such a project, makes the following statement: "Any one, or any company, wishing to come to Milwaukee to build and operate a street car line, I do not care who or where they come from, can come here as far as I am concerned, providing they have the proper financial backing and support; and I will welcome any or all of them, particularly any one who will give Milwaukee a three-cent fare service."

Conductor Convicted for Transfer Fraud.—The discovery of an attempt to defraud the Brooklyn Rapid Transit Company of a portion of its daily cash fares has resulted in the arrest and conviction of one conductor, with a six-months sentence in the penitentiary, and evidence which it is claimed implicates three other conductors and an outside confederate. The plan followed was that of exchanging transfer tickets and passing them in place of cash fares received. The scheme was made practicable, it is alleged, by the aid of a 12-year-old boy who carried the tickets back and forth between the conductors, who were in the deal, and who received as his portion of the proceeds one cent for each transfer carried. It is claimed that each conductor could make \$2.00 or more a day by this method. An employe of the company who had been invited to join the combination reported the incident and led to the discovery of the practice.

Chicago "Public Comfort" Ordinance Declared Void.—Judge George A. Carpenter, of the circuit court, on January 5 declared void the Chicago ordinance prohibiting the overcrowding of street cars. The city had brought a large number of suits against the street railway companies under this ordinance, but was restrained from continuing prosecution about a year ago by Judge Mack. The Illinois supreme court recently dissolved the injunction and ordered a rehearing of the cases. The companies filed demurrers and it was in sustaining these demurrers that the court declared the ordinance void, on the ground that it does not define with certainty the offense it condemns. The ordinance provides that passengers must be carried comfortably and without overcrowding. The court held that there is no exact definition of the words "comfort" and "overcrowding," and that the companies consequently could not know the exact conditions to be complied with.

Northwestern Electrical Association.—Secretary B. C. Adams, Lincoln, Neb., has announced the programme of the annual meeting, which will be held at the Coliseum, Chicago, in connection with the electrical show on January 16, 17 and 18. The following papers are to be read: "Enthusiasm," by Geo. E. Legler; "Profitable Co-operation," J. Robert Crouse; "Premiums to Employes," Ernest Gonzenbach; "Some Characteristics of Alternating-Current Motors in which the Central Station Man is Vitaly Interested," C. W. Bergenthal; "Producer Gas Power," Professor Richter; "Outline Lighting," Homer Honeywell; "Some Phases of Smaller Central Station Management," H. H. Scott; "Uniform System of Accounting for Small Companies," Fred W. Insull; "Some Points on Illuminating Engineering for the Small Central Station," J. R. Crayath; "The Trend of Improvement in the Design and Operation of Boiler Plants," A. Bement; "Warrantable Expense for Meter Testing," O. J. Bushnell; "Premiums to Employes," Ernest Gonzenbach. This programme is subject to revision.

Does Not Want Trolley Lines.—The attitude of the Boston & Maine Railroad concerning the acquisition of electric roads was defined recently by President Tuttle in denying a report that the company was seeking control of the Massachusetts Electric Companies. He said: "Whatever may be the policy of the New Haven road, that of the Boston & Maine is strongly opposed to the wholesale absorption of trolley lines. I have found that when you provide a market for electric lines they are built almost as fast as the public highways will accommodate them. The Boston & Maine does not intend to constitute itself a market to which trolley promoters may take their securities. So far as any interest in the Massachusetts Electric Companies is concerned, the Boston & Maine has never owned, directly or indirectly, a share in the stock of this corporation, and has no disposition to obtain any interest in it whatsoever. If the New Haven road wants the Massachusetts Electric

Companies, either in whole or in part, it is welcome to buy it and such purchase will encounter no opposition from the Boston & Maine. Where the trolley can be made a feeder to the steam road the latter may here and there find it to its interest to own the electric line, but the Boston & Maine is not seeking to buy up competing or parallel roads.

Increases in Wages for Conductors and Motormen.—The beginning of the new year witnessed an increase of the wages of the conductors and motormen on electric railways in all parts of the country. Some of the companies who announced increases at that time are as follows: Indiana Columbus & Eastern Traction Company, increase of from 1 to 2 cents an hour according to length of service; Northern Ohio Traction & Light Company, increase of 10 per cent on the southern division, thus putting the men on that division on the same schedule as those on the northern division; Indianapolis Traction & Terminal Company, increase of 1 cent an hour; Ft. Wayne & Wabash Valley Traction Company city lines, increase of 1 cent an hour; Illinois Traction Company, increase of 15 cents a day to all employees receiving less than \$2.50 per day; Cedar Rapids & Iowa City Railway & Light Company, increase of 10 per cent; Topeka City Railway, increase of about 9 per cent. The Public Service Corporation of New Jersey on January 1 put into effect a new schedule for motormen and conductors of from 20 to 23 cents per hour, increasing one cent an hour for each five years of continuous service. The Concord Maynard & Hudson Street Railway announced a schedule of 20 cents an hour for the first year of service, 21 for the second, 22 for the third and fourth, 23 for the fifth and sixth, 24 for the seventh and eighth, and 25 after the eighth year.

Interurban Road Petitions for Joint Rates with Steam Road.—The Cedar Rapids & Iowa City Railway & Light Company of Cedar Rapids, Ia., has petitioned the interstate commerce commission to establish joint through rates covering the shipment of livestock and cereals between points on its lines and points on the Chicago & Northwestern Railway. The complainant sets forth that it operates an interurban electric line from Cedar Rapids through Swisher, North Liberty and Coralville to Iowa City, and is capable of handling trains of regular freight cars, and that its road is connected with the Northwestern at Cedar Rapids. No other roads pass through North Liberty and Swisher and various industries which do a large amount of shipping are located on the complainant's line and have no access to outside points except over its lines and the Northwestern. Several of these industries had asked for joint through rates but when the electric road requested the steam road for such rates the latter had refused. The commission is also asked to prescribe a division of the rate. The Cedar Rapids & Iowa City is interested in a proposed line from Iowa City to Muscatine and if it is secured the joint rates asked for the financing of the project would be greatly facilitated.

The Northwestern, in its answer to the complaint, states that the electric road is not engaged in interstate commerce nor subject to the provisions of interstate commerce laws, and that it has no facilities or equipment for the handling of freight; that it has at various times received freight for shipment from points on the electric road and that it has in every case been obliged to furnish the necessary equipment; that the complainant has never delivered or offered to deliver to it cars loaded with grain, livestock or other freight. The answer further states that the company's rates have been reasonable and just and that the volume of the business originating on the electric road is not sufficient to warrant joint through rates.

American Railway Insurance Company Organized.—Representatives of 27 leading electric railway and power companies met at Cleveland, O., on January 10 and completed the organization of the American Railway Insurance Company, the object of which, as previously mentioned at various times in the Review, is to carry the insurance of the companies at actual cost, thus avoiding the necessity of paying the high rates charged by the old-line insurance companies. The plan is that worked out principally by Mr. Henry N. Staats, of Cleveland, and was outlined in the report of the "Insurance" committee of the American Street and Interurban Railway Association at Columbus. The preliminary meeting to organize the company was held in the office of that association in New York on December 7. This company, together with three other companies to be organized, the Traction Mutual Insurance, the Electric Mutual Insurance and the Associated Railway Companies' Insurance company, is expected to carry the entire insurance of the companies subscribing to the stock. A board of directors was elected as follows: H. E. Andrews, Cleveland; G. L. Andrews, New York; A. B. Akins, Cleveland; H. L. Clark, Philadelphia; Alexander Dow, Detroit; H. A. Everett, Cleveland; G. I. Eastbrook, Philadelphia; C. G. Goodrich, Minneapolis; J. C. Hutchins, Detroit; Walter Kernan, New York; R. E. Shelton, Columbus; and J. H. Price, Samuel Seavill and H. N. Staats, Cleveland. H. E. Andrews was elected president and H. N. Staats vice-president and general manager. The companies represented were: Metropolitan Street Railway, Brooklyn Rapid Transit, Twin City Rapid Transit, Cleveland Electric Railway, Rochester Railway, Syracuse Rapid Transit, Erie & Mohawk Valley Railway, Baltimore City Railway, Rochester & Eastern Rapid Railway, Rome City Railway, Omaha Railway, Northern Ohio Traction & Light, Toledo Railway & Light, Canton-Akron Railway, Detroit United Railway, Henger Railway & Light, East St. Louis & Suburban Railway, Alton Grand St. Louis Traction, Grand Rapids Railway, St. Joseph Railway, Light Heat & Power, Columbus Railway Light, Lake Shore Electric Railway, Cleveland & Southwestern Traction, Cleveland Plainville & Eastern, Detroit Edison, Cleveland Electric, Philadelphia Interurban, Baltimore & Philadelphia. The headquarters will be in Cleveland.

Construction News

FRANCHISES.

Denver, Colo.—A franchise has been granted for an electric line from Orchard Place to Cherelyn, Petersburg, Ft. Logan, Littleton and back to Cherelyn. This will do away with the old horsecar line from Orchard Place to Cherelyn.

Glencoe, Ill.—A perpetual franchise has been granted to the Chicago & Milwaukee Electric Railway for right of way through the town, embodying the following provisions: All curves in the tracks may be straightened; there may be four tracks through the town when deemed advisable; dangerous grade crossings shall be eliminated; the company shall construct a macadam street parallel to its entire right of way through the town; 5,000 feet of railroad track shall be removed from the public street.

Kenosha, Wis.—The Chicago & Milwaukee Electric Railroad has been granted right of way over the only two remaining north and south streets of the city. The Chicago Kenosha Milwaukee & Lake Geneva line which was planning to parallel the line of the former company has been refused entrance to the city. It is stated that the Chicago & Milwaukee is planning to build a road west from Kenosha to Lake Geneva to be connected with the Milwaukee division.

Keokuk, Ia.—L. Behr & Co. has been granted a franchise for an electric line from Burlington to Keokuk, Ia.

Lawton, Okla.—A 50-year franchise has been granted to the Lawton Rapid Transit Railway for an electric line from Lawton to a summer resort to be established by the company in the Wichita mountains, the road to run by way of Fort Sill.

Mt. Pleasant, Pa.—A franchise has been granted to the Pittsburgh McKeesport & Greensburg Railway over the principal streets of the city. The company expects to extend its line from Hunker to Mt. Pleasant early in the summer.

Ogden, Utah.—The Ogden Rapid Transit Company has petitioned the city council for a 50-year extension of the present franchise, which has 15 years yet to run. The company agrees to electrify the Ogden & Northwestern Railroad and to extend the line to Utah Hot Springs within two years.

San Francisco, Cal.—The Parkside Realty Company has applied for a franchise for a street railway in lower Sunset and Lake Merced districts, to open up the district now being developed by the company. The United Railways Company is said to be behind an application for a franchise over Sixteenth street from Kansas eastward to the intersection of Seventh and South streets.

Seattle, Wash.—Franchises for a street railway have been granted to the Seattle Electric Company on Summit, Thirty-first and Nineteenth avenues, Ewing street and Wallingford avenue. Application for a franchise on Third avenue from the intersection of Third avenue south and Main street to Third and Jackson, has been referred to the corporations committee.

Wallace, Idaho.—W. J. Hall has been granted a 50-year franchise to construct and operate an electric railway line in this city.

Wilmington, N. C.—The Consolidated Railway Light & Power Company has been granted a franchise to double track much of its lines in the city and to build several extensions, including a line to Carolina Place. A. B. Skelling, manager, Wilmington, N. C.

INCORPORATIONS.

Brunswick & Middletown Electric Railway.—Incorporated in Maryland to build an electric railway from Brunswick to Middletown via Petersburg and Burkittsville. Capital stock \$80,000. Incorporators: William Schnuffer, of Brunswick; Edward C. Shaffer, O. Horsey, Levin West, Charles M. Huffer, Samuel Cloggett, Charles J. House, Joseph D. Ahalt, Millard F. Cook and A. G. Horloe.

Buffalo Construction Company.—Incorporated in West Virginia to build a street railway in Fairmont, with extensions later to Morgantown and Clarkburg. Capital stock, \$10,000. Incorporators: A. L. Pearson, C. F. Shannon, M. M. Ward, R. O. Miller and J. H. Mann.

Chicago & Southwestern Electric Railway.—Incorporated in Oklahoma to build an electric railway from Chicago, Ill., to Denver, Colo., 2,500 miles, passing through Joliet, Mendota, Rock Island, Moline, Galena, Peoria, Pekin, Streator, Bloomington and East St. Louis in Illinois; St. Louis, Jefferson City, Sedalia, Independence, Kansas City and St. Joseph in Missouri; Dayton, Muscatine, Des Moines and Council Bluffs in Iowa; Omaha, Lincoln, Topeka and Sapulpa in Nebraska; Kansas City, Lawrence, Topeka, Junction City, Minneapolis, Osborne and Stockton in Kansas; and Denver, Colorado Springs and Pueblo in Colorado. Capital stock, \$250,000,000. P. M. Dunn and Louis F. Rabe, of Chicago are the principal incorporators. Headquarters Chicago and Guthrie.

Caledonia Street Railway.—Incorporated in Pennsylvania to build a line from Gruffenburg to Gettysburg, 12 miles. Capital stock, \$120,000. M. C. Kennedy, Chambersburg, Pa., president.

Central Texas Traction Company.—Incorporated in Colorado,

(Tex.) Capital stock, \$50,000. Incorporators: J. V. Watkins, William H. Moser, W. T. Medders and E. A. Firman, all of Dallas.

Finlum & Sharon Hill Railway.—Incorporated in Pennsylvania to build a 4-mile electric railway in Delaware county. Capital stock \$25,000. W. A. Riggs, Reading, Pa., president.

Frankfort Delphi & Northern Traction Company.—Incorporated in Indiana to construct and operate interurban lines. Capital stock, \$100,000; principal office Frankfort, Ind. Incorporators, A. S. Strauss, W. M. Cohee and William H. Cohee.

Halifax Suburban Electric Company.—Organized for building an electric railway from Halifax, N. S., through Rockingham, Bedford and Sackville to Waverley. It is stated that construction will begin about April 1. Harvey E. Harding of Bradstreet & Harding, New York City, is interested in the project. Directors, George E. Boak, Hon. Wm. Chisholm and others.

Iowa Railway Light & Power Company.—Incorporated in Iowa to take over the Marshalltown Light Power & Railway Company and build the proposed Boone street loop, the fair-ground extension and a line to Milbourne and Riverview park. Capital stock \$10,000. President, Hamilton Browne, Geneva, Ill.; vice-president, S. W. C. Jones, South Orange, N. J.; secretary and treasurer, Arthur T. Browne, of Geneva, Ill.

Jefferson & Wilson Street Railway.—Incorporated in Pennsylvania to build one and a third miles of electric road in Allegheny county. Capital, \$8,000. President, Hugh Miller, Dravosburg, Pa.

Lederachville & Pennsburg Electric Railway.—Chartered in Pennsylvania to build a trolley line between Lederachville and Pennsburg. President, George Hoeger, Norristown; directors, William S. Lambert, Reading; William C. Riffert, Dauphin; Michael A. Kelley, Pittston, and John F. Lederach, Lederachville, Pa.

Lisbon Durham & Freeport Street Railway.—Articles of association for this company have been approved by the Maine railroad commissioners. The proposed line will run from Lisbon through Durham to Freeport, Me., nine miles. Cyrus W. Davis of Waterville, Me., Edwin J. Lawrence, S. A. Nye, A. B. Page and Amos F. Gerald of Fairfield, Me., are directors.

Mt. Desert Transit Company.—Articles of association have been approved by the railroad commissioners for a line 40 miles long to run from Ellsworth through Trenton, Eden, Mt. Desert and Tremont to Southwest Harbor, Me. Capital stock, \$160,000. Directors, Clement Newbold, Philadelphia; John J. Kennedy, New York; George B. Dorr, Robert Amory and Fred C. Lyman of Eden, Me.

Newcastle Union Railway.—Incorporated in Indiana to build an electric railway through Newcastle, Sulphur Springs, Middletown and Honey Creek. Capital stock, \$50,000. Incorporators: Thomas B. Millikan, Charles S. Hernly, Charles W. Mouch, Myer Heller, Harry E. Jennings and Albert D. Ogborn. Headquarters, Newcastle, Ind.

Terre Haute & Western Railroad.—Incorporated in Illinois, with a capital stock of \$100,000. Directors, Frank T. O'Hara and James Stewart, Paris, Ill.; William B. Trogdon, Vermilion, Ill.; Charles T. Mordock and John E. Lamb, Terre Haute, Ind.

Transcontinental Electric Railway.—Organized at Portland, Me., for the purpose of building electric railways anywhere in the United States. Capitalized at \$50,000,000.

Utica Southern Railroad.—Incorporated in New York to build and operate an electric road 26 miles long in Oneida and Madison counties. Capital stock, \$600,000. Directors, W. M. West, Hamilton; M. W. Terry, Waterville, and F. K. Baxter, Utica.

TRACK AND ROADWAY.

Alton Jacksonville & Peoria Railway.—It is announced that work on an extension of this company's line from Alton to Godfrey, Ill., will be started immediately. The line is now being built from Third and Belle streets in Alton to the city limits on Belle street.

Boston, Mass.—The Stone & Webster Engineering Corporation, of Boston, has filed with the Massachusetts railroad commission, detailed plans for an electric road from Boston to Providence, asking for a certificate of public necessity.

Bowling Green Railway.—This company announces that it will extend its lines about two miles on the principal streets of Bowling Green, Ky., during the present year. It is expected to abandon the present power station and rent power from the Green River Hydro-Electric Company as soon as that company completes its plant on Green River.

Chicago Lake Shore & South Bend Electric Railway.—Grading has been completed and eight miles of track laid on this company's line between South Bend and New Carlisle, Ind. The Cleveland Construction Company has the contract for grading the entire line from South Bend to Kensington, Ill. J. B. Hanna, Cleveland, O., president.

Citizens' Light & Transit Company.—Rails have arrived for this company's extension in Pine Bluff, Ark., out East Sixth avenue from Main to Ohio street, 1 mile. F. E. Cherot, manager, Pine Bluff.

Cleveland & Indianapolis Interurban Railway.—Riggs & Sherman, of Toledo, have completed surveys for this line between Ottawa and Norwalk, O., and a 40-foot right of way is now being secured between those points. Options are also being taken on an additional 10 feet for use in case it is decided to use double track. The route is practically an air line.

Eau Claire Gilmanton & La Crosse Electric Railway.—It is reported that La Crosse, Wis., capital has become interested in this project for an electric line to Eau Claire. Surveys have been made from La Crosse as far as White Hall and estimates are to be presented to the promoters in a few weeks.

Evansville & Southern Indiana Traction Company.—The declared object of this company, recently incorporated in Indiana with \$4,500,000 capital stock, is to construct, purchase and operate lines and systems of street and interurban railroads in, to, through and between the following towns and cities: Evansville, Maubstadt, Fort Branch, Princeton, Patoka, Hazleton, Decker, Purcell, Vincennes, Oaktown, Sullivan, East Mount Carmel and westward to and through Smith, Stevenson, Chandler, Deforest, Booneville, Edgewater, Oakland City, Petersburg, Washington, Bloomfield and Bloomington. The company also proposes to engage in supplying electricity for light, heat and power to the cities and people along the entire line. The Evansville Princeton & Vincennes Interurban Railway, which is in operation from Evansville to Princeton, and under construction from Princeton to Vincennes, has already been acquired. James Murdock, Lafayette, president.

Fairmont & Clarksburg Traction Company.—This road between Fairmont and Clarksburg has recently been opened for operation. A. J. Purinton, general manager, Clarksburg, W. Va.

Ft. Wayne & Springfield Railway.—The first car over this new line from Ft. Wayne to Decatur, Ind., was operated on January 2, but after the first seven miles was pushed by a steam locomotive, as the overhead was not entirely completed. It was expected that regular service would be started this week. W. H. Fledderjohann, president and general manager, Decatur, Ind.

Goff's Falls Litchfield & Hudson Electric Railway.—This company, controlled by the Manchester (N. H.) Traction Light & Power Company, has recently completed a line from Manchester to Nashua, N. H., via Goff's Falls and Litchfield, which is the last gap in the connection between Boston, Mass., and Concord, N. H.

Illinois Traction Company.—A party of the officers and directors of the Illinois Traction System, including some of the Montreal capitalists interested in the company, last week made a tour of inspection of the entire property, for the purpose of considering several contemplated extensions to be made this year, as well as to review the work of the past year. It was announced that a line will probably be built from Eureka to Peoria via Washington, that the line from Springfield to Lincoln will be extended either to Mackinaw or to Bloomington, if sufficient interest is taken by the property owners along the line; that the line from Bloomington to Champaign will probably be built, and that there is a possibility of extending north from Bloomington to Joliet at some future time, acquiring the line now under construction from Pontiac north. Ralph Modjeska, consulting engineer, of New York, has been engaged to make an investigation and report on the feasibility of constructing a bridge across the Mississippi river at Venice, to carry the company's cars to Nort St. Louis. It was stated that if the engineer's report on the bridge is favorable, if satisfactory franchises can be secured in St. Louis, and if the necessary charter can be secured from the government the project will be realized. Regular service was opened on January 6 between Bloomington and Danvers, the first section of the Bloomington-Peoria line.

Indianapolis & Louisville Traction Company.—J. E. Greeley, of Jeffersonville, Ind., superintendent of construction, announces that cars will be running between Sellersburg and Scottsburg, Ind., by April 1.

Iowa & Missouri Traction & Power Company.—This company will let contracts at an early date for constructing its line from Fairfield, Ia., to Memphis, Mo., 52 miles. J. W. Andrews, Keosauqua, Ia., is chief engineer.

Kalamazoo Lake Shore & Chicago Traction Company.—S. J. Dunkley, president, Kalamazoo, Mich., is reported as saying that financial arrangements have been made for completing this line from Kalamazoo to South Haven, Mich. The section from Kalamazoo to Paw Paw is already in operation.

Kansas City St. Joseph & Excelsior Springs Electric Railway.—Work has been started on the bridge across the Missouri river at Kansas City for the line from Kansas City to St. Joseph, Mo. The bridge is to cost about \$1,190,000. The contract for the four piers has been let to the Kansas City Construction Company; the contract for the steel work is still to be let. The entire line to St. Joseph is to be double track. Entrance to Kansas City will be made over the tracks of the Metropolitan Street Railway. Ira Hedrick, consulting engineer, Kansas City.

Lexington & Interurban Railways.—Grading has been completed for a line from Lexington to Frankfort, Ky., 30 miles, and it is expected that the road will be in operation during the coming summer. The right of way for a line to Winchester, 16 miles, has been secured, and it is expected that construction will begin during the year. The company also has plans under consideration for extensions to Richmond and Nicholasville, located to the southeast and southwest, respectively, of Lexington.

Macon Americus & Albany Electric Railway.—Surveys are being made on this line between Macon and Albany, Ga., and as soon as they are completed the work of building the road will be started. W. Jordan Masseur is president of the Interurban Construction Company, Macon, Ga., which has the engineering work in charge.

Mankato Electric Traction Company.—This company will soon be organized and incorporated under the laws of New Jersey with \$175,000 capital stock to build 6 or 7 miles of road within the city limits of Mankato and North Mankato, Minn., and possibly a line

to Kasota and St. Peter. The Minkato Commercial club is securing subscriptions to the stock.

Mansfield, O.—The Roberts & Abbott Company, of Cleveland, is making surveys for an electric railway from Mansfield to Mt. Vernon and Columbus, O.

Michigan United Railways.—General Superintendent J. M. Bramlette, of Lansing, Mich., has announced that extensive improvements are to be made on the Lansing city lines this spring, including some double tracking and special work.

Monmouth County Electric Railway.—This company, which connects Red Bank and Long Branch, N. J., has completed an extension from Red Bank to Fair Haven and cars were operated over the line on January 2. W. F. Hoggan, of New York, president.

Mt. Vernon, Ind.—G. F. Martin, of Albion, Ill., is interested in a project to build an electric railway from Mt. Vernon, Ill., to Mt. Vernon, Ind., and it is stated that surveys are being made.

New Orleans Railway & Light Company.—It is stated that many improvements on this company's line at West End will be made as soon as a new ordinance drawn on the same lines as that in force last year and now being considered by the council, has been passed.

New York & Pennsylvania Railroad.—It is reported that estimates are being secured for changing this road, which extends from Shingle House, Pa., to Canisteo, N. Y., from a steam to an electric line. G. W. Pierce, Canisteo, N. Y., is chief engineer.

Northern Ohio Traction & Light Company.—The Cleveland Construction Company has announced that it will begin work in the spring on the extension from Wadsworth to Seville, O. Only two miles of track remains to be laid on the line between Barberton and Wadsworth and it is expected that it will be in operation in a few weeks. Charles Currie, general manager, Akron, O.

Northwestern Elevated Railroad.—Rapid progress is being made on the Ravenswood extension of this elevated road in Chicago. The new branch extends 4 1-3 miles in a northwesterly direction from Clark street, a little above Belmont avenue, to Kimball avenue, north of Irving Park. Rails have been laid as far as the Irving Park boulevard station and ties are laid as far as the Berteau street station. The first foundations were laid in November, 1905. E. C. Noe, general superintendent, Chicago.

Northern Texas Traction Company.—This company now has improvement work under way on its city lines in Ft. Worth, Tex., aggregating about 5 miles. H. M. Flanders, chief engineer, Handley, Tex.

Oregon Electric Railway.—This company, backed by Moffatt & White, of New York, is building a line from Portland to Salem, Ore., with numerous feeders. W. S. Barstow & Co., of Portland and New York, is the contractor. The main line is 49 1/2 miles long and is estimated to cost about \$2,000,000. A bridge 800 feet long, with 2,300 feet of trestle approaches, is now under construction at Wilsonville, Ore., over the Willamette river. The road is completed from Salem to Lake Labish, 8 miles, and cars are being operated from Salem to Chemawa. Construction is to begin at the Portland end during the present month. There are now 4,000 tons of rails on the ground and 2,000 tons more have been ordered.

Peoria Railway.—This company has decided on an extensive programme of improvements for the next few months. New equipment is to be ordered and electric switches will be installed at important points. A loop will be built at Glen Oak Park. S. L. Nelson, manager, Peoria, Ill.

Point Loma Electric Railway.—Organized at San Diego, Cal., to build an electric railway from San Diego to Ocean Beach and Rosville, Cal. Capital stock, \$250,000. Incorporation papers will soon be applied for. Directors: D. C. Collier, G. M. Hawley, S. F. Smith, G. D. Easton and C. O. Reinbold.

Red Bank, O.—Captain Peter Richards, of this city, is contemplating the construction of a double-track line from Red Bank, through the Duck Creek Valley, to Winton Place, 8 miles. Estimated cost, \$500,000.

Shelburne Falls & Colerain Street Railway.—It is reported that Wilmington, Vt., lumber interests have secured options on a majority of the stock of this company, which connects Shelburne Falls and Colerain, Mass., and that if the purchase is made they will extend it over a bridge across the Deerfield river to Buckland, Vt. C. G. Murey, of Colerain, president.

Somerset (Ky.) Railway & Light Company.—This company has recently completed a new street railway system in Somerset, and cars were operated for the first time on January 1.

Southern Michigan Railway.—It is reported that this company which connects South Bend, Ind., and St. Joseph, Mich., is planning to extend its lines from St. Joseph to South Haven and eventually to Grand Rapids, Mich. J. McAl Smith, general manager, South Bend.

Spokane & Inland Empire Railroad.—President Jay P. Graves has applied to the city council of Spokane, Wash., for a franchise for a tunnel nearly a mile long to connect the freight and passenger terminals of the company in that city. The franchise would provide for a double-track tunnel from the passenger station at Main avenue to Front avenue under Lincoln street, thence under Front to Center street between Bernard and Brown, thence diagonally from Front avenue to the freight grounds of the company, and on Front between Division and Franklin streets with the right to carry power transmission lines and to use either electricity or steam as motive power. The tun-

nel is not to exceed 60 feet in width and the crown of the roof is to be not less than four feet below the surface. The purpose of the tunnel is to save time for trains in the city and to avoid dangerous crossings, and it will be used as an entrance to the terminals of the various interurban lines of the company including the Spokane & Inland Railway, the Coeur d'Alene & Spokane Railway and a line which is to be built down the Spokane river to Nine Mile bridge. It is also expected that this tunnel will be used by an electric railway which is to be built into the Big Bend country. The required property has been purchased. The cost of construction is estimated at about \$800,000 not including the improvements at the terminal stations, which would cost \$100,000 more, and it is estimated that the subway can be built in two years.

Steubenville & Ohio Valley Traction Company.—This company has recently begun operating from Steubenville to Mingo, O., over the county roads. The running time between the two points is 15 minutes.

Suburban Transit Company.—It is reported that right of way has been secured for this company's lines from Columbia to Colonial Heights, S. C., 1 1/2 miles. Contracts are to be let within 60 days. Julius H. Walker, Columbia, S. C., is president.

Toledo & Chicago Interurban Railway.—This company has begun condemnation proceedings to secure right of way for the extension from Waterloo to Butler, Ind. The road is now in operation from Ft. Wayne to Butler, Ind. F. B. Perkins, general manager, Kendallville, Ind.

United Cities Traction Company.—This company, recently incorporated to build a street railway in Ft. Smith, Ark., has begun work. The Ft. Smith Construction Company is doing the grading. Ira L. Reeves, of Ft. Smith, is interested.

United Railways (Portland, Ore.)—It is reported that rails have been ordered for the city lines in Portland, for which franchises are held by C. E. Loss, and it is stated that work is to be started in a short time. The company has passed through several financial difficulties but Mr. Loss has deposited a bond to secure the franchises and states that the project will be carried out. A line from Portland to Forest Grove is contemplated.

United Traction Company.—Edgar S. Fassett, general manager of this line and its new subsidiary company, the Hudson Valley Railway, together with several other officials of these companies, has just returned from a trip of inspection over the lines and announces that plans for substantial improvements on the Hudson Valley are being made. These will include the placing of orders for new equipment and the eventual double-tracking of its entire length. Twenty-five news cars have been ordered by the United Traction Company, one of which embodying many new features, has arrived and will shortly be given a trial trip.

Western Massachusetts Street Railway.—It is reported that this company will build an extension from Chester to Lee, Mass., this summer, to connect at the latter point with the Berkshire Street Railway. H. C. Page, general manager, Springfield, Mass.

POWER HOUSES AND SUBSTATIONS.

Boston Elevated Railway.—The annual report of this company, which has just been issued, says that the company has made arrangements to increase its power supply by the construction of two gas-engine plants, supplying 1,675 kilowatts; by the installation of a turbine generator rated at 2,000 kilowatts, and by the purchase of about 3,000 kilowatts, making a total of upward of 7,275 kilowatts, which is an increase of about 20 per cent.

Camden Interstate Railway Company (Huntington, W. Va.)—This company is soon to build a new power house at Ironton, O., to furnish power for the Ohio division of that railway. The machinery formerly used in its Ashland, Ky., power house will be utilized as far as practicable in the new structure. The Ashland power house has been laying idle since the company's new plant at Kenova, W. Va., was completed more than a year ago.

Cumberland & Westernport Electric Railway.—It is reported that this company will install a new 600-h. p. engine and boiler in its power house at Clarysville, Ind.

Green River Hydro-Electric Company.—This company, organized some time ago with a capital stock of \$200,000, will begin the construction of a concrete-steel power plant at Glenmora, Ky., on the Green river early in the spring. The specifications call for three 50-inch vertical turbines which are to be connected to alternators of 250 kw. capacity. It has not yet been decided what make of machines are to be used. In addition to the main power station an auxiliary steam station will be built to care for the load during the flood period. The current is to be carried to Bowling Green, a distance of 12 miles, and to other towns by a 12,000-volt transmission line, and will be utilized for railway lighting and general power purposes. The men behind the project are Mr. H. D. Fitch of Bowling Green, Ky., and Mr. T. L. Fitch and Marshall Ballott of Louisville. Mr. H. Von Schom, of Detroit, is consulting engineer.

Omaha & Council Bluffs Street Railway.—A contract has been closed with the General Electric Company for a 2,000-kw. alternating current turbo generator to be delivered in six months.

Utah Light & Railway Company.—The officials are looking about for a building site of about 12 blocks, where it is intended to centralize the car barn, power house and repair shops of the entire Salt Lake City system.

Personal Mention

Mr. E. E. Winters has resigned as assistant to the president of the Chicago & Milwaukee Electric Railroad.

Mr. Frank S. Drake has resigned as superintendent of maintenance of way of the Portland (Ore.) Railway & Light Company.

Mr. W. H. Horton has been appointed assistant superintendent of the Rutland (Vt.) Railway Light & Power Company, succeeding Mr. Nathan S. Eldredge, resigned.

Charles L. Furbay, general superintendent of the Augusta Railway & Electric Company, Augusta, Ga., has resigned after five years' service with the company.

Mr. J. A. Barry, of Buffalo, N. Y., has been elected president of the Jamestown Chautauqua & Lake Erie Railroad succeeding Mr. F. L. Chase, of Jamestown, N. Y., resigned.

Mr. Fred D. Potvin, of Grand Rapids, Mich., has been appointed manager of the Citizens' Railway & Light Company, of Muscatine, Ia., succeeding Mr. A. L. Lindner, resigned.

George S. Rice, chief engineer New York Rapid Transit Commission, who has charge of engineering work on the tunnels being built under the East river from the Battery to Brooklyn, the headings in one tube of which met recently was born on February 23, 1849, at Boston, Mass.

He was educated at Harvard University, class of 1870, graduating with the degree of S. B. A. Mr. Rice has had a long and varied engineering experience. The year before his graduation he was employed in the engineering department of the Boston water works and assisted in the construction of the Chestnut Hill reservoir. Upon leaving the university he became assistant engineer of water works at Lowell, Mass., and in 1871 division engineer of the Boston water works. This position he held until 1877. He was then made principal assistant engineer in charge of the Boston main drainage works, which position he held for three years. In 1880 he engaged in mining



George S. Rice.

work in Arizona and Colorado and after seven years' experience in mining engineering went to New York City as deputy chief engineer of the Aqueduct Commission which had charge of the New Groton aqueduct. He worked vigorously for four years in revising the methods of construction which had been adopted for this work, and in 1891 resigned to become chief engineer of the Rapid Transit Commission of Boston. From 1892 to 1900 he engaged in engineering in private practice, serving from 1893 to 1900 as instructor of water supply and sanitary engineering at Harvard University. In 1900 he was appointed deputy chief engineer of the Rapid Transit Commission of New York, and in 1905, at the resignation of William Barclay Parsons, was made chief engineer of that commission. Mr. Rice is a member of the American Society of Civil Engineers, the Boston Society of Civil Engineers, the New England Water Works Association and the American Institute of Mining Engineers and of various clubs in New York City and Boston.

Mr. M. J. Kehoe, who has been for several years chief engineer of power plants of the Ft. Wayne & Wabash Valley Traction Company, has had his title changed to superintendent of power.

Mr. F. B. Royster, formerly master mechanic of the Virginia Passenger & Power Company, of Richmond, Va., has been appointed superintendent of the Montgomery (Ala.) Traction Company.

Mr. H. C. Page, general manager of the Springfield Street Railway, of Springfield, Mass., has had his jurisdiction extended over the Woronoco Street Railway and the Western Massachusetts Street Railway.

Mr. Clarence Keever has been appointed local superintendent of the Indiana Union Traction Company at Muncie, Ind., succeeding Mr. William Emmons, resigned to take service with a new road in Kansas.

Mr. H. G. Fitzpatrick has been appointed superintendent of the city lines of the Cincinnati Dayton & Toledo Traction Company at Hamilton, O. Mr. Fitzpatrick was formerly chief operator for the company at Trenton.

Mr. William A. House, second vice-president and general manager of the United Railways & Electric Company, of Baltimore, Md., has been appointed acting president, succeeding the late General John M. Hood. Mr. House has been connected with the company for 26 years, having started as a conductor. Mr.

William Early, General Hood's private secretary, has been elected assistant secretary.

Mr. M. W. Surratt has been appointed superintendent of the local lines of the Indiana Union Traction Company at Tipton, Ind.

Mr. W. P. Read, for the past 17 years superintendent of railway service for the Utah Light & Railway Company, Salt Lake City, Utah, has resigned. The duties of the office have been assumed by Mr. F. L. Morse, general superintendent, and Mr. O. P. Arnold, Jr., assistant superintendent.

Mr. G. J. A. Paul, general superintendent of the Youngstown-Sharon Railway & Light Company, has been appointed general superintendent of the lines of the Mahoning & Shenango Valley Traction Company, which include the Youngstown-Sharon. Mr. Paul will retain his headquarters at Youngstown, O.

Mr. Winthrop B. Nye, general superintendent of the Ray system of electric railways in Rhode Island and Massachusetts, which has been acquired by the New York New Haven & Hartford Railroad, has resigned and will act as private secretary to M. Joseph G. Ray, former general manager of the Ray system.

Mr. L. S. Storrs has been appointed vice-president of the Consolidated Railway & Light Company with headquarters at Boston. Mr. Storrs was formerly geologist of the Northern Pacific Railway and later expert and engineer of tests of the New York New Haven & Hartford, which position he has held until his recent appointment.

Mr. Edgar S. Fassett, general manager of the United Traction Company, Albany, N. Y., has been appointed manager of the Hudson Valley Railway, Glens Falls, N. Y., control of which has been secured by the Delaware & Hudson Company interests. The Hudson Valley has been practically merged with the United Traction.

Mr. Albert H. Stanley, general superintendent of the northern and central New Jersey divisions of the Public Service Corporation of New Jersey, has been given entire charge of the street railway department for the state, including South Jersey. Mr. Stanley was formerly general superintendent of the Detroit United Railway system.

Mr. George A. Iler, formerly connected with the Western Maryland Railroad as electrical engineer and superintendent of motive power and machinery for all its mines, has resigned to become electrical engineer and superintendent of the Las Vegas (N. M.) Railway & Power Company with headquarters at Las Vegas. Mr. Iler was formerly chief electrician in the United States Navy.

Obituary.

J. W. W. Bryant, division superintendent of the Nashville Railway & Light Company and ex-member of the county court, died on December 27, at his home in West Nashville of spinal meningitis, aged 38 years. Mr. Bryant had been identified with the street railway company for 14 years and had risen from the position of motorman and conductor to that of division superintendent of the lines in North and West Nashville.

James Smith, who, until seven years ago, was superintendent of all track work carried on by the Toronto Railway Company, died at his residence in Toronto on December 18. Mr. Smith was 31 years of age, and had been engaged in railway work all his life. In 1869, when the Toronto Street Railway was purchased by Kiely Brothers, Mr. Smith was placed in charge of the mechanical department of the system. When the present company was formed he was promoted to the position of superintendent of construction, from which he retired seven years ago.

Railroad Commissions Ask Jurisdiction Over Interurbans.

The Washington railroad commission in its report to the governor recommends that the section of the present law which exempts interurban lines from the operation of the act be repealed, inasmuch as it creates a doubt as to the validity of the law, and also because electric lines are coming more and more into competition with the steam roads. The commission says: "A doubt exists in the minds of some as to the constitutionality of the provision of the law conferring the power on the railroad commission to fix reasonable rates to take the place of rates found by the commission to be unreasonable, by virtue of the exemption of interurban lines from the operation of the act, as found in Section 22 thereof. Since the passage of the commission act two years ago, interurban lines have assumed an importance in the transportation of freight in direct competition with the steam railroads in eastern Washington, and many important lines and extensions are projected in western Washington. While these competing lines are probably under the jurisdiction of the commission and subject to its control, no uncertainty should exist upon a subject assuming such importance as this. The commission feel that the law should be amended so as to include electric interurban lines and thus settle and remove any existing doubt. The exemption found in Section 22 should be eliminated."—The report of the Indiana railroad commission to be issued soon will recommend to the legislature that interurban lines of the state be put under the jurisdiction of the commission on the same basis as steam railroads. The constitutionality of the act creating the commission has been questioned by the steam roads, on the claim of class legislation, because the interurban electric systems were left out in the construction of the bill. The report also will recommend the prohibition of all passes on railroads in the state, steam and electric.

Financial News

Alabama City Gadsden & Attalla Street Railway.—This company has filed a mortgage for \$300,000 to the Trust Company of America, of New York, for the purpose of making improvements and extensions, including a new lighting plant. John D. Gaboury, general manager, Gadsden, Ala.

Arbutus Park Street Railway.—Owing to the mayor's veto of the ordinance recently passed by the council on account of its provision for a perpetual free franchise, this company has announced that it will offer for sale by public advertisement its charter and rights of way over all private property free from any charges, to any person or persons who will guarantee to build the line within a reasonable time. In the event of failure to receive a favorable proposal within 30 days announcement is made that its charter will be surrendered to the state and the project abandoned.

Berlin & Waterloo Street Railway.—The town of Berlin, Ont., is negotiating for the purchase of this company, which operates about 6 miles of road in Berlin and vicinity, the franchise for which expired in September. A board of arbitration has valued the property at \$75,000.

Boston & Northern Street Railway.—The Massachusetts railroad commission has authorized this company to issue \$300,000 additional capital stock.

Boston Elevated Railway.—The annual report for the year ended on June 30, 1906, has just been made public. The statement of earnings and expenses for the year, as compared with the two previous years is as follows:

	1906	1905	1904
Gross	\$13,527,185	\$12,689,676	\$12,391,353
Expenses	9,306,950	8,617,653	8,631,553
Net.....	\$4,220,235	\$4,072,023	\$3,759,800
Other Income.....	107,426	51,893	45,240
Total Income.....	\$4,327,661	\$4,123,916	\$3,805,040
Charges.....	3,475,882	3,288,831	2,975,268
Surplus.....	\$851,779	\$835,085	\$829,772
Dividend 6 per cent.....	798,000	798,000	798,000
Surplus.....	\$53,779	\$37,085	\$31,772

The company controls 414.4 miles of surface track, an increase of 9.4 miles for the year, and owns 16 miles of elevated road, making a total of 457.4 miles of track. For the fiscal year 1906, the company carried 262,267,240 passengers; in 1905 the total was 246,941,776, while in 1904 it was 241,681,945.

Forty-five "easy access" elevated cars, and 150 "easy access" semi-convertible surface cars, seating 52 persons each, have been bought. There was spent \$757,354 in renewals and repairs of surface tracks, exceeding the amount spent the previous year by \$114,504, and the year before that by \$283,683.

Buffalo & Lake Erie Traction Company.—The governor of Pennsylvania has approved the merger of this company and the Lake Erie Traction Company, under the name of the former, with \$6,750,000 capital stock.

Canyon City Florence & Royal Gorge Electric Interurban Railway.—Former Governor Peabody, of Colorado, has been appointed receiver for this company, at the application of C. C. Durkee, a creditor. The road was projected by F. S. Granger, of Florence, Colo., to connect Florence with surrounding towns, with a line to the top of the Royal Gorge. A controlling interest in the company was recently purchased by F. G. Heath, of Florence, and the receivership is on account of complications arising from this purchase.

Chicago Union Traction Company.—The annual meetings of the stockholders of the three underlying companies, the North Chicago Street Railroad, the West Chicago Street Railroad and the Chicago West Division Street Railway, were held on January 8 and the directors were all re-elected.

Dallas Consolidated Electric Street Railway.—The officers of the street railways in Dallas will apply to the legislature for a local law permitting the consolidation of the Dallas Consolidated Electric Street Railway, the Rapid Transit Railway and the Metropolitan Street Railway, which was recently authorized by the city council. The Dallas Consolidated Company will acquire the property, rights and franchises of the other two and according to the terms of the city ordinance no increase of stock or bonds is allowed except for improvements and extensions. The proceeds of such increase shall be expended in good faith for such purpose within 24 months from the date of issue.

Geneva Waterloo Seneca Falls & Cayuga Lake Traction Company.—The New York railroad commission has consented to the issuance of a first mortgage for \$1,000,000, and to the increase of the company's capital stock from \$450,000 to \$1,000,000.

Lake Shore Electric Railway.—This company expects to sell \$500,000 of three-year 6 per cent gold notes secured by general mortgage bonds now in the treasury of the company. The proceeds are to be used in liquidation of the balance of last year's improvements and the improvements of this year. The Lake Shore has done a great deal of improving during the past year, including the double-tracking of the line from Rocky river to Lorain, and the practical doubling of its power plants. During the past year a new plant of 2,000 kw. has been completed at Beach Park, and

the same sized addition will be added to the plant at Fremont, the additional power at Fremont being largely necessary to operate the Sandusky Fremont & Southern, which is now being built at a rapid rate.

Kalamazoo Gull Lake & Northern Railway.—This company, which proposes to build from Kalamazoo to Grand Rapids, Mich., via Richland and Gull Lake, has organized by electing the following officers: President, J. T. Upjohn, of Kalamazoo; treasurer, Martin P. Huyk, of Chicago; secretary and vice-president, Edward D. Hosmer, of Chicago. It is stated that financial arrangements have been made and several franchises have been secured.

Mahoning & Shenango Railway & Light Company.—It is reported that this company has acquired all the outstanding stock of the Youngstown Park & Falls Street Railway, as a part of its merger of the street railway property in Youngstown, Niles, Warren, Newcastle, O., and Sharon, Pa. E. N. Sanderson, president, New York.

Mansfield Railway Light & Power Company.—Rudolph Kleybolte & Co., of Cincinnati, has transferred its controlling interest in this company to Thomas Latham, and associates, of Cleveland, O. The consideration is not announced.

Old Colony Street Railway.—The Massachusetts railroad commission has authorized this company to issue additional stock to the amount of \$200,000.

Rapid Transit Railway (Dallas, Tex.)—The stockholders met recently and authorized the proposed merging of the property with the Dallas Consolidated Electric Street Railway and the Metropolitan Street Railway. The directors were re-elected. President C. F. Freeman, vice-president C. E. Bird, and treasurer B. E. Van Vliet were re-elected. W. W. Loomis was elected secretary in place of S. E. Williams.

Rock Island Southern.—This company, incorporated in 1905 to build a railroad equipped with steam and electric power, connecting the cities of Rock Island, Moline, Davenport, Menmouth and Galesburg, Ill., is offering \$400,000 of first mortgage 5 per cent gold bonds at 98 and interest. The line is completed from Monmouth to Galesburg and will be completed to Rock Island and in operation during 1907. The trust deed provides that additional bonds may be issued only for 60 per cent of the cost of the property during construction and 25 per cent more when the net earnings from operation equal 1½ times the interest charges on the bonds issued.

Springfield, O.—It is reported that a New York syndicate is negotiating for the merger of the Springfield Troy & Plqua Railway, the Springfield & Xenia Railway, the Washington Traction Company, the Home Light Heat & Power Company, and the People's Light Heat & Power Company.

Stark Electric Railroad.—At a recent meeting at the general offices of the company at Alliance, O., the following officers were elected: President, C. R. Morley; vice-president, D. Morison; secretary, E. S. Cook; treasurer, E. Weibenson. In addition to the above the directors are William Grief, R. H. Brown and Frank Straus. All the officers are from Cleveland.

The City Railway (Dayton, O.)—This company has announced an issue of 1,000 shares of additional common stock at par, to be allotted to present stockholders pro rata of their holdings. The company has also announced a special dividend of 5 per cent.

Toledo Railways & Light Company.—The annual meeting of the stockholders will be held in Toledo on January 17. At this meeting the matter of leasing the street railroads owned and controlled by the Toledo Ottawa Beach & Northern Railway Company will be voted upon. The Toledo Ottawa Beach & Northern Railway Company is a consolidation of the Toledo & Point Place Railway and the Toledo & Ottawa Beach Railway. The stock of these companies will be transferred to the Toledo Railways & Light Company, and that company will also guarantee the bonds of the Toledo Ottawa Beach & Northern.

United Railroads of San Francisco.—Conclusive evidence of the general resumption of business in San Francisco, more particularly that of the street railway traffic, is furnished in the latest report on the receipts and earnings of the United Railways Investment Company, the holding company of the United Railroads of San Francisco, which operates the four leading surface traction lines in that city. This report, which was made public by Ernst Thalman, of Ladenburg, Thalman & Company, president of the holding company, shows that the gross passenger receipts for December amounted to \$556,000, despite the numerous delays and losses occasioned by the fire and labor troubles. The gross receipts for the entire year were \$5,941,000, a decrease of about \$1,116,000 compared with the gross receipts of 1905. "The officers and directors of the United Railroads of San Francisco," said Mr. Thalman, "are confident that the rebuilding of San Francisco will go forward with continued vigor. They report that the labor situation is steadily improving, and that the company now has no difficulty in obtaining all the labor necessary for the reconstruction of its old cable lines. Several of these lines have been completed and the entire work of reconstruction will be finished by spring. The delivery of the 250 new cars begins this week and, when they are placed in service, the United Railroads should be a well equipped as any street railroad property in America. This new construction has been of the highest order, the weight of the rails used in the new tracks varying from 109 to 141 pounds. The officials of the company report a most favorable outlook for the year's business. It is confidently believed the earnings for 1907 will exceed those of 1905."

Manufactures and Supplies

ROLLING STOCK.

Peoria Railway Company, Peoria, Ill., is in the market for 15 new cars.

Chicago Milwaukee & St. Paul Railway is in the market for ten motor cars.

Chicago City Railway Company will soon be in the market for 300 cars for city use.

United Railways Company of St. Louis, Mo., is building a sample car at its own shops.

Brooklyn Heights Railroad Company, Brooklyn, N. Y., is preparing specifications for 100 cars for surface use.

Michigan United Railways, Lansing, Mich., is reported in the market for a considerable amount of rolling stock.

Laconia Street Railway, Laconia, N. H., ordered in 1906 one closed double truck car from the Laconia Car Company.

Hartford & Springfield Street Railway, Hartford, Conn., placed orders during 1906 for four 15-bench open double truck cars for city service.

Louisville Railway Company, Louisville, Ky., has contracted with the St. Louis Car Company for 50 cars for delivery in the spring of 1907.

Lewiston Brunswick & Bath Street Railway, Lewiston, Me., ordered during 1906 one 35-foot double truck interurban car from the Laconia Car Company.

New York Auburn & Lansing Railway, New York, N. Y., has ordered through A. H. Flint, 15 Broad street, New York, ten cars from the Jewett Car Company.

Atlantic Shore Line Railway, Kennebunkport, Me., ordered in 1906 four 36-foot box trailers and three 30-foot electric locomotives from the Laconia Car Company.

Willamette Valley Traction Company, Portland, Ore., has ordered through W. S. Barstow, 56 Pine street, New York, eight cars from the Jewett Car Company.

Chicago Union Traction Company's receivers have been granted authority by Judge Peter S. Grosscup of the United States Circuit Court of the seventh district to purchase 149 cars.

Kansas City St. Joseph & Excelsior Springs Electric Railway, Kansas City, Mo., is considering bids for new equipment including passenger, express and parlor cars. Ira G. Hedrick, consulting engineer, Kansas City, Mo.

International Railway Company, Buffalo, N. Y., has just placed an order for 75 new cars with the J. G. Brill Company for September delivery. The cars will be 46 feet in length with a seating capacity of 44 persons, will have end ventilators and be equipped with air brakes. This company is also reported in the market for a number of cars for interurban service.

Spokane-Pend d'Oreille Rapid Transit Company, Limited, Spokane, Wash., advises that it will adopt first-class passenger equipment as follows: six motor cars with closed motorman's cab, 10-foot baggage compartment, 12-foot smoking compartment and passenger compartment to seat 72 persons, length over all being 60 feet, width 8 feet 3 inches and fitted with Walkover rattan seats. Ten trailers without compartments, of the same dimensions as the motor cars, upholstered in plush; two express motor cars similar to those furnished by the J. G. Brill Company for the Washington Water Power Company of Spokane, Wash., to have a length over all of 39 feet 4 inches, height from top of rail to trolley base, 11 feet 11 inches, arched roof and hood covered with canvas and enclosed vestibule for motormen. The company advises that it will also order 20 box and 40 flat cars of standard freight construction and air brakes.

SHOPS AND BUILDINGS.

Birmingham Railway Light & Power Company.—This company is considering plans for an addition to its present car barns to cost \$75,000, consisting of a new shed similar to the present one, covering half the block bounded by Third and Fourth avenues and Tenth and Eleventh streets, Birmingham, Ala. W. A. McWhorter, master mechanic.

Halifax Electric Tramway Company.—This company is building a new car barn on Lower Water street, Halifax, N. S., which will be 100 by 135 feet, of brick, with concrete floor and folding steel doors. It is expected to be ready for occupancy by December 31.

International Railway (Buffalo, N. Y.).—Work has been completed on the new Cold Springs shops and car house at Buffalo, at a cost of about \$350,000. The old car house has been remodeled and converted to a truck and carpenter shop. The completion of the new building, which is 560 by 620 feet, gives the company accommodations for 200 cars. T. W. Wilson, general manager.

Shreveport (La.) Traction Company.—This company has closed a contract for the erection of a new car shed and shop building, to

cost about \$23,000. The building will be of brick, steel and reinforced concrete, 120 by 160 feet in area.

TRADE NOTES.

Kobbe Company, designer of technical advertising, making a specialty of "follow-up" business-getting systems and publisher of *Compressed Air*, has removed its office from 90 West Broadway to 108 Fulton street, New York.

George F. Hichborn assumed the duties of general traffic manager of the United States Rubber Company, 42 Broadway, New York, effective January 1, 1907, filling the vacancy created by the resignation of J. N. Galloway.

Dean Electric Company, Elyria, O., is having plans prepared by the Osborn Engineering Company for a \$100,000 addition to its plant. Work will be commenced in the spring and considerable new machinery including a 500-horsepower engine, boilers and generators will be purchased.

Standard Coupler Company, 160 Broadway, New York, has appointed George A. Post, Jr., engineer representative of the company. Mr. Post, Jr., graduated from the Cornell University in 1905 with the degree of M. E., and was formerly a sales engineer with the Westinghouse Machine Company.

Gideon N. Caleb, vice-president of the Bettendorf Axle Company, has been confined to his apartments for the past eight weeks. Bronchial asthma developed into pleurisy and this into pneumonia and his condition has been critical. The crisis, however, has passed, and it is believed he will soon be able to get around again.

R. W. Marshall & Co., 95 Liberty street, New York City, dealer in electric railway material, both new and second hand, reports the following sales: 4 interurban cars, 55 feet long fully equipped, 1 freight car and 2 combination baggage and passenger cars to the Meyersdale & Salisbury Street Railway, Pittsburg, Pa. Also 4 single-truck cars fully equipped to the Pittsburg & West Moreland Railway, Irwin, Pa.

Railway Commercial Training School, 117 Main street, Elmira, N. Y., is now under the general management of E. E. Tingley. W. G. Moore, previously manager, is now assistant secretary of the General Engine Company, 640 Ellicott square, Buffalo, N. Y. The Railway Commercial Training School provides training for young men in railroad work, offering courses in telegraphy, freight traffic, passenger traffic, baggage and express work.

J. H. Wagenhorst & Company, of Youngstown, Ohio, reports among its sales of electric blue printing machines the following: Oklahoma City Railway Company, Oklahoma; Ohio State University, Columbus, O.; G. D. Peters & Co., Moorgate works, London, Eng.; Griffin Wheel Company, Chicago, Ill.; Alvey-Ferguson Company, Louisville, Ky.; New England Structural Company, Boston, Mass.; Eugene Dietzgen Company, Chicago, Ill.; American Steam Pump Company, Battle Creek, Mich.

Lidgerwood Manufacturing Company New York, has appointed Francis F. Coleman publicity manager of that company. Mr. Coleman was formerly connected with the Westinghouse and Allis-Chalmers companies and recently with the Taylor Engineering Company. He was at one time editor of the *Electrical Age* and during the Louisiana Purchase Exposition at St. Louis had charge of three large exhibits there, being the organizer and first vice-president of the Machinery Club, and was active in bringing about the organization of the United Exhibitors' Association at the fair. Mr. Coleman is a member of the Technical Publicity Association.

A. O. Backert, for a number of years in charge of the Pittsburg office of the *Iron Trade Review*, and for the past two years associate editor of the *Iron Age*, with headquarters at Chicago, has accepted the position as editor of *Foundry* and associate editor of the *Iron Trade Review*, effective January 17. T. J. Wright has been appointed successor to Mr. Backert as western editor of the *Iron Age*, with headquarters at Chicago. Mr. Wright was formerly connected as salesman with Joseph T. Ryerson & Son, Chicago, and with the Western Iron & Steel Company, of St. Louis, and later with the Hartford Steam Boiler Inspection & Insurance Company as special agent, during which time he contributed several articles on steam boiler practice to the technical press.

Peter Smith Heater Company, Detroit, Mich., manufacturer of the "Smith" type of hot-water heater, announces that arrangements have been made with the Electric Service Supplies Company of Philadelphia and Chicago to sell its products during the coming year. This change has been made due to the increasing business and in anticipation of a still greater increase the company will erect a two-story addition 100 by 120 feet. This will be equipped with all the modern devices necessary for increasing the plant to about four times its present capacity. The "Smith" heaters are used on more than 175 different railway companies in the country. Among these is the Public Service Corporation of New Jersey, which has installed 100 of the new magazine type of heater.

William J. Clark, of New York, has been appointed by Governor Charles E. Hughes as a delegate from that state to the national convention for the extension of foreign commerce of the United States, which will be held at Washington, D. C., beginning Monday, January 14, 1907. Mr. Clark is general manager of the foreign department of the General Electric Company. He has been interested in and studied for many years the conditions of foreign commerce and there are few men in the United States who under-

stand the commercial conditions better. His book, "Commercial Cuba," is recognized as an authority on the subject. He has been a delegate to many important commercial conventions and in 1895 was a member of the United States delegation at the International Railway Congress held at Washington, D. C.

New York Switch & Crossing Company, Hoboken, N. J. has purchased a rail bender, cold saw, planer for crossing work and other machinery for use in its manufacturing plant. The company reports a very good business. It manufactures a full line of frogs, switches, crossings, automatic electric switches and is making a specialty of hard-steel centers. The anti-straddling tongue switch is a special patent of the company and is meeting with great success.

ADVERTISING LITERATURE.

H. B. Underwood & Co., Philadelphia, Pa.—A neat blotting pad has been issued to call attention to the portable railway repair shop tools which this company makes, a novel idea being introduced by the use of portraits suggestive of the different ways of soliciting orders.

Royal Ventilator & Manufacturing Company, Philadelphia.—The "Royal" system of ventilation is described and illustrated in a booklet, issued by this company, which contains sizes and prices; also, illustrations of the application of the ventilator to various situations—in factories, engines and boiler rooms, train sheds, barns, etc.

McConway & Torley Company, Pittsburg, Pa.—A 152-page catalogue substantially bound and handsomely illustrated has been issued by this company. It contains illustrations and lists of parts of the various forms of coupler equipments manufactured by it for passenger cars, freight cars and locomotives. The changes in railway principals and service requirements have demanded changes in coupler equipments, and the catalogue shows a number of new ideas and improvements in this direction. Developments in automatic coupler appliances as well as earlier combinations are shown.

Union Switch and Signal Company, Pittsburg, Pa.—"Westinghouse Automatic Electro-Pneumatic Block Signals on the Electrified Division of the West Jersey & Seashore Railroad" is the subject of Bulletin No. 28. The matter contained therein is reprinted from the Railroad Gazette for October 5, 1906. Bulletin No. 26 deals with the electro interlocking system of the Union Switch and Signal Company. Some 26 pages are devoted to description and there are numerous color plates and folders. The electric interlocking system of the company has been under development some three years and since 1904 has been in railroad service.

Babcock & Wilcox Company, New York, has purchased from the Stirling Consolidated Boiler Company, of Barborton, O., its American property and interests including all accounts and bills receivable and has assumed its obligations. The purchased plant will be operated in the future by the Babcock & Wilcox Company under the name and style of the Babcock & Wilcox Company (Stirling Department) and will be operated under the management of the same gentlemen who have operated the Stirling Consolidated Boiler Company, the sales department of this company being associated with the Babcock & Wilcox Company in similar capacities. The Babcock & Wilcox Company (Stirling Department) will manufacture the Stirling Altman & Taylor and Cahill water tube boilers and appliances heretofore manufactured by the Stirling Consolidated Boiler Company.

Ingersoll-Rand Company, 11 Broadway, New York City.—"Ingersoll-Sergeant Air and Gas Compressors," a publication of 184 pages, covers the complete line of compressors built by the Ingersoll-Rand company. A brief description of each of the nine classes is given followed by tables of sizes and illustrations of typical machines and representative plants. A large number of illustrations covering almost every line of industrial activity is a particular feature of the publication. Two articles are also presented, one being entitled "Some Important Elements of Economy in the Straight Line and Duplex Types of Compound Air Compressors" and the other entitled "Compound Air Compression" which enters exhaustively into the details of the subject. The Ingersoll-Rand company states that it has made every effort to make the publication not only a catalogue of their compressors, but a text book of useful information to engineers. Leaflet 45-A is designed to call attention to Ingersoll-Rand rock drills of which the company states that it has built over 90,000.

Roberts & Abbott Company, Schofield Building, Cleveland, O.—This company has just issued a second edition of its booklet relative to electric railways. It has 83 pages and cover and is illustrated of the matter in this edition is new. The company is composed of E. P. Roberts and W. H. Abbott, well known electrical and mechanical engineers, who have been retained as consultants by the construction of more than 300 plants for electric lighting, heating, power transmission, water works, etc. The booklet is intended to answer the question "What are the duties of a construction and supervising engineer for electric railways?"—that proposed railroad, second edition properties." It has a large number of maps and helpful illustrations and the result of 20 electric railways will be said to be a partial list of these with which the company has been connected. The booklet is made that a road can be built in 90 per cent of the estimate made by the engineer and that a road can be built at a cost less than the estimate. The company has the necessary experience in contracting in advance to a forecast of roads about to be built.

THE NATIONAL BOILER TUBE CLEANER.

The National steel tube cleaner, illustrated in the accompanying engraving, is a device for cleaning boiler tubes, which is manufactured by the H. W. Johns-Manville Company, of New York.



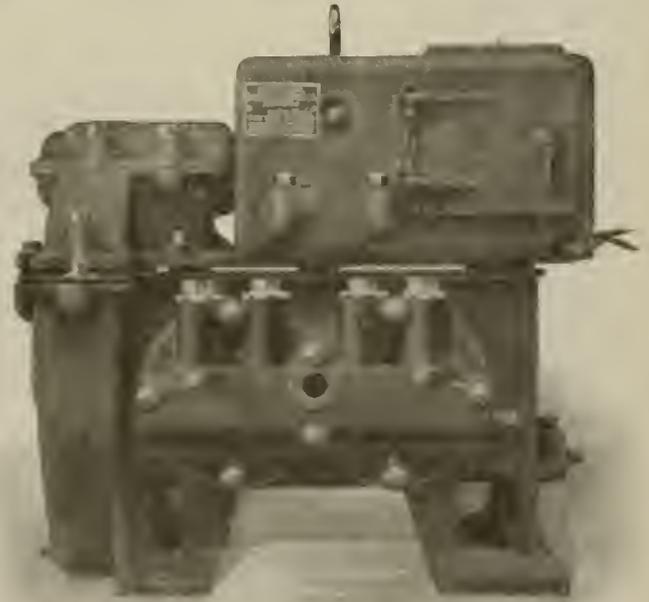
The National Steel Tube Cleaner.

The salient feature of the National steel tube cleaner is that each blade acts independently of the others and is so spring-like in nature that it conforms very snugly to the surface which is to be cleaned. It can be forced through the tube with very little effort and each plate removes the particles of sediment or scale within the pipe. Another advantage of this cleaner is that it can be adjusted to fit various sizes of pipe, and if one or more of its blades become broken by rough usage or wear, they can be readily repaired at nominal expense.

The manufacturer states that it is meeting with great success in the sale of this device.

THE NEW NATIONAL MOTOR COMPRESSORS.

In very recent months the National Brake & Electric Company, of Milwaukee, has developed and is now manufacturing in large numbers its new types of motor compressors, of which the most frequently used for street railway service are the A-4 and BB-2 types. These motor compressors represent many advanced ideas in design and construction, and are modelled according to the suggestion of some of the foremost master mechanics and street



(27)

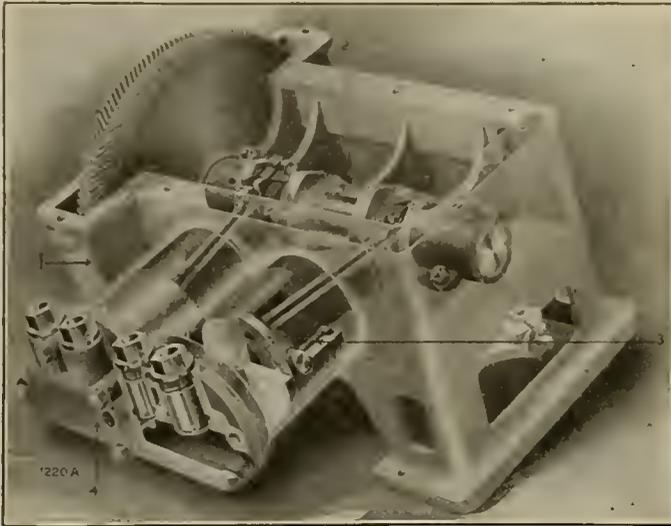
National Motor Compressor—Figure 1.

railway officials, as well as embodying the most progressive and practicable features which the long experience of the airbrake experts of the company had dictated.

One of their many distinctive features is the construction of motor and compressor as entirely separate and self-contained units. When the two parts are assembled a very compact and rigid compressor unit is produced. In Figure 1 is shown a complete A-4 type compressor. The crank chamber cover and motor base are separated by a 1/2-inch air space, which is clearly shown in the illustration. In addition to acting as a separator of the heat radiated by the compressor the motion of the air causes a strong current of air to circulate through the space, thus rapidly sweeping away the heated air. This feature greatly conduces to low temperature operation while the separate cover gives the required bracing and stiffening for the crank chamber casting.

Since the enclosure of a motor compressor in a box will by surrounding it with warm air and preventing the escape of currents generated by a car in motion from reducing the temperature, lower the efficiency of operation many per cent in

cases where the car is running the greater part of the day, the new National motor-compressors are enclosed and made absolutely dust and water proof. Thus the operating parts are constantly exposed to the atmosphere, eliminating the dear price of about 25 per cent reduction in efficiency in a box-enclosed type



National Motor Compressor—Figure 2.

compressor which for the sake of cleanliness may be gained in a few minutes with a jet of water with the enclosed type.

The simplicity of design and construction of the compressor is splendidly shown in the phantom view, Figure 2. Referring to this figure, the crank shaft is fitted with a third bearing (2) in its center, which in addition to supporting and strengthening

The valves are of the solid cold-drawn tubular steel type and are interchangeable. They are seated by gravity aided by air pressure, no spring or auxiliary device being required. The discharge pipe runs straight out of the valve head to the main reservoir, thus disposing with the necessity of attaching unsightly elbows and goose necks. Both gear and pinion are a standard herringbone pattern and are cut with the greatest accuracy on gear cutting machines.

The motor of the compressor outfit is a standard 4-pole entirely enclosed type, designed with an unusually liberal rating and with a view to complete accessibility. One of the many distinctive features of the motor is the heavy insulation employed in the brush gear. The brush gear on compressors is often a weak part, due to the fact that only about $\frac{3}{4}$ to $\frac{1}{2}$ inch external leakage surface in insulation is provided and the accumulation of oil and dust frequently results in complete breakdowns by the current eating through the bushing or creeping over the small oil-covered surface. The thickness of the insulation used on National motor compressor brush gear is $1\frac{1}{4}$ inches, which gives assurance that no such contingencies will occur.

ROLLING STOCK FOR LANCASTER, PA.

The Conestoga Traction Company, of Lancaster, Pa., operates two types of closed cars, the one shown in the illustration, which is one of a number of new cars built by the J. G. Brill Company; the other, the Brill grooveless-post semi-convertible type. The first named type has been adopted for general use in the city and additional orders are pending. Last year nine cars of the latter type were purchased and additional orders for this type also will soon be placed. Forty-seven miles of new track have recently been laid, making the aggregate length of the lines 147 miles; this added mileage will make the Conestoga Traction Company rank as one of the largest trolley companies in Pennsylvania outside of the few largest cities.

The new cars do not differ materially from standard Brill cars of the closed type; the upper sash are stationary; the lower sash drops in the ordinary manner. The chief dimensions are: Length over end panels, 20 feet 8 inches, and over vestibules, 30 feet 1 inch; width over sills including sheathing, 7 feet 4 inches, and over posts at belt, 8 feet 2 inches. The car bodies are mounted on the Brill No. 21-E single truck with a wheelbase of 7 feet.

The interiors have a finish of cherry; ceilings are of birch. The builders furnished their own make of specialties throughout



Closed Car for Conestoga Traction Company.

it at the weakest point, eliminates all tendency of the shaft to fracture at the center. This third bearing also makes the operation of the compressor much quieter and gives greater freedom from vibration than is the case with two bearing compressors. Thus the life of the pump and gearing and their efficiency is greatly increased.

Removal of crank shaft and gear is accomplished by lifting them straight out of the crank chamber. The removal of the gear from the shaft, which must be done on most compressors before the crank shaft can be dismantled is entirely unnecessary; thus greater accessibility to the pump is gained and the minimum time consumed in dismantling and reassembling the parts. The splash system of oiling is used the gear and crank running constantly in a bath of oil which is splashed over all the operating parts of the compressor. It will be noticed that the gear case (1) is constructed as an integral part of the crank case instead of being cast separately. Such construction makes a highly rigid pump base, reduces the number of loose parts and unsightly bolts and does not necessitate draining the oil from the gear case and crank chamber for inspection of these parts.

The valve head is constructed with discharge valves towards the center and the suction valves towards the outside of the head.

the cars, such as: "Dumpit" sand boxes, angle-iron bumpers, radial drawers, and spring cane seats.

To Build Interurban Station at Toledo.

The Interurban Station Company, of Toledo, has been incorporated at Columbus by John C. Reid, Joseph S. Young, William R. Hodge, William H. McClellan and William F. Nutt. The initial capital of the company is \$10,000. The object is to build and control the proposed interurban union passenger station on the ground bounded by Superior, Huron, Beach and Jackson streets. The project has been held up many months by the board of public service, which refused to give the necessary permit to construct furnouts on Superior street. This question is now in the hands of council committee on railways and telegraph, and as the granting of the permit is being urged by the chamber of commerce and by many prominent business men, it is believed that in a short time council will act accordingly. If this controversy is settled in the near future, it is probable the new station, costing over \$200,000, will be built before the close of the year.

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The growing use of the electric and cable car in the carriage of mails is indicated by a few figures given in the annual report of the postmaster general for the year ended on June 30 last. The number of electric and cable car routes in operation on June 30, 1906, was 460, with a total length of 6,014.74 miles, and an annual travel of 11,114,183.98 miles, costing \$572,495.89. This is an increase of 20 routes, of 369 miles in length, of 572,496.55 miles of travel, and of \$29,540.51 in annual cost. The report does not state how much of this business was handled by cable cars, but as there are now very few cable roads in existence the significance of the figures is not affected greatly. Although the increasing importance of electric railways as an indispensable factor in the transportation world has long been recognized, this particular branch of their usefulness has attracted little notice. And while they have been rapidly extending their fields of endeavor, both in competition with and as supplementary to the steam railroads, by taking up the handling of express and freight, little has been said of their value as carriers of mail. This is a field for which the electric railway is especially fitted, both in large cities and between small communities which are without the advantages of a frequent steam railway service, and there is little doubt that the large increase in this department for the past year will be followed by a still larger one in the next year.

Electric Railway Mail Service. That the rate of compensation for electric and cable car mail service has been increased during the past year should make the business more attractive to the companies. The last report of the postmaster general asked congress for authority to increase the rates applicable to electric and cable car service from 3 cents per mile traveled for closed-pouch service to not exceeding 4 cents per mile traveled in cases where exceptional conditions as to weight of mail and number of offices existed, and from three-fourths of a cent per linear foot per mile traveled for

apartment and full car service to not exceeding 1 cent per linear foot per mile traveled in exceptional cases. Congress authorized this increase, with the proviso that on routes over 20 miles in length, outside of cities, the rates shall not exceed those paid for steam railroad service. Under this legislation, effective on July 1, 1906, compensation has been restated, on certain routes where the conditions referred to have prevailed, at the rate allowable for railroad service. In a number of the larger cities service has been restated at the rate of 1 cent per lineal foot. A few of the electric and cable car companies are still demanding higher rates for service than are deemed necessary by the postoffice department, but the efforts to secure service under the amended law have been reasonably satisfactory, and the postmaster general recommends no further legislation at this time.

Starting with Portable Substations. The Illinois Traction System, which has under active construction several connecting lines of 40 or more miles in length has found that portable rotary converter substations are quite useful at the time of first opening new lines. This company has five such substations, each consisting of a substantially-built box car carrying one 300-kilowatt rotary converter together with transformers and switching apparatus. When a new line is to be opened, one of these substations is set off on a temporary side-track and a short pole, with standard high-tension cross-arms and insulators, is erected close to the end of the car. In this way the three-phase transmission wires may be brought to the high-tension disconnecting switches in the car. The substations are also useful in assisting permanent rotary converter equipments at the time of concentrated loads. One of the reasons why the Illinois Traction System finds portable substations to be of value is that it contemplates using single-phase current for operating all that part of its system north of Springfield and Decatur, but at the present time, while some 80 miles of this track are ready for the single-phase operation, the single-phase car equip-

Rates for Handling U. S. Mail. That the rate of compensation for electric and cable car mail service has been increased during the past year should make the business more attractive to the companies. The last report of the postmaster general asked congress for authority to increase the rates applicable to electric and cable car service from 3 cents per mile traveled for closed-pouch service to not exceeding 4 cents per mile traveled in cases where exceptional conditions as to weight of mail and number of offices existed, and from three-fourths of a cent per linear foot per mile traveled for

ments are not yet at hand. Thus with portable substations available it is possible to locate them so that they may feed direct current to the catenary construction and the usual type of direct-current interurban car equipments be used until the delivery of the single-phase transforming and motor equipment.

A HOLDING COMPANY IN CLEVELAND.

The decision of the United States supreme court to the effect that the franchises of the Cleveland Electric Railway Company on Quincy street and Central avenue expired in 1905, although leaving that company with valid franchises for all the rest of its great system, seems to have brought about a condition in which its shareholders are willing to consider the "holding company" plan long advocated by Mayor Johnson. For this reason it is worth while to consider that plan, not from the point of view of the owners of the street railway property, but from that of the municipality and the users of the street railways whose control would be transferred.

Mayor Johnson's plan for Cleveland is in every substantial element the same as that which he advocated in Detroit in 1899 when, as a street railway owner, he was seeking to sell the lines in that city to its people. It is, in short, that a leasing corporation of public-spirited citizens be formed to take over the street railway property and operate it for the benefit of the community without hope of or effort for private pecuniary gain beyond the standard rate of interest upon an agreed valuation. Of course this interest must be paid to the real owners of the property and, therefore, the men charged with the operation of the leased street railways can have no pecuniary reward beyond the moderate salaries which they can properly vote to themselves. Under such circumstances it is obvious that there can be no desire to invest money in securities of the leasing corporation and that its capital resources, compared with the obligations for rentals, renewals and repairs which it must assume under any lease which at all adequately protects the owners of the property, must necessarily be insignificant. In fact such a corporate group could not qualify as lessors, especially when they make a drastic and wholly experimental reduction in rates the chief part of their programme, and no owners of street railway property would deal with them on that basis. Therefore, Mayor Johnson, first in Detroit and now in Cleveland, was obliged to devise some way by which a city which has no legal right to own or operate street railways or to go into the street railway business as a partner with any corporation or in any other way, could come to the support of the lessors and equip them with a fraction of its own credit and responsibility. The device adopted is that of a so-called "security franchise." It is unquestionably adroit but questionably legal. That, however, is another story, and one that Cleveland and Ohio will take care of in due course.

By a "security franchise" Mayor Johnson means one nominally issued to the owning company but so restricted that it shall not go into effect or become operative unless and until the holding corporation defaults in some of its obligations under the lease. In order to satisfy the most reluctant shareholder, who might otherwise block his enterprise, Mayor Johnson has particularly specified that the privileges under this "security franchise" shall be broader and more liberal than the city would directly grant to any corporation. In other words and adapting the statement to the concrete conditions of the Cleveland situation, the city of Cleveland is asked, by its mayor, to bet a more liberal franchise than its citizens would approve as a separate proposition, against nothing whatever, that a group of estimable gentlemen with little experience in the street railway business and no direct financial interest in the success or failure of their undertaking can and will successfully and profitably operate the great

local system upon lower rates of fare than the owners of that system believe to be possible. And it is to be observed that this "holding company" plan cannot go into effect until the present owners have testified to their conviction that three-cent fares cannot be made profitable, in the strongest possible manner, by parting with the control of their property in preference to undertaking that task. If their judgment is not radically wrong it is plain that the security franchise must soon fall into their hands and thus prove the folly of not dealing with them directly and at once.

Assuming, however, that the holding company plan will continue for a number of years it is certainly questionable whether it can be regarded as a good one for the city of Cleveland. A growing city demands a growing street railway system. The holding company, having no capital of its own, or practically none, cannot build new lines and extensions; at three-cent fares it certainly will not be able to build them out of earnings. Having nothing to pledge it can not borrow capital. There remains the question whether private capital will, under such conditions, come to the rescue. With the spectacle of one company practically expropriated in favor of the mayor's holding company it is plain that private capital will not rush into this void. If it comes at all it will undoubtedly demand a new "security franchise" and thus neither horn of the dilemma affords much comfort to the citizens. The same conditions which control extensions are certain to control and to prevent proper improvements. Cleveland's street car service is even now hampered by the fact that proper rapid transit facilities, commensurate with the size and rapid growth of the city, do not exist in its business center. Nothing but such a perennial controversy as has been in progress throughout the whole of Mayor Johnson's administration could have prevented the normal development which would have given the city a complete system of subway transit of modern character long before this. Such a system is, in the judgment of experts on municipal transportation, much more needed than lower fares, but it will be long deferred if the "holding company" plan is adopted.

It is not necessary to go into the question of the quality of service likely to be rendered under the proposed conditions. The peculiar combination of inexperienced operating officers, extraordinarily low fares, a system inadequate to the city's needs, pressing demands to meet the conditions of a lease requiring regular payments of rent and recurrent expenditures for repairs and renewals, with probable political interference at nearly every step, is, of itself, sufficiently suggestive in that direction.

Of the many remaining objections to Mayor Johnson's plan the political one is easiest comprehended. This is perhaps enhanced by the peculiar conditions prevailing in Cleveland where the very mayor who has produced the unparalleled street railway situation has already announced his candidacy for the governorship of Ohio and is a recognized aspirant for the presidency of the United States. Such a candidate for high political honors, whose peculiar methods are illustrated by a recent convention to which he sent a majority of delegates who were on the payroll of the city which he controls, is not likely to overlook the advantages to be gained by complete domination of the political action of the two thousand voters in the employ of the local street railway system. That there can be a holding company which he does not completely dominate no one in Cleveland for a moment believes.

Will the holding company plan be accepted by the people of Cleveland? It will be remembered that when Mayor Johnson tried to get the same plan accepted in Detroit the popular sentiment against it was so strong that it compelled a city council which had voted in his favor to rescind its action within three weeks. And in Detroit both the power of Governor Pingree and the influence of the street railway company were united in favor of the "holding company" plan.

Perhaps the latent opposition to such a plan as that advocated by Mayor Johnson has in Cleveland remained dormant on account of the public opposition to the plan on the part of the street railway company. It is not impossible that, if it had been less reluctant to submit to expropriation, the public would have been less blind to the evils inherent in the plan proposed or would have been more conscious of the need of acting in its own protection. If it should now appear that the corporation has been won over to the "holding company" plan that fact may be the signal for an awakening of public sentiment that will put an end to the scheme at the very moment when it appears about to realize victory.

RIGHT OF WAY AT INTERSECTING POINTS.

Intersection points on important routes are always danger spots in the operation of cars and the prevention of collisions at crossings and junctions is one of the constant anxieties of a division superintendent. Failure of brakes, over-speeding, slippery rails, bad weather and other causes are often contributory to major or minor collisions, but uncertainty as to the right of way is, perhaps, the most important of all operating defects bearing upon the danger of such accidents.

Operating rules frequently require that cars shall come to a full stop before crossing another line at grade, and a red band painted upon the traditional white post in such cases announces to the motorman his arrival within the danger zone. It seldom makes any serious difference to the public upon which side of an intersection a car stops, provided printed notices of the stopping points of inward and outward bound travel are conspicuously displayed. The full-stop rule is doubtless a step in the right direction, though it delays traffic somewhat in instances where the tracks can be seen in all directions for several hundred feet on each side of the intersection.

There must be no uncertainty about the right of way, whether the cars stop before the intersection or pass over it at greatly reduced speed. The exact right of way to be given depends upon the practice of the operating company; but in general, United States mail cars should take precedence over all other rolling stock, and traffic bound inward toward the business district should be regarded superior to outward travel. A foreign car operating upon a local system as part of a through interurban route should be given a clear headway whenever possible, for there is nothing more annoying to the through passenger than to finish the last quarter of his journey by traveling at a snail's pace behind some low-powered, obstructive car of the local lines; in fact, it is a question if a through car should be obliged to stop and pick up local passengers near the end of the run if it has a clear track ahead and is closely followed by a regular car of the terminal city system.

The approach of the cars at a junction point beyond which both take a common route must result in an arbitrary settling of the right of way. In general, the most direct route should be the favored one, but in certain cases arbitrary hard-and-fast rules will have to be laid down for the particular intersection point. The main issue is that the rules must be sufficiently inclusive to cover all the cases on the system, leaving no uncertainty to the judgment of the motorman. On steam roads interlocking switches and signals solve the problem of right of way at intersection points, but on surface electric lines tightly drawn and strictly enforced regulation seem to be the most feasible way of avoiding trouble. The subject is an important one for such collisions occur every few weeks on one system or another and the resulting damage suits are decidedly worth avoiding.

THE NEW YORK STATE ASSOCIATION MEETING.

It is seldom that a technical publication has the opportunity to furnish a report of the proceedings of so satisfactory a meeting as that which occupies so large a portion of the present issue. The quarterly conference, as the president named it, of the Street Railway Association of the State of New York was distinctly a satisfactory and instructive one.

The order of the day was business from the start and the president, almost in the same breath in which he announced the meeting open, also announced the first subject under discussion. From this point the discussion proceeded without a break through two extended sessions. The general subject for consideration at the meeting was "Track and Roadway," and a part of the successful result reached by the discussion was due to the logical arrangement under which the general subject was subdivided, and to the care with which each of the several papers had been prepared. As a whole the proceedings form rather complete specifications for the construction of electric railway roadway and track, especially in paved streets, and in addition some valuable information was given as to line construction.

Under the first subhead, "Track Construction in Paved Streets," three papers were presented. The first related more especially to the track foundation, the second to ties and rail supports and the third to methods of connection between ties and between ties and rails. In this connection it was especially interesting to note the conspicuous part which concrete is beginning to play in the construction of street railway foundations. Though the subject was discussed by a number of members, there was but one dissenting voice to the proposition that the best foundation for track in paved streets is a layer of from ten to twelve inches of concrete under the base of the rail, in which the ties, whether of steel or wood, were fully embedded. Decided preference seemed to be given to the use of steel ties; in fact the authors of two of the papers defined the best track construction for paved streets to be steel ties embedded in concrete and with from four to six inches of concrete under the ties and filling the spaces between the ties up to the level of the base of the rail. The discussion of this subject was sufficiently full and general to make the results of decided value to the electric railway engineer under the varying conditions met in different sections.

It is worthy of note that the advantages of a well-tied track, in distinction from one in which the rails are separately braced, was well brought out, and this feature apparently constitutes one of the reasons on account of which the steel tie is meeting with so much favor.

Probably the most generally interesting feature of the proceedings was the paper on "Standard Rail Sections for Paved Streets," taken in connection with the discussion which it called forth. The author of this paper had made great efforts to bring out the practices and opinions prevailing in a great many places and the unanimity with which the T-rail is favored in comparison with the girder rail for paved streets seems to indicate a change of sentiment on the part of the municipal authorities, which has taken place within the past few years. The author of the paper was perhaps all the more earnest and successful in his search for data of this character for the reason that he was confronted with the alternative of putting in a construction which he was convinced would be unsatisfactory or proving to the satisfaction of the municipal authorities that practice and opinion in many other cities were upon his side of the issue. The only objection that was brought out to the use of the T-rail was with reference to a few large cities and in restricted localities in smaller cities, where there was a large amount of heavy loading traffic. In the course of the discussion the

objection apparently narrowed itself down to a question of proper paving in connection with whatever rail was used, the objection to the T-rail being that the paving stone was liable to be irregularly worn next the gauge-line of the rail, making necessary frequent repairs to the pavement. The principal arguments in favor of the T-rail were well summarized in the report referred to, and may be briefly mentioned as follows: That with the T-rail the load is taken over the center; that with proper paving there is unlimited flange-way; the section permits of the use of a long angle bar, requiring less repair at joints; the rails are less noisy and stay where they are put; they are more substantial in every way and the cost is less, an equality of cost being established between a 90-pound T-rail and a 70-pound girder.

The discussion upon rail joints established the fact that there were advocates of various methods of welding and of the mechanical joint. A new form of joint, which is a combination of the mechanical and welded, was described, which seemed likely to meet with considerable favor. One paper described in detail the process of thermit welding and another gave an interesting tabulation of costs of electric welding. Some minor objections were stated with reference to each of these two methods of forming a joint. A new form of joint described as in recent use in Cleveland, is a combination of an angle-bar connection, forming the joint mechanically, and a welded section upon the base of the rail to form the electrical connection. The description of the operation of forming this joint and a statement of the items of cost were listened to with interested attention and various expressions of approval were given.

A discussion upon "Derailing Devices" gave emphasis to a thought which was brought out in connection with the preceding quarterly meeting of this same association, namely, the desirability of close co-operation between the railway association and the Board of Railroad Commissioners of the state. At the preceding meeting two questions which were debated by the New York State association were taken up at the request of the railroad commissioners. The matter of derailing devices was considered at this meeting at the request of the same authority and while the discussion did not go far toward the establishment of any new practice or determination of the efficiency of previous practice, yet one new plan of derailing switch and method of operation was brought forward for consideration.

Under the head of "Rail Bonds," a brief discussion took place as to the relative merits of the various types of bond upon the market, but this seemed to resolve itself into a matter of personal preference, and little data of determinative value was produced.

The only part of the programme relating to other parts of railway plant than that of roadway and track was comprised under the general head of "Overhead Lines." One member who was expected to produce a paper on "Center-Pole Construction," explained his delinquency from the fact that in going thoughtfully into the subject he had been unable to find any arguments in favor of that type of construction, but much in favor of span construction. His chief objections to center-pole construction were in the matter of supporting the trolley wire with a bracket arm, which made one point of the trolley wire fixed in comparison with the flexibility of the rest of the wire. This was said to be a frequent cause of the-jumping of the trolley wheel. The use of center-pole requires a greater distance from center to center of tracks, causing an added expense in ballasting and maintenance. While span construction costs more per mile than center-pole work, it was argued that taking into consideration grading and ballasting, the balance would be in favor of span construction.

The growing use of the catenary form of construction gives great interest to the paper upon this subject, in which a large number of forms of suspension were described in de-

tail. While this method of suspending the trolley wire has been considered especially adapted to the center-pole construction, there appears to be no reason why it cannot be used equally well with span construction; in fact the author of the paper pointed out that the only feature to which it would be necessary to give attention was the fact that owing to the additional weight of the messenger wire to be carried it was advisable to allow a little more dip between the point of support on the cross suspension and the connection between the messenger wire, than in the ordinary form of cross suspension. This construction is in use, and it is authoritatively stated that the results are entirely satisfactory.

As before stated, the two sessions were devoted entirely to the discussion of the subjects mentioned. One of the advantages of a small association was thus indirectly called to mind. The small association is able to perform its functions with less machinery than seems essential to the operation of a much larger body. The Street Railway Association of the State of New York is an excellent example of the amount of work that may be accomplished in a single day, if no time is lost in getting about it.

THE RELIABILITY OF TROLLEY SERVICE.

No better demonstration of the reliability of electric railway service is needed than that given during the past few weeks by the lines in the vicinity of Boston as contrasted with the service of the competitive steam railroads in the same territory. It has for some time been apparent that the schedules of both local and through trains entering the great terminal stations of Boston have become far too uncertain for the satisfaction of the general traveling public. Delays ranging from only a few minutes in the case of local trains with short runs, to several hours in the case of many through expresses have become so frequent that the Massachusetts railroad commission has issued an order requiring all delays above 10 minutes in the case of through trains to be reported for subsequent explanation throughout a period of 30 days.

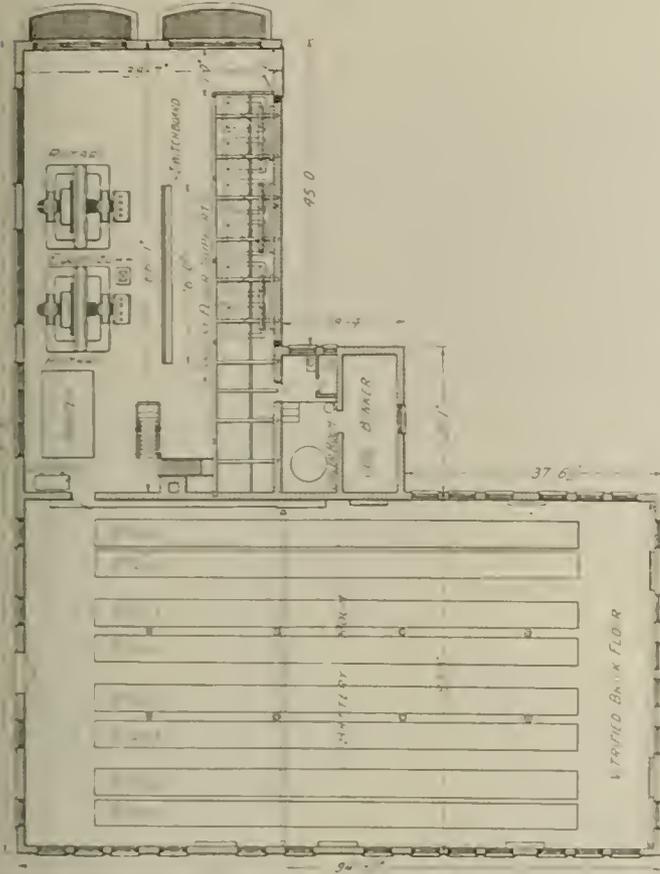
Whatever may be the causes of these lapses from schedule, carrying with them as they do enormous waste of productive time, it is most gratifying to the electric railway operator that few complaints of the lack of punctuality of trolley lines in the territory have been voiced by the public. Suburban residents boarding outward-bound cars have been sure of getting home at the usual hour, and inward-bound passengers have not been obliged to figure from 50 to 150 per cent extra running time in making business engagements. On some lines there have been annoying equipment breakdowns in the rush hours, but in proportion to the traffic handled there has been little trouble.

The modern large steam railroad terminal with its half-dozen or so miles of track under a single roof and its intricate interlocking slip switches, becomes an easy prey to a snowstorm which would be regarded as far from serious by a trolley manager. The upsetting of a few train schedules in the busy hours is liable to paralyze the entire traffic of a terminal costing a score of million dollars. Highly organized as such a machine is, it is extremely sensitive to derangement and it often happens that a freight wreck in Michigan or Indiana cumulatively delays the movement of suburban trains at Boston 24 hours later by causing some fast through express to fall far behind its timetable at its destination. The smoke and steam emitted by the present type of locomotive, difficulties in firing boilers in zero weather, unprecedented volumes of traffic and other causes contribute to the steam railroad situation, but whether the ensuing delays are justified or not, the fact remains that the electric lines are reaping the benefit of their greater reliability and are making the most of a welcome class of business.

NEW SUBSTATIONS OF THE METROPOLITAN WEST SIDE ELEVATED RAILWAY COMPANY.

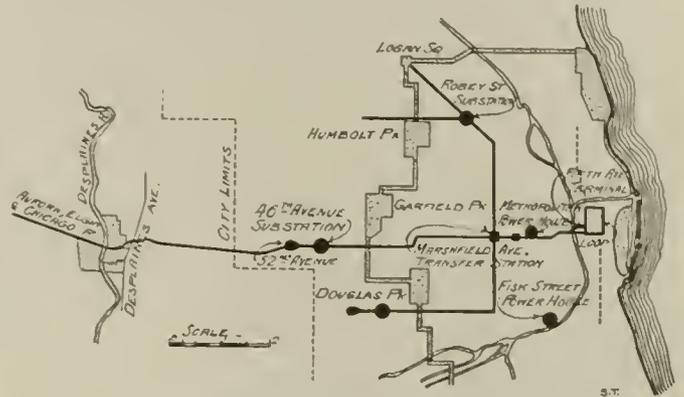
The Metropolitan West Side Elevated Railway Company of Chicago has recently put into operation two rotary-converter substations of interesting design. This company

supplied as direct current through the third rail and auxiliary feeders from a generating station between Loomis street and Throop street. This power house is located well downtown and as the lines have been built toward the west the feeders have been extended and enlarged until they have about reached the economical point for distribution with 600-volt current. While it might have been possible to increase the capacity of the generating station by the addition of a turbo-driven alternator, the physical conditions, with the power plant located as it is between two double-track elevated structures in a thickly built district, combined with the limited floor space



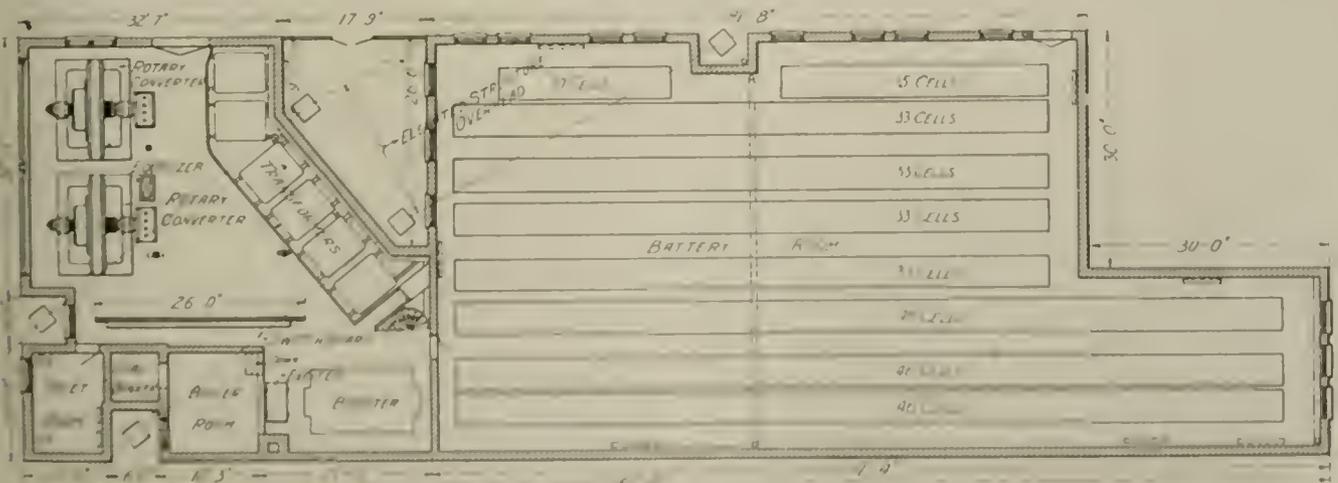
Metropolitan Elevated Railway—Floor Plan Forty-Sixth Avenue Substation.

operates 52 miles of elevated track consisting of a four-track structure from the connection with the Union elevated loop in the business district to Marshfield avenue, at which point the system divides into three double-track lines extending



Metropolitan Elevated Railway—Map Showing Location of Generating Stations and Substations.

and the difficulties incident to condensation and fuel supply, seemed to make it more advisable to obtain additional power from another source. When the amount of capital necessary to increase the capacity of this station, and its limiting features was compared with the cost of building rotary-converter substations and purchasing power, it was found that the substations had a favorable balance. By locating such substations at outlying points the investment for cables to carry both alternating and direct current, which would have been necessary with an increased capacity in this company's generating station, was not required. The present conditions warranted the building and equipping of two rotary-converter substations, one on the Garfield Park branch at Forty-Sixth avenue and the other near Robey street at the junction of the Humboldt Park and Logan Square branches, both substations to be operated with purchased power. At each of



Metropolitan Elevated Railway—Floor Plan Robey Street Substation.

north, south and west. The north branch again divides at Loomis street into two double-track lines extending west and northwest.

Heretofore, the power for operating all the cars has been

obtained from the power house at Loomis street and Throop street. The locations where batteries with booster sets had previously been operated. The rotary converter equipment now installed is the same for both stations, and therefore will be described for one station only. The physical conditions of the

ited the structures so that they are interesting in detail and will be described separately.

Robey Street Building.

The floor plan of the Robey street rotary-converter and battery station is shown in one of the accompanying illustrations. As the storage battery building and its equipment were already in operation at the time of planning for the rotary-converter equipment it was advisable to utilize for the substation the limited available real estate adjoining the battery room. The problem before the designers consisted of getting into this restricted space the largest capacity of apparatus possible. It should also be noted that this substation is directly under the elevated track-structure, making available a head room of only 12 feet. How well this problem has been solved is answered by the statement that this substation with a normal machine capacity of 4,500 kw. occupies a floor space of but 2,032 square feet, this area including a boiler room, coal bunker and toilet rooms. The unit capacity is 2.21 kw. per square foot of floor area.

This substation building at Robey street is of fireproof

nue substation there is floor space available for the addition of another unit with its transformers and switch apparatus. The rotary converters are wound for 25-cycle, 380-volt alternating current and 600-volt direct current, and operate at 250 revolutions per minute. The limited head room of 12 feet at the Robey street substation necessitated placing the rotary converters with their bed plates depressed so the top is only two inches above the floor level.

Each rotary converter is supplied with alternating current from three 550-kw., oil-insulated self-cooling transformers which have a ratio of 9,000 to 380 volts. The transformers are supported on I-beams so that there is a free circulation of air on all six sides of the cases. At the Robey street substation it was necessary to place the transformers at a lower level than the machine floor in order to provide head room for removing the cores, but at the Forty-sixth avenue substation the transformer cases rest on beams interconnected with the machine-floor structure. Here the high-tension gallery is directly above the transformers with a floor having heavy I-beams so placed as to make them available



Metropolitan Elevated Railway—Interior Forty-Sixth Avenue Substation.

construction with concrete foundations and roof, brick walls and steel window frames with wired glass.

Forty-Sixth Avenue Building.

Like the situation at the Robey street station the ground area at the Forty-sixth avenue location was also limited. The size of this building was determined by a battery house on one side, a car storage yard on another, the Garfield Park main-line elevated structure on the third side and the street line on the fourth. As will be noted from the illustrations, the arrangement of this substation conforms more to standard practice than that of the Robey street station.

The Forty-sixth avenue substation building is 39 feet wide by 66 feet long and of rectangular shape joining at one end with the storage battery room. The building is of neat design and of the fireproof type with concrete floors, brick walls and cement tile roof supported by steel trusses.

Rotary and Transformer Equipment.

Each substation has two 1,500-kw. capacity compound-wound Westinghouse rotary converters with mechanical oscillators and speed-limiting devices. In the Forty-sixth ave-

ue substation there is floor space available for the addition of another unit with its transformers and switch apparatus. It will be noted that at this station the switchboard is set at a sufficient distance from the transformers to allow cores to be handled between it and the transformer cases.

Storage Battery Equipment.

The storage battery equipment at the Robey street substation comprises 295 cells with 49 type-R elements each. This battery has a one-hour rate of 2,880 amperes.

The battery at the Forty-sixth avenue station consists of 296 cells of 49 type-G elements each and has a one-hour discharge rate of 1,920 amperes. Both batteries were furnished some few years ago by the Electric Storage Battery Company of Philadelphia.

Switchboards.

The switchboards for the two stations are alike except that one is assembled righthand and the other lefthand. Each board comprises the following panels with their complements of instruments:

Two high-tension panels with oil-switch levers, and three-phase integrating wattmeter on entering lines.

Two alternating-current rotary-converter panels, each having

three single-pole switches, one for each phase, one three-pole single-throw starting-motor switch, one two-pole single-throw synchronizing-rheostat switch, an alternating-current ammeter for measuring the input to each rotary and a power-factor meter.

0000 conductors insulated with paper. It is interesting to note that the two cables to each substation are laid in separate duct systems following different routes between the power house and substation so far as was practicable.

Two direct-current rotary-converter panels each with a positive and a negative main switch, integrating direct-current watt-



Metropolitan Elevated Railway—Exterior Robey Street Substation Showing Elevated Structure Above.

meter, an ammeter, 3,000-ampere circuit-breaker, rheostat handle and voltmeter plug.

Battery regulating panel with a carbon regulator operated from the main bus.

Six standard feeder panels, each with a circuit-breaker, ammeter and single-throw switch.

Three panels for controlling the battery booster, motor and exciter sets.

Arrangement of Circuits.

Each station is supplied with 9,000-volt, 25-cycle alternat-

As the cables enter the substation they end in terminal bells and each conductor has a disconnecting knife switch. From the knife switches the conductors are led to non-automatic oil switches in series with automatic overload-trip oil switches. Between these two oil switches, which afford flexibility of operation in case of feeder cable troubles, there is a set of disconnecting knife switches. From the auto-



Metropolitan Elevated Railway—Interior Robey Street Substation.

ing current through two independent high-tension cables from the Fisk street station of the Commonwealth Electric Company (in one case 9½ miles and in the other 6 miles distant). These cables are of the three-core type consisting of No

matte oil switch the high-tension conductors are led direct to the primary terminals of the step-down transformers.

The arrangement of the automatic and non-automatic oil switches in the 9,000-volt conductors is such that both or

either one of the rotaries may be operated from either incoming high-tension line. Under normal operating conditions one rotary is operated from each line with the tie switches open so that if the high-tension supply is interrupted on either line but one rotary will be affected.

From the low-tension side of the transformers the alternating current is taken direct to the rotary-converter panels on the switchboard so that each phase may be connected through the medium of the single-pole switches to the three-slip rings of the rotaries.

The rotary converters are started by separate motors mounted on the same shaft as the rotary converter armatures. The current supply for these motors is taken from the low-tension side of the transformers at the machine panels of the switchboard.

From the brushes on the direct-current side of the rotary both the positive and negative conductors are taken to the switchboard through the switches and direct-current instruments to the buses from which the feeders leading to the third rail through the feeder panels and ground return cables are connected.

Results of Operation.

With the combination of instruments as used in these substations the total alternating-current input and the total direct-current output are measured direct, their ratio giving the station efficiency. By comparison with the measurements taken at the generating station it is possible to get a definite idea as to the line loss.

The contract under which the Metropolitan company buys its current at present, provides for a maximum of 4,000 kw. and as the railway company can utilize the total output of the substations to a good advantage it is interesting to note how high the load factor has been maintained. During the first month of operation this factor was 76 per cent and for the month of December, the second month of operation, the load factor was increased to 85 per cent and it is anticipated that this figure can be maintained. This unusually high load factor is made possible by the use of the storage batteries which are charged during the light midday loads and at night, and discharged at periods of heavy load to cut down the peaks.

Since the new substations have been in operation it has also frequently been found possible to operate the entire elevated system of the Metropolitan company from 9 p. m. to 5 a. m. from the substations permitting the power house to shut down for convenience in making repairs, and overhauling equipment.

The construction of these interesting substations and the operation and maintenance of the motive power and way of the Metropolitan West Side Elevated Railway Company are in charge of Mr. B. H. Glover to whom thanks are due for the information contained in this description. Acknowledgment is also made to the Commonwealth Electric Company for interior views of the substations.

The production of pig iron and steel throughout the world last year is estimated at 60,524,505 tons, as compared with 40,543,000 tons in 1900, showing a probable increase in five years of no less than 19,981,505 tons. The output in the United States is set down at 25,602,000 tons; that of Germany, at 12,273,935 tons; that of the United Kingdom at 10,105,000 tons; that of France, at 3,873,504 tons; that of Russia, at 3,000,000 tons; that of Austria and Hungary, at 2,000,000 tons, and that of Belgium at 1,448,065 tons. The figures are necessarily only approximate; but they exhibit an astonishing advance in production during the last six years, the increase of the seven principal metallurgical countries being as follows:—United States, 11,813,000 tons; Germany, 3,778,936 tons; United Kingdom, 1,197,000 tons; France, 1,174,504 tons; Russia, 125,000 tons; Austria and Hungary, 460,000 tons, and Belgium, 430,065 tons.

CENTRALIZATION AT NASHVILLE.

It has long been agreed that an ideal condition for city street railway operation would obtain were it possible to locate the power house and car barns at a point not far distant from the traffic center, and yet few instances can be cited where this has actually been accomplished. The traffic center is usually near the heart of a city where the property has a value for commercial purposes that makes it almost prohibitive for street railway buildings. There usually is also a public sentiment that prevents the locating of car houses, shops and power plants in or near shopping and the business districts.

One of the exceptions that can be cited is Nashville, Tenn., where the Nashville Railway & Light Company has approached the ideal condition to a remarkable degree. This company's transfer station, from which all cars are started on their runs and at which point about 99 per cent of all transfers of passengers are made is located near Deadrick street and occupies the entire block between Third and Fourth avenues—less than two squares from the business district and just opposite the public square. One square to the north of the station are the car houses and shops, and two squares to the east is the power house.

The money saved annually by this comparatively unique situation cannot readily be estimated in dollars and cents, but from the fact that cars are never required to dead-head more than one square before taking their regular schedule, it will be seen that the dead mileage, and the cost of getting the car from the barn to the center of traffic is reduced to a minimum. The advantages of having the power house located at the point from which the peak load is drawn is also apparent.

During the past year the Nashville Railway & Light Company has expended nearly \$2,000,000 in new work. This includes the construction of a new car house, repair, paint and carpenter shops—at a cost of about \$250,000—the remodeling and enlarging of the power station and rebuilding the tracks outside of the paved district of the city. During the present year the tracks in the down-town district will be relaid with 7 or 9-inch rail.

The Nashville Railway & Light Company is one of the properties of Isadore Newman & Son's of New York, and though it is operated entirely distinct from the affiliated companies it is closely allied with them.

The affiliated companies are the Knoxville Railway & Light Company, Birmingham Railway Light & Power Company, Little Rock Railway & Electric Company, Memphis Street Railway Company and the Houston Electric Light & Power Company. The financial interests of these companies maintain a consulting, auditing and operating department for railways, the duties of the superintendents of which are to visit the various properties and by co-operation with the heads of the local departments aid in solving the intricate problems with a view toward the possible reduction of maintenance and operation expense, increasing of the revenues and providing better service for the public. Mr. Hugh M. Beugler, formerly associated with the Elmira (N. Y.) Water Light & Railroad Company, is advisory superintendent of the railway operating department of the Newman interests; Messrs. Ford, Bacon & Davis are the company's engineers and have charge of all improvements.

The officials of the Nashville Railway & Light Company are: Percy Warner, president; J. H. Fall, vice-president; H. C. Walters, secretary and treasurer; H. A. Davis, superintendent of railway, and J. P. W. Brown, superintendent of lighting.

On account of the shortage of fuel in the northwest, Manager W. S. Dimmock of the Tacoma Railway & Power Company has given orders to the trainmen that all construction, freight and passenger business for a limited time be made secondary to the handling of cars carrying fire-wood.

NEW YORK STREET RAILWAY ASSOCIATION.

The quarterly meeting of the Street Railway Association of the State of New York was held on January 11 at the Hotel Iroquois, Buffalo. The register, which was circulated in lieu of roll-call, showed 51 in attendance as follows:

Those Present.

LeGrand Brown, consulting engineer, Rochester.
 W. R. W. Griffin, superintendent, Rochester & Eastern Rapid Railway, Canandaigua.
 R. P. Stevens, general superintendent, Auburn & Syracuse Electric Railway, Auburn.
 I. E. Matthews, chief engineer, Rochester Railway Company, Rochester.
 C. B. Fairchild, Jr., Electric Traction Weekly, Cleveland, O.
 E. P. Roundey, engineer maintenance of way, Syracuse Rapid Transit Company, Syracuse.
 Charles H. Clark, engineer maintenance of way, Cleveland Electric Railway Company, Cleveland, O.
 M. J. French, engineer maintenance of way, Utica & Mohawk Valley Railway Company, Utica.
 F. A. Bagg, chief engineer, Fonda Johnstown & Gloversville Railroad Company, Gloversville.
 Francis W. Lane, Electric Railway Review, New York City.
 T. W. Wilson, general manager, International Railway Company, Buffalo.
 Albert H. Stanley, general manager, Public Service Corporation of New Jersey, Newark, N. J.
 Charles L. Wilson, traffic manager, Toronto & York Radial Railway Company, Toronto, Canada.
 J. S. McKechnie, chief engineer, Toronto & York Radial Railway Company, Toronto, Canada.
 John E. Duffy, superintendent, Syracuse Rapid Transit Railway Company, Syracuse.
 E. T. Peck, general manager, Schenectady Railway Company, Schenectady.
 Andrew J. Farrell, claim agent, International Railway Company, Buffalo.
 E. E. Hawkins, president and treasurer, Ogdensburg Street Railway, Ogdensburg.
 A. R. Meyers, electrical engineer, Buffalo & Lake Erie Traction Company, Buffalo.
 F. D. Jackson, superintendent of track, International Railway Company, Buffalo.
 H. L. Mack, superintendent of line, International Railway Company, Buffalo.
 George C. Graham, superintendent of car equipment, International Railway Company, Buffalo.
 W. W. Myers, paving inspector, International Railway Company, Buffalo.
 F. Symons, Peekskill Lighting & Railroad Company, Peekskill.
 Stuart Wilder, vice-president and general manager, Peekskill Lighting & Railroad Company, Peekskill.
 J. L. Holmes, roadmaster, Rochester & Eastern Rapid Railway Company, Canandaigua.
 W. F. Burket, superintendent of line, Rochester & Eastern Rapid Railway Company, Canandaigua.
 B. V. Swenson, secretary and treasurer, American Street & Interurban Railway Association, New York City.
 B. Wilbur, roadmaster, Syracuse Rapid Transit Company, Syracuse.
 E. D. Watkins, manager, Lima & Honeoye Falls Railroad Company, Lima.
 B. L. Coy, division superintendent, International Railway Company, Buffalo.
 C. A. Coons, superintendent of transportation International Railway Company, Buffalo.
 William A. Hinkle, assistant engineer, J. G. White & Co., New York City.
 Jos. D. Evans, division superintendent, J. G. White & Co., Albion.
 G. A. Harvey, electrical engineer, International Railway Company, Buffalo.
 John Hanf, master mechanic, International Railway Company, Buffalo.
 W. J. Harvie, electrical engineer, Utica & Mohawk Valley Railway Company, Utica.
 Henry W. Blake, Street Railway Journal, New York City.
 C. Gordon Reel, general manager, Kingston Consolidated Railroad Company, Kingston.
 H. Penoyer, engineer track and roadway, Schenectady Railway Company, Schenectady.
 M. Sheehan, division superintendent, International Railway Company, Lockport.
 J. N. Shannahan, general manager, Fonda Johnstown & Gloversville Railroad Company, Gloversville.
 J. H. Pardee, general manager, Rochester & Eastern Rapid Railway Company, Canandaigua.
 W. Jackson, Street Railway Journal, New York City.
 P. N. Wilson, roadmaster, Rochester Railway Company, Rochester.
 R. E. Dunforth, general manager, Rochester Railway Company, Rochester.
 Julius C. Gilch, general manager, Buffalo & Lake Erie Traction Company, Buffalo.
 E. H. Hubel, general auditor, Buffalo & Lake Erie Traction Company, Buffalo.

R. J. Garvin, superintendent of buildings, International Railway Company, Buffalo.

George Chambers, tax agent, International Railway Company, Buffalo.

H. J. Pierce, president, International Railway Company, Buffalo.

President J. N. Shannahan, of Gloversville, called the meeting to order and announced that at this quarterly conference, the executive committee had determined to devote the entire meeting to a discussion of "Track, Roadway and Overhead Lines," and the meeting proceeded immediately to the reading of the papers and their discussion.

Track Construction in Paved Streets.

The first paper was on "Track Construction in Paved Streets," by I. E. Matthews, chief engineer maintenance of way, Rochester Railway Company, which appears elsewhere.

In connection with this paper was taken up that by F. D. Jackson, superintendent of track, International Traction Company, Buffalo, on "Concrete Stringers and Concrete Stringers with Ties and Steel Ties" and also one entitled "Tie Plates, Braced Tie Plates and Tie Rods," by E. P. Roundey, superintendent of tracks, Syracuse Rapid Transit Company. (The latter paper was published in the Electric Railway Review of January 12 and the former appears elsewhere.)

Mr. F. A. Bagg (Fonda, Johnstown & Gloversville) asked Mr. Matthews if his estimate of cost included the cost of the paving, to which Mr. Matthews replied that in each case all the figures he gave included not only the cost of the track, but the cost of the paving itself. In Rochester roads are required to maintain the pavement between the tracks and two feet outside of the track. About \$2.75 or \$2.80 was paid for block stone.

Mr. LeGrand Brown (Rochester) asked Mr. Matthews if on the track laid where every third steel tie was carried across, it helped to maintain the track. At that time the track was laid with 4½-inch, old Johnson section-B rail, inverted and clasped with clips, every third one running across.

Mr. Matthews said that that track was practically as good today as when it was laid, that is, in brick pavement. The track deteriorated next to the rail to some extent, due to heavy wagon traffic, but the track itself is in perfect condition.

Mr. M. J. French (Utica & Mohawk Valley) asked both Mr. Matthews and Mr. Jackson their opinion as to the relative noisiness of the concrete construction and the old construction in which the broken stone was used underneath and the regular paving above that, as compared with the construction in which the steel ties and entire concrete construction is used. He found that was a great argument against the concrete construction. Mr. Matthews thought there would be possibly a little more rumbling, but did not think the concrete construction with steel ties very objectionable on account of the noise.

Mr. E. P. Roundey (Syracuse Rapid Transit) asked Mr. Matthews what was the object of using a full-grooved rail in paved streets. Mr. Matthews replied that the city authorities in Rochester would not allow the use of a regular girder rail; only a grooved girder rail. He thought the full grooved rail made a better looking pavement, and possibly a better track in some respects. Certain grooves would be very objectionable on account of filling up with dirt in winter and getting clogged with ice and snow. The Trilby rail section is objectionable in that respect, but sections are now made which have a wider groove and which seem to be very satisfactory.

Mr. Charles H. Clark (Cleveland Electric) asked if there was any trouble with suburban cars going over Trilby rails. To which Mr. Matthews replied that his suburban cars did not have a very large flange and they did not have any trouble. Mr. Clark explained that in Cleveland, on Lake

avenue, where the Lake Shore electric comes in, they had the Trilby rail and had had a great deal of complaint from the Lake Shore people on account of flanges breaking, the inside of the flange of the wheels rubbing against the inside of the flange of the Trilby rail and this, of course, had a tendency to press the wheels outward on the bottom, breaking the flanges. They wanted all the rails ground, so as to reduce the flange, but it was concluded to widen the gauge on account of their heavy flanges.

Mr. W. R. W. Griffin (Rochester & Eastern) said that the Rochester & Eastern came in over the Rochester Railway track, and a portion of the Trilby rails happened to be very narrow, made for a $\frac{3}{4}$ -inch flange, and the trouble found was with the inside gauge. They had to set out the wheels somewhat more than $\frac{1}{8}$ inch and regauge the track to overcome the difficulty. The first cars which came in on these tracks used cast wheels, and the tracks broke the flanges very badly, but after it was recognized that the inside gauge had to be widened out, and after steel wheels were put on there was no trouble.

Referring to the matter of noise Mr. F. D. Jackson (International Railway) said that there might be more noise on solid concrete construction, because it is more rigid, but it would depend on conditions. For instance, on a wet day, or on a day when the rail was perfectly clean, the rumbling noise was not any more than with the other style of construction, but that on a dry day, when sand gets on the rail, it would naturally make more rumbling because there is less yield to the substructure.

Mr. Charles L. Wilson (Toronto & York Radial) asked if any of the members had any experience in using sand or coarse gravel in making up the mixture for concrete, instead of broken stone. Broken stone was becoming more and more difficult to get. He had had several pieces of track put down in which coarse gravel was used in place of broken stone, and had had very good results. Mr. C. H. Clark referred to the Herkimer bridge, at Utica, and said the concrete mixture used in that construction was made of gravel, no broken stone being used. Mr. LeGrand Brown had put in a large quantity of gravel in some paving work which he did in Canada, and his opinion was that it made better concrete than the ordinary broken stone. Mr. Clark added that it was important that concrete should be mixed accurately. He used a 3-foot cubical box and filled it level full with gravel. Water was poured into it until the box was filled with the water and gravel. The amount of water placed in the box gave the amount of the voids in the gravel. In that way the quality of the concrete could be determined exactly. He believed the best concrete was obtained by making it out of gravel, but there must be no guesswork in the mixing of the concrete. On the Herkimer bridge the proportions were 1— $2\frac{1}{2}$ — $5\frac{1}{2}$.

Mr. Roundey said he took gravel just as it came from the bed, and considered that he got a better job of concrete than city contractors who use crushed stone and sand. The proportions were about 1—3—7, mixed in a box without a bottom.

Mr. M. J. French said that in 1894 he laid some gravel concrete, mixing it in proportion of 1 of cement to 10 of gravel. A paving contractor had occasion afterward to dig across one of the trenches in which the concrete had been used, and he said it was the toughest concrete he ever struck. There was no doubt in his mind but that the ideal concrete material is composed of all sizes of stone, the smaller sizes of stone filling the voids of the other, and in using gravel one was more likely to get the voids filled. The concrete composed simply of sand and 2-inch stone was apt to be a rather poor concrete.

Mr. B. Penoyer (Schenectady Railway) said he used crushed stone, measured the proportions in a box and used 1—2—6. He said concrete stood much better than the con-

crete as put in by the city, in the paving alongside the track.

Mr. F. A. Bagg (Fonda Johnstown & Gloversville) referring to Mr. Jackson's paper said it seemed to him that the steel ties placed 10 feet apart had not a very important part to play in the track construction after the concrete had set and asked if an ordinary yellow pine tie would not answer just as well as a steel tie. Assuming that the concrete was set and the work all done, if the steel tie were eliminated, he asked if the track would not stand almost as well. To which Mr. Jackson replied that it might stand almost as well, but the tie plays the part of holding the gauge while the construction is going on, and also after. The concrete is brought only up to the tread. If the concrete should break, on account of the pounding of the cars over it, the tie acted to hold the track in place. With a Carnegie steel tie he thought there was better holding power, because of the holding power of the cement against the web and also underneath the top flange. If the concrete should settle, or the bottom should settle underneath the concrete, between the ties, then the ties would act as a support in that particular case.

Mr. T. W. Wilson (International Railway) said that there was one point which Mr. Jackson did not bring out clearly, and that was that the concrete extends under the steel tie, so that the tie itself is supported by 6 inches of concrete. As for the use of wooden ties, the life of wooden ties is from 8 to 10 years, or possibly 12 years, and it is figured that the tracks should last at least 15 years, and it seemed to be poor economy to put a wooden tie in permanent construction of that sort. He believed tracks could be relaid after the rail is worn out, simply by taking out the stone, removing the rail, and replacing a new rail on the steel ties, without removing the base of the track.

Mr. C. H. Clark said he was using Carnegie steel ties in Cleveland, laid on 5-foot centers. He put 6 inches of concrete between the tracks and 4 inches under the Carnegie steel tie, which gave 10 inches of concrete and tie-rods every 5 feet.

Mr. French asked Mr. Jackson whether they had any occasion to take up any of the rails over the steel ties, and whether there was difficulty in replacing any given portion of the track, as far as gauge is concerned, i. e., the clips holding it to gauge; whether there was any wear that would make a loose gauge. Mr. Jackson said he had only just started the construction this year, but saw no reason why there should be any trouble at all, because it would only require a bolt to be used or different clips to be used in special places.

Mr. M. J. French, in answer to Mr. Bagg's question, stated that in Utica he had used a few Carnegie steel ties during the past year, and instead of stopping the concrete at the bottom of the rail, had brought it up 2 inches over the base of the rail, and in that way they got the whole steel structure bound into the concrete, so that there was no liability of a movement of the rail. They had to be careful in tamping the concrete thoroughly under the rail on account of the natural shrinkage of the concrete as it dried out.

Mr. Clark said that could not be done with block stone pavement; it might be done with brick pavement, or with 7-inch block, no cushion. Mr. Roundey said that in Syracuse, where the concrete came 4 inches above the top of the tie, it would not hold the rails to gauge. It might be due to the concrete. He knew the concrete was not good; it was put in ten years ago; and he thought it was natural cement. He did not think concrete was of much use in holding a track to gauge; it might support it. Mr. French's idea was not to use the concrete to hold the track to gauge, but to prevent vertical motion. He would not lay a track without tie-rods in it, with the present type of car. Mr. T.

W. Wilson said in connection with Mr. Clark's statement, that was one of the criticisms which has been made on tracks in Buffalo, and it was a question in his mind whether they should not increase the number of steel ties and put them 5 feet apart instead of 10 feet, and also put the tie-rods 5 feet apart. On the steel tie question he expressed the opinion that a steel tie 4 inches deep was sufficient for street railway work, this year the Carnegie Steel Company, at his suggestion, rolled a steel tie 4 inches deep, and 41 cents cheaper than the 6-inch. As to concrete, either gravel or stone concrete was all right. There were two things to be considered in connection with concrete; first, the cement, and second, the method of mixing. The cement should be good standard Portland cement.

Mr. LeGrand Brown said that the track put down in 1899, in Rochester, was all 4½-inch steel ties made of old rail.

Mr. I. E. Matthews (Rochester) asked Mr. Jackson, in the use of the steel tie, where the street has been torn up, whether they used a long tie to connect the two tracks together.

Mr. Jackson said they used tie-rods and made each track independent of the other. They used 60-foot, 85-pound T rails and also 60-foot 100-pound T-rails. He said there was no trouble from getting out of line and there were only half the number of joints, and half the number of bonds.

Mr. A. H. Stanley (Public Service Corporation of N. J.) asked if any one knew of a failure through the use of concrete in track construction. He knew of a large city, where they had used a good deal of concrete in their track construction, and every mile of track they laid, using the concrete under the ties, either metal ties or wooden ties, had to be rebuilt. None of it lasted ten years. That track construction provided for 6 inches of concrete underneath the tie, and later on that was increased to 13 inches. There could be no criticism about the method adopted in the construction of that track. It was, he said, built in the best possible manner, using the best kinds of material, employing either brace plates or tie-rods, both 9-inch and 7-inch rail. The tracks in question were single-track roads, light traffic, streets with heavy traffic, with the interurban cars weighing not to exceed 65,000 pounds. That experience had been of value to him in the reconstruction of the tracks in properties in New Jersey, on which they were building a great many miles of track each year, and practically all of it on public streets. There broken stone was used entirely, there was no concrete used underneath the ties. The only place concrete was used was between the ties for supporting the paving. The subgrade was rolled before any stone was put on it, with a 15-ton roller. Many soft spots were found and in every instance they were able to pound down the grade at least 2 inches by the use of the roller; in some places 3 inches. As the stone was laid on the subgrade, it was rolled, and the process continued until there was 6 inches of foundation. The ties were laid and the ends tamped, and the cars put on the track as soon as the rail was laid, the idea being to get as much weight as possible and as soon as possible on the track. The concrete was then put between the ties to the proper depth, depending on the pavement used. Some of that track had been laid for three years, and there was not the slightest depression. The interstices between the rails were filled with cement grout, making it as nearly water-proof as possible, and there was no deflection in the pavement or the rail. It appeared to him as if he was in the enemy's country in the use of concrete. In reply to a question of Mr. French as to the manner in which the structure failed, Mr. Stanley replied that the concrete broke—the rail broke through the concrete. Almost immediately after the heavy cars were put on, it started to break through and the metal tie buckled, and threw the track out of gauge. These ties were placed in some instances 10 feet apart in

other cases 5 feet, 3 feet and 2½ feet, and all sorts of methods were used to keep the track up.

Mr. F. Simmons (Peekskill Lighting & Railroad) asked if it was the practice to continue to operate the cars over the road during the setting of the concrete. Mr. Stanley replied that where the concrete was used the track was idle for seven days, and in most instances for fourteen days.

Mr. M. J. French thought Mr. Stanley's objection to the concrete must be from the fact that it was poor concrete, and nothing else, if it would not stand as well as loose broken stone under the car. The concrete had the stone and the cement in it, whereas Mr. Stanley simply had the loose stone in the present work he is doing.

Mr. Matthews described an experience of a couple of years ago in the case of concrete construction, where a waterpipe broke underneath the pavement and washed out a large hole under the concrete 3 feet in depth, and the track was operated over that washout for some time before it was discovered. The concrete did not give way.

Mr. C. H. Clark had the same experience in Cleveland. For six months a depression was noticed. The city sent its men to the place and started to repair the pavement, and they found there was a hole under the track probably six or eight feet wide caused by a broken waterpipe, and the water flowed into the sewer, under the solid concrete track construction.

Mr. C. B. Fairchild, Jr., related an instance where they did a great deal of concrete work. There was the same trouble Mr. Stanley spoke of, and after a long series of experiments the depth of the concrete was increased to 18 inches, and there was no further trouble.

Mr. Stanley said the point he wanted to make was the advantage of using concrete over the broken stone, if broken stone is cheaper. Mr. F. D. Jackson asked, if with the use of broken stone, the pavement would stand up against the rail as well as if concrete were used, and if in time the rail and ties would not work and allow moisture to go down underneath the stone, and the pavement settle from the rail. Mr. Stanley replied that in his territory there was as heavy teaming as exists anywhere in the United States. The track had only been down three years, but there was not the slightest break in the track, nor the slightest depression.

Mr. William A. Helndle (J. G. White Co.) stated that he had had some experience in track laying, principally in the English type of construction, entirely of concrete, using no ties or sleepers whatever. His company had had a great deal of the solid mattress type of track construction in connection with its foreign contracts, bedding the rails entirely on the concrete and on stringers alone, having a stringer under each rail from 9 to 12 inches deep and 18 inches wide. The whole secret of that type of construction was the foundation and the absence of water. It had been found in the English type of concrete construction, or in any type of concrete construction, if there was a bad foundation or an excess of water, moisture, or anything of that kind, the rail would eventually begin to pump, rise up and down, and follow the motion of the car, and this was increased until the concrete immediately under the base of the rail was worked up into a powder. The concrete in time would flow away and give a greater rise and fall of the rail. Traffic here was considerably heavier than they had in England, but there they were confined entirely to concrete stringer construction, very heavy grooved glider rail, and these gave the best results, but the cost of installation was very great.

The president announced that there had been an invitation extended to the members in attendance at the quarterly conference by the Central Railway Club to attend its annual banquet to be held in the hotel that night at 7 o'clock.

Standard Rail Sections.

Mr. C. Gordon Reed, general manager, Klugston Connell

dated Railway, presented a paper on "Standard Rail Sections for Paved Streets."

(On account of the illustrations forming a part of Mr. Reel's paper which could not be prepared in time for publication this week, the discussion upon the paper is also omitted, and will be published with the paper next week.)

Rail Joints.

The first paper on the subject, "Rail Joints," was on "Thermit Welding," by Mr. M. J. French, engineer maintenance of way, Utica & Mohawk Valley Railway Company.

Mr. French read the paper as published elsewhere, and Mr. P. N. Wilson, roadmaster, Rochester Railway Company, presented the paper on "Electric Welding," which is given in another column.

Mr. Wilson concluded by asking a question. "The cost of putting on step joints, or bonds, labor and material is more by about one dollar than welding all the joints. The cost of putting on a 9-inch improved mechanical joint is about the same as the welding cost. Why does the general manager not weld?"

Mr. T. W. Wilson (International Railway Co.) answered that he was one of the general managers who does weld, and believes he had more welded track than any city in the country. But he was obliged to say that lately he had been getting away from the electrically welded joint. In the first place, it was hard to weld the joints in the beginning. A certain number of joints must be guaranteed daily—four joints an hour. If anything went wrong the company was under penalty to pay for the hours that the welder remained idle. He added that they had breakages every year on track that was welded in 1899. There were breakages last year. The first year after welding there was a number of breakages. They always occurred in the winter, and it was quite an item of cost to cut out the broken joints and replace them. They cannot be welded because there is no welder at hand. Continuity was broken until the welder was on hand again. Of late years he had been getting away from the electrically welded joints. It was an admirable joint, he said, after it was welded—the Main street track in Buffalo is all electrically welded—but the question of repairs made it a question in his mind whether it was economical to weld joints.

As to the thermit weld, he had been looking with interest on its record. He thought that there was a great deal in the future for the thermit weld. The reason was that it did not require any large mechanism or a train of cars to apply it. The electric weld would be a better joint if it could be put on with a brush and pot, but the trouble was it was necessary to have a machine and it was impossible, except by owning one of the machines, to keep up the track. On some new track work to be done this year he was seriously considering going to the Nichols riveted joint, such as used almost exclusively in Philadelphia. He said this had been used by the Philadelphia Rapid Transit Company for their standard since March, 1901, and since that time they had laid over 135 miles of track in which this joint had been used. It is a riveted joint, riveted to the web of the rail, and the return is obtained by means of spelter, both in the base and the head. The question of electrical return is one point about the joint he was not entirely satisfied with. As a mechanical joint Mr. Wilson was of the opinion that it was the best mechanical joint on the market. He then asked Mr. Clark for a description of the joint that was in use in Cleveland; a combination of a riveted joint, and on the base of the rail, in order to make the conductivity, a small thermit weld.

Mr. C. H. Clark (Cleveland Electric Railway) said that in Cleveland they, perhaps, had had more experience with joints than in any city of the United States. They had the old electric weld, the chuck weld, the cast weld, the new electric weld, the thermit weld, continuous joint plates, the Weber joint plates, Atlas joint plates, the common joint

plates, and the Clark joint. During the year 1905, they placed about 3,500 thermit welds and in the year 1906, concluded they would not use the thermit weld. He had this to contend with in Cleveland—in case of a broken joint it was necessary to get a permit and state the exact time of making the opening, and pay a city inspector 46 cents an hour to watch the work. If there was only one joint broken, it would take five hours from the time of making the opening to get the weld on and get it paved up, even if the pavers came right to the spot and attended to the job as soon as the repairs had been made. One could consider that he had spent \$2.30 for politics. He concluded he would try the combination between a common joint and a thermit. The rail was drilled for the common wrought splice bar, such as the Lorain Steel Company and the Pennsylvania Steel Company furnish. The holes in the rail are drilled 11-16 inch, and the holes in the plates are round holes 11-16 inch. He rigged up a car with two Christensen air pumps, No. 2, having a bank of tanks, and used an air reamer. The holes were reamed to 1½ inch and a 1½-inch machine bolt for hexagonal nuts and hexagonal heads was used to make a dry fitting bolt. In laying the rail, two holes were reamed by hand and the workman applied two bolts in these holes and screwed them up as tight as he could get them. Then the car came along, carrying the bolts for the rest of the joints so that the bolts were not lying on the ground and getting rusty. The man in charge of the car reamed the holes and placed the bolts in and the workmen followed along and tightened them up. As a general rule there were five or six jobs going on at the same time, and the men could run from one job to another. Then the thermit car came. The weld which was placed on the base of the rail was the same size as the regular thermit weld, only it was placed across the base of the rail. At first this weld was ½-inch thick at the edge of the base of the rail, and ¾-inch thick at the center. Sawing the joints in two, to see how much of the joint was welded, it was found that the center of the rail was not welded, and it was concluded that the steel was settling in the bottom of the mold and by the time it got to the rail it had cooled sufficiently so that it would not weld. After that, instead of making the weld ¾-inch thick in the web of the rail, it was made 1¼-inch thick. This caused the hot steel to flow from one side to the other continuously, and in this way he succeeded in welding the base of the rail thoroughly, and up into the web. Joints sawed in two showed a perfect weld, and the strength of the joint was greatly increased. There was about 6 inches of solid welded metal, the size of the weld and the base of the rail together making about 6 inches of metal. If that is figured at 40,000 pounds for tensile strength, it would give 120 tons pull at this point. He considered that the six bolts on each side of the joint will stand a safe shear, being a double shear of 90 tons, so that he did not believe that the rail would ever break at the joint. When concreting, a hole was left at the joint. The welder came along after the concreting had been done, and then the hole was filled up with concrete. He said he had placed about 3,000 of them and had not found a broken joint. The electricians tested out one rail on Jennings avenue, 85 rails laid continuously in the street, and not one of them showed a leak. They all tested 3 feet. Mr. Clark stated that the cost of the joint was \$1.75 for the thermit, using 7 pounds of pure thermit, and about ½ pound of steel. The joint plates cost, when bought with the rail, \$37.50 a ton. The reamer could do seven joints an hour, two men placing the joints in the street. Sixteen cents would place the bolts in the joint. Welding was done by a crew of five men, four men at \$1.80 and \$3.00 for the foreman, making a total of \$10.20 a day. They could do 75 joints a day easily. The welding cost about 25 cents, making the total cost of the joint \$4.24, or at most under \$4.50. He believed he had an absolutely perfect joint so far. The rails had been tested

after cold weather—85 of the rails. 62 feet long—but it had been impossible to find a break. There is the further feature that if breaks occur, it is not known, because the joint plates there hold the rails at all times. It is the policy to keep a couple of men going over the track testing for breaks in the joints. If a break is found, they use a rail-pin that will braze on the side of the rail, but they had not had occasion to put a pin on any of the joints which were laid last summer.

Mr. T. W. Wilson asked if riveting the joint would not improve it. Mr. Clark said the reason he did not rivet the joints was that this year he was experimenting, and that during the coming year he would probably rivet.

The president announced that Mr. Pierce, president of the International Railway Company, and Mr. T. W. Wilson, general manager of the company, had invited the members in attendance, and the representatives of supply houses present, to luncheon. He also read a letter from Mr. W. Caryl Ely, the former president of the American Street and Interurban Railway Association, in which he regretted his inability to be present at the meeting.

Prof. Swenson was called upon to say a few words about the work of the American Association.

Remarks of Prof. Swenson.

Prof. B. V. Swenson—Mr. Brockway, the president of our Accountants' association, said at the convention which we had at Columbus, when he attended the meeting of the Engineering association, and was called upon unexpectedly to make some remarks, that he came to "Stop, Look and Listen." That is exactly my purpose here. I came not to say anything before this meeting, but to get some new ideas, get more thoroughly in touch with your work, and get more acquainted with the people of the State association. I attended the quarterly meetings at Elmira and Schenectady last year, and also the annual meeting at Saratoga. I was particularly impressed last year, and I am again today, with the great importance of these quarterly meetings which you began a year ago at Schenectady. It seems to me a great deal more good, solid work can be obtained through these meetings where you gather around in a small room, where everybody gives free expression of his opinion, but I am sorry that we cannot have just such meetings in our National organization. That, of course, is quite out of the question, because we cannot have more than one meeting a year and that must be a large convention. But to get together and take up topics such as you have been doing today and at the other quarterly meetings, and discuss them in a sort of heart-to-heart way, it seems to me would bring out many points that are extremely valuable from the standpoint of the experiences of the various people present. These meetings cannot help but be a very great good, not only to your association, but also to all the street railway people in the country.

I want to say that twice this week I have talked with Mr. Ely over the long distance phone from New York to Buffalo, and we have talked about this meeting, and he fully expected to be here—in fact, up to yesterday, when he talked with me again and said it was quite out of the question.

So far as the National organization is concerned, I want to say that the year opened up very well for us and things are going along very nicely. We sent out just a week ago our annual statement for dues, and we have already received a large number of remittances of annual dues, which is very encouraging. Our reports this year will be quite luminous. We have four associations, and each of them this year has a report. They will average at least 350 pages each and will make a book of about 1,400 pages, as I figure. We expect to bind these in two volumes, one of which will contain proceedings of the American Engineering Association and the other those of the Accountants' and Claim Agents'. The reason we do it that way is that the Accountants' and Claim Agents' proceedings are strictly member company proceedings and only go to member companies, whereas the Engineering and American proceedings also go to all associate members, irrespective of whether or not they belong to member companies. We expect to bind these proceedings in good cloth bound volumes. Each associate member will receive a cloth bound volume, not a paper covered volume, such as used to be given out. In that way we hope our proceedings will be considered of greater value than in the past, and better care taken of them.

I cannot help but take this opportunity to say a word or two about associate membership in the American association. Of course you know, we desire to have everybody understand that all of the engineers and officials connected with member companies really belong to the association, without any regard as to whether or not they may or may not be associate members, but associate membership, which only costs \$5 a year, is a purely individual membership and keeps every man in touch with the work, whether or not he belongs to a member company, or whether or not he might sever his connection with that company. I always enjoy very much being with the New York State Association. As I told your president this morning, when he spoke to me, and said he thought I was too busy to come, I hope the time will never come when I will be too busy to go to the State association meeting.

The meeting then adjourned until 2 o'clock.

Afternoon Session.

President Shannahan called the meeting to order at 2:30 o'clock, and the discussion on joints was resumed. Mr. A. H. Stanley (Public Service Corporation of New Jersey) being called upon, said he knew very little about joints, but wanted to know something about them. He said his company was building a great deal of track and the joints used were the Continuous rail joint on the Trilby 96-pound rails. That was used because they did not know of any other joint outside of the mechanical joint that they felt justified in using. Careful investigation had been made about the thermit joint, which has been used in a number of places, the electric welded joint and the cast-welded joint. Many hundreds of miles of track in New Jersey were laid with the cast-welded joint, and in almost every instance, he said, that joint has proved a failure, the effect of change of temperature of the rail and there were hollow spots in it, and after two or three years of life on brand new rail it had pounded very badly. They were having to replace practically every mile of track that was laid with the cast weld. He had seen many miles of track laid with the electric weld, and the managers and maintenance of way men were very enthusiastic about it, but after a year or two there was much less enthusiasm and the same thing seemed to be true with the thermit weld. He preferred at this time to use some mechanical joint which he knew would answer the purpose for a reasonable period and hoped, when it became necessary to remove that joint, that experience would have demonstrated which was the most advantageous joint to use, a welded joint or not a welded joint. Mr. Clark's joint appealed to him more than anything he had seen yet.

Mr. C. H. Clark referred to what Mr. Wilson said of the breakage of electrically welded joints, and said he had 12,221 joints welded electrically in 1904. There was a number of breaks. The practice in repair was to cut into the rail and weld the break. By making an extra large mold, a man with a little mechanical genius could dig the mold out to fit the break, and weld the break with thermit, right over the top of the bar; wherever the break was it could be welded with freedom and satisfaction.

Mr. C. G. Reel said the objection to the welded joint was not the feature of breaking, because as Mr. Clark said, breaks could be repaired. In new work he planned to use a thermit-welded joint to come up to the head of the rail from below, and omitted the end bolt hole. The first hole was 6 inches or 8 inches back from the end of the rail. What he wanted to know before he put this thermit joint in was whether the head of the rail was going to be injured by the excessive heat in close proximity to it while the weld was being made, and he wished some one who had had long time experience with welded joints would say whether a deterioration of those joints could be expected as time went on. He had put in cast welded joints as long back as twelve years ago, some of the first in the country, but did not remain with the railroad on which they were put in and did not know how they turned out. In five or six years the rails began to soften and go down at the joints, manifestly owing

to bad construction. He would like some information on long time welded joints, either cast-welded, electrically-welded, or thermit-welded.

Mr. Clark did not think the head of the rail was injured by the thermit process. The kind of bonds was an important question. He put in plug bonds, solid terminal. He had not used soldered bonds, because he did not believe in them. He had not been able to get a bond but what, tested at the end of the year, would be shown to be oxidized and leaking. He said he was now brazing the bond on the head of the rail, going through the whole system, and everywhere a leak appeared with a Conant tester, that bond was brazed to the head of the rail.

Mr. French, in answer to Mr. Reel as to the wear of the rail head, said that there apparently was not more wear at the weld than in the center of the rail, and if he remembered rightly, the thermit people guaranteed that the weld would not injure the rail in that respect.

Mr. P. N. Wilson (Rochester Ry. Co.) explained in relation to the electrical welds, that they were placed about 18 months ago, and he noticed no bad effects from the heat. The heat was so concentrated and applied in such a way that he did not think it affected the head of the rail at all; at least, there was no appearance of it affecting the head of the rail. In connection with Mr. T. W. Wilson's statement, in relation to the Philadelphia joint, he thought that in placing the zinc joint, there was as much machinery necessary as in an electric weld. It required a riveting machine, a machine which applied the zinc, a sand blast, and quite a number of other machines which were rather expensive. He could not see that any mechanical joint was as good as a welded joint. Any mechanical joint would unquestionably become loose in time, and the bond feature was a very important thing. One could not consider the joint without considering the bond. With a weld, there was unquestionably bonded track.

In answer to a question as to what he thought of a thermit weld in unpaved streets, Mr. French said he did not see any objection as long as the rail was kept covered so that the temperature could not affect it or cause breakage through contraction of the rail. Mr. Clark related that when the city of Cleveland got a little hotheaded and tore up tracks on Holton Road in Cleveland, the tracks were all electrically welded, 6-inch rail. They broke the rails in two on over 400 or 500 feet of track, and threw them in the gutter, and it was impossible to relay them. When an injunction had been obtained against the city and made permanent new rail was laid. Tom L. Johnson came to Mr. Clark and said: "There is one thing about it, you cannot weld that track." Mr. Clark replied that perhaps he had not seen the thermit weld. He said: "Even if you weld it, how will you keep it in line?" Mr. Clark welded the tracks and they lay out in the sun for about three or four weeks, in August. They were simply banked up with dirt and there was no trouble in keeping them in line. The hat he was wearing was paid for by Mr. Johnson.

Mr. Reel inquired whether, in the event of welded joints being put in an unpaved street, and later on in the course of time the street was paved, it would be safe to open up 100, 200 or 300 feet of the welded track without getting any buckling effect in the summer time. If the track should buckle, it would be a serious thing to get it back.

Mr. French suggested if anyone contemplated anything of that kind, he should make a record of the temperature when the rails were laid originally, and do the paving at the same temperature, or just a little below. A certain section at a time, not over 200 feet, could be uncovered and concreted and paved.

Mr. Jackson remembered one instance where he opened up at least 1,000 feet. It got out of line somewhat before it was closed in, but there was no great difficulty in getting it

back again. He thought to uncover a stretch of track 500 feet would be all right if it was held sidewise, by bracing it against the end of the ties that would hold the rail in line. Mr. LeGrand Brown knew of one case where 400 or 500 feet of electrically-welded track in Rochester was laid in the cold weather, and the next morning there were four or five joints broken back of the welded joint.

Mr. P. N. Wilson described a case of about 1,200 feet uncovered, but connected at both ends, in Philadelphia. It buckled very badly, the result being that the man in charge of the work covered it with canvas and sprinkled the canvas with water and the track came back to its original position. Mr. Brown had had a case similar to that. Mr. Clark had had that experience on a drawbridge. The viaduct was 2,800 feet, with T-rails laid on planks, and the rail curled on the planks. The sprinkler was put on it and the rail came back.

Derailing Devices.

"Derailing Devices" was a general discussion without paper. This was included at the suggestion of Mr. Barnes, of the state railroad commission. Neither Mr. Barnes nor Mr. Baker were able to be present.

Mr. Stanley, in opening the discussion, said that except in one or two instances, he only had the ordinary hand-derrail. The main line was opened, the conductor went ahead with the flag, and opened the switch by pulling the lever.

Mr. T. W. Wilson said he had a few places where the derail was interlocked with home and distance signals, operated in a tower on interurban lines. The main thing with reference to derailing switches was to have the apparatus thoroughly drained. He had any amount of derailing switches in use, but as a rule there had been no effort to drain the pipes through which the levers run and consequently the first thing in winter the trainmen disconnected and plugged them. He thought a derailing switch operated by the conductor was a very good thing, and a preventive of accidents in many cases. The derailing switch should be back a sufficient distance, so that if a car ran off the track it would not run into another car or into a steam railroad train. Mr. C. A. Coons (Int. Ry.) said most of their derails were 25 or 30 feet away from the steam railroad track. His idea of a derail was that it should be located 100 feet from the first rail, back far enough so that when the car left the track it would be impossible for it to reach the steam railroad track.

Mr. Clark said that the state of Ohio had a law that the derailing switch must not be further than 70 feet from the track nor closer than 40 feet. If the derailer was too far away, it caused a great deal of trouble. In connection with that, he had been contemplating trying a new derailer. With the Porter derailer, or any derailer, the conductor had to go over to the track, cross the track and pull the derailer. Sometimes he would be behind a string of cars, or behind a fence and he could not see. He said he had been contemplating putting a Cheatham electric switch in the track at the derailing point. The connections were such that whether the motorman had the power on or off, this switch would open up as he came to it. It did not make any difference whether he kept his power on or off, that switch was bound to open up by putting both terminals on the same point. Then he would make an order that the conductor must go ahead and stand on the track, not go across the track and get behind a string of cars, but stand on the track, and if a train was coming, just wait. In the meantime the motorman must get off the car and take a switchiron and throw the switch back before he could go ahead. That was suggested to him by one of his conductors.

The president said that offhand that was a great improvement over anything he had known of. The reason that the Board of Railroad Commissioners hoped this question would be taken up was that they had had a number of acci-

dents on railroad crossings, and in a number of instances on crossings supposed to be protected by some form of derailing device. These devices had been put in at the suggestion of the electrical expert of the board, and it was a great surprise, the commission admitted, that the accidents continued to occur at these very crossings. In the investigation it was found that the derailleurs had been frozen tight, or for other reasons had been disconnected and were out of order. It really seemed to the commission as though they might be a source of danger rather than a source of safety. It would seem to him that the device which Mr. Clark described would obviate the danger to great extent. Mr. Clark said its use put the conductor in a position where he had got to be hit by the train. He did not run across the track and get behind a string of cars, nor do anything mechanically. He had thirty of the devices and said they gave very little trouble. If the conductor should not go ahead and perform his duty, it did not take long to catch him.

Mr. P. N. Wilson thought the conductor would go ahead and pull the switch, but not look at the track. He would step down and pull up the switch, and there would be a mechanical operation; he might not go ahead of the car and look for the train. If the conductor went ahead and signaled for the motorman to go ahead, he would go, of course. It depended on the conductor looking for the train coming. The thing was to have some one go to the track and look for an approaching train, and some device to make him go there and look, but it appeared to him necessary to depend on a man in any event.

The president asked if it would not be possible to locate the switch so that the conductor would be obliged to throw it rather than the motorman. Mr. Clark replied that if that was done the conductor was made to do something more which was mechanical. The motorman was the man who would get hurt in the case of a collision. If the motorman got out of the vestibule, the car would be at a dead standstill, and he would see the train as well as the conductor. That placed the responsibility on two men. It occurred to Mr. W. J. Harvie (Utica & Mohawk Valley) that there might not be any objection to placing the lever on the derailing switch somewhat in the position of a dwarf signal which would either be between the tracks or close to the tracks, so that the conductor would have to know that the track was clear.

Mr. G. E. Eveleth (General Electric Co.) asked if it would not be possible to use an electrically controlled switch and have the switch control between the tracks so very close to the steam tracks that it would be necessary, with the derail closed, for the conductor to hold the control switch, so as to hold the derail closed until the car passed the derail. That was a suggestion of carrying out the idea of putting a man in a dangerous place and keeping him there. Mr. Clark believed the conductor should go ahead of the car. The orders were to get over the railroad crossings as quickly as possible after it was ascertained that the coast was clear. If the conductor was sent ahead and he had got to stand there and pull some device, it might not be possible for him to get out of the way. If he had nothing to do but look up and down the track and give a signal, he could take the car as it came across. His road had crossings of five and six tracks. For a conductor to run over that crossing, if the derailer was located on an average 60 feet from the tracks and the back of the car was 35 feet further distant, a total of 95 feet, with six or seven tracks to cross, the man had got to run 125 to 150 feet, and was awny over across the track where he could not always see everything that was on all the tracks. A derailer with a handle in the center of the track would freeze up more than the box that ran across the pavement with the chain.

Mr. P. N. Wilson thought that one bad feature of send-

ing the car ahead was that while the conductor was on the track, the car would be stopped and some one might try to get out. At that moment the conductor might signal to go ahead, and the motorman might not see the passenger. That was one bad feature. Mr. Clark said that all of the agreements with the steam railroads in Cleveland expressly stated that the conductor must go ahead of the car and signal to the motorman to advance. There were practically no accidents in the shape of people getting off the car at the moment of starting, because it was second nature for the motorman before he started to turn and look and see if any one was getting off. As a general rule, few people get off the car at steam railroad crossings. Mr. P. N. Wilson said he had had several rather serious accidents because the railroad crossing was situated at a station. There would be some passengers on the car who wanted to catch a train, and as soon as the car stopped they immediately jumped off, and in that connection there was considerable difficulty.

Rail Bonds.

A paper on "Rail Bonds," by Mr. H. L. Mack, superintendent of line, International Traction Company, was presented. It is given elsewhere.

Mr. Clark said he was discarding the use of bonds. His electrical engineer had recommended that all repair joints on lines that are carrying heavy current back to the power house should be repaired with the thermit weld on the bottom of the rail. In the last year all bonds and the rail have been coated with amalgam to keep the air out. He had concluded that was the best he could do with the terminal bond. He used the Brown bond, because most of the bonding was simply around the special work where the compressor could not be used.

Mr. Brown asked Mr. Matthews where they had the Brown plastic bond, whether they put them back again into the new joints. Mr. Matthews said the Brown plastic bonds mentioned were put on in 1896, and in 1903 he had occasion to move the track in order to widen the devil-strip. At that time he tested the joints and found there was no deterioration, except where the bolts became loose, the joints were loose and the plastic material had come out. The track was moved over and paved up again, and after it was paved up it was practically the same as before.

Mr. P. N. Wilson said he had used a special bond for the last five years. He took a copper plate $2\frac{1}{2}$ inches square and about $\frac{1}{2}$ -inch thick, with two grooves on one side and a smooth face on the other. There was a one-inch hole in the center of the plate. This plate was treated with flexible solder and alloy, and the wires were treated the same way. Two No. 0000 copper wires were fitted into the groove and an iron plate similar in size and appearance to the copper plate was bolted through the rail, clamped on to the two copper wires and made a bond completely around the plate. In some places where he could connect the wires under the plate he put them under the plate. It cost \$1.50 a joint, put on, for labor and material. A test made after five years' service showed that these bonds were equal to a solid section.

Mr. M. J. French had some experience with soldered bonds. In 1905 a small portion of the West Shore Railroad, between Frankfort Junction and Herkimer Junction, was electrified, and on his recommendation soldered joints were used. He used a bond of 500 circular mils capacity, and the bond was made up by ribbons running horizontally and riveted together. It was the Lord Electric Company type of bond. It developed that the freight traffic on the road was heavy and the shock from the heavily loaded freight cars was excessive, and the bonds worked loose because they were not flexible enough. These bonds were taken off and regular 10-inch compression bonds put on under the #14 plate. He thought if the bond in the first place had been more properly constructed with a terminal, having the wire coming from

it vertically, instead of horizontally, and perhaps a wire connection between the terminals, instead of the ribbons, they would have held a great deal better and perhaps have held perfectly. He had also used recently the American Steel & Wire Company's twin terminal bond, which appealed to him more strongly than the old fashioned compression bond. In applying two half-inch holes were drilled into the back side of the ball of the rail, and a reamer inserted in the hole that made a slight channel near the entrance to the hole. The terminal of the bond was inserted into the hole and driven up with a hammer until it struck the end of the hole drilled, and compressed and filled out the little channel, and in that way the bond was thoroughly anchored in the hole. In a test it showed a conductivity equal to that of a soldered bond of the same capacity. He thought this bond really beat the compression bond, except for the fact that it must be placed on the outside of the rail.

Mr. E. E. Hawkins (Ogdensburg Street Railway) said that in open track work the bonds were frequently stolen. In open track work he used an open copper wire bond, placed outside of the fishplate. Mr. Charles H. Wilson (Toronto & York Radial Railway Co.) said that in Toronto, on the suburban line, they used twin terminal bonds similar to the one Mr. French spoke of, and to do away with the chances of the bonds being stolen, they made a mixture of oil and lamp black, with shellac in it, and gave them a coat of this mixture as soon as finished. He had about thirty miles of road with that bond, and had not yet had any stolen. Junkmen, traveling continually up and down the line stole the trolley wire, but not the bond wire.

Overhead Lines.

Mr. G. E. Eveleth (General Electric Company), next read a paper on "Span and Catenary Construction," which will be found on another page of this issue.

The last paper on the programme, "Center Pole Construction," was to have been presented by Mr. F. A. Bagg (Fonda Jonstown & Gloversville), but Mr. Bagg said that after he had prepared a paper he found it was more of an argument in favor of span construction than center pole construction, and as there was a paper on span construction he thought it would be useless to give his paper. His principal objection to center pole construction was in the matter of supporting the trolley wire with the bracket arm. It was not as flexible as the rest of the trolley wire, and especially on high-speed service there was a jumping of the wheel which might derail the wheel, and besides there was always sparking at the ear. That would hit the wire, and in time cause a failure. He objected to seeing poles in the devil-strip between the tracks; it always appeared dangerous. Though generally considered that center pole construction presents a fine appearance, he would rather have the poles out of the way. There was a saving in the grading and in the ballasting in span construction over the center pole construction, because the roadbed could be narrowed about two feet; in other words, with center pole construction the tracks were placed about 15 feet, center to center. With span construction the tracks could be 11 feet center to center. In the maintenance of way, that was quite a consideration. He said there was also less labor required to maintain the roadbed, keeping it clean and dressing it up; it had better drainage. That would show in a better track surface, less labor required to maintain the track in a given line of surface. He thought the span construction will cost more per mile than center pole work, but considering also the grading and the ballasting, the figures would be in favor of span construction. He did not consider at all the catenary work that had just been explained. That, of course, imposed another consideration, and might be controlling, but his observation was that both span and center pole construction were used indiscriminately in the same territory, and even on lines of the same company. It seemed as though there were no particular advantage in one system

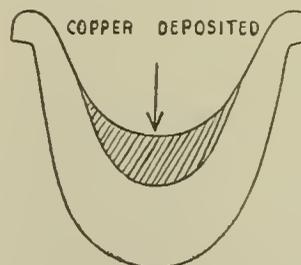
over another; that is, it apparently was not known there was any particular advantage, but he believed there was. He thought time and experience would prove that one was better than the other, and one system would become obsolete. He believed the span construction would survive.

Mr. A. B. Meyers asked Mr. Eveleth if he considered 15 feet the minimum distance between hangers on the catenary construction for the use of the wheel. Mr. Eveleth replied that there was nothing to limit the distance between the points. On the road from Atlantic City to Semers Point, they had been running with a distance of 80 feet between points, and the assumption was at the present time that a distance of 50 feet between points would be close enough for wheel collector work. It was possible to get the distance between stations even less than 50 feet for the wheel. Less than 15 feet would make the whole system rather more rigid and would be getting to a point where very little value would be obtained for the additional expense. Mr. Reel asked if it would not be feasible and desirable to apply the catenary system to span construction; instead of carrying the catenary on center poles, which has certain disadvantages, as Mr. Bagg pointed out, to carry the catenary on span construction and save the width in the roadbed and get all the advantages of the catenary construction, which were so self-evident.

Mr. Eveleth said that a number of roads operated in that way, and the only requirement different from ordinary catenary construction, or cross suspension, was the additional weight of the messenger wire to be carried, and it was advisable to allow a little mere dip between the point of support on cross suspension and the connection between the messenger wire, than in ordinary cross suspension. The thing as entirely possible. The operation of such a condition he had watched on one line in particular had been very satisfactory. That line was operated with the wheel trolley, and he never saw the wheel go off the wire, and from what he could obtain from the various operators, they had never seen the wheel leave the wire on a tangent track.

Mr. J. H. Pardee (Canandaigua) said there was one question he would like to bring up for information. He used No. 0000 trolley wire, and was having a number of breaks on that trolley wire about one inch inside the end of the splicing sleeve. There had been five or six breaks in the last few months, and every time the wire was broken it was about one inch inside the sleeve. The sleeve was soldered. Mr. Clark said the damage was done in soldering the sleeve; he should use a mechanical sleeve. Mr. Mack thought it was probably due to overheating the wire.

Mr. W. R. W. Griffin (Canandaigua) exhibited a sample trolley wheel, in which most of the copper, which should be on the trolley wire, was on the wheel. The wheel was a 7-inch wheel with a collector contact of $2\frac{1}{4}$ inches. The ordinary Kalamazoo wheel is $1\frac{3}{4}$ inches. He had increased the size to get a good contact for current collection. That wheel was put on a two-car train, with a busbar, carrying eight motors. The other wheels bored at the same time were placed on single cars of four motors, 75 hp. and all the wheels were worn out and



Section of Trolley Wheel with Deposit of Copper.

made from 5,000 to 6,000 miles. That wheel had increased in size over 5-16 inch all the way around in 1,725 miles. The schedule speed was 24 miles per hour. Mr. Sheehan said there was only one remedy he knew of, to run cars faster. He had the trouble with the slow-running, it collected copper on the trolley wheel. He thought it was due to the amperage and the running slow.

This concluded the discussion.

The president announced that Mr. Charles R. Barnes, of the railroad commission, had sent a telegram that Commissioner Baker was at home ill and sent his regrets.

Mr. Wilson, on behalf of the International Railway Company, extended an invitation to all the members who desired to inspect their shops.

Mr. F. A. Bagg moved that a hearty vote of thanks be extended to Mr. H. J. Pierce, Mr. T. W. Wilson, and the other officers of the International Railway Company for the courtesies extended at the meeting.

The meeting then adjourned.

TRACK CONSTRUCTION IN PAVED STREETS.*

BY I. E. MATTHEWS, ROCHESTER RAILWAY COMPANY.

An absolutely "permanent way" is a dream which will never be realized, but is the ideal condition toward which we aim. The increasing weight of rolling stock has been met by altering the sections of the rail from the flat-strap to the girder and gradually increasing the weight and depth of the rail; thus affecting the depth of foundations and increasing the cost.

Joints are one of the greatest sources of trouble to the maintenance of way engineer. Owing to the difficulty of removing the paving, many slight defects in joints are neglected until it is absolutely necessary to make repairs, and then the cost is much greater than it would have been if repairs had been made at the first indication of trouble. This condition of affairs leads to a considerable amount of rough track, not quite bad enough to warrant ripping up the pavement, and yet by no means a track in first-class condition. It is, therefore, imperative that the joints be as substantial and durable as the rail itself. In order to eliminate joints, it is now customary to use rails 60 feet in length, and if the idea be indefinitely extended we obtain a continuous rail. This is accomplished to some extent by the electric or cast-welding of the rail ends; but as this is the subject of another paper I will not consider this matter further at this time. The question of joints, tie-plates and bonds have also been made subjects for special papers.

Smooth track to true gauge is an essential feature to electric roads. Wooden ties spaced 24 to 30 inches, center to center, and laid in or on concrete foundations probably give the best support to track. It has generally been advocated that the rail should have an elastic support, such as the wooden tie affords, but more recent practice would seem to indicate that the metal tie thoroughly embedded in concrete would be an improvement on the older method. In keeping the track to gauge the braced tie-plate is preferable to the tie-rod.

Passing from these general remarks, we may consider some of the variations in construction. Obviously the selection of the proper track construction for any given street will depend, as indeed does the pavement itself, on the class of traffic which will use it. For a street of heavy traffic, one would expect to use stone blocks for paving material with a corresponding heavy track construction. Where traffic is light, brick or asphalt might be selected as paving and a lighter track construction would be used. In either case, a concrete foundation at least six inches in thickness under the ties is recommended. This is costly, but necessary to good permanent track construction. Where the foundation is quite solid and has never been disturbed by gas or water pipe trenches, sewers or other excavations—a condition rarely, if ever, found in our modern cities—this concrete foundation might be replaced by broken stone or gravel with fairly good results.

Under the concrete foundations and about one foot outside of the outside rails there should be laid a three-inch farm-tie drain in coarse gravel with joints covered with gunny cloth, to be laid parallel with and the full length of the track, connecting with surface sewers or manholes. It should be at least two feet six inches below the grade of the finished pavement and covered with coarse gravel for a width of six inches and up to the bottom of the concrete foundation under the pavement. The subgrade should be crowned so as to render the drain more effective.

Track Construction in Rochester, N. Y.

The type of construction best adapted to streets of heavy traffic is the nine-inch full grooved rail, well tied with Geor-

gia pine ties spaced 24 to 30 inches center to center and laid on a six-inch concrete base. The concrete should be mixed—Portland cement one part, sand three parts, and broken stone which will pass through a two-inch diameter ring, six parts. This concrete should be laid at the same time as that for the foundation of the adjoining pavement and should be carefully tamped under the ties and rails. A fine concrete or grout of one part of Portland cement to two parts sand should be poured around and under the rail in order to give a firm and uniform bearing to the rail. The space between the flange and head of the rail should be filled with a Portland cement mortar in the proportion of one to three. The stone blocks resting on six inches of concrete and with joints thoroughly grouted, complete this construction. It is the type used by the Rochester Railway Company on streets of heavy traffic, the paving blocks being of Medina sandstone. The cost of the construction has averaged \$5.80 per lineal foot of track. Using the same track construction, but with brick paving, the cost has been \$5.00 per lineal foot of track.

In recently rebuilding the University avenue line of the Rochester Railway Company, we adopted a concrete-beam construction under the rails. The beam is 12 inches in depth below the base of rail and is 18 inches wide under the outside rails, and 14 inches wide under the center rails. Wooden ties are spaced five feet center to center; the beam being carried to a depth of eight inches under the ties. Ninety-four-pound nine-inch girder rails held to gauge by braced tie-plates at each tie rest solidly on the continuous concrete beams. The pavement between the tracks and two feet outside is of Medina block, the paving in the street beyond being asphalt. This construction costs \$5.06 per lineal foot of track. University avenue is an outside street and would not be classified as one with heavy traffic; however, by using the concrete beam we were able to obtain a stone block pavement at about the same cost as the brick pavement with solid concrete foundation. One point should be emphasized—to render the continuous concrete-beam construction satisfactory, the concrete foundations of the track and pavement should be thoroughly bonded together. If the subgrade has been disturbed and there is any possibility of future settlement taking place, I should hesitate to use the concrete beams.

Use of T-Rail.

I am of the opinion that a material reduction in the cost without lowering the standard of construction from that given above, can be effected by the use of the high T-rail in paved streets.

The municipal authorities to a large extent seem to be opposed to the growing use of T-rail in paved streets, but there are now upon the market paving bricks of such shape that the paving around the rail gives practically the same effect as the groove in the girder rail and in many western cities this type has become the standard. It is claimed that the groove or flange-way so formed is superior to the grooved girder rail. In streets of heavy vehicle traffic the cost of maintenance of the paving might become excessive with T-rail, but on all other streets I am of the opinion that the T-rail would be preferable to the grooved rail, both because it is cheaper in first cost and because it gives the bearing of the wheel squarely over the center of the base. The base being wide, there is no tendency to over-turn and the flange-way formed by the special paving blocks gives a groove which is self-cleaning as that of the grooved rail. Another consideration which should receive attention is the increasing number of interurban cars which are entering our cities with their greater depth of wheel flange. Very little wear can take place on the ordinary grooved or girder rail before the cars are running on the wheel flanges. With the T-rail, however, the amount of wear that can take place before the track is entirely worn out is independent of the car-wheel flanges.

The Street Railway Journal of June 3, 1905, discussed, editorially, the persistency with which city engineers in certain municipalities cling to the idea that the grooved rail is the only suitable rail for paved streets, and then advanced the idea that the grooved rail was dangerous to interurban cars, citing some examples from Cleveland where serious derailments had occurred due to the grooves in the rails not being deep enough to admit the flanges of the interurban wheels.

Wherever T-rail in paved streets has been given a fair trial it has been notably successful. I believe the honor of the first use of T-rail in paved streets belongs to Denver, Colo. They use a 72-pound 6-inch shanghai T-rail laid on wooden ties only 21 inches between centers, tamped with gravel. Extreme care is taken, however, to have the ground thoroughly settled before placing the ballast. Other cities in which T-rail construction in paved streets has been adopted to a large extent, are Indianapolis, Milwaukee, Minneapolis and St. Paul—the two latter cities being notable because

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it was there that T-rail was first used in streets paved with asphalt, where girder rail had been the rule before. The rail used is an eight-inch shanghai T, weighing 79 pounds to the yard. A concrete beam supports each rail and is 22 to 24 inches wide and 12 inches deep under the rail. Around and above the base of the rail is placed three inches of natural cement, if the paving is of brick, and less if the paving is of granite.

The most notable instance of recent adoption of T-rail construction in the east was in Boston some two years ago when they installed about 25 miles, following closely the practice of Minneapolis. As the writer has not built any T-rail track in paved streets, he is not in position to present any figures as to actual costs. Mr. John A. Beeler, who, I believe, designed the first shanghai rails, made some estimates of track construction which are given in "Herrick's Electric Railway Hand-Book," in which he states that stone block paving on concrete base with 70-pound T-rail, track on wooden ties 21 inches between centers and ballasted with gravel costs \$4.43 per lineal foot of track. Using the same track construction and paving, but with a six-inch concrete foundation, the cost is stated at \$4.90 per lineal foot of track. This is 90 cents per foot of track less than the cost of the same type with girder rails in the city of Rochester. The difference between track on gravel ballast and concrete base as shown above is only 47 cents per lineal foot of track. This additional 10 per cent of cost would insure a more serviceable and durable construction and in the end give the best satisfaction.

In conclusion, I would suggest the high T-rail with wooden ties on a concrete base, or steel ties on the concrete stringers as the ideal track construction in paved streets; excepting, however, in streets of heavy traffic where the grooved girder rail would be superior on account of the better protection afforded to the pavement adjacent to the rail.

CONCRETE STRINGERS, CONCRETE STRINGERS WITH TIES, AND STEEL TIES.*

BY F. D. JACKSON, ENGINEER OF WAY, INTERNATIONAL RAILWAY COMPANY, BUFFALO.

In two very able articles of Mr. T. W. Wilson appearing in the Street Railway Review, issues of March and August, also in the Street Railway Journal of October, 1903, "Standard Practice in City Track Construction" and "Track Construction and Maintenance in Buffalo," a very complete description was given of the Buffalo track system.

The present article is to treat, not of the various styles of construction, but of two distinct types, i. e., concrete stringers with and without ties, and solid concrete in the track.

Realizing, as we do, the necessity for providing a suitable and substantial substructure for roadbeds in electric railway work in order to take care of the increasing weights of cars, which to date are 30-ton, work today is in the direction of providing a foundation for the rails which shall be as nearly rigid as possible. Many engineers question the advisability of so rigid a construction, claiming undue wear to the rails, due to the inelasticity of the roadbed. Measurements of rails on a one-half minute line do not bear out this statement. We find that the head of the rail has worn $\frac{1}{8}$ -inch in about $4\frac{1}{2}$ years, which would give the rail a life, under this very frequent service, of more than 16 years, before the $\frac{3}{4}$ -inch flanges would commence to touch the bottom of the groove.

There is also a very important thing to consider, namely, the life of the pavement adjoining rails in city streets which is prolonged by rigid track construction, as is maintenance very considerably cut down. It is true that the elasticity of roadbed favors the life of rail and the desirability of either construction will be eventually determined by the comparative cost of renewing rails more frequently, the pavements remaining in good condition, or paving oftener during a longer life of the rails.

Concrete Substructure.

Buffalo has carried the concrete stringer idea further than most roads, by making one solid bed of concrete the entire width of roadbed 6 inches deep and 6 inches under the ties, instead of a concrete beam under each rail. This style of construction is used in stone-paved track. On the other hand in asphalt-paved track, we have gone to the other extreme and placed a concrete beam 12 inches wide by 8 inches deep under each rail and not bonded to the concrete

which forms the paving foundation. Thus the track is supported by no concrete except that under each rail.

The solid concrete construction with stone paving has been adopted as our best style of work, and the following data will show to what extent it has been used:

Of the 194 miles of city tracks, 62 miles are of the concrete-beam construction, and 87 miles of the solid-concrete construction, the remaining 45 miles being old-style work and mostly on lightly traveled lines, where sand, gravel or stone are used for ballast.

Two streets have concrete-beam construction without ties, Clinton, Bailey avenue to city lines, 5,300 feet, double-track, and Jefferson street, Dexter to Main, 2,998 feet double-track. In each case the rail is 9 inches 94-204; standard 12-bolt joint; tie-rods at 8-foot and 5-foot centers; toothing and asphalt; built in 1897. Today these two pieces of track are in fair condition. On Clinton street 16-foot single-truck cars are run on 10-minute headway. No repairs have been made to the track. On Jefferson street double-truck cars are run on 5-minute headway. Repairs on portions of this track have been made.

One reason why this style of track has held so well is due to the rails being suspended, put in good surface and line, then concrete tamped well up against their bases. The remaining 59 miles of concrete-beam is with tie construction, with both 9-inch and $6\frac{1}{4}$ -inch girder rail; steel channels 7 inches by 5 feet 9 inches and yellow pine ties 5 inches by 7 inches by 7 feet at 10-foot centers. With the steel channels no tie-rods were used, and with wooden ties, tie-rods were placed at 10-foot centers and brace tie-plates were used. Most of the track was built in 1899. With this style of construction the rail gets out of surface and line, affecting both pavement and rolling stock.

Of the 87 miles of solid concrete construction there are several notable features. Nearly all this rail is 9-inch girder mostly welded, and some standard 12-bolt joints. There are only 2.2 miles of $6\frac{1}{4}$ -inch rail. Most of the welding was done in 1899 and 1900. Yellow pine 5 inches by 7-inch by 7-foot ties at 5-foot and 10-foot centers; tie rods at 10-foot centers and in a few cases brace tie-plates at 6-foot centers; various kinds of paving, as common stone, a little brick; but mostly No. 1 block stone. Some of this track was laid in 1893. The average shows that the track was laid in 1900.

Track Laying with Steel Ties.

The construction we consider most up to date is solid concrete with Carnegie steel ties, and tie-rods at 5-foot cen-



Track Construction with Nine-Inch Rails, Carnegie Steel Ties and Tie-Rods at Five-Foot Centers.

ters. This style of construction was put in this past year on Fillmore avenue, 5 miles of double track, and on Sycamore Street, 1.1 miles of double track. A trench was dug 15 inches below the surface of the street and 18 feet wide. Nine-inch rail was laid and bolted with four bolts and clips, to Carnegie steel ties spaced on 10-foot centers. These ties are of I-beam section, top flange, $4\frac{1}{2}$ inches; bottom flange, 8 inches; depth, $5\frac{1}{2}$ inches; 6 feet long and weighing 19.7

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pounds per foot. The track was then surfaced and lined by blocking up under the ends of ties and $\frac{3}{8}$ -inch tie-rods spaced at 5-foot centers were put in. A 6-inch trench was dug under each tie. Concrete, proportioned 1 part of Lehigh Portland cement, 3 parts of clean, sharp sand and 5 parts of $2\frac{1}{2}$ -inch stone, was then put in by a Foote continuous concrete mixer. This mixer was of traction type, one pair of wheels running on the outside asphalt, the other pair of



Track Construction with Nine-Inch Rails, Carnegie Steel Ties and Tie-Rods at Five-Foot Centers.

wheel on 5-foot planks properly blocked up so that no weight was brought upon the track. The concrete was shoveled into the trench to a depth of 6 inches, well tamped under the rail and thoroughly pounded after being leveled to the top of the ties. Three ties were kept tamped ahead of the mixer to insure thorough work at the ties. Four hundred feet of single track were concreted per day of 10 hours, which includes besides in the track, 2 feet on the outside and 2 feet in the devil strip. By the use of the continuous concrete mixer a uniform mix was made on the entire job with a saving of about 10 per cent of cement. The pavers followed behind the concrete gang, using 3 inches of coarse gravel for a cushion and on that the No. 1 Medina block stone was placed; full stone paving was placed between the rails and in the devil strip, and tooling along the outside of track (to receive the asphalt) and up against it. This stone paving was then pounded and slushed with a grout composed of a mixture of 1 part Portland cement to 2 parts of sand, which completely filled up the voids between the stones, making a perfect bond. This style of construction costs about \$5.00 a running foot of single track as against \$1.50 where wooden ties and tie-rods at 10-foot centers are used. Part of this increase in cost is due, not only to extra cost of the steel tie over wood, and to an extra tie-rod, but also to the higher price of labor and material.

Where it is necessary to keep cars moving over a stretch, where track is being reconstructed, portable crossovers are used and cars are kept off the new work for at least 72 hours to allow the cement to set. Special care should be taken to see that concrete is thoroughly tamped under and around the ties and under the rails, following this up by thorough pounding.

The fact that we have considerable track with the concrete beam under each rail laid since 1897, and more of the solid concrete style laid at a later date, has given us a chance to make a just comparison between the two styles of construction. That we have so much solid concrete construction is proof of which style of work we find the best.

In Lockport, on Main street we have 4,217 feet of single track of 100-pound A S C E section T-rail on solid concrete in a brick paved street using a special brick along the groove side of the rail. Over this track three styles of wheels are run, namely, wheels with 2-inch tread, $\frac{5}{8}$ -inch flange, $2\frac{1}{2}$ -inch tread, $\frac{3}{8}$ -inch flange and M. C. B. wheels. Over this track 100,000-pound gondola cars are run. This track was constructed in 1903 and to date is standing up perfectly.

THERMIT RAIL-WELDING.*

BY M. J. FRENCH, UTICA & MOHAWK VALLEY RAILWAY COMPANY.

In all branches of electric railway work there are knotty problems to be solved, and in the track construction department surely no subject has called for more careful study and received more serious consideration than that of the maintenance of rail joints. Manufacturers and track engineers alike have put forth their best efforts in the endeavor to solve this problem.

The hardest proposition with which manufacturers of improved rail joint fastenings have to contend is to secure fair play for their devices. Many fastenings have features that mark a material advance over the old style of joint plates but their application requires such care that its neglect would make the joints appear less desirable than those of older date, especially when the extra cost and consequent additional loss through failure is given due weight. All track engineers and superintendents concede the great advantage of a continuous rail, but the attempts to secure it have in some cases been so expensive and unsatisfactory that others have hesitated to recommend to their superiors the use of the latest and most scientific appliances.

Thermit, electric and cast-welded joints all have their partisans among track engineers, who have given study and especial care in the application of one particular type of weld. No one disputes the statement that all three methods have been successfully employed, but it likewise must be admitted that there have been some failures, and in some instances that money loss has resulted in the abandonment rather than in a more careful mechanical application of the process.

On the Utica & Mohawk Valley Railway Company's system we have used only the thermit process of welding, but know that others have had such marked success with electric and cast welding that we cannot take exception to their practice. Granted that we have had failures, we must also admit that, save in one particular, the fault is attributable either to carelessness in application or to lack of knowledge of requirements. This is proven by results obtained this year in applying the knowledge gained through failure last year.

Details of the Thermit Process.

Although the details of the thermit welding process are familiar to track engineers generally, a brief description may help others to appreciate its advantages more fully. The process consists in pouring molten iron, or more correctly mild steel, from a crucible into sand and flour molds placed around the rails at the joint. The rails having first been flared and surfaced, the joint is thoroughly cleaned with a sand blast or wire brush. Then the rails are heated by gas-oline or oil blow-torch to expel all moisture, and by heating the rails to a dull red better results are insured, as the temperature of the molten steel is not reduced as much when coming into contact with the rails.

A pair of molds made of an equal mixture of common clay and sand, or more preferably of sand and 10 per cent of cheap rye flour, is then clamped firmly to the rails. The material of the molds is held by wrought-iron framework provided with handles to facilitate carrying. The rail head is then painted with a watery solution of common red clay which the heated rail immediately dries up to a thin coating. This is to prevent the molten slag or steel from unlinging with or burning the rail-head. After thoroughly luting all joints of the molds with clay of the consistency of putty, common earth is packed around the outside of the molds. The molds and rails are then given a final warming with the blow torch, the flame being directed inside the molds to expel any remaining moisture. The crucible on its tripod is placed with pouring hole directly over and about two inches above the gate in the mold. After placing the tapping pin, iron disc, asbestos disc and refractory sand in the bottom of the crucible to act as a plug for the opening, the thermit compound is poured in and in the center of the top is placed about one-third of a teaspoon of ignition powder. A storm match starts the chemical process.

The chemical reaction is a great mystery to the curious bystanders, and a foreman might spend all of his time answering questions. The thermit compound is composed of aluminum and iron oxide, both in granular or flake form; the ignition powder is composed of aluminum and barium peroxide in much finer form. When the match is applied the barium peroxide ignites and releases its oxygen to the aluminum very quickly. The heat produced is so in-

*Paper presented at the quarterly meeting of the Street Railway Association of the State of New York, Buffalo, January 11, 1907.

tense that it causes the iron oxide to release its oxygen, which in turn is seized by the aluminum and almost instantly the entire contents of the crucible are a boiling and seething mass. By this reaction the pure steel is liberated and settles immediately to the bottom of the crucible. This wonderful chemical action is concluded within 30 seconds, the crucible is tapped by striking the tapping pin with a special iron spade, and the incandescent steel runs smoothly into the mold, the aluminum oxide or corundum slag following. In five minutes the mold can be removed for the passage of cars.

Some Improvements.

To go back to the beginning of the operations, our attempts to make molds of half proportions of clay and sand



Thermit Rail Welding—Welded Compromise Joint.

resulted unsatisfactorily in that they shrunk and checked badly in baking and required a great amount of careful luting to fill all irregularities at the joints. Also the clay was baked like a brick from the great heat of the welded joint and was quite hard to remove, adding somewhat to the expense.

An old foundryman suggested to our foreman that he should try a mixture of clean, sharp sand with 10 per cent of coarse rye flour, moistening the mixture sufficiently to retain its form when pressed in the hand. This mixture came away from the mold without adhering, baked without shrinking a particle, and was hard enough to stand ordinary handling. I believe we were the first users of thermit to employ this mixture that has now become general. For baking the molds we have found that a moderate heat of about the temperature required in baking bread proved most satisfactory, as a higher temperature burned the rye flour and destroyed its cementing property.

By adding a teaspoon of turpentine for each pair of molds the material was made as hard as concrete—unnecessarily hard for ordinary use but most desirable for special molds for broken or combination joints. These special molds we make solid and then with cold chisel and file hollow out the space to form a welt of iron.

We first tried baking the molds in a furnace with banked fire under a boiler, but the heat could not be regulated sufficiently and we lost many molds through burning. Our foreman then built an oven out at our Utica Park storeyard, using old bricks and building in a flat plate of iron above the firebox to baffle the heat. Above that two racks were placed to hold the molds. This oven has a capacity of 12 sets of molds, one man receiving 15 cents an hour making and baking 12 sets in five hours. Thus we have a capacity of 24 sets per day at a cost of 6¼ cents a set for labor. Our molds actually cost about 10 cents a set, as the workman was not constantly employed and we did not require the full output each day.

Our oven is constructed with but one door for the molds and fuel, but it is more desirable to have a separate door on the side of the baking chamber, as the oven is not then cooled off when fuel is placed in the firebox. We use old ties for fuel.

We have made our crucibles since using up the first six furnished by the Goldschmidt Thermit Company. We buy the magnesia tar and mix with it 25 per cent of old crucible

material finely powdered. These crucibles are very durable and last on an average for about 30 joints. We bake these in our oven with a higher temperature than that required for the molds.

Results with Welding.

We have welded about 900 joints during the years 1905 and 1906. Of these 600 were made in 1905 on Lorain 95-pound, 297 9-inch tram-head rail. This work was subsequently paved in with vitrified blocks on concrete extending from the bottom of ties. The ties were 6 by 8-inch hewed Southern pine, 8 feet long, spaced 24 inches center to center on 8 inches of crushed stone. Ten of these joints proved faulty during the year, the break being generally elliptical in shape and extending from the end of the rail just underneath the head and above the weld, to the upper bolt hole; thence to the lower bolt hole and back to the base of rail near its end. This break is supposed to follow closely the line defining the extreme limit of recrystallization of the rail that is produced as a result of the heat radiated from the weld itself. These rails had been drilled with 1¼-inch holes, spaced 2½ inches—6 inches—6 inches in upper row and 3½ inches—6 inches—6 inches in lower row, for regular ribbed-girder joint-plates, and the line of recrystallization passed through the first holes in most instances. I understand that this recrystallization is the cause of most of the breaks in both cast and electrically-welded rails. Nearly all of these joints that failed broke through contraction of the rails due to failure to protect them properly after welding continuously 500 to 600 feet of rail. Later we omitted the weld at every sixth joint until after the paving was finished on all joints but those left for contraction, when the latter were welded and the concreting and paving around them was finished. Thin sections sawed from the upper half of a rail were placed in the openings before welding.

Another kind of joint failure developed in the form of a slip joint, due to the iron of the weld failing to unite properly with the rail itself. We had about four of these slip joints during 1905. Later on we tested all welds immediately after cooling by striking them on both sides of the rail with a heavy spike maul, the laborer being instructed to break off the weld if possible. These defective joints were all repaired by making a special mold to enclose the old weld and by running another weld close against and at one side of the old one, over the break in the rail. This year we have had seven breaks in this total of 600 joints, all of them breaking through the bolt holes.

During 1906 we welded 200 joints on the same section of rail laid in 1902, where the 12-bolt, ribbed plates had begun to show failure through working loose or the rail head had mashed down at the receiving end. In the latter case the receiving rail was shimmed up and after welding the head was ground true to a straight edge by means of a hand-power emery wheel grinder. Thus far but one of these joints has proven defective, as there was no expansion or



Thermit Rail Welding—Joint Weld with Cable Bond.

contraction noticeable, the pavement being removed only at the joints.

We have also welded during 1906 about 100 joints on Pennsylvania Steel Company's section 95-272, a T-rail 7 inches high with 6-inch base and head 3 inches wide. We ordered this rail with the first bolt hole omitted. Thus the distance from end of rail to nearest bolt hole is 6 inches, and as the line change of crystallization fell several inches short of the holes we have experienced no trouble from the breaks except in two instances where long sections were left uncovered along the outside rail, awaiting paving. After

this we banked earth against the rail on long sections without expansion joints.

Some Precautions.

When we began welding this 7-inch rail we found that we could sledge off the welds and that the iron from the thermit compound had not united with the rail; also that the iron came up to the top of the rail head. We subsequently found that the mold models had become mixed, and we had used one of two small horizontal cross-section, and consequently the rail chilled the small volume of molten iron coming in contact with it. Upon enlarging the mold model so that the thermit portion furnished only enough iron to come up under the rail head, we obtained welds that resisted the most vigorous sledgeing that could be given with a 10-pound hammer. We were able to batter the weld out of shape, but could not separate it from the rail. This sledgeing test is now applied to all welds.

We found when welding in the morning with rising temperature that tightly-closed joints often humped up when welded. This proved to be due to the latent compression in the rails that did not manifest itself until the rail ends became soft. These humped joints were ground down with an emery wheel grinder. We had only a few of these joints when we realized the cause, and readily prevented such action by welding on cooler days or when the temperature was falling. We obtained the best results with joints open about one-sixteenth to one-thirty-second inch, the expansion in welding closing tightly such an opening. We have made excellent combination welds between 80-pound T-rail, 7-inch 70-pound and 95-pound T-rails and 9-inch girder rails. In making combination welds we found that it was essential to get a good body of metal between the upper side of the base of the deeper rail and the under side of the shallower section in order to secure the strongest type of weld.

Thus far there has been no appreciable excess wear in the head of the rails at the welds and the heated portion seems to take the original temper, as it cools down slowly in about the same way as when coming from the rolls.

A few portions of thermit, not over six, have been lost through failure of the workman to tap the crucible properly, or lack of luting around the joints of the molds. We have had but one explosion during our entire experience. That occurred after using the process 18 months, and was caused through carelessness in welding on a rainy day and in not thoroughly luting the molds near the top. The slag came in contact with the wet earth around the mold, but aside from the scare occasioned by the report and a slight burn on the foreman's arm from flying slag no harm was done, and the weld turned out to be a good one.

Cost of Thermit Joints.

The total cost per joint to weld the 9-inch girder rail on the 1906 construction, including all labor, materials, tools and patterns incident to the work, experimenting with mold



Thermit Rail Welding—View of Completed Joint.

materials and cost of oven, was \$5.86. The total cost of welding old 9-inch girder work, including the removal of brick pavement and concrete at the joints and replacing the same, was \$7.44 per joint. The total cost of welding the 7-inch T-rail during 1906 was \$5.81 per joint.

Our track construction work has not been of such magnitude as to require continuous welding day after day, and we have used three men from a regular track gang for this work. In consequence the cost has not been so low as

would have been the case under continuous operation. We have never exceeded 20 welds in any one day.

We tried welding at night for a short time, but on account of increased expense and liability of accident gave it up, as there was no real necessity for doing it at night so far as the operation of cars was concerned. The comparative simplicity and small cost of the outfit required, the facility of manipulation and the flexibility of the process in its application to various sections of rails and to other welding purposes serves in our opinion to make it altogether desirable.

Welding Truck Frames and Cross Bonds.

Besides the regular rail welding we have successfully welded a broken side frame of a Brill 27-F truck at a cost



Thermit Rail Welding—Tapping a Cupola.

of \$6.85. This new part would have cost \$30, and the master mechanic considers the frame as serviceable as a new one. As the truck was not taken apart to do the welding, the advantages and economy of the thermit for this kind of work must appeal strongly to the economical mechanical engineer.

We have made a practice of welding in 500,000-circular mil copper cable cross-bonds spaced about 1,000 feet apart, and have met with signal success. As a matter of economy we have used a joint weld at one end of the cross-bond by boring a hole through the mold and inserting the cable opened to receive the projection of the rail base. The other end of the cable was welded opposite the joint by using a regular mold and one-fifth of a portion of the thermit at a cost of about \$1.25.

We feel that our experience and the signal improvement of 1906 over the welding done in 1905 warrants us in continuing the use of the process. If our breakage does not exceed 2 per cent a year, assuming the life of the rail to be 15 years, we shall have expended about \$2.25 per joint in paved streets in maintaining perfect stability and practically full electrical conductivity of the rails. Moreover, we have every reason to expect that the failures will materially decrease, as the weak joints should show themselves within the first year of service. We are also confident of reducing the breakage and loss of welding portions at the time of welding because of the experience gained by our men.

A preservative process for wood intended for the interior finish of buildings, railway cars, etc., and for furniture, etc., has been invented by a Mr. Horak, and is in use at his factory in Klosterneuburg, near Vienna, Austria. The process is applied to green timber, the preservative fluid being forced in under hydraulic pressure. The same fluid is also used to give the wood any desired color, and when the wood is dried it can be sawed and turned for manufacture. It is claimed that by this treatment all interior painting may be avoided, the colored wood being simply polished or varnished. It is further claimed that the treatment makes the timber free from attack by insects, and that by a slight additional treatment the wood can be rendered fireproof. No details of the process or the preservative have been made public.—Engineering News.

ELECTRIC WELDING.*

BY P. NEY WILSON, ROCHESTER RAILWAY COMPANY.

I am in a rather peculiar position, having been with the Rochester Railway Company only about one week, and therefore not familiar with the performance of the electric welded joints in that city.

I shall not go into the subject of the details of electric welding so far as the equipment is concerned. This matter has been covered, I understand, very thoroughly in past meetings of this organization. Joints are unquestionably the most important detail in the permanent-way department. It is my opinion that no mechanical joint is equal to a good weld. Viewing this from the financial standpoint, or from the standpoint of the purely practical track foreman, the weld is the thing. We know that we can make a good roadbed if sufficient funds are available. Unless the joints are welded, we cannot by any means be positive that we can hold our joints.

Cost of Electric Welding.

I shall read a detailed statement of cost of welding 3,087 joints in Camden, N. J., which is the South Jersey division of the Public Service Corporation.

Summary of Costs of Electrically Welding 3,087 Joints, on Haddonfield Pike, Moorestown Pike, Kaighn Avenue, Broadway, State Street and River Road, Camden, New Jersey.

Cost of labor	\$7,031.24
Cost of material	581 00
	<u>\$7,612.33</u>
Credit from sale of old fish plates and bonds	2,816.59
	<u>\$4,795.74</u>
Cost of welding 3,037 joints @ \$5.25 each.....	16,206.75
Cost of replacing asphalt, 899.6 yds. @ \$2.53; 117 yds. @ \$2.51	2,569.65
	<u>\$23,572.14</u>
Total cost of operation	\$23,572.14
First cost per joint, labor	2.277
First cost per joint, material .....	.188
First cost per joint, labor and material	2.465
Cost per joint, labor and material, after credit is deducted	1.553
Final cost per joint, all labor, material, welding and asphalt charges	7.635
Cost per mile, under similar conditions, 30-ft. lengths..	2,627.52
Cost per mile, under similar conditions, 60-ft. lengths..	1,343.76

Cost Per Joint, Paving and Rail Section on Above Streets.

Haddonfield pike, 7-inch girder (P. S. Co. Sect. No. 238 and Cambria No. 824) rubble stone on sand, 989 joints..	\$ 6.684
Moorestown pike, 9-inch girder and 7-inch girder (P. S. Co. Sects. 238 and 200) rubble stone on sand, 1,128 joints..	6.704
Broadway, 7-inch girder (P. S. Co. Sect. No. 238) asphalt between rails and part of shoulder, Belgian block along rail, on 6-inch concrete.....	
Kaighn avenue, 7-inch girder (P. S. Co. Sect. No. 238) brackets between rails and shoulder, on 6-inch concrete, 779 joints	10.438
State street and River road, 7-inch girder (Cambria Sect. 334) rubble stone on sand, 191 joints	6.632

Total, 3,087 joints, average cost.....\$ 7.635

You will note that the credit for sale of old fish-plates and copper bonds represents rather a large figure. I admit that I was somewhat surprised at this figure myself, but it is based upon actual cash received from a local scrap dealer in making sale of the old material. I might add that the sale of the bonds figured very materially in making this figure so high. We used a bond devised by ourselves, which cost in material alone \$1.25 per joint. The material being almost entirely composed of copper naturally gave us a very good return in the way of credit.

Breakage.

Regarding expansion and contraction: We paid little or no attention to this matter, as I am strongly of the opinion that in the improved paving, there being little change in the temperature of the earth, there is correspondingly very slight expansion and contraction. In the total of 3,087 joints in one year, we had 32 breaks, or about one per cent. On Broadway and on Kaighn avenue we had a total of 779 welded joints, and none broken. These two streets were paved with asphalt on concrete. The entire number of broken joints occurred on Haddonfield Pike and Moorestown Pike where the track was laid on sand and paved roughly with rubble-stone. The condition of the paving was such that in the winter months the snow and ice had an opportunity to get in around the rail, and this condition I regard as the cause of the broken joints, as the same section of rail was welded in each instance.

Cost and Value.

The bonding of joints is so closely identified with the joint itself that one should be considered with the other.

*Paper presented at the quarterly meeting of the Street Railway Association of the State of New York, Buffalo, January 11, 1907.

This feature should be given consideration as a very important matter, as the question of installing a rail bond is, to my mind, simply a choice of evils; with the weld we know we must have a perfect bond. From the general manager's standpoint I think the matter should be approached in this way: In the case of old track with more or less battered joints, prices should be obtained upon a step-joint for raising the receiving rail sufficiently to surface the lowest spot in the dish with the abutting rail. To this figure should be added the cost of the bonds (loose and battered joints are usually accompanied with bad bonding); then add labor cost and incidental material and make a total. This total should be compared with the cost of welding.

In the case of the work in Camden I found that the cost of electric welding was less than the estimated cost of placing step-joints. I found by making tests of electrically welded joints the conductivity was equal to or greater than that of the solid rail section, using the Conant T-pole bond-testing machine.

I have heard the opinion expressed by several managers that they would not weld new track, but that welding was all right in the case of battered joints. Personally, this appears to me as a discrimination without a difference.

I learn from Mr. Kleinschmidt that the Lorain Steel Company has recently successfully applied the process to T-rail track on interurban lines, having welded a stretch of about six miles from Providence, R. I., to River Point. In this track they used expansion joints every 1,000 feet. They also welded the third rail on some two miles of elevated track in Brooklyn. Another interesting piece of welding was the new T-rail tracks on the Brooklyn bridge. As this rail is laid directly on the plank, it is evident that the electric weld was the only form of welded joint that could be used. There are, I believe, five expansion joints on each rail and no reports have been made to date.

In August, 1905, 1,770 joints were welded in Rochester. The cost of welding was \$5.00 per joint. Total cost, including welding and replacing pavement, etc., was \$11.25 per joint. Up to January 29, 1906, there had been 114 breaks, or about 6½ per cent.

On Monroe avenue, Rochester, out of a total of 303 joints there were 48 breaks, or 15 per cent. This was a Trilby rail and I believe Mr. Matthews attributes these failures to the type of rail, especially on account of the weak web. The fact that 415 joints were welded on Park avenue and Mt. Hope avenue and Main street, and none broken, seems to prove the above statement.

I would like to conclude by asking a question: The cost of placing a step-joint with bonds on old and battered joints is about one dollar more than welding. The cost of placing an improved mechanical joint is about the same as a weld. Why don't the general managers weld?

Signal Operation on Interborough Rapid Transit.

The report of the signal engineer of the Interborough Rapid Transit Company for the month of October, 1906, shows "failures" as follows:

Cause of Failure	Total No. Failures	Total No. Delays
Signals:		
Broken wire	3	5
Broken track wire	2	2
Direct current relay.....	1	1
Fuse	1	1
Insulated joint	4	8
Trackman	1	1
Piece of umbrella bridging joint	1	2
Dirt in valve	1	1
<u>Total</u>	<u>14</u>	<u>21</u>
Switches:		
Indication spring	1	2
Out of adjustment.....	1	1
Ran by signal	1	6
Rail running ahead.....	2	2
Changing spring comb	2	1
Thrown under train.....	1	3
<u>Total</u>	<u>8</u>	<u>15</u>

During the month of October the number of signal and stop failures was 14. The number of signal movements was 6,718,346, making one failure to 479,881 movements. The interlocking and block signal system is operated electro-pneumatically with alternating current track circuit control, and was installed by the Union Switch & Signal Company.

It is to be remembered that the so called failure with this apparatus means that the signal from some cause indicates danger when the track is in fact clear, and not that it indicates clear when the track is not clear.

RAIL BONDS.

BY H. L. MACK, INTERNATIONAL TRACTION COMPANY.

The object of rail bonding is to join the ends of rails so as to afford an unbroken circuit through them for the return current. The carrying capacity of the bonds can be determined in the same manner as the carrying capacity of the feed wires. When the tracks or rails of one line are to carry return current from two or more lines, the carrying capacity of the bonds can then be determined on the carrying capacity of the feeder, on the two or more intersecting lines. Where numerous lines intersect and the return current is to pass over a single line, and in case the flow of current is greater than the carrying capacity of the rails there may be used a supplementary cable or cables with a carrying capacity to off-set the overload of current passing through the rails. This cable can be run along the rails or through conduit or on poles; but in any case the best results may be obtained by frequent connections to the rails. Where trolley tracks cross steam railroad tracks at grade, supplementary wires can be used with good results. These wires are of no value around curves or special work, but only at such places where the uniform bond cannot be applied. Grounding the rails to water or gas pipes is of no value. As to increasing the capacity of the return circuit, damaging results often occur through such practice.

Installing Bonds.

The question is often asked—What is the best bond? The best bond is that in which the greatest care is exercised in its application, as the workman can make the bond an effective connection, or so much junk. Too much care cannot be taken in such application, which should not be made until the hole in the rail is perfectly bright and free from rust, dirt or moisture. The terminal on the bond should also be bright and free from moisture before being put in. Bonds should not be applied in damp or wet weather, as moisture will start corrosion and greatly reduce their efficiency. In drilling rails for bonds the best results may be obtained by drilling dry and in no case should there be any oil used on the drill, as oil forms a coating at the point of contact and greatly increases the resistance of the bond.

Where holes for bonds are drilled in the rails at the mills they should be drilled 1/32 inch smaller than the diameter of the terminal of the bond, as the rails often become rusty before they are used, and if the holes should be drilled large enough at the mills, they would be too large after reaming out. The hole should be reamed out to exactly the diameter of the terminal. No type of bond should be installed by unskilled labor if good results are expected. One man should have charge of, and be responsible for, the installation of all bonds and keep as nearly as possible a complete record.

Test Results in Buffalo.

The International Railway Company has used nearly all types of bonds which it was thought would give good results. After long experience and a careful study of different types, we have adopted as a standard the compressed-terminal bond which we have used for several years with very good results. During the summer of 1906 we had the entire system gone over with the Albert B. Herrick autographic test car to determine the condition of the bonds; the test proved very valuable, as well as interesting. In the city of Buffalo there are about 19½ miles of electrically-welded track; the test showed this to be a uniform conductor the entire length, as when the rail ends are welded together it no longer remains a joint and affords no greater resistance than any other portion of the rail.

Compressed-Terminal Bonds.

The type of compressed-terminal bond which we use is a No. 0000, 10 and 12 inch flexible with 7/8-inch terminal; two of the bonds are put under the splice bars at each rail joint and if these bonds are carefully installed I believe they will be found the most reliable and after four or five years' service will show less resistance than any other type of bond which is on the market. At the present time we have this type of bond installed on some of the track which was laid in 1897 and 1898, and the tests taken in the summer of 1906 showed the resistance of the joint to be less than that of four feet of adjacent rail, which I think is very good in view of the fact that the importance of a bond or a complete re-

turn circuit was not considered as serious at that time as at the present.

Crown-Pin Bonds.

In 1900 we laid about 12 miles of track which was bonded with 10 by 12-inch No. 0000, crown-pin figure-8 bond, 3/4-inch terminal, two bonds in each joint put in under splice bars. A recent test made did not show these bonds to be as efficient as the compressed terminal bond. As the compressed terminal bond had been installed nine years, and the crown-pin bond but five years, this would show a marked difference in the efficiency, but in justice to the crown-pin bond, I may state that owing to the work being rushed and not enough time taken to afford careful installation, there was not the care exercised in applying these bonds that there should have been to give the best results. The bond has some advantages over any other type of bond when rebonding is necessary and trains or cars run at frequent intervals, and at high speed, and when it is not desirable to interfere with the service. Its application is very simple as it is only necessary to drive in a pin; the drilling and bonding can be done without placing any obstacle on the rail, such as a screw compressor, to cause any fear of derailment. This would apply mostly to high speed interurban lines, or to steam roads undergoing electrification.

Soldered Bonds.

I believe we were one of the earliest users of the soldered bond, which we started to use in 1893. After a number of tests, both electrical and mechanical, we thought we had solved the bonding problem; we not only used the bonds on all new track and track relaid, but we went in very extensively to rebonding. In about three years we had occasion to change some special work, where these bonds were used, and to our surprise we found some of them practically of no use at all, as the tinning between the bond terminal and the rail had very nearly all disappeared and rust taken its place. It is needless to state that we discontinued for the time the use of soldered bonds. The bond which we used was made in our shops; the terminal was about 2 1/2 inches in diameter, carefully planed off; the rail was also carefully cleaned off with a special tool made for the purpose; the bond terminal and rail were both tinned before installing the bond so it is quite evident that our experience with soldered bonds has not been very satisfactory. About one year ago we had installed by one of the leading makers about 500 soldered bonds and I have just recently made a test of a number of these bonds and am pleased to state the results were very satisfactory. I do not believe enough is known of soldered bonds to determine their exact location in the scale. I would like to see a soldered bond not only stand as a competitor to other types of bonds but to rank first in the list, as I believe it is the most practical of application and has the highest electrical test when first applied. What remains to be determined is the life of the bond.

Southwestern Traction Company to Abandon Ganz System.

The stockholders of the Southwestern Traction Company of London, Ont., have approved the plans of the board of directors for discarding the Ganz two-trolley three-phase system now in use, which has proved unsatisfactory during the past season, and substituting the direct-current system. The current is now generated at a power house located at Chelsea Green at a pressure of 10,000 volts. Transmission lines carry the current at this voltage to transformer stations located along the line, where it is stepped down to 1,000 volts, three phase, and fed to the double trolley wires. The rails constitute the third conductor of the circuit. It is expected to have the new system installed and in working order by May 1, without interrupting traffic. The contract for the electrical equipment, substation apparatus, car motors, etc., has been let to the Canadian Westinghouse Company of Hamilton, Ont. At present the company operates three passenger cars which run at a speed of about 30 miles per hour and stop only at towns. Three combination passenger, baggage and express cars running at a slightly lower rate of speed are used for the local service. An hourly schedule is maintained. Considerable new rolling stock has been ordered from the Ottawa Car Company. These cars will be 50 feet in length, with seating capacity for 54 passengers and provided with smoking compartments. The company's plans also provide for the erection of a substantial brick depot at the London terminal, with accommodations for passengers and express; also the erection at Lambeth of a substantial building to be used as a substation, passenger and express depot, and dispatcher's office. The road is operating from London to Ft. Thomas, Ont., and under construction to Port Stanley, 20 miles.

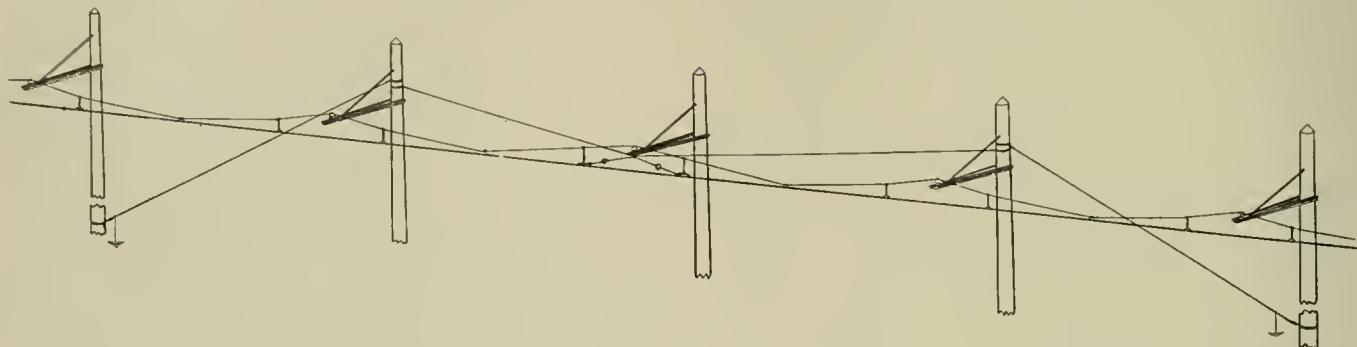
*Paper presented at the quarterly meeting of the Street Railway Association of the State of New York, Buffalo, January 11, 1907.

SPAN AND CATENARY CONSTRUCTION.*

BY G. E. EVELETH.

The primary cause for the change from bracket and span construction, as ordinarily used for direct current, to catenary construction was the difficulty in obtaining suitable insulation with higher voltages. With the trolley wire supported by a messenger wire, which in turn can be directly supported on porcelain insulators, there is no difficulty in obtaining sufficient insulation for almost any voltage. This type of construction results in a more flexible trolley wire and one which a wheel follows with much less jumping. By providing additional points of support the deflections of the trolley between supports may be decreased as much as desired. Another advantage of the catenary is that when used with trolley-wheel collectors there is little chance of the overhead work being pulled down by catching of the wheel on the supporting wires when the wheel comes off the trolley wire. It is only at curves that there is anything which could give trouble from this source as the tangents are entirely clear even at anchors.

With catenary construction it has been found feasible to increase the distance between poles up to what is now considered a standard distance of 150 feet on tangents with shorter distances on curves. The poles are set about 6 feet to 6 feet 6 inches in the ground. With bracket catenary construction the poles are given an outward rake at the top of about one foot. Guys are needed only on curves or where the ground has poor holding qualities, since with bracket supported trolleys the strains tending to bend or displace are only from one-fifth to one-tenth as great as those existing



Typical Form of Catenary Suspension.

with span construction. The question of doping the poles with tar or protecting them at the ground surface with cement and asphalt is largely a matter of individual taste.

A new element is introduced in the requirements for a bracket with the catenary construction. When the trolley is installed the maintenance will depend largely upon the exact balance of forces on the messenger wire, which means that the deflection for the individual spans should be the same. It is desirable then to have a certain amount of rigidity in the horizontal direction so that the initial dip of the messenger wire may be adjusted to the desired amount. To obtain this stiffness an angle iron bracket has been designed, consisting of 2 by 2½ by ¼-inch angles fastened together with suitable spacing blocks at the end over the track at a point 18 inches nearer the pole. Through this latter block is passed the stay bolt supporting the bracket from the pole top. The angle brackets are shipped unbent, as they are flexible enough to spring out sufficiently to take the pole.

For double track work longer angle irons are used, which are riveted together with suitable spacing blocks at each end. These may be sprung open and slid down over the top of the pole. Where this is impossible, due to wires or other conditions, one end of the bracket is usually bolted. The distance mentioned between the spacing blocks on the bracket is provided to allow an adjustment of the insulator position to accommodate alignment of the trolley and provide means to obtain staggering when the bow or pantograph collector is used.

The short iron pin designed with a special base and having a bolt passing up between the two angle irons is used to support a standard type of insulator, which is preferably made in two pieces cemented together. The insulators are cemented to the pins. Cementing is preferred to threading, as it gives the porcelain a more rigid backing and so aids

materially in preventing breakage from missiles. It will be seen that any friction due to movement of the messenger wire on the insulators will create a force tending to twist the insulator around the bracket. This is prevented by the pin stud passing between the two angle irons.

If rigid economy requires a lower cost bracket than the angle iron. One made of T-iron would be the next choice, as this possesses a shape to which the insulator pin may be readily attached without danger of twisting around the arm, though this latter bracket is undesirable from the construction standpoint as it has no stiffness in the horizontal plane.

For single-track work it is well to raise the outer end of the bracket two or three inches so that when loaded with a messenger wire and trolley the pole deflection will make the bracket level.

When the poles and brackets have been put in position and the insulators installed the line is ready for the messenger wire, which for trolley wire up to No. 0000 capacity usually consists of a 5-16-inch second grade or high strength 7-strand, double-galvanized steel cable having an ultimate strength of about 8,100 pounds, or a ¾-inch Siemens-Martin 7-strand, double-galvanized steel cable, having an ultimate strength of about 6,800 pounds. The grade first mentioned requires the use of mechanical clamps at the splices, while the softer steel can be made up into the usual cable joint. One or two miles of this messenger wire are usually run out and pulled up to give the required uniform deflection before loading with the trolley wire and fittings. For a 150-foot span at about 50 to 75 degrees F. the initial deflection of the wire should be about 16 inches. With the messenger wire in place the trolley is run out, pulled tight and clipped in at the center points of the spans. This will change the span

deflection at the center from 16 to 24 inches. The deflection will be about 28 inches when the rest of the hangers have been installed with three or more points of suspension. It is well to anchor the trolley while clipped in at the center points only so that any change in the relative position of trolley and messenger wire will not necessitate adjusting the additional suspensions. Both the trolley and messenger wires should be anchored at each end of every curve. The messenger wire deflection as given seems to be about the most satisfactory for 150-foot spans, as less deflection will cause much more variation in height of the trolley wire due to temperature changes and make the system rigid, while more deflection makes the whole system too flexible in the horizontal plane.

For years the spacing between trolley supports has been in the neighborhood of 100 feet. Many roads are now running quite satisfactorily with wheel trolleys with this spacing up to speeds of 60 miles per hour. It is probable, therefore, that with the direct-current trolley-wheel collectors and three-point suspension, bringing the distance between points down to 50 feet, will be entirely satisfactory for any reasonable speed. With sliding contacts of either the bow or pantograph type, having much more inertia than the wheel collectors, a closer spacing of supports is doubtless of advantage, as this makes the difference in level between the supports and center points of spans sufficiently less to enable the heavier collecting device to follow the wire and also lessens the blow at each support. There is nothing to decide just the number of points to give the best results, but it appears that the stiffness of a No. 0000 trolley is such that the system seems to pass the point of maximum flexibility when the supports are about 15 or 16 feet apart. If they are closer than this a contact passing under a support not only raises that support but the two adjacent ones, while at this spacing the trolley wire will bend and lift only the support under which the collector is passing. If more than three points of

*Paper presented at the quarterly meeting of the Street Railway Association of the State of New York, Buffalo, Jan. 11, 1907.

suspension are used the weight of trolley carried by the center point is not very great, and an initial twist in the trolley conductor is liable to cant the center point ear sufficiently to cause it to hit on the moving collector. It is, therefore, desirable to allow a greater distance between the lowest point of the messenger wire and the trolley so that the weight of the latter will be sufficient to prevent an initial twist canting the center point hangers.

Inertia tests on the pantograph collectors indicate that with a properly installed trolley supported every 20 or 25 feet, there is sufficient activity of the collector to follow up the deflections in the trolley wire, even supposing that these deflections were not actually reduced by the pressure of the collector on the wire at intermediate points between suspensions.

A number of styles of connection have been developed to support the trolley wire from the messenger, but the one which is recommended most strongly at the present time consists of a sister hook of malleable iron grasping the messenger wire, having a flat strip of steel $\frac{1}{8}$ by $\frac{5}{8}$ inch, connecting this sister hook with the clamping ear. This ear has been made up in a variety of forms and the selection of the type is largely a matter of personal choice, as a number of mechanical and screw clamp ears have been developed for this purpose.

With the pantograph collectors a clearance of about 6 inches vertically, 3 feet away from the trolley wire is required for clearance on curves where the outer rail is elevated, throwing the collector contact surface at an angle with the horizontal. Since the pull-offs must be on the outside of the curves where the clearance space is necessary a bridle arrangement has been adopted, which consists of $\frac{1}{4}$ -inch seven-strand cable attached to a special clamping ear with eye on the trolley wire and a special sister-hook with an eye on the messenger cable. A rod forms a rigid connection between sister-hook and ear. The strain insulator is inserted in the apex of the triangle formed by this bridle. With curves of large radius, a device known as the "steady brace" is used to push off the trolley wire at a point directly below the bracket. This push-off brace consists of a screw-clamp ear to which is attached a gooseneck piece of $\frac{5}{8}$ -inch threaded steel rod, which in turn is attached to the end of a wooden stick about two inches in diameter. The other end of this stick is fitted into a socket carried, in the case of high voltage work, by a special porcelain insulator, which is so pivoted at the pole as to allow the motion in a horizontal plane that is required by movements of the trolley wire. In double-track work the principle of the bridle pull-off is used just as the double-curve hanger for direct current work.

It is well to anchor the trolley about four times to the mile. The anchor is attached to the trolley about 25 feet either side of the pole anchor bracket, which in turn is anchored to adjacent poles. The change from the center point of span, where the anchor cable would be nearly parallel to the trolley wire, to this location nearer to the bracket is necessitated by the danger of a loose anchor cable catching in a sliding contact. With this type of anchor and a wheel-collector the angle between the anchor guy and the trolley is so small that it is not possible to catch a wheel between them.

All of the catenary material is installed suitable either for wheel or bow collectors, with the exception of the frogs which must be special for each condition.

The strain insulator required for this high voltage work has been one of the most difficult problems to solve, but a solution has been very well worked out in a special type of insulator made of porcelain, weighing $4\frac{1}{2}$ pounds and capable of withstanding 12,000 pounds pull, or in other words more pull than any cable used in this sort of construction.

It seems difficult of belief that public cars in New York carry far more passengers than in London. Such, however, was the case for the year 1905. The omnibuses, trolleys and underground railways carried in London, in 1905, some 604,834,000 passengers, as compared with 596,315,000 in 1904, an increase of 1.4 per cent. In New York the figures are 1,442,347,999 for 1905 and 1,241,939,000 for 1904, a gain of 7.6 per cent. Both figures are more than double the corresponding figures for London.

At the Rochester branch of the Street Railway Young Men's Christian Association it has been found a satisfactory practice to use the association's funds for cashing weekly payroll checks of the members. This association conducts educational classes in rooms especially fitted for the purpose at one of the branches in Rochester. The average daily attendance is 575 and the number of lunches served in the association restaurant is 327.

NORTHWESTERN ELECTRICAL ASSOCIATION.

The fifteenth annual convention of the Northwestern Electrical Association was held at the Coliseum building, Chicago, on January 16, 17 and 18, in connection with the electrical show of the Chicago Electrical Trades Exposition Company. Both morning and afternoon sessions were held. President Harold Almert occupied the chair. Thursday evening, January 17, a meeting was held in connection with that of the Illuminating Engineers' Society. A large number of interesting papers was read, as follows:

"Warrantable Expense for Meter Testing," by O. J. Bushnell.

"Profitable Co-operation," by J. Robert Crouse.

"Water Powers of Wisconsin," by Ernest Gonzenbach.

"Some Characteristics of Alternating Current Motors in which the Central Station Man is Vitally Interested," by C. W. Bergenthal.

"Producer Gas Power." General discussion.

"Outline Lighting," by Homer Honeywell.

"Some Phases of Smaller Central Station Management," by H. H. Scott.

"Uniform System of Accounting for Small Companies," by Fred W. Insull.

"Some Points in Illuminating Engineering for the Small Central Station," by J. R. Cravath.

"The Trend of Improvement in the Design and Operation of Boiler Plants," by A. Bement.

"Premiums to Employees," by Ernest Gonzenbach.

ILLUMINATING ENGINEERS' SOCIETY.

"Large Versus Small Units in Street Lighting."

"Globes and Reflectors for Street Lamps."

"New Street Lights."

At the Friday morning session Mr. Ernest Gonzenbach, general manager of the Sheboygan (Wis.) Light, Power & Railway Company, addressed the meeting on the subject of "Premiums to Employees," giving an interesting explanation of the premium system as applied by his company. He said that he had wanted to reduce the cost of power production by awakening an interest in the employees, but without scattering broadcast among the public the cost of producing electricity. Therefore, about a year ago, after calculating the cost of coal, oil, repairs, etc., for a year he told the men that a certain per cent of the saving over that amount should be divided up each month among the employees according to the rank of the men, the engineers receiving the largest per cent. The men were not told the exact per cent of the saving. This system had proved very satisfactory and had produced a spirit of rivalry and interest among the men which was very advantageous to the company. The firemen watch the engineers to see that they do not waste the power and the engineers watch the firemen to guard against the use of too much coal. He said that the highest compliment to this system had been paid by a coal company, which objected because the employees were too scrupulous in inspecting the coal. On one occasion when the carelessness of an engineer had wiped out the entire month's premium in cost of repairs it had been unnecessary to ask the man to resign because the men made it so uncomfortable for him.

This system had also been applied to the sollicitors for the lighting business. Many sollicitors had gone away from the town disgusted with their lack of success because Sheboygan is very socialistic and the feeling against public service corporations is so strong that the sollicitor's task is made exceedingly difficult. After considerable experience of this kind it was decided to employ as sollicitors men who resided in the town and understood the peculiarities of the people. All employees who had to deal with the public were organized into a business board which met every Monday night and held regular board meetings, electing their own officers, and this had created an esprit de corps, which produced very satisfactory results. Every month 10 per cent of the increase in revenue from the lighting department over the same month of previous year was set aside and distributed among the men. During the year the system has been in force the average increase per month over the corresponding month of the pre-

vious year had averaged over 16 per cent. The premium system was an incentive to each man to treat the public with increased interest and courtesy.

In the discussion which followed, the opinion was expressed that under the premium system as applied to the power house there would be a tendency to keep the amount of repairs as low as possible for several months in order that the premiums might not be affected and to bunch the repairs into one month. Mr. Gozenbach said that large repairs, such as alterations, were not included in calculating the premiums, and there has been no tendency to hold off the smaller repairs in order to keep the premium up.

Mr. A. Bement, then read a paper on "The Trend of Improvement in the Design and Operation of Boiler Plants," which will be found elsewhere in this issue.

The following officers were elected for the ensuing year:

- President, Edward Daniels, Menominee, Wis.
- First vice-president, B. C. Adams, Lincoln, Neb.
- Second vice-president, H. F. Pierce, Negaunee, Mich.
- Secretary-treasurer, R. N. Kimball, Kenosha, Wis.
- Directors: J. S. Allen, Lake Geneva, Wis.; W. R. Putnam, Red Wing, Minn., and Geo. H. Lukes, Evanston, Ill.

The next meeting of the association will be held at Milwaukee, Wis., January, 1908.

STUDENT RECORDS IN MEMPHIS.

In order that a complete record may be kept of the student work of all new conductors and motormen, the Memphis Street Railway Company uses instruction order-blanks

P. F. Campbell
Form No. 13-10-08

THE MEMPHIS STREET RAILWAY COMPANY

INSTRUCTION ORDER STUDENT BADGE

No. _____ MEMPHIS, TENN. 190 _____

ISSUED TO _____ MOTORMAN'S BADGE No. _____

On entering the service Students will be given this blank. Students will be assigned to the different lines, one at a time, until he has completed his course of instruction and has learned all of the lines. The Motorman or Conductor in whose charge the Student is placed for instruction, will O. K. the Student in the space provided, after he is competent to perform the duties required of him on that particular line, and no until he is competent. After the Student has completed his course of instruction on all the lines, he will report for examination.

Assigned to _____	Badge No. _____	Assigned to _____	Badge No. _____
Line _____	Date _____	Line _____	Date _____
Hour on _____	Hour off _____	Hour on _____	Hour off _____
O. K. _____		O. K. _____	
Assigned to _____	Badge No. _____	Assigned to _____	Badge No. _____
Line _____	Date _____	Line _____	Date _____
Hour on _____	Hour off _____	Hour on _____	Hour off _____
O. K. _____		O. K. _____	
Examined and found O. K. _____	190 _____	Approved for Regulation Badge _____	190 _____

Student's Instruction Record as used at Memphis. (Original 8 3/4 by 10 inches.)

for each "student." These blanks present spaces for each of the 14 lines operated by the company. When the student is assigned to one line he remains there until his instructor, either conductor or motorman as the case may be, is satisfied that he is competent to perform the duties required of him. The instructor then fills out and O. K.'s the blank for his line, and passes the new man to the foreman instructor for assignment to another line.

It is required that the student learn the peculiarities of each of the 14 lines before he will be given charge of a car. When the instruction order-blank has been properly filled out it is filed in an envelope with the student's application for employment, his recommendations and other records that have been gathered of him.

Men who have not qualified for the operation of a car over all the lines are furnished with badges reading "Student Motorman" or "Student Conductor." As soon as their courses of instruction are completed the "student" badges are taken up and the standard badge issued in its stead.

THE CHICAGO TRACTION ORDINANCES.

We present herewith a brief abstract of the principal features of the two ordinances reported to the Chicago city council by the local transportation committee on January 15 as the basis of a settlement of the long pending street railway controversy. The committee has been working out the terms of the settlement ever since the United State supreme court in the famous "99-year case" last spring declared that the greater part of the franchises of the Chicago City Railway and Chicago Union Traction companies had expired. Since the decision of the court the companies have been operating under a temporary license from the city. The ordinances now in the hands of the council give the Chicago City Railway Company and the Chicago Railways Company, which is to reorganize the Chicago Union Traction Company, a license to operate a street railway system in designated streets from February 1, 1907, to February 1, 1927, or until the city or a company licensed by the city shall purchase the properties with a view to eventual municipal operation.

They have been agreed upon, after numerous and exhaustive conferences in the committee, by the city authorities and the financial interests controlling the companies, and represent compromises on many important points, particularly in regard to the value of the properties. The valuation decided upon, \$21,000,000 for the Chicago City Railway and \$29,000,000 for the Union Traction Company, was fixed after thorough inventories had been made both by the companies, who called their property worth \$74,000,000, and by a commission appointed by the city, who estimated the property at approximately \$46,000,000. The ordinances differ materially from a franchise contract and contain several unusual features. In effect, they constitute a partnership contract between the city and the companies until the city is in a position to adopt municipal ownership. In the provisions for the operation of the roads under this partnership, the reconstruction of the property and the terms of municipal purchase, the two ordinances are identical. The Union Traction ordinance differs from that for the City Railway only in the provisions for reorganization, for the perfection of its title to the north and west side lines, for the relations with the Consolidated Traction Company, which is controlled by the Union Traction Company, but which still holds its franchises, and for the construction of new river tunnels to connect with the future subway system.

Under the terms of the Foreman resolution, passed by the council, a petition asking for a referendum vote on the ordinances at the April election is to be circulated. If 86,000 voters sign the petition before February 2 the council may pass the ordinances subject to the referendum vote. If the petition does not receive the required number of names it will be taken for granted that the people approve the ordinances and the council may pass them at once, the work of rehabilitation to begin immediately thereafter. The most important features of the two ordinances, which it is believed will be passed in substantially their present form, are as follows:

Reconstruction.

Both ordinances provide that the work of reconstructing the street railway properties and of bringing the service up to the highest attainable standard shall begin at once under the supervision of a board of supervising engineers selected by the city and companies. The cost of the rehabilitation is to be borne and paid by the companies, it being provided that no contract or subcontract (except in the case of tunnel construction) shall be let by the companies without the approval of the board of engineers, and no bills for material and labor paid without similar approval. To the actual cost of the work 10 per cent will be added as contractor's profit and 5 per cent as brokerage in the procuring of funds. The board of engineers will report monthly to the city comptroller the amounts expended for rehabilitation and extension. In the case of the Union Traction Company it is provided that the reconstruction cost may be represented by bonds bearing 5 per cent interest and maturing not earlier than 20 years hence.

Cars.

Within three years the City Railway shall have 800 and Union Traction 1,200 new and thoroughly up-to-date cars in operation.

besides a certain number of cars now in service which they will be allowed to retain. The cars must be kept clean and well ventilated and not below 50 degrees in temperature. Single cars only are to be operated after one year from the passage of the ordinances. The companies also bind themselves to abide by any reasonable service regulations imposed by the council, the board of engineers to be a judge of the reasonableness thereof.

Motive Power.

The motive power shall be electricity, and after the expiration of three years the companies may be required to install the underground trolley system.

Subways.

The city has the option of building a subway through which the companies will be required to operate cars, or of exacting a contribution of not more than \$5,000,000 from the companies to apply on the cost. The title of the subway is to be held by the city in any event, but only the grantee companies may use the system for street railway purposes during the life of the ordinance. Three-fifths of the amount advanced toward the cost shall be paid by the Union Traction and two-fifths by the City Railway. The location and extent of the system is to be specified by the council and the plans approved by the board of engineers. After the expiration of five years the companies may be required to join the city in building subway extensions. At the same time the companies may be required to operate cars on the surface of such streets as they occupy underground, and if the capacity of the subway permits the city may require and authorize elevated railways to operate underground on payment of a rental.

Board of Engineers.

Within 30 days from the acceptance of the ordinance each company will select an engineer and the city an engineer to sit on the supervising board. The third engineer is to be Blon J. Arnold, in full charge of the rehabilitation work. The city, or the companies, may remove its engineer at any time, and the third engineer may be removed by agreement between the city and companies. In case of disagreement the judges of the first district appellate court may appoint and remove the third engineer, and in case of the failure of these judges to act either party may apply to the circuit court for redress. The courts may be asked to remove any of the engineers on charges of fraud or corruption. The city's and the companies' engineers are to receive not less than \$3,600 nor more than \$10,000 a year, and the third engineer is to receive \$15,000 a year, and \$15,000 a year additional during the three years of rehabilitation.

Through Routing.

Through routes will be established jointly by the companies, 21 such routes being specified in the ordinances, running from Seventy-first street to the northern and western limits of the city. Other such routes may be added from time to time by the city council with the approval of the board of engineers.

Fares.

With the fare remaining at 5 cents for a continuous ride, universal transfers are to be given passengers everywhere except in the downtown district, bounded by Twelfth street and the river. Outside of this district transfers will be interchangeable between the lines of the Union Traction, City Railway and Chicago General Railway companies, the last-named operating in Twenty-second street. Transfers are to be good till 15 minutes after the time the passenger's car reaches the transfer point. No passes are to be issued, and only employes of the company, city policemen and firemen in uniform may ride free. Mail carriers may ride free provided the postoffice department shall reimburse the companies on the basis of the number of carriers and the amount paid in 1905.

Division of Receipts.

There will be an annual accounting and division of net receipts between the city and the companies on April 15 of each year. From the gross receipts will be deducted all operating expenses, including maintenance, repairs and renewals, percentages of special funds for these purposes and depreciation, and personal injury claims, taxes, assessments, engineers' salaries, together with 5 per cent interest on the amount of the purchase price which the city would be obliged to pay if purchasing at the close of the year. In the case of the Union Traction Company a deduction may also be made for a special fund to protect the city against interest charges on bonds. The net receipts then remaining are to be divided, 55 per cent going to the city and 45 per cent to the company.

Purchase by the City.

The city may purchase the properties of the companies at any time upon giving six months' notice of its intention. If the city desires to operate the roads the price to be paid will be the value of the present properties \$50,000,000 plus the cost of reconstruction and re-equipment. The amount shall be paid in cash to the companies and the city will take over any incomplete contracts for construction or deposit sufficient funds to cover the cost of the work. These conditions having been fulfilled the city will enter into possession of the properties free of all liens and claims except such as are created by the ordinance. Without intending to operate the roads the city may purchase unconditionally at any time prior to February 1, 1927, on the payment of a 20 per cent bonus in addition to the purchase price.

Purchase by a Licensee.

The city may authorize a licensee company to purchase the properties from the companies on payment of the city's purchase

price and a 20 per cent bonus. The licensee will not be required to pay the bonus provided that it has entered into a valid contract with the city to operate the properties for only a 5 per cent profit on the investment, 95 per cent of the profits going to the city. If the city or its licensee purchase during the three years' construction period it is provided that the City Railway shall be permitted to finish the work under way and planned. The city must then deposit in trust sufficient funds to cover the cost of this work, including the 10 per cent contractor's profit and the 5 per cent brokerage, to be paid out by the depository at the order of the engineers. In the case of Union Traction the city has the option of allowing the company to complete the work or it may pay only the purchase price and assume the property subject to the construction bond liens. If the city does not purchase before February 1, 1927, it may designate some person or corporation to purchase as its licensee on the same terms as the city might purchase. If the city does not exercise this right it may grant the right to operate in the streets to another company, which shall purchase on the same terms as the city.

Chicago Railways Company.

The Chicago Railways Company agrees to acquire all the property and rights of the Union Traction Company within 120 days after the passage of the ordinance provided a clear title can be obtained on the same terms as the city's purchase price, which at this time is \$29,000,000. In case such a clear title cannot be thus obtained the company has 30 days more in which to promulgate a plan of reorganization of Union Traction which shall be approved by Judge Grosscup or Judge Seaman. It is stipulated that this plan must recognize fully the rights of all securities involved. Not later than January 20, 1908, the company must proceed to perfect its title, the city using its powers to assist and the company agreeing to indemnify the city for all expenses so incurred. By the end of three years from the passage of the ordinance the title must be perfect and the company have deposited in trust a majority of the stock of the North and West Chicago Street Railroad companies and two-thirds of the stock of the North and West Chicago Street Railway companies and the Union Traction Company. If the company afterward fails to comply with the terms of the ordinances these stocks are to be held subject to the control of the city in perfecting the title. The company is to have no right to accept the ordinance unless it is in legal possession of the properties and in a position to comply with the terms.

New Company's Guarantee.

The new company guarantees to give the public through routes, one fare, and universal transfers over the Consolidated Traction lines, and to protect the city against any diminution of receipts by virtue of its operating agreement with the subsidiary company. This operation agreement is to be canceled by the company when the city purchases if the city so requires. If the company defaults on any of the terms covering the Consolidated situation, the city may take over the properties and operate them, paying the company 5 per cent on the purchase price at that time and retaining all the remaining net receipts. In case the Union Traction Company fails to accept its ordinance, the City Railway is authorized to extend its lines to the north and west sides through the medium of the Chicago City Railroad Company. If the City Railway fails to accept its ordinance the Union Traction Company is authorized to extend to the south side.

Improvements at Covington, Ky.

Extensive improvements are being made to the power house and tracks of the South Covington & Newport Street Railway Company of Covington, Ky. This company's lines connect Covington with Cincinnati, O., and with Newport, Ky.

During the past season the company has expended upwards of \$200,000 in laying new rails and repairing its tracks and it is announced will spend an additional \$150,000 during 1907. Especial attention is being given to the relaying of special track work. Where new steel is necessary 96-pound rails in 60-foot lengths are used. The track is laid in concrete and is paved with brick between the rails.

The improvement of the Newport power house and its equipment includes the installation of a Curtis turbine unit of 2,250 kw. capacity, two 500-horsepower Stirling boilers with superheaters, Sturtevant economizer, Jones underfeed stokers, Wheeler condenser, vertical-triplex motor-driven Wheeler-Mullan dry vacuum pump, and a water softener and purifier.

Additions 16 by 30 feet and 35 by 50 feet, respectively, have been built to the engine room to accommodate a new switchboard and the turbine unit. Provision is made for the installation of a second turbine at some future time.

China now has a railway mileage of about 9,000 miles. Of this 1,330 miles are in operation and the rest under construction, except 930 miles "in abeyance." Last year the Chinese Imperial Railways, 526 miles, paid 20 per cent on the capital outlay.

TENDENCY IN DESIGN OF BOILER PLANTS.*

BY A. BEMENT, M. E.

The most useful suggestions that the author feels he can offer concern some features of boiler and furnace design.

The usual boiler does the largest portion of its work with the smaller portion of its surface; the horizontal water-tube type provided with two flame plates, ensuring three passes of the gases across the tubes, does from 70 to 90 per cent of the work in the first pass, or in other words, with one-third of the boiler surface, while the other two-thirds, or 66 per cent, performs only from 10 to 30 per cent, and this performance applies to other types in corresponding measure. Thus the larger proportion of the investment is in that part of the apparatus which renders but little service. One of the reasons why the boiler surface is not brought into more active service, is that the proportions of the gas passages are such that the natural volume of the gases can not fill them, therefore many corners and portions of the passes are not filled with hot gas, because the pass is larger than the mass of gas flowing through. Thus the work is performed along an exactly defined path over which the gas naturally flows, the most direct one from the furnace to the chimney.

For this reason it does not pay to use a large boiler as compared to a small one, unless with the larger, provision is made for as good utilization of the surface as secured with the smaller one. For example, one of the Heine type of 11 tubes high is approximately of the same capacity as one of 17 tubes high when equipped with the same sized grate, because the magnitude of the gas volume is the same from each, and it will be only that portion of the surface over which this gas flows that will absorb heat, and the distance from the entrance to the exit of the tube surface is approximately the same for each. Or with the Babcock & Wilcox type, as much work could be obtained with a boiler 16 feet long as now baffled, as in one of 18 feet, with the result of saving not only a small amount of investment required for boiler, but a large amount in land and buildings.

The truth of the foregoing has begun to be realized, and the tendency is for better proportioning of gas passes, so arranged as to ensure the use of a larger portion of the boiler surface than under present practice. For illustration, the performance of three boilers of the Heine type will explain the matter. One of these boilers was equipped in the usual manner, allowing the gas to flow diagonally across the tubes directly to the exit, while with the others, by means of additional baffles, the gas flowed twice the length of the tube surface in one case, and three times in the other, all three boilers having the same size and kind of grate. The relative performance was as follows:

Heine Type of Boilers	Relative work performed —by boilers—	
	Capacity	Amount of steam per pound of coal
With single flow of gas.....	1.00.....	1.00.....
With double flow of gas.....	1.04.....	1.10.....
With triple flow of gas.....	1.04.....	1.20.....

This emphasizes the importance of utilizing as much of the boiler surface as possible.

Up to a certain point the application of additional baffling will increase the capacity, owing to the fact that the amount of heat absorbed will be greater, but beyond this the reduction of draft due to the more restricted passages, will be sufficient to result in a decrease in capacity. To overcome this, special means for draft production are justified, and it has been considered possible, by means of proper baffling and a combination of forced and induced draft, to get twice the capacity from the same sized boiler as now obtained, and do so with no loss in efficiency, which would mean a saving in investment cost of one-half the boiler plant, land and building, at an added expense only of draft producing apparatus.

The setting for boilers is something which is now having special attention, as it is found that even the very best brick setting is very leaky, allowing the entrance of much cold air. As a remedy, steel jackets and reinforced concrete have been used, also brick settings have been sealed by applying a tight cement covering, over which canvas has been pasted and then painted.

Requirements for good furnace performance are, that there should be an ample combustion chamber located between the grate and boiler, in which combustion shall be enabled to continue until completed. Also, that the feed of the coal shall proceed at as nearly a uniform rate as possible, and that the removal of ash be accomplished with a minimum disturbance of the fire.

*Read before the Northwestern Electrical Association, Chicago, January 18, 1907.

ELECTRIC RAILWAY PROGRESS IN KENTUCKY.

Although the state of Kentucky has not as yet been especially active in the initiation of electric railway projects, in the central and northern part of the state the electric railway interests are now awakening to the new opportunities in this field and are planning many improvements, to keep up with the rapid advances along industrial and commercial lines.

Many of the street railways of Kentucky were built when power house, track and roadway and trolley construction had not attained their present state of perfection and since their inception but little new work has been done on them. As a result of this inaction, since Kentucky has emerged from its almost lethargic condition the railways have proved inadequate to care for the new travel. The operating companies have found it necessary practically to rebuild their city lines and to plan interurban railways to accommodate the demands made by the residents of the rural districts.

This is especially true at Lexington, Louisville and Covington, the three leading cities of the state. At Lexington, which is located in the center of the productive Blue Grass territory, a system of interurban railways is being built that bids fair to compare favorably with that radiating from any other city of the middle west. The Lexington & Interurban Railways Company, which owns or controls the city railways at Lexington, Frankfort and Winchester, has three interurban railways operating out of Lexington and is contemplating the construction of new ones that will be operated in conjunction with the existing lines. The operating lines serve the cities of Paris, located 19 miles to the northeast, Georgetown, located 14 miles to the northwest, and Versailles, located 12 miles to the west of Lexington.

By referring to a map of Kentucky it will be noted that exceptional opportunities are presented by the cities located within a radius of 30 miles from Lexington for the development of a compact system of interurban railways. Grading for a line to Frankfort, the state capital, has practically been completed. This line, which will be about 30 miles long, will be in operation during the coming summer. The right of way for a line to Winchester, a distance of 16 miles to the east, has been secured and it is expected that its construction will begin during the year. Other interurban projects under consideration by the company are lines to Richmond and Nicholasville, which are located to the southeast and southwest, respectively, from Lexington.

Heretofore the Lexington & Interurban Railways Company has not paid especial attention to the development of its power stations and car houses nor to the remodeling of its city tracks but it is announced that these are to be rebuilt at an early date.

At Louisville and Covington the operating companies are making many improvements in city and interurban properties which will better enable them to care for the increasing traffic. At Somerset a new street railway has been constructed by the Somerset Railway & Light Company. Cars began operating on this line on January 1. At Bowling Green a new power house is to be built for railway and lighting purposes, the city tracks are to be repaired and extended and it is projected to build an interurban railway to several of the nearby towns.

The Boston & Montana Mining Company, of Butte, Mont., has contracted for five electric locomotives and a complete underground haulage system. The engines will cost about \$2,000 each and are to be delivered in ninety days. They will be of the Baldwin pattern with Westinghouse equipment. The installation of these engines and proper electrical appliances to operate them will do away with the present system of tramping. When the Boston & Montana began operations men were employed to do the tramping, but eventually horses were substituted and are now in use

News of the Week

Chicago Traction Situation.

The Chicago traction ordinances were reported to the city council by the local transportation committee at the meeting on January 15, and according to the Foreman resolution adopted at that meeting, they cannot be passed until after February 2. The city officials are to circulate a petition asking the board of election commissioners to place upon the ballots at the April election the question of public policy as to whether the pending ordinances granting an indeterminate license to the Chicago City Railway Company and the Chicago Union Traction Company shall be passed. If the petition does not receive the signature of one-fourth of the registered voters of the city, or 85,000 names, before February 2, it will be taken for granted that the people approve the measures. If the required number of signatures to the petition is secured the plan is to pass the ordinances at once, with a provision making their validity conditional on the approval of the voters as indicated by the referendum vote.

At a meeting of the committee on January 11 the mayor demanded that the amount to be expended by the companies for rehabilitation be limited so as to bring the total value of the properties, including the cost of reconstruction, below \$75,000,000, the amount the city is empowered to expend to secure municipal ownership.

As the value of the properties has been fixed at \$50,000,000 and the cost of reconstruction is estimated at from \$40,000,000 to \$50,000,000 the mayor thought that the possibilities of municipal ownership were fading into the dim distance. He also desired a provision guaranteeing that the city's percentage of the net receipts should amount to a certain per cent of the gross earnings. Both plans were voted down by the committee.

The Referendum League in connection with other civic and municipal ownership organization on January 11 began circulating a referendum petition which combined the question of repealing the Sunday closing laws with the traction question on the same ballot. The mayor stated that while he did not approve of this confusion of issues, he would be guided by the result of the vote if sufficient names were secured.

At the meeting of the committee on January 14 it was decided to report the ordinances, an abstract of which appears on another page of this issue. Attorney Fisher announced the names of the five trustees who are to reorganize the Union Traction and its subsidiary companies under the name of the Chicago Railways Company, as follows: Charles G. Dawes, A. A. Sprague, Chauncey Keep, Charles H. Hubbard and A. C. Bartlett. Mayor Dunne offered a resolution providing for a referendum petition and providing that if the required number signed the petition no action should be taken on the ordinances until after the election. The resolution was voted down. Alderman Foreman then introduced the resolution before mentioned. At the meeting of the council the following night the ordinances were introduced. The Foreman resolution was adopted after a sharp debate by a vote of 55 to 12, which indicates sufficient strength in the council to pass the ordinance over the mayor's veto if necessary. One hundred thousand copies of the petition were ordered printed and circulated.

The matter will therefore lie in abeyance until the result of the petition is ascertained, although the radical element will probably carry on an active campaign for the adoption of various amendments by the council before the measures are finally passed. Mayor Dunne on January 17 came out with an announcement of his candidacy for re-election with the traction issue as his platform, advocating amendments authorizing the issue of at least \$25,000,000 additional Mueller certificates; guaranteeing that the city's profits shall not fall below a certain per cent of the gross receipts; giving an outside company the right to take over the lines by giving three-cent fares in lieu of a 20-per cent bonus; and eliminating the contractor's profit when subcontracts are let.

Cleveland Traction Developments.

The decision of the United States supreme court on January 7, holding that the Cleveland Electric franchises in Central avenue and Quincy street had expired in 1905, followed by the decision of Judge Babcock on January 10 that the Low Fare Railway Company's franchise in Sumner avenue is valid, has changed the entire aspect of the Cleveland street railway controversy and negotiations are now being made looking to a settlement of the problem according to the plan proposed by Mayor Johnson to lease the Cleveland Electric property to a holding company.

The proposition of the Cleveland Electric company submitted to the city council on January 10, to continue to operate the Central avenue and Quincy street lines on the basis of three-cent fares, all surplus of receipts over cost of operation to go to the city until the question of new franchises can be settled, was followed by other propositions from the Municipal Traction Company and the Low Fare Railway Company. The Municipal company offered to lease the Cleveland Electric property on the same terms on which it now operates the Forest City Railway, i. e., paying 5 per cent interest on the stock representing the actual value of the property, and, in case such a plan is approved by the council, to confer with President Andrews in regard to the valuation. The Low Fare company offered to operate the Central avenue and Quincy street lines at a three-cent fare, paying the Cleveland Electric company a rental for the use of its property or buying it outright, at valuation to be agreed upon by the parties concerned.

On Friday morning, January 11, President Andrews of the

Cleveland Electric and President Du Pont of the Municipal company met and agreed upon a thirty-day armistice, during which neither side should take any action on the offensive; the injunctions restraining the operation of Forest City cars should be lifted; proceedings in various suits brought by the Cleveland Electric, particularly the "financial interest" case, should be postponed, and the Forest City should do no construction work. This agreement was ratified at an informal meeting of the council that afternoon, as was the Cleveland Electric's plan for operating the Central and Quincy lines. A resolution was also adopted approving the proposition of the Cleveland Electric company to submit to the determination of A. B. Du Pont and D. J. Davies, secretary of the Cleveland Electric company, the question of the compensation to be paid to the city by the company for its occupancy of Quincy avenue and Central streets since March, 1905. The chairman of the street railroad committee was authorized to introduce such a resolution into the council for its official action. Another resolution was adopted stating that it was the sense of the meeting that an immediate settlement of the whole street railway situation would give to all the people of Cleveland the benefits of low fare, and recommending to the Cleveland Electric company, as a basis of such a settlement, the immediate consideration of the leasing proposition of the Municipal company, as embodying the best suggestion thus far made for dealing comprehensively with the entire question. The company was requested to inform the council at its next meeting of its attitude to the suggestion or of any other plan it might desire to submit.

On the morning of January 12, the Forest City cars ran to the Public Square, at a three-cent fare, and the Cleveland Electric cars in Quincy avenue and Central street were also operated at a three-cent fare.

At the council meeting on Monday, January 14, the resolutions approving the plan for determining the compensation to be paid to the city by the old company, and recommending the holding company plan, were formally adopted.

A communication was received from the Cleveland Electric company stating its willingness to consider the leasing proposition. After stating that the offer of the company to accept a franchise on the basis of seven tickets for a quarter and universal transfers is still open, the letter says that in the judgment of the company the system cannot be operated at a less rate of fare with transfers, properly maintaining the property and giving such service as the public has a right to demand. The company also says it would be glad to have its proposition submitted to a vote of the people. In regard to the holding plan it says:

"The company, however, realizes the existence of a general public sentiment in favor of the settlement of the long drawn out controversy on the subject of the operation of street railways in this city and if, in your judgment, it is not in the public interest to settle the matter by granting to this company a franchise upon the lines above referred to, we are, of course, willing to consider propositions or suggestions along other lines; and if, as we understand the action of your body last Friday, it is your wish that we do so, this company will give careful business consideration to a proposition for a lease of its property and franchises to some other company, together with an option to the city to purchase, and to this end our president will be glad to confer with Mr. Du Pont."

The communication was referred to the street railway committee.

In its offer to lease the Cleveland Electric property the Municipal company agreed to make such changes in its personnel as shall meet the approval of all concerned. The full details of the plan, as explained by Mayor Johnson, contemplate that the holding company shall consist of public-spirited citizens who shall represent the interests of both the investors and the city, and who shall have no financial interest in the result. It is proposed to reorganize the stock of the Cleveland Electric so that it shall represent the actual value of the physical property plus the appraised value of the franchises and to pay a 6 per cent rental on that amount plus one-ninth, with a provision for ultimate redemption of the stock at 110. It is proposed to lease the property to the holding company for a certain term of years, to be operated at a three-cent fare. The old company, however, is to be given a "security franchise" providing for a higher rate of fare, under which the company can step in and operate in case of default by the leasing company.

Bills to Permit City Railway Companies to Own Interurbans.

Bills have been introduced into both houses of the Nebraska legislature to give city electric railway companies the right to own interurban lines. At present this is prohibited.

Bill to Provide Vestibules.

A. R. Parker, of Ft. Wayne, Ind., has introduced into the state legislature a bill to compel street railway companies to equip the forward ends of their cars with vestibules for the protection of the motormen, between April 15 and November 15.

Wages for Extra Employees.—The Rhode Island Company, of Providence, R. I., has announced a new system of paying its extra conductors and motormen, whereby such men will be paid a minimum wage of \$1.50 per day if they work only part of the day, and will receive full pay for a full day's work.

Mayor Asks for Municipal Low-Fare Railway.—Mayor Fagan, of Jersey City, N. J., has addressed a message to the city street and water board, in which he recommended the building of an experimental three-cent fare street railway line, either by the city or by a private contractor under the control of the city. The mayor also enclosed a draft of an ordinance requiring the Public Service Corporation of New Jersey to operate sufficient cars that

every passenger may be provided with a seat and that passengers desiring transportation shall not have to wait more than five minutes for a car.

Interurban to Carry Mail.—The Bloomington Pontiac & Joliet Electric Railway has been awarded a contract for the carrying of United States mail on its line between Dwight and Odell, Ill. Under the new arrangement it is said that Chicago mail will arrive at Odell at 7 a. m., instead of at noon as at present.

Central Passenger Association Lines May Interchange with Electrics.—The members of the Central Passenger Association at a recent meeting agreed to withdraw the understanding which has prevailed for some time; that the steam roads were not to make prorating arrangements with the electrics. This leaves each steam line free to make such arrangements as it may desire.

Development of the Chicago Edison & Commonwealth Electric Systems.—At the annual meeting of the electrical section of the Western Society of Engineers held on January 11, Mr. Ernest F. Smith, superintendent of substations for these companies, delivered an interesting address on the development and operation of the large transmission and conversion system of the Chicago Edison and Commonwealth Electric companies.

International Tramway Union.—Mr. P. Serstevens, secretary general of the Union Internationale de Tramways et de Chemins de Fer d'Interet Local, announces that the International Tramway Union will publish early in February a detailed account of the proceedings of the congress of the Union held at Milan in September last. This publication will appear in French and German and will comprise about 400 pages, folio. The report will be sent to all members of the association.

Electric Railways and Municipalities.—The address of Hon. Henry J. Booth, Columbus, O., on "The Electric Railway and the Municipality," which was delivered at the annual banquet of the American Street and Interurban Railway Association on the occasion of the Columbus convention, has been reprinted in pamphlet form and is being distributed by Secretary Bernard V. Swenson. The address was published in the daily edition of the Electric Railway Review on October 20, 1906.

Springfield Consolidated Railway Increases Wages.—The Springfield Consolidated Railway Company, of Springfield, Ill., recently announced an increase of wages for its motormen and conductors who have been in the company's service for two years from 18 to 19 cents an hour. The company had previously adopted the plan of giving a uniform free every year to each man who has been in its employ for five years, and a uniform and an overcoat to each man who has been with the company for ten years.

Increased Service on the Illinois Traction System.—The Illinois Traction Company will put into effect on February 1 a new schedule between Springfield and East St. Louis, adding four limited cars. Limited cars will leave each terminal every two hours, from 6 a. m. to 8 p. m. The cars leaving Springfield at 6 a. m., 10 a. m., 2 p. m., and 6 p. m., are the regular "Corn Belt Limited" cars, with buffet service. The time consumed between Springfield and East St. Louis, near the Eads bridge, is 3 hours and 30 minutes. The new schedule is made necessary by the constantly increasing traffic.

Interstate Interurban Association.—The annual meeting of the Interstate Interurban Association, composed of representatives of the electric railways in Illinois and Wisconsin, was held on January 7 at Wheaton, Ill., where the members were the guests of the Aurora Elgin & Chicago Railway Company. L. E. Fisher, general manager Illinois Traction Company, Danville, Ill., was elected president of the association, and C. E. Flenner, auditor Aurora Elgin & Chicago Railway, Wheaton, Ill., was chosen secretary.

Portland Mutual Benefit Association.—The employes of the Portland (Ore.) Railway Light & Power Company recently organized a mutual benefit association, with about 400 members, under the name of the Brotherhood of Electric Railway Employes of the Portland Railway Light & Power Company. The constitution provides for sick and death benefits. The company will soon begin the construction of four clubhouses in various parts of the city, which will be used as meeting places for the association. General Manager F. I. Fuller, of the company, is ex-officio president of the organization and Treasurer S. G. Reed is treasurer.

Boston & Worcester Asks Freight Rights.—Having secured local permits to do a freight and baggage business over its lines in Newton, Marlboro, Wellesey, Natick, Framingham, Westboro, Shrewsbury, Northboro, Southboro and Hudson, Mass., the Boston & Worcester Street Railway has petitioned the state railroad commissioners for approval. The company has several freight cars ready for operation, and it wishes to carry newspapers, agricultural products, baggage and all the usual classes of light freight and express matter, excepting explosives. It agrees not to let the freight business interfere with its passenger service.

Meeting of American Institute of Electrical Engineers.—The annual meeting of the American Institute of Electrical Engineers will be held in the auditorium of the Engineers' building, 33 West Thirty-ninth street, New York, on Friday, January 25, 1907, beginning at 8:15 p. m. Messrs. Lewis B. Stillwell and Henry St. Clair Putnam, consulting engineers, of New York, will present a paper on "Substitution of the Electric Motor for the Steam Locomotive." The paper will include: 1. Presentation of certain facts established by experience in the operation of elevated, subway and interurban lines by electricity. 2. Discussion of comparative cost of operation by steam and electricity applied to railways in operation, and including both passenger and freight service.

3. The importance of standardizing electric railway practice. 4. The question of frequency in the operation of railways by alternating current. Members of the American Society of Civil Engineers, the American Institute of Mining Engineers, the American Society of Mechanical Engineers, the New York Railroad Club and the Transportation Club have been invited to attend.

Want Speed Limit Raised.—President George T. Dunlop of the Capital Traction Company and Vice-President George H. Harries, of the Washington Railway & Electric Company, Washington, D. C., have jointly sent a letter to the commissioners of the District of Columbia asking that the police regulations be amended to allow street cars to be operated at the rate of 15 miles an hour within the city limits and 20 miles outside of the city. The law now restricts the speed to 12 and 15 miles an hour. The request states that it is not desired to increase the running time between terminals but to prevent the arrest of motormen for occasional bursts of speed.

Green Bay Traction Company Building New Pavilion.—The Green Bay (Wis.) Traction Company has nearly all of the material on the ground for a mammoth new pavilion to be erected at its amusement resort at Ridge Point, Wis. The piling has already been driven at the river bank and active building operations will be started as early as possible in the spring so that the structure will be in readiness for the pleasure seekers early in the season. The new building will be 75 feet wide and 124 feet long, including porches, and will contain a dance floor 50 by 100 feet, as well as a stage. The old pavilion will be allowed to stand and will be used for private parties and various entertainments.

Prizes for Employes' Hours of Service.—Pursuant to a custom inaugurated several years ago, the Nashville Railway & Light Company has awarded cash prizes to its motormen and conductors whose names have been placed on the "honor roll" of the company, which is based upon the number of hours the men have worked during the year. The prizes range in amounts from \$5.00 to \$50. The winner of the first prize for motormen, \$50, had worked 5,502 hours. The second and third prizes were \$40 and \$25, respectively. Ten-dollar prizes were also awarded to all motormen who had made an average of 10 hours a day or over and five-dollar prizes to those making an average of nine hours and over. Similar prizes were awarded to the conductors on the same basis. Of the conductors the winner of the first prize had worked 5,260 hours.

Indiana Engineering Society.—The twenty-seventh convention of the Indiana Engineering Society was held at the Commercial Club, Indianapolis, on January 17, 18 and 19. The program included several papers discussing railway subjects, among which were the following:

Engineering of Interurban Railway Construction. Robert P. Woods, Indianapolis, Ind.

Report of Committee on Electric Railways. J. P. Moore, Indianapolis, Ind.

Paving Between Street Car Tracks and Rails. B. J. T. Jeup, Indianapolis, Ind.

The Work of the State Railroad Commission. Union B. Hunt. Advantages of Electric Inspection. F. R. Daniel, Indianapolis, Ind.

Electric Car Braking. Prof. H. T. Plumb, Lafayette, Ind.

Improvement of Big Island Park by the Twin City Rapid Transit Company.—The Twin City Rapid Transit Company, of Minneapolis, has announced elaborate plans for the improvement of Big Island Park, on Lake Minnetonka, which it is expected will be ready for formal opening on Decoration Day. Big Island Park contains 65 acres, which will be converted by landscape artists into a beautiful picnic ground and amusement resort. Besides the usual amusement features, such as a roller coaster, merry-go-round, etc., a large casino seating 1,500 persons will be erected, and excellent band concerts are to be offered. A large dancing pavilion, an electrically-lighted tower 200 feet high, and four kitchens with fires maintained by the company for picnic purposes are also included. The architecture of the buildings is to be of the Spanish mission style. A large force of workmen is now engaged on the improvements. Three large ferry boats, with a capacity for 1,000 passengers each, will be operated on Lake Minnetonka, with three excursion boats and six express boats to accommodate the cottage resorts on the lake.

Annual Meeting of American Forestry Association.—The American Forestry Association held its annual meeting at Washington, D. C., on January 9. The report of the board of directors described the progress of forestry—national, state, and private—during the preceding year, and recorded the growth made by the association. It was brought out that in the entire history of the forest movement the year 1906 has been the most notable, especially in the very rapid expansion of national forest work, in the increased activity of states in forestry, in advantageous forest legislation, in the strengthening of forest education, and in the increase, both of membership and in activity, of the American Forestry Association. During the year the association had again given special attention to the promotion of legislation, looking to the establishment of national forest reserves in the White Mountains and the Southern Appalachians. The promotion of legislation for the establishment of a wood-testing laboratory in connection with the Forest Service was also strongly recommended in the report. Interesting addresses were given by Dr. Edward Everett Hale on the need of forest preservation; by J. B. Blades, of New Bern, N. C., voicing the strong desire of the people of his section for the Southern Appalachian Forest Reserve.

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by Prof. Henry S. Graves, director of the Yale Forestry School, on the progress of forest education; by Enos A. Mills, of Colorado, on the marked change in sentiment in favor of the forest reserves by the people of the west upon a better acquaintance with their purposes and administration, and by George K. Smith, secretary of the National Lumber Manufacturers' Association, on the cooperation in forest work by the lumber associations.

International Exposition of Safety Devices.—Space is now being assigned for the exhibits of the first International Exposition of Safety Devices, to be held at the American Museum of Natural History, New York City, beginning January 29, 1907, and continuing two weeks. The exhibits will include safety devices for wood and metal-working machinery; stamping, grinding and polishing machines; safeguards for boilers, elevators, windlasses, cranes and hoisting machinery; textiles and building trades; safety lamps and explosives; quarrying and agriculture; chemical industries, safety from fire; railway and trolley safety. It is earnestly desired that all those wishing to exhibit safety devices in any of the above classes should apply at once to W. H. Tolman, director, 257 Fourth avenue, New York, for space. The object of this exposition is to awaken the American public to the necessity of doing something to lessen the causes of accidents to American life and labor by means of a permanent Museum of Safety Devices, where all problems of safeguarding life and limb can be studied in their working details. There will be no charge for space.

Bill to Regulate Street Railways in District of Columbia.—United States Representative William B. Madden, of Illinois, has introduced in Congress a bill providing that every street railroad operating in the District of Columbia shall give free continuous transfers good on all intersecting lines to all points within the District; shall sell 25 tickets for a dollar good for a ride to any point in the District, and shall run cars at least every five minutes between 6 a. m. and 1 a. m., and every thirty minutes between 1 a. m. and 6 a. m., on all lines within the District. The question of universal transfers was discussed by officers of the Capital Traction Company and the Washington Railway & Electric Company at a hearing before the District Commissioners on January 11. Vice-President George H. Harries, of the latter company, said that in no city in the United States is there a universal transfer system that enables passengers to use the lines of two distinct companies on a transfer issued by either company. President George T. Dunlop, of the Capital Traction Company, said the plan would open the way to great abuse of the transfer privilege and that the stockholders would suffer thereby.

Number of Cars Entering Indianapolis in 1906.—The Indianapolis Traction & Terminal Company made its annual settlement with the city of Indianapolis on January 8 for the use of the streets by the interurban cars which use its tracks. The company pays the city 4 cents for each round trip made by an interurban car. The report shows that there were 57,730½ round trips in 1906 made by the various companies, as follows:

Indiana Union Traction Company—	
Muncie division	8,640
Logansport division	7,894
Broad Ripple division	13,539
Army Post Division	2,557
Indianapolis & Cincinnati Traction Company—	
Shelbyville division	7,460
Rushville division	7,306½
Indianapolis & Northwestern	8,405
Indianapolis & Eastern	7,549½
Indianapolis Columbus & Southern	9,889½
Indianapolis & Martinsville	6,943½
Indianapolis Coal Traction Company	6,557½
Indianapolis & Western	889
Total	57,730½

The Indianapolis & Western is a new road and did not operate through the entire year. The number of round trips in 1905 was 83,150. Estimating that each car carried an average of 30 passengers the number of passengers carried each way was 2,631,900.

Annual Meeting Central Electric Railway Association. Secretary Millholland has announced the program for the first annual meeting of the Central Electric Railway Association which will be held at the Caypool Hotel, Indianapolis, on January 24. A list of the subjects follows:

- Cost of Power for Rental Purposes (Discussion)
- Developing a Demand for Renting Power Does It Pay? G. H. Kelley, Anderson, Ind.
- The Model Car for Long Travel W. H. Evans, Indianapolis, Ind.
- Car Lighting R. C. Taylor, Anderson, Ind.
- Handling of Accidents and Claims E. C. Carpenter, Anderson, Ind.

The program will be followed by the annual election of officers. At 8:30 p. m. the formal banquet will be held as formerly announced.

Through the courtesy of the Indianapolis & Cincinnati Traction Company a special excursion train will leave the terminal station at 9 a. m. and after making a trip over this inter-city single-track road will return to the terminal station at 1 p. m.

Through the courtesy of President Selig it is expected that there will be a large number of private cars in exhibition on Kentucky avenue opposite the Caypool Hotel.

The many attractive features of this annual session should warrant an especially large number of members and guests making special efforts to attend.

Annapolis, Md.—Franchises to build an electric railway in Annapolis have been granted to the Washington Baltimore & Annapolis Electric Railway, the Maryland Electric Railroad and the Annapolis Short Line, which embody the following provisions: The company shall be required to pay a tax of 35 cents per foot of track; cars shall be limited to 40 feet in length, run at intervals of 15 minutes and at a speed of not over 10 miles an hour, and the road shall be in operation by July 1, 1908.

Chattanooga, Tenn.—S. W. Devine has been granted a franchise for an interurban electric road which he proposes to build from this city to Chickamauga, Catoosa Springs, Crawfish Springs, Lafayette, Spring Place and other points in Georgia. It is stated that he is backed by eastern capitalists and that work will be started in the near future.

Columbia, Tenn.—Horace Rainey, of Columbia, representing a company of Maury county capitalists, has applied for a franchise for an electric railway from Columbia to Mt. Pleasant.

Darlington, Wis.—The Dubuque-Madison Electric Railroad, which will serve the lead and zinc mining districts of Wisconsin, has applied for a franchise in this city. A. L. Dewar, Chicago, president; J. C. Winship, Chicago, first vice-president; C. W. Tostevin, secretary and treasurer; W. H. Winter, general manager; P. H. Conley, general counsel. William C. Newberry, Winnetka, Ill., is also interested.

Dayton, O.—The city council has granted The City Railway a franchise for extensions on various streets of the city. T. E. Howell, superintendent.

Duluth, Minn.—The Northern Traction Company has asked for a franchise to build and operate an electric railway on certain county highways on the Mesaba range. President R. F. Berdie, Hibbing, Minn., states that grading has already been started on a line from Hibbing to Virginia, Minn.

Enid, Okla.—C. H. Bosler, Dayton, O., has been granted a franchise to build an electric railway in Enid. By the provisions of the franchise work is to be started in 10 days and four miles of track shall be completed in six months. A portion of the material on hand at Tulsa, I. T., where Mr. Bosler is constructing an electric line, it is stated, will be shipped to Enid. A certified check for \$20,000 has been deposited as a guarantee that the line will be built.

Hammond, Ind.—It is stated that the Calumet Electric Street Railway is about to apply to the city council for a franchise to extend its line from a point just west of Robey to Hammond.

Kansas City, Mo.—A franchise has been granted to the Metropolitan Street Railway for a line on Twenty-fourth street, from Jackson avenue to Brighton street.

Lincoln, Neb.—The Citizens' Railway has been granted a franchise for extending its lines into the north and south sections of the city.

Manitou, Colo.—Franchise rights for a street railway in Manitou, to extend to Crystal Park, have been granted to W. C. Dotterer and Wesley Compton, representatives of the eastern syndicate backing the project. The road, which will cost in the neighborhood of \$250,000, must be completed and put in operation within two years, according to the franchise, which has a life of 25 years. It is understood that the new electric railway will utilize the old roadbed built 25 years ago for a projected steam line to the summit of Pike's Peak via Crystal Park. Power for the road will be secured from the Pike's Peak Hydro-Electric Company.

Norman, Okla.—The city council has granted a franchise over several streets to the Tecumseh Guthrie & Norman Interurban Electric Railway.

North Birmingham, Ala.—The Tidewater Development Company which proposes to build from Gadsden to Tuscaloosa, Ala., has applied for a franchise for the full length of Twenty-ninth and Twenty-sixth streets.

North Yakima, Wash.—T. A. Noble, representing Frederick Elmendorf, of Spokane, has applied for a franchise for an electric railway to the Mexico valley through Union Gap to a point some distance below the intake of the Sunnyvale canal. Also, for a separate franchise to build a road to the Altamira valley as far as Oak Springs.

Oakland, Cal.—The city council has granted a franchise to the Oakland Traction Consolidated for a line in Claremont avenue.

Richmond, Cal.—A franchise has been granted to W. S. Reelin for an electric railway on Eleventh avenue.

Rochester, Ill.—The Springfield Clear Lake & Rochester Railway Company has been granted a franchise to build an electric line on Main street.

St. Charles, Ill.—The Aurora Elgin & Chicago Railway has applied for a five-year extension to its present franchise with the privilege of hauling freight through the streets from 10 o'clock at night to 9 o'clock in the morning. It returns 15¢ when it agrees to pay one-third of the expense of building the proposed

Fifth street viaduct, the Chicago Great Western Railway to pay the other two-thirds.

San Diego, Cal.—The East Side Railway has applied for a franchise on El Cajon avenue or University boulevard from Thirtieth street to the east line of the city limits.

San Luis Obispo, Cal.—The board of supervisors has granted a franchise to J. L. Beckett to construct an electric railway in San Luis Obispo county.

Schenectady, N. Y.—A special committee of the city council has approved eight of the twelve franchise grants applied for by the Schenectady Railway last October. Several restrictions in the way of reduced fares and improvements to streets are included in the report.

South Bend, Ind.—A franchise has been granted to the Goshen South Bend & Chicago Railroad for a line through St. Joseph county.

Springfield, Ill.—The Coal Belt Electric Railroad Company has been granted by the state board of railroad and warehouse commissioners permission to construct a grade crossing with the Illinois Central line at Herrin, Ill., to be protected by interlocking switch.

Toronto Railway.—Manager J. R. Fleming is quoted as saying that the company will apply to the city council before the end of January for permission to construct a line of railway up Bay and Terulay streets to College street; also for a line up York street to University avenue, past the Parliament buildings and through Queen's Park to Avenue road.

Tulsa, I. T.—It is stated that a franchise will soon be applied for by Tulsa capitalists to build a line connecting this city with the Glenn oil pool. The plan includes the use of the Midland Valley tracks to Jenks and from there to the pool, a distance of four miles, independent tracks are to be built. Switches for facilitating the transportation of supplies will be built over the pool and it is said that cars will be run every hour.

Tuscaloosa, Ala.—The Tidewater Development Company has been granted a franchise for the construction of a passenger and freight line in this city. The main freight line will enter the city and pass over Third street to the intersection of Queen City avenue where it will branch off in another direction. The passenger line is to be built on Queen City avenue to Sixth, down Sixth to Twenty-eighth avenue and up Twenty-eighth to the main line again. One year in which to begin the work and three years for its completion are allowed by the terms of the franchise. J. M. Dewberry, Birmingham, Ala., is president.

INCORPORATIONS.

Canandaigua Southern Electric Railroad.—Incorporated to build an electric road 33 1/3 miles long from Canandaigua to Atlanta, Ontario county, N. Y. Capital, \$1,000,000. Directors: E. G. Hayes, Alexander Davidson, George W. Hamlin, Canandaigua, and H. C. Hatch, Atlanta, N. Y.

Chicago City Railroad Company.—Incorporated at Springfield, Ill., to purchase, lease, construct, maintain and operate street railways in Cook county. Capital stock, \$100,000. Directors: Edward Morris, T. E. Mitten and J. P. Wilson. Mr. Wilson owns \$30,000 and his associates \$35,000 each of the capital stock, half of which is paid in. The license to incorporate was issued to R. B. Hamilton, John R. Davies and Robert N. Seney.

Decatur Taylorville & Litchfield Traction Company.—Incorporated to build an electric line from Decatur to Litchfield; principal office, Chicago. Capital stock, \$5,000. Incorporators: Dudley Taylor, Frederick W. Job, Thomas B. O'Connell, Alma L. Dorothy and W. W. Taylor.

Duquoin Rapid Transit Company.—This company has filed articles for an amended charter to change its name to the Duquoin Belleville & St. Louis Electric Railway Company.

Friendship Avenue Street Railway.—Incorporated at Harrisburg, Pa., to build 4.5 miles of street railways in Pittsburg beginning at Liberty avenue and Denny street, Denny to Mifflin, to Fortieth, to Main, to Mifflin, to Carroll, to Edmonds, to Friendship to St. Clair, to Baum and return by the same route. This line will be a feeder for the elevated lines which the M. J. Hosack interests are promoting. Capital stock, \$27,000. M. J. Hosack, Roger Knox, James M. Magee, Charles K. Robinson and W. D. McBryar are the directors.

Iowa & Northwestern Railway.—Incorporated in Iowa to construct, lease, purchase, equip, maintain, operate and sell railway lines in the United States, either steam, electric or other motive power, but especially to construct an electric line from Waterloo, Ia., to points on the Mississippi river to be determined later. Capital stock, \$100,000. Stephen B. Howard, president; Edward M. Rice, first-president; Edward C. Luther, secretary and treasurer.

Linden Avenue Street Railway Company.—Incorporated in Harrisburg, Pa., to build 2.5 miles of street railways in Pittsburg from Neville and Bayard streets, out Bayard to Amberson, to Westminster, to Pitcairn, to Fifth avenue and across to Wilkins avenue, to Beechwood boulevard, to Linden, to Thomas, to Brad-dock, to Susquehanna, to Pitt or Dunbar street and return by the same route. This will be a feeder to the proposed elevated lines of the M. J. Hosack interests, whose applications for charters will be renewed shortly. Capital stock, \$15,000. Directors, M. J. Hosack, Roger Knox, James M. Magee, Charles K. Robinson and W. D. McBryar.

Montgomery Fresno & Eastern Railway.—Incorporated in Cali-

fornia to build an electric railway from Monterey to Fresno, a distance of about 140 miles. Capital stock, \$15,000. Incorporators: Alfred D. Bowen, G. W. Purcell and H. L. Sanborn, all of San Francisco, and others.

Oklahoma Railway.—Incorporated in Oklahoma to build electric interurban railroads from Shawnee to El Reno and Ft. Reno, from Shawnee to Tecumseh, from Guthrie to Purcell, and from Yukon southwest to Chickasha, a total of 170 miles. Capital stock, \$5,000,000. Incorporators: Frank Wells, O. R. Rittenhouse, G. G. Barnes, J. J. Johnson, Carlos Combs, Fred S. Combs and Edward L. Lawson, all of Oklahoma City.

St. Louis Electric Bridge Company.—Incorporated in Illinois to build a bridge across the Mississippi river at Venice, to give the Illinois Traction Company an entrance to St. Louis. Plans for the bridge have been completed and it is said that application for permission to build it will soon be made to the war department. Capital stock, \$2,500. Incorporators: W. H. Burke, G. A. Wright and George M. Mattis, all associated with the Illinois Traction Company.

Shannonin Street Railway.—Incorporated in Pennsylvania to construct six miles of road in Allegheny county. Capital, \$72,000. President, S. J. Dugan, Coraopolis, Pa.

Sharon Hill & Upper Darby Railway.—Incorporated in Pennsylvania to build a 7-mile electric railway in Delaware county. Capital stock, \$50,000. W. A. Rigg, of Reading, president.

Shenango Street Railway.—Incorporated to build a street railway system in Greenville, Pa. Capital stock, \$12,000. Incorporators: Edwin Ripley, E. C. Emery, W. H. Waugh, E. A. Henry and others, of Greenville.

Swan Creek Railway.—Incorporated in Tennessee to build an electric railway from Mt. Pleasant through Maury and Lewis counties, Tenn., to Weatherly, 17 miles. Capital stock, \$50,000. Incorporators: G. T. Hughes, J. W. Fry, J. A. Smizer, W. W. Dyer and G. W. Killbrew.

Washington Railway & Power Company.—This company has recently been incorporated under the laws of Washington. Its principal office will, early in the summer, be established at Vancouver, Wash., with a branch office in Portland, Ore. Valuable franchises to construct and operate a system of electric cars in Vancouver have been acquired, and in all probability lines will be extended into the country during the year 1907. Vancouver is older than the city of Portland, 12 miles distant by water, yet this electric system will be the pioneer electric railway in Clarke county, Washington. Walter H. Moore, president of the Oregon Trust & Savings Bank, of Portland, is president of the railway company; L. B. French, vice-president; Arthur Langguth, Portland, secretary, and H. C. Phillips, of Vancouver, Wash., treasurer. The construction and equipment are to be up to date, and work on the power plant and track building is to begin about April 1st.

TRACK AND ROADWAY.

Addison, N. Y.—The Tuscarora Valley Traction Company has been granted a certificate of necessity to construct a line from Addison to Woodhull and Jasper, N. Y., 19 miles. C. A. Brewster is interested.

Arnold City Southern Railway.—This company has been organized by Pittsburg capitalists, believed to represent the West Penn Railways Company, of Pittsburg, to build a line from the present terminus of the Monessen trolley line to Connellsville, touching Perryopolis, Star Junction, Flatwoods and Vanderbilt en route. It is said that the company has purchased a right of way from one end of the proposed road to the other. Edmond Englert, Pittsburg, Pa., president.

Augusta & Aiken Electric Railway.—J. A. Wills, chief engineer, Augusta, Ga., writes that this company, which operates a line between Augusta, Ga., and Aiken, S. C., will build an extension, under the name of the Augusta & Columbia Railway, from Aiken to Columbia, S. C., 59 miles, making a total of 86 miles, via Trenton, Batesburg, Leesville and Lexington. Surveys have been completed and right of way has been secured. Grading is to begin in a few months. The overhead construction will be of the catenary type. A 10,000-hp. water power will be developed near Lexington, S. C., and current will be transmitted to Augusta and other points on the line, probably at 50,000 volts. The road from Augusta to Aiken is being straightened and relocated so that no grade will be greater than 1 1/2 per cent, in order to enable a higher speed. It is intended to handle both freight and passenger traffic. William T. Van Brunt, 120 Broadway, New York, is president.

Aurora Elgin & Chicago Railway.—It is reported that this company is contemplating building an extension north from the Carpentersville line to Nunda, Woodstock and other points in McHenry county.

Bayou Teche Railway & Light Company.—President P. M. Schneidau, of New Orleans, La., states that active construction will begin at an early date, as the building materials, which have been delayed, are expected shortly. The road is to connect New Iberia, Franklin, Lafayette, Abbeville and St. Martinsville, La. Surveys have been made.

Bisbee, Ariz.—The Warren Company is asking bids until February 4 for the grading on about five miles of electric line between Bisbee and Warren, Ariz. C. W. Van Dyke, manager, Bisbee.

Black Diamond Electric Railway.—John Schrader, of Chester, W. Va., A. H. Boone, Zanesville, O., and John Bane, Parkersburg,

W. Va., are reported to be back of a plan to revive this project for electric lines in Wheeling, W. Va., Marietta, O., and Parkersburg, W. Va.

Boston Elevated Railway.—This company is acquiring land for the purpose of connecting the southerly end of the new Washington street tunnel and the elevated structure in upper Washington street. Over the land now taken, the company intends to build an inclined structure, carrying its tracks on an easy gradient from the place where they will emerge from the tunnel, at surface level, up above the surface, crossing Oak street, Pine street, Broadway, and intervening private land; and over the steam railroad cut in which run the tracks of the Boston & Albany and New York New Haven & Hartford railroads, to a connection with the present elevated structure at the junction of Motte and Castle streets with Washington street.

Boston & New York Electric Railroad.—This company, whose plans for an electric road from Boston to Providence, R. I., were rejected some time ago by the Massachusetts railroad commission because they were incomplete, has filed a new set of plans showing with minute detail its proposed route from Boston to the Rhode Island state line. A. B. Leach and O. B. Clancy, of Boston, are interested.

Brownsville Masontown & Smithfield Street Railway.—Plans and profiles have been filed for the first 5 miles of this road, which as projected will be 15 miles long, through Masontown, West Masontown, Lambert, New Salem, Smithfield and New Geneva, Pa. W. J. Sheldon, McKeesport, Pa., is interested.

Buffalo & Lake Erie Traction Company.—The work of surveying this line between Buffalo and Dunkirk is progressing rapidly. The line is laid out nearly to Silver Creek, the greater portion being through private right of way.

Buffalo & Rochester Traction Company.—This company has petitioned for the right to construct an electric railway connecting Buffalo, Batavia and Rochester, N. Y. The proposed line will start at Dewey near the southeastern corner of Buffalo and run in an easterly direction through Grimsville, Looneyville, Wendel, Crittenden, Pembroke, Batavia, Stafford, Le Roy, Lime Rock and Caladonia. From this point it will turn north and pass through Mumford, Chili and several smaller towns to its terminal in Genesee street. From there it is stated that it will use the tracks of the Rochester Railway Company to enter the city.

Butte, Mont.—James Brien, of Spokane, Wash., and associates, propose to build an electric railway from Butte to Anaconda, Mont., via Gregson Springs.

Charleston & Summerville Electric Railway.—D. E. Baxter & Co. Inc., 27 William street, New York, which has the entire contract for building this line, has two large construction gangs working from both ends and has completed grading for about five miles and will soon commence track-laying on the finished portions of the grade. G. S. Brantingham, manager of construction for D. E. Baxter & Co., has arranged for prompt delivery of engines, generators, etc., and has been assured by the manufacturers that there will be no delay in delivery. This machinery will be installed in a concrete fireproof building of the most modern design and will be of ample power to operate a first-class passenger and heavy freight service. The road throughout will be of first-class single-track construction with sidings and branch to the new Charleston Navy Yard, thus making direct communication to Charleston and Summerville for government officials and employes. It is expected that this line will be ready for operation by September 1, 1907.

Cincinnati Northern Traction Company.—It is reported that this company, which is laying out a new route between Hamilton and Middletown, O., will build a 750-foot bridge over the Great Miami river just south of Middletown. F. J. J. Sloat, general manager, Hamilton, O.

Citizens' Railway.—This company has recently amended its articles of incorporation, increasing its capital stock to \$1,000,000, to provide for extensions in Lincoln, Neb. During 1906 the company built about 6 miles of track and about 15 miles of extensions are planned for 1907. Materials for 7 miles have been purchased. Charles H. Cox, of Lincoln, is general manager.

Columbus Greensburg & Richmond Traction Company.—Walter McCord, secretary, Richmond, Ind., writes that this company, recently organized, hopes to begin construction by March 1, 1907, on its proposed line from Richmond to Columbus, Ind., 83 miles, via Connersville and Greensburg. August M. Kuhn of Indianapolis, is president.

Columbus Magnetic Springs & Northern Traction Company.—General Manager H. E. Buck is reported to have announced that this company's extension from Magnetic Springs to Richwood, O., six miles, will be completed within 30 days and that cars will be operated on that portion of the road immediately after its completion. Strong gasoline-motor cars will be used. Right of way for the extension of the line north from Richwood to La Itue, 14 miles, has been secured. When this is completed it is stated that cars will enter Columbus either over the Columbus Delaware & Marion Railway or one of the other roads entering Delaware from Columbus. W. S. Galbreath, Pittsburg, president; W. N. Embert, Baltimore, secretary and assistant treasurer; Carl Magee, Pittsburg, treasurer.

Connecticut Railway & Lighting Company.—John E. Sewell, acting general manager, Waterbury, Conn., is reported as having secured the right of way and engineering to the amount of \$200,000 on a contemplated extension of the company's line this year, some of which will be started immediately. \$500,000 of this amount

will be spent in improvements on the Waterbury trolley lines. Among these are included the double-tracking of all the lines in Waterbury, new car barns and possibly a new steam lighting plant for the Bulls Bridge station; also the building of a tunnel under the Highland division of the trolley line to come out on Main street, instead of double-tracking the surface line by way of Maple street. From there a track will be laid in Thomaston avenue to connect with the present track near the Waterville hotel.

Dalton (Pa.) Street Railway.—It is officially announced that this road will be opened for traffic by March 1. The track has been laid the entire distance from North Scranton to Glenburn, Pa., and the rails and ties are on the ground from Glenburn to La Plume. The poles have been set along the entire route. The car barn and power house at Dalton are almost completed.

Des Moines Winterset & Creston Electric Railway.—B. Schreiner, chief engineer, Des Moines, Ia., reports that the largest part of the right of way has been secured for this new line from Des Moines to Winterset and Creston, Ia. Financial arrangements are now being made and it is the intention to begin construction by May 1.

Elizabethtown, Ky.—It is reported that G. J. Lampton, of Louisville, Ky., is interested in a project to build an electric line from Cecilian to Elizabethtown, 25 miles.

Ft. Wayne & Springfield Railway.—At the local elections on January 10 the towns of Washington, Monroe, and Wabash voted against granting subsidies for the construction of an extension of this road from Decatur to Portland, Mo. The road is now in operation between Ft. Wayne and Decatur. W. H. Flodderjohann, president, Decatur, Ind.

Ft. William, Ont.—This town will soon call for bids for construction and supplies for an extension of seven miles to its municipal street railway system, to cost about \$83,000. A. McNaughton, clerk.

Geneva Waterloo Seneca Falls & Cayuga Lake Traction Company.—An official of this company states that the purpose of the recent decision to increase the capital stock from \$450,000 to \$1,000,000 and to issue a mortgage for \$1,000,000 is to extend the road from Seneca Falls to Auburn, N. Y. The road now connects Geneva and Seneca Falls. The surveys between Seneca Falls and Auburn were completed from three to five years ago, by Westinghouse, Church, Kerr & Co., and the company, with the issuance of the new securities, will be ready to begin the extension work without delay. One of the engineering features will be the construction of a bridge a mile in length, across Cayuga lake, a short distance south of the present New York Central bridge. W. C. Gray, general manager, Seneca Falls, N. Y.

Grafton (W. Va.) Electric Railway.—Contracts for constructing a 2½ mile extension will be let about March 1.

Grand Rapids, Mich.—The W. A. Cullen Construction Company, 25 Broad street, New York, has been awarded a contract for the construction of four new lines in southern Michigan, as follows: Grand Rapids & Ionia Railway, connecting Grand Rapids, Cascade, Lowell, Saranac and Ionia, 33 miles; the Grand Rapids Belding & Greenville, 20 miles; the Ionia & Owosso Railway, connecting Ionia, Lyons, Mulr, Pewamo, Fowler, St. John and Owosso, 48 miles; the Owosso & Pontiac Railway, 50 miles. A surety bond of \$100,000 has been filed to assure the completion of the contract, which provides that the four lines must be fully equipped for service by November 1, 1908. E. M. Hopkins, of Detroit, Mich., is president of the companies, and Robert E. Kline, Dayton, O., is engineer in chief.

Grand Valley Railway (Brantford, Ont.)—This company, now in operation between Brantford and Galt, Ont., and which holds a charter for an extension from Brantford to Woodstock, will apply for a charter for a line from Woodstock to London. It is stated that the first extension will be built this year. A. J. Pattison, Jr., Brantford, general manager.

Great Northern Railway.—James J. Hill, president, is quoted as saying that the plan of electrifying the Cascade tunnel, in the Cascade mountains, is near to realization, and that two large electric locomotives are under construction for use in the tunnel. The bore of the tunnel is 13,000 feet long and it is expected that the use of electricity, by eliminating smoke and gases, will permit of trains being run through it more frequently.

Hagerstown (Md.) Railway.—It is reported that this company has obtained an option on the Potomac River bridge on the Norfolk & Western Railway at Shepherdstown, to be used in building an electric railway from Hoomsboro, Washington county, to Shepherdstown, via Keedysville, Sharpsburg, and Antietam battlefield, a distance of 10 miles. W. C. Hepperle, general manager, Hagerstown, Md.

Houghton County Street Railway.—It is reported that this company, which connects Houghton, Hancock, and Lake Linden, Mich., is soon to prepare plans for the extension of its Wolverine line north to the mines at Alloway and Ahmeek. W. H. McGrath, manager, Houghton, Mich.

Illinois Traction Company.—After the recent monthly meeting of the officials of this company at Springfield, it was announced that work would be started on the construction of the line from Springfield to Jacksonville, 33 miles, as soon as the weather will permit. L. E. Flecher, general manager, Danville, Ill.

Indiana Columbus & Eastern Traction Company.—The city engineer of Columbus, O., has reported this company to double-track the Mound street line over which the cars of the eastern division enter the city. The city proposes to let a contract for

paving the street in the spring and wishes the double track before paving is commenced.

Jackson (Tenn.) Railway & Light Company.—This company is extending its track across Deer river to Bemis, a distance of 3 miles, and is building another extension to East Jackson, $1\frac{1}{4}$ miles. The company recently completed a $1\frac{1}{2}$ -mile extension to North Royal and a $\frac{1}{2}$ -mile extension of the Harlem avenue line to Hicksville. S. S. Bush, Louisville, Ky., vice-president and general manager.

Kalamazoo Elkhart & South Bend Railroad.—The Westinghouse Electric & Manufacturing Company is preparing plans, specifications and estimates on contracts for the complete electrical equipment and construction of the Kalamazoo Elkhart & South Bend Railroad Company for submission to promoters and capitalists interested in the enterprise. No details of the plans nor the figures of the estimates are disclosed nor will be until contracts are approved and executed. It is stated that arrangements for financing the road by Cleveland and New York capitalists are nearly completed. A. D. Harris, South Bend, Ind., president.

Kalamazoo Lake Shore & Chicago Traction Company.—James Grant secretary and manager, Kalamazoo, Mich., writes that 22 miles of track were laid last year on the proposed line from Kalamazoo to South Haven, Mich., 54 miles. This portion is being operated by steam temporarily. $7\frac{1}{2}$ miles have been graded, from South Haven to Packard. S. J. Dunkley, of Kalamazoo, is president; J. T. Lockwood, of Toledo, O., is chief engineer.

Kennett, Del.—George D. Dodge is soon to begin surveys for an electric line between Kennett and Coatesville, which will be a connecting link in the line between Wilmington and Lancaster.

Lafayette & Hoopston Interurban Railway.—Surveys have been completed and right of way secured for this proposed line from Lafayette to Hoopston, Ind., 40 miles. I. E. Switzer, Otterbein, Ind., is president.

Lake Erie Bowling Green & Napoleon Railway.—At a recent meeting of the stockholders plans were discussed for the extension of this road, which now connects Bowling Green and Woodville, O., west through Wood county and either Henry or Defiance county. D. B. Whipple, of Bowling Green, is president.

Lake Shore Electric Railway.—President E. W. Moore, Cleveland, O., has announced that the line from Fremont to Fostoria, O., which will connect the Lake Shore and Western Ohio systems, and considerably shorten the distance between Cleveland and Dayton, will be built this year.

Lancaster (O.) Traction & Power Company.—At the recent annual meeting of this company, a consolidation of the Lancaster Traction Company and the Fairfield Traction Company, plans were considered for building a line to Buckeye Lake, 8 miles, and also a line to Logan. The company is closely associated with the Columbus Railway & Light Company. The following officers were elected: President, Henry B. Peters; vice-president, Andrew Bauman; secretary-treasurer, Philip R. Peters, all of Lancaster, O.

Lewiston & Southeastern Electric Railway.—It is stated that as soon as the weather will permit active work will be resumed on the construction of this road from Lewiston to Grangeville, Idaho. From Lewiston the road will follow the Snake river to a point about opposite Asotin. From there it will climb to the prairie and cross the country into Grangeville, tapping several small towns en route. A branch line is to be run to Nez Perce. Considerable grading and heavy cut work was done last summer and fall, when inclement weather put a stop to operations. Since then it is reported that the road has been completely financed. The permanent survey of the route has been practically completed. Judson Spofford, general manager, Lewiston, Idaho.

Louisville & Eastern Railroad.—President Percival Moore, Louisville, Ky., has announced that the contract for the construction of the extension from Beechwood, 8 miles east of Louisville, to Shelbyville, Ky., 23 miles, has been let to W. L. Love, of Indianapolis. The cost is estimated at \$500,000 and the contract is to be completed by October, 1907.

Louisville Railway.—It is stated that this road will extend its West End Broadway line from Shawnee Park to Riverview, Ky., one-half mile, which will make a through line to the "White City," a new pleasure resort.

Metropolitan Street Railway (Kansas City, Mo.)—This company has made a proposition to the city of Kansas City to build a combined tunnel and viaduct connecting Kansas City, Mo., and Kansas City, Kan., in return for an extension of its franchise, or it will join with the city in paying for a tunnel and viaduct of a width to accommodate wagons.

Mt. Vernon, O.—Dr. Schrontz, of Martinsburg and Ed. Dever, of Mt. Vernon, O., report success in securing right of way for the proposed electric line from Loudonville to Newark, via Mt. Vernon.

Nashville & Chattanooga Electric Railway.—This company is making surveys for an electric railway line from Nashville to Chattanooga, Tenn. C. H. Fisk, of Detroit, Mich., is at the head of a syndicate which is backing the project.

New Orleans & Baton Rouge Railroad.—H. V. Meily, right of way agent for this company, which proposes to build an electric railway from New Orleans to Baton Rouge, La., states that construction work will begin during the month of February, if there is no further delay in securing the rails. Eighty-pound rails are to be used. Edward Godschaux, of New Orleans, president.

New York Auburn & Lansing Railroad.—H. A. Clark, chief engineer, Auburn, N. Y., writes that 20 miles of track were laid

last year, from Auburn to Genoa, N. Y., and that an extension from Genoa to Ithaca, 20 miles, is in progress. The road is now being operated for freight service by steam, but when completed next summer will be operated by third rail.

New York City Railway.—President H. H. Vreeland has announced in a letter to the rapid transit commission that the company has decided to do away with the horse cars now operating in several parts of the borough of Manhattan and to substitute the underground trolley system. Work is to be started as soon as the frost is out of the ground.

Niagara St. Catharines & Toronto Railway.—This company, which last year extended its road to Fonthill, Ont., has awarded a contract to Joseph Battle, of Thorold, Ont., for extending the line from Fonthill to Welland, five miles. Surveys are also being made for a line from St. Catharines, Ont., to Niagara-on-the-Lake, 12 miles. E. F. Seixas, general manager, St. Catharines.

Nagasaki, Japan.—The early construction of three electric tramways in the northern portion of the Japanese island of Kyushu is under contemplation. The first, from Moji to Kokura, 8 miles; estimated cost \$350,000; the second, from Moji to Yawata, 12 miles; cost \$500,000; the third, one of 23 miles, between the important towns of Fukuoka and Kokura; estimated cost \$1,250,000 gold.

Norfolk & Portsmouth Traction Company.—The directors have approved the plans of General Manager Hathaway for extensive track improvements on terminal facilities at the Jamestown exposition grounds. The changes, however, are subject to the approval of the exposition authorities.

Northern Electric Company.—This company, which is building a system of electric roads in Central California, has commenced grading operations at Meridian, on the Marysville-Colusa division. This line will connect at Colusa with another running north to Hamilton City and Red Bluff. Grading has also been started on the Chico-Red Bluff division. A. D. Schindler, general manager, Chico, Cal.

Oklahoma City Railway.—Vice-president J. W. Shartel has announced that during the year 5 miles of extensions to the city lines will be built and a large part of the system will be double-tracked. During 1906 the mileage has been increased from 16.1 to 22.5 miles, with 10.5 miles under construction. It is planned to build a line about 10 miles long toward Shawnee.

Omaha & Council Bluffs Street Railway Company.—It is announced that this company contemplates an extension to its present line by which Omaha and Plattsmouth, Neb., will be connected. The line will be 25 miles long, 15 miles of which are already built to Ft. Crook. A bridge over the Platt river will be a feature of the new line.

Omaha & Nebraska Central Railway.—The Westinghouse Electrical & Manufacturing Company is preparing plans and estimates for the complete electrical construction and equipment of this proposed line from Omaha to Hastings, Neb. J. C. Kinsler, of Omaha, is one of the promoters.

Pittsburg McKeesport & Greensburg Electric Railway.—We are advised by P. A. Meyer, chief engineer, Greensburg, Pa., that this company will build an extension from Hunker to Scottsdale, Pa., $10\frac{1}{2}$ miles.

Portland & Brunswick Street Railway.—Superintendent A. F. Gerald, of Fairfield, Me., has announced that this company will soon commence building an extension from Lisbon Falls via Durham to Freeport, Me.

Portsmouth (O.) Street Railroad & Light Company.—This company has about completed laying steel for a $4\frac{1}{2}$ -mile loop extension to its lines. Seventy-pound 7-inch rails are being laid.

Povidence & Burrillville Street Railway.—It is stated that the New York New Haven & Hartford Railroad, which recently acquired this property, will expend about \$75,000 in completing the double-tracking between Providence and Woonsocket, R. I. Willard Kent, chief engineer, Woonsocket.

Presidio & Ferries Railroad.—President George A. Newhall, of San Francisco, Cal., has announced that the portion of the road between Steiner and Polk streets, San Francisco, would be in operation inside of two weeks, and that the road would be in operation from Polk street to the ferry in three months.

Ridgway & St. Mary's Street Railway.—W. H. Tens, secretary, St. Mary's, Pa., writes that grading is to begin in April on this proposed road from Ridgway to St. Mary's, Pa., 17 miles, via Centerville and Dagus Mines. Gas-engine motor cars are to be used. W. T. Hoblitzell, president, Meyersdale, Pa.; J. J. Hoblitzell, Jr., chief engineer, Meyersdale, Pa.

Selinsgrove & Freeburg Electric Railway.—Secretary George W. Wagenseller, Middleburg, Pa., writes that this road will extend from Selinsgrove to Freeburg, Pa., 5 miles, via Kantz. E. M. Leader, Shamokin, Pa., president.

South Dakota Central Railway.—Surveys will be commenced at once for this proposed line from Rutland, N. D., to Brookings, S. D. W. J. Wagner, of Sioux Falls, S. D., is chief engineer.

Southwestern Traction Company.—This company has let a contract to the Canadian Westinghouse Company for replacing the present Ganz three-phase alternating-current system by the direct-current system. The road connects London and St. Thomas, Ont., and is extending to Port Stanley. S. Walter Mower, London, Ont., general manager.

Springfield & Southeastern Traction Company.—A contract for

the construction of this line from Springfield to Pana, Ill., has been let to the New Orleans Construction Company, of which J. J. Finn, of Decatur, Ill., is president.

Spokane & Inland Railway.—The contract for the extension of this line from Palouse, Wash., to Moscow, Idaho, has been awarded to Grant, Smith & Co., of Spokane, Wash., who also had the contract for the work between Spokane and Palouse.

Thermopolis & Hot Springs Street Car Company.—This company, it is reported, has been organized in Thermopolis, Wyo., with \$50,000 capital stock and has secured a franchise for a street railway line in Thermopolis and to the hot springs near the city.

Toledo & Indiana Railway.—This company has completed arrangements for the extension of its line westward from Bryan, O., to Waterloo, Ind., where it will connect with the Toledo & Chicago Interurban Railway running to Fort Wayne and Kendallville. E. E. Darrow, general manager, Toledo, O.

United Railways & Electric Company.—This company is making surveys for a new line on the York road from Towson to Cockeysville, Md., via Lutherville.

Union Traction Company of Kansas.—D. H. Siggins, president, Independence, Kan., announces that work is to begin in April on the line from Independence to Cherryvale and Parsons, and that the line from Coffeyville to Independence, which is now nearing completion, should be in operation by May 1. A city line is also to be built in Coffeyville. The power house at Independence is nearing completion.

United Traction Company.—General Manager E. S. Fassett, of Albany, N. Y., has announced that this company will build a line from Troy to Rennselaer, N. Y., connecting with the present systems in those two cities, and establish a belt line between Troy and Albany.

West Penn Railways Company.—This company will build an extension from Footedale to Brownsville, Pa., 9½ miles. John Duggan, of New Haven, has the contract for the first 3 miles from Footedale to Orient. The line from Leckrone to Masontown will be completed by February 1, it is stated. F. H. Glenson, of McKeesport, Pa., receiver for the Bessemer Contracting & Ballast Company, which had the contract, is finishing the work.

Winona Interurban Railway.—It is reported that this company will begin the immediate construction of its proposed line from Warsaw to Valparaiso, Ind. S. C. Dickey, general manager, Winona Lake, Ind.

Woodbury & Waterbury Street Railway.—This company has awarded the contract to construct a trolley line from the Waterbury town boundary through Middlebury to Woodbury, Conn. The contractors will do as much rough work as possible during the winter, and in the spring a large force will be employed to push the enterprise to completion. At the Waterbury end the line will connect with the Connecticut Railway & Lighting Company.

York County Traction Company.—This company has completed surveys for its line from York to Hanover, Pa., 20 miles, and has filed a plan with the secretary of state showing the route. David Young, Jr., general manager, York, Pa.

POWER HOUSES AND SUBSTATIONS.

Denver City Tramway.—This company has contracted with the Allis-Chalmers Company for a 4,000-hp. steam turbine, to be installed in the Platte street power house, at a cost of about \$75,000. According to the contract the turbine is to be installed and in operation by July 1. The new turbine will add 35 per cent to the present power capacity of the company, and is required for the numerous extensions that are to be undertaken at once under the provisions of the franchise voted last May. John A. Beeler, vice-president and general manager, Denver, Colo.

Jackson (Tenn.) Railway & Light Company.—This company expects to occupy its new power plant, located just outside the city of Jackson about March 15. The generating units are to be two 300-kw. Parsons turbines. The building, which is of concrete and brick construction, will be enclosed by February 1. Mr. S. S. Bush, of Louisville, Ky., is vice-president and general manager.

Omaha & Council Bluffs Street Railway.—This company will begin work this spring on the construction of three substations, one at the shops at Twenty-sixth and Lake streets in Omaha, and one near the south end of South Omaha, to supply the Bellevue line. A portable substation will also be built. G. W. Wattles, vice-president and general manager, Omaha, Neb.

Utah Light & Railway Company.—The board of directors has authorized an appropriation for the construction of a new power plant on the site of the present one near the Jordan river and it is announced that work will be commenced in a few days and aimed to completion. Plans and specifications have been prepared. The new plant will have a capacity of 25,000 hp. and will replace the four power houses now required for the entire system, in Salt Lake City and vicinity, which are located near Provo, at Garland near the mouth of the Big Cottonwood canyon, and near the Jordan river. The new plant will provide for both the railway and lighting loads and will be so arranged as to enable the capacity to be increased when occasion shall require it. O. A. Honnold, chief engineer Salt Lake City, Utah.

Youngstown-Sharon Railway & Light Company. A new 400-kw. rotary converter has been installed in the substation of the Valley Street Railway at Sharon, Pa. A 3,000-kw. generator has been installed in the main power house at Youngtown, O.

Personal Mention

Mr. D. L. Prendergast has been appointed acting secretary of the Boston Elevated Railway, in place of Mr. John T. Burnett, resigned.

Mr. Frank L. Casey has been appointed assistant superintendent of the traffic department of the Elmira Water Light & Railroad Company, of Elmira, N. Y., to succeed Mr. Edwin S. Becker, resigned.

Mr. E. S. Pattee, secretary and auditor of the Twin City Rapid Transit Company, of Minneapolis, Minn., has been appointed secretary and comptroller of the company. Mr. D. J. Shouse, heretofore assistant auditor, has been appointed auditor.

Mr. M. E. Kaper has been appointed division passenger and freight agent of the Indianapolis & Eastern Railway and the Indianapolis & Martinsville Rapid Transit Company, with headquarters at Greenfield, Ind., succeeding Mr. J. F. Fletcher, resigned.

Mr. Parley L. Williams has been appointed general counsel of the Utah Light & Railway Company, of Salt Lake City, Utah, succeeding Judge Le Grand Young, resigned. Mr. E. M. Bagley has been appointed claims attorney.

Mr. W. H. Owens, heretofore superintendent of the Madison County Light & Power Company, has been appointed assistant general superintendent of the Decatur Railway & Light Company, a part of the Illinois Traction System, with headquarters at Decatur, Ill.

Mr. W. G. Jayne, for the past three and a half years superintendent of the Columbus Urbana & Western Traction Company, has resigned to take a similar position with the Schoepf syndicate at Dayton, O., effective on January 15. Mr. Jayne's successor has not yet been appointed.

Mr. C. S. Bidwell, for the past three years purchasing agent for the Indiana Columbus & Eastern Traction Company, with headquarters at Columbus, O., has been appointed chief clerk to Mr. J. L. Adams, general manager of the western division of the system, with headquarters at Dayton, effective on February 1. In future all purchases will be made from the Cincinnati office and the purchasing department at Columbus will be abolished.

Mr. Charles A. Floyd, since 1902 general passenger and freight agent of the Grand Rapids Holland & Chicago Railway, with office at Grand Rapids, Mich., has been appointed manager of the Michigan State Fair Association, and will devote a third of his time to his new position, with headquarters at Detroit, retaining his position with the railway. Mr. Floyd has been connected with the Grand Rapids Holland & Chicago for eight years, having entered its service as a bookkeeper.

Financial News

Bennington & North Adams Street Railway.—This company, which is owned by the Consolidated Railway, of New Haven, Conn., and which is constructing an electric railway from North Adams, Mass., to Bennington, Vt., has acquired by exchange of stock the Bennington & Hoosick Valley Railway, which connects Bennington and Hoosick Falls, N. Y., and has franchise for several extensions, including one to Troy. The Bennington & North Adams company is capitalized at \$650,000. The officers of the company are: President, Charles S. Mellon, of New Haven; vice-president, Calvert Townley, New Haven; treasurer, O. M. Barber, of Bennington.

Broad Street Rapid Transit Railway.—The court of common pleas in Philadelphia has decided that the Broad Street Rapid Transit Railway Company, which was chartered under the act of 1901 for the purpose of operating a surface railway on Broad street, cannot legally exercise the alleged right conferred by the act of the legislature, and the court directed that a judgment of ouster be entered against the defendant company. The court holds that the act of 1866 for the improvement of Broad street, which directed the removal of all railway tracks and forbade the city from any time in the future granting any privilege to railway or railroad companies to occupy that street, is still in full force and effect, and was never repealed by implication or otherwise.

Central California Traction Company.—An agreement has been reached between the promoters of the Central California Traction company and the projectors of the new electric line to connect Sacramento and Lake Tahoe, whereby the latter company will have the use of the former's tracks from Brighton to Sacramento, including the terminal of the traction company in that city, which will be reached by a private right of way between J and M streets. The Tahoe road will follow the banks of the American river from Folsom to Brighton, where it will connect with the traction company's line running from Stockton through Lodi, Elk Grove and Florin. E. P. Hillburn, of Stockton, Cal., is general manager of the Central California company.

Cincinnati Newport & Covington Light & Traction Company.—The directors have declared a quarterly dividend of 1½ per cent on the preferred stock, payable on January 15.

Denver City Tramway Company.—The case of the people of Denver against the company, brought by the district attorney,

to test the legality of the franchises voted to the company last May, has been decided in favor of the company.

Denver Southeastern Railway.—This company, which proposes to build an electric railway connecting Denver, Englewood, Littleton and Ft. Logan, Colo., has elected the following officers: President, George I. Cole; vice-president, C. H. Chase; secretary, I. C. Cockey; treasurer, S. B. Thomas; all of Denver, Colo.

Des Moines Winterset & Creston Electric Railway.—At the recent annual meeting the officers were re-elected as follows: W. D. Skinner, president, Des Moines; J. H. Mack, vice-president, Macksburg; W. B. Steere, vice-president, Des Moines; S. D. Alexander, treasurer, Winterset; Milo Ward, secretary, Des Moines; A. E. Park, general manager, Des Moines. The company has secured about half of the right of way for its proposed line from Des Moines to Winterset, via Creston and Macksburg, Ia., 60 miles, and surveys have been made. B. Schreiner, of Des Moines, is chief engineer.

East Reading Passenger Railway.—At the recent annual election of this company, which is controlled by the United Traction Company, of Reading, Pa., the following directors were chosen for the ensuing year: A. J. Brumbach, Jonathan G. Leinbach, William R. McIlvain, George W. Bard, J. A. Strohecker, Frank P. Esterly and Wm. McIlvain. The board elected the following officers: President, A. J. Brumbach; vice-president, J. G. Leinbach; secretary, William McIlvain; treasurer, A. Raymond Bard.

Frederick & Middletown Railroad.—At the annual meeting on January 8, the following officers were elected: President, James E. Ingram, Jr., of Baltimore, Md.; vice-president, Emory L. Coblenz, of Middletown, Md.; secretary, Edgar W. Hartlove, of Baltimore; treasurer, Thomas H. Haller, of Frederick.

Gallon Mt. Gilead & Delaware Electric Railway.—This company which proposes to build an electric line connecting the towns named, has organized by electing the following officers: President, S. P. Gage, Mt. Gilead, O.; first vice-president, John A. Shumaker, Delaware, O.; second vice-president, W. P. Vaughn, Cardington, O.; secretary, O. A. White, Mt. Gilead.

Hagerstown (Md.) Electric Railway.—It is stated that a meeting of the stockholders will be called at an early date to authorize an increase in the capital stock from \$200,000 to \$1,000,000 for the purpose of securing funds for proposed extensions.

Hartford & Springfield Street Railway.—This company has applied to the secretary of state of Massachusetts for an amended charter authorizing it to exercise all the rights and franchises of the East Windsor Street Railway, the Somers & Enfield Electric Railway, the Windsor Locks Traction Company and the Rockville Broad Brook & East Windsor Street Railway, to build a railway in Somers and Stafford, Conn., and to increase its capital stock. W. A. Tucker, Boston, Mass., is president.

Houston-Galveston Traction Company.—A bill has been introduced in the Texas legislature which carries a clause to enable the Stone & Webster Engineering Corporation, of Boston, Mass., to build its proposed line from Galveston to Houston, Tex. It is considered that such an enabling act is necessary because it is proposed to cross from Galveston to the mainland over a causeway to be constructed. Surveys have been made for the road and the project has been financed on condition the enabling act is passed.

Interborough-Metropolitan Company.—The stockholders held the annual meeting at New York on January 15 and re-elected the following seven directors, whose terms of office had expired: August Belmont, Andrew Freedman, Cornelius Vanderbilt, Paul D. Cravath, Edward J. Berwind, P. A. B. Widener and Walter G. Oakman. The board is composed of twenty-one members, divided into three classes seven of whom are elected each year.

Kansas City & Bonner Springs Railway.—It is reported that Samuel Brown, of Philadelphia, has purchased the rights and property of this company, which has the right of way and has done some construction work between Kansas City, Mo., and Bonner Springs, Kan., for \$200,000. John W. McDaniel, president, Bonner Springs, Kan.

Kansas-Oklahoma Interurban Railway.—This company, which proposes to build an electric railway connecting Winfield, Arkansas City, Geuda Springs, Ark., and the Chilocco Indian School, has organized by electing the following directors: W. C. Robinson, W. H. Somermier, of Winfield; C. A. Scruton, S. P. Gould, L. H. P. Northrup, A. J. Hunt and C. L. Brown, of Arkansas City. The directors elected the following officers: W. C. Robinson, president; L. H. P. Northrup, vice-president and general manager; C. A. Scruton, secretary and treasurer; S. P. Gould, auditor.

Lake Shore Electric Railway.—At the annual meeting in Cleveland on January 15 the directors were all re-elected. The directors then re-elected the following officers: President, Edward W. Moore; vice-presidents, W. H. Price and J. Cooke; secretary and treasurer, F. W. Coen, all of Cleveland. In President Moore's annual report it was shown that the double-tracking of the line between Cleveland and Lorain has been completed. There was also built during the year an extension to the Beech Park power-house, while a substation was installed with good results at Dover Bay. In addition the company has done a good deal of work along the line and in rebuilding the tracks in Sandusky. In the matter of new equipment the company purchased and put in operation ten new cars, which are showing good results in the way of increased earnings. During the year, also, the construction of the line between Sandusky and Fremont was started, and so much progress has been made that the line will be completed and in operation by the first or middle of May. As far as improvements for the current year are concerned the company has

under contemplation an increase in power house facilities at Fremont. The company also has under order 12 new cars that will be delivered early this spring. The financial statement for the year compares as follows:

	1906.	1905.
Gross receipts	\$866,970.16	\$788,268.47
Operating and taxes	476,257.85	428,588.23
Net earnings	390,712.31	359,680.24
Interest charges	254,198.37	244,850.90
Net surplus	136,513.97	114,830.24

Milwaukee Electric Railway & Light Company.—The annual meeting will be held in Milwaukee on January 21. Arrangements will be made to provide additional capital for the extension of the lines within the city; for the construction of new power generating stations or adding to the capacity of the present ones; for the construction of car houses and machine shops, and for other purposes necessary to meet the increasing demands which are being made upon the company. It is proposed not only to provide for the immediate wants of the company but to make provision for future requirements. It is also proposed to refund the extension mortgage bonds by a new issue of common stock. The meeting of the subsidiary company, the Milwaukee Light, Heat & Traction Company, will be held at the same time and it is proposed to issue additional stock to provide for several extensions. John I. Beggs, of Milwaukee, is president of both companies.

Newport & Alexandria Traction Company.—At the annual meeting of this company held in Alexandria on January 7, the following officers were elected: A. S. Berry, president; Andrew Turner, vice-president; Joseph Wright, treasurer; W. H. Wagoner, secretary. The directors are, Henry Fahrenholtz, Frank Thatcher, John Todd and M. Kintler. The route for this proposed line has been surveyed and it is stated will be built in the near future.

Newton & Northwestern Railroad.—The minority stockholders of this company has applied for an injunction restraining the majority from leasing 44 miles of the road to the Ft. Dodge Des Moines & Southern Electric Railway, claiming that the leased part of the road would destroy the value of the remainder. The Ft. Dodge Des Moines & Southern, which is composed of many of the same stockholders as the Newton & Northwestern, is preparing to electrify the latter road and use it as part of an electric railway system from Ft. Dodge to Des Moines.

Northern Ohio Traction & Light Company.—The city of Akron, O., has brought suit against this company to recover \$27,732, half of the city's share of the cost of the Mill street viaduct. The city paid for half of the viaduct and the other half was paid by steam railroads. The city now seeks to compel the traction company, which uses the viaduct, to pay half of its share, as provided by an ordinance of April 4, 1904.

Omaha & Council Bluffs Street Railway.—The annual meeting of the stockholders and directors was held on January 14 and the officers and directors were all re-elected. The officers are: President, Guy C. Barton; vice-president, G. W. Wattles; second vice-president, M. S. Hopkins; treasurer, W. A. Smith; secretary, R. A. Leussler.

Paris Traction Company.—This company, which is building a line 3½ miles long in Paris, Ill., has certified to an increase of capital stock from \$5,000 to \$50,000.

United Traction Company.—The board of railroad commissioners of New York state has granted the application of the United Traction Company, of Albany, N. Y., for permission to increase its capital stock from \$5,000,000 to \$13,500,000. The new issue will be used to take up the outstanding securities of the Hudson Valley Railway, which are owned by the United Traction Company. Steps toward the consolidation of the two companies were taken at a meeting of the United company several weeks ago, and the merger was made effective about two weeks ago when General Manager E. S. Fassett, of the United Traction Company, had his jurisdiction extended over the Hudson Valley company. The Hudson Valley company was formed in 1901, and operates in the territory from Troy to Saratoga and north to Caldwell and Warrensburg, on Lake George. The capital stock is \$3,000,000, and the original bond issue amounted to \$4,000,000. There has since been a debenture issue to meet the requirements of the company.

Urbana Bellefontaine & Northern Railway.—The court has confirmed the report of the receivers, J. G. Schmidlapp and Myron H. Wilson, and the receivership has been closed. The road is one of the old Appleyard lines, and was purchased last spring by the Schoepf syndicate.

Utah Light & Railway Company.—The executive committee has decided to call in on August 1 an issue of \$500,000 6 per cent second mortgage bonds, issued in February, 1901.

Western New York & Pennsylvania Traction Company.—The New York railroad commission has granted this company permission to issue a first refunding mortgage for \$5,000,000, only half that amount of bonds, however, to be issued under this consent.

Worcester Consolidated Street Railway.—At the recent meeting of the directors President Francis H. Dewey and the other officers were re-elected.

York (Pa.) Street Railway.—This company has purchased the property, charters and franchises of the Colonial Street Railway, the Penn Park Street Railway, the York Intramural Street Railway, the York Railway & Electric Company, the York & Hanover Western Railway and the York & Susquehanna Railway, all of York, Pa. The company has applied to the city council for the right to build these lines, with several changes in routes and other changes made necessary by the new arrangement, agreeing to pay the city 3 per cent of the gross earnings. These extensions include various loop lines in the city and lines to the suburbs.

Manufactures and Supplies

ROLLING STOCK.

Citizens Railway, Lincoln, Neb., is reported about to order 6 additional cars.

Gray's Harbor Electric Company, Aberdeen, Wash., has ordered one car of the J. G. Brill Company.

United Railways & Electric Company, Baltimore, Md., has ordered 40 cars from the John Stephenson Company.

Newport News & Old Point Railway & Electric Company, Newport, R. I., is asking prices on new equipment for eight cars.

Vallejo Benicia & Napa Valley Railway, Napa, Cal., is reported to have ordered 8 new cars from the Niles Car & Manufacturing Company.

Norfolk & Portsmouth Traction Company, Norfolk, Va., has an order on file with the J. G. Brill Company for 41 motor and 28 trailer cars.

Spokane Traction Company, Spokane, Wash., is reported to have placed an order for ten new cars of the Detroit type for delivery in March.

Lima & Toledo Traction Company, Lima, O., has ordered five passenger cars from the Cincinnati Car Company for delivery early in the summer.

Terre Haute Traction & Light Company, Terre Haute, Ind., has ordered 16 new trucks from the Baldwin Locomotive Works for use under new cars.

Oakland Traction Consolidated, Oakland, Cal., is reported to be building 20 new 50-foot cars and will soon commence work on 20 new 55-foot steel frame cars.

Savannah Electric Company, Savannah, Ga., will order 12 new cars. Prices are being asked on equipment for 10 motor and 4 trailer cars and the company expects to order 50 new equipments in the near future.

Memphis Street Railway Company, Memphis, Tenn., will place an order during this month for 25 double-truck full-vestibule cars to be 30 feet in length. No details of the specifications for the cars have yet been announced.

Jackson Railway & Light Company, Jackson, Tenn., is soon to receive from the American Car Company six 20-foot semi-convertible single truck cars to be mounted on Brill 21-E trucks and to be equipped with Westinghouse 92-A motors, two to each car; Consolidated Car Company's heaters and Ohmer registers. The company is also rebuilding in its own shops 6 old cars.

Nashville Railway & Light Company, Nashville, Tenn., will order 30 double-truck cars in the spring, specifications for which are now in the hands of the engineers of the company. This company is also converting eight 42-foot trailers into motor cars at the new shops of the company. Three of the cars have already been converted and work on the other three will be commenced at an early date.

SHOPS AND BUILDINGS.

Illinois Traction Company.—The present power house of the Peoria Railway, between Chestnut and Walnut streets, Peoria, is to be remodeled and used as a passenger station and freight house for the Peoria Bloomington & Champaign Railway division, and power will be taken from the new power house now being completed at Peoria.

Interborough-Metropolitan Company.—This company has applied to the city authorities to close Ninth avenue above Two Hundred and Eighteenth street, New York, and also several cross streets, for a site for its proposed \$2,000,000 repair shops. The company has already acquired the private property.

Rhode Island Company. It is stated that this company is considering plans for a new car house, 160 by 150 feet at Westcott. R. I. A. E. Potter general manager, Providence, R. I.

Utah Light & Railway Company. This company has purchased a 16-acre block of land, located between Fifth and Sixth South streets and Sixth and Seventh East streets, in Salt Lake City, Utah, on which to erect a large car barn and shops to accommodate the cars of the entire system. It is stated that the buildings will cost approximately \$1,500,000. The land chosen is centrally located and is an ideal site for the car barn. O. A. Honnold, chief engineer, Salt Lake City.

TRADE NOTES.

Silker Car Works, Limited, Halifax, N. S., has been incorporated with \$125,000 capital stock and will manufacture street cars.

Central Steel Castings Company, of Columbus, O., has been incorporated with a capital of \$100,000. The incorporators are John B. Bonney, Walter E. Floyd, Perin B. Monypenny, John Rogers and Karl E. Burr.

Buchanan-Foster Company, Philadelphia, manufacturers of roofing materials and cold air product, have removed their office from the Broad Building to the West End Trust Building, Broad

and South Penn Square. The company make a special brand of ready roofing known as the "Congo" which is readily applied to all classes of buildings.

Central Inspection Bureau, 17 State street, New York, has received an order from the American Railways Company, Philadelphia, for the inspection of ten double-truck cars to be built by the Jewett Car Company.

Buffalo Forge Company, Buffalo, N. Y., reports a long list of recent orders for its products, including mechanical draft apparatus, heating equipment, centrifugal pumps, air pumps, jet condensers and pressure pumps.

Dossert & Company, 242-244 West Forty-first street, New York, manufacturers of Dossert solderless connectors and terminals for wires and cables, has an exhibit at the electrical trades exposition in Chicago. Its booth is located in section F, space 8.

Allis-Chalmers Company, Milwaukee, has received an order from the Seamless Tube Company of America for four 300-horsepower Allis-Chalmers compound wound, non-reversible direct-current motors for use in the manufacturing plant of this company situated at Monessen, Pa.

Elroy N. Heath, the New England manager for H. B. Smith Machine Company, has established in the Oliver building, Boston, Mass., a machinery exchange, occupying about one-third of a street floor. The idea of this exchange is to bring together concerns in mechanical lines in one home.

Fitzgerald Air Brake Company, of Chicago, has removed its offices from the Railway Exchange building to 1321 First National Bank building. The new quarters secured by the company will give it considerable more space and a very desirable location from which to carry on its business.

Electric Fountain Company of America, Philadelphia, Pa., recently made a shipment of its portable fountains to Valparaiso, Chile. This company makes electric fountains suitable for electric railway parks, many of which, including Willow Grove Park of the Philadelphia Rapid Transit Company, have been supplied during the past few years. The electric fountain at Willow Grove Park is apparently as popular an attraction today as it was when first installed several years ago.

Midvale Steel Company, of Philadelphia, has ordered from Allis-Chalmers Company a heavy-duty cross-compound engine, with cylinders 30 and 46 by 48 inches, for direct-connection to an electric generator, to be installed in its plant at Nicetown, Pa. As this unit will be subjected to extreme overloads during its ordinary operation, the engine is required to be very strongly built. The engine is to be operated non-condensing and the normal capacity of the unit will be 1,000 kw.

Henry R. Towne, president of the Yale & Towne Manufacturing Company, of Stamford, Conn., at a meeting of its superintendents and foremen held recently, made an announcement of an increase of wages and piece rates of its 3,000 employees. The company proposes by this change to distribute annually \$120,000 additional to its employees, believing that its liberal policy in these respects is appreciated and will result in increased efficiency and therefore in better economy. This action is entirely voluntary on the part of the company.

Beaudry & Co., manufacturers of Champion power hammers and Duplex forging presses, has been incorporated under the state laws of Massachusetts. The growth of the business in the past few years has necessitated this and permits Otto Abrahamson, who has been in charge of the sales department, to become a member of the company. Mr. Abrahamson will have the title of vice-president and general manager, still continuing in charge of sales. The office of the company is in the Oliver building, Milk and Oliver streets, Boston. Mr. A. Beaudry is president and treasurer.

Electric Storage Battery Company, of Philadelphia, manufacturer of the chloride accumulator, has installed four of the eight substation batteries contracted for by the New York Central & Hudson River Railroad Company for use in connection with the electrification of the New York terminal. The batteries now in operation are located respectively at Bronx Park, Kings Bridge, Mott Haven and Fifteenth street. The eight batteries will have a total capacity of 60,000 hp. One of the two exciter batteries contracted for by the same company has also been installed at Port Morris.

Randall Tram-Rail Company, Philadelphia, Pa., has moved its offices from Waterloo street to the corner of Allegheny and Frankfort avenues where they will occupy the whole of a one-story building. The company has added new machinery, making the plant modern and up-to-date, and the entire line of the company will be devoted to the manufacture of the Moyer tram-rail system. This business was formerly conducted under the name of R. T. Randall & Co., but has now been made a distinct concern. Mr. Albert W. Moyer, well known in this line, has been appointed general manager of the company.

Chicago Pneumatic Tool Company, in connection with the announcement that it has in course of preparation a catalogue describing and illustrating its line of Chicago Giant rock drills, calls attention to rock drills as a factor in the prosperity of the country. It is less than 50 years since the state of Massachusetts undertook to excavate the Housatonic tunnel, when the Burleigh rock drill was introduced, it being the first rock drilling machine. Since that time it is admitted that the rock drilling machine has been an important factor in the industrial world, it being one of the means of securing the best and quickest production of coal

and other minerals which have to be mined, and of quarrying rock needed for a multitude of purposes appertaining to manufacture and transportation.

Quincy Manchester Sargent Company, Chicago and New York. has appointed Howard M. Post advertising manager of the company. Mr. Post originally fitted himself for a telephone engineer and for three years held a position as switchboard installer for the Western Electric Company. Later he accepted a position as telephone engineer of the Kellogg Switchboard & Supply Company, and during a period of five years took out several telephone patents. His thorough knowledge of the telephone business led the company to offer him the position of advertising manager, which he accepted and handled very successfully.

Pittsburgh Steel Company, as announced from Monessen, Pa., will build a \$7,000,000 addition to its plant at that point to include two blast furnaces, a blooming mill and open hearth furnaces. In the past few months the steel company has purchased a tract of land from the Monessen Foundry & Machine Company and considerable land on which the village of Wireton stands from the Standard Land Improvement Company, giving it a total river frontage of from one to one and a half miles. The new furnaces will be erected between the Pittsburg & Lake Erie Railroad and the Monongahela river, taking up a large amount of river frontage.

ADVERTISING LITERATURE.

General Fireproofing Company, Youngstown, O.—This company is mailing samples of "Trussit" metal for reinforcing purposes.

Buffalo Forge Company, Buffalo, N. Y.—Catalogue No. 77 introduces, in addition to the regular line of tools which has been upon the market under the name of the Buffalo Forge Company for several years, a number of entirely new machines, as well as changes and improvements in older designs. Among the new

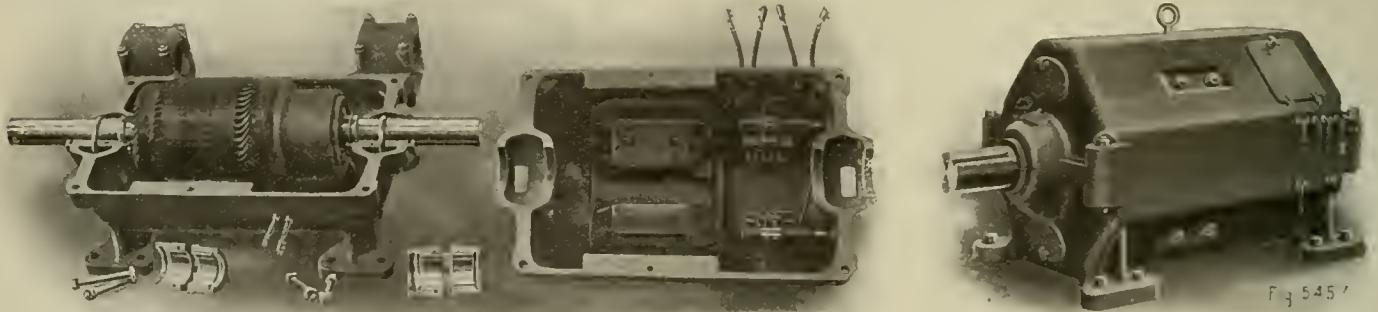
which is manufactured for a great variety of industrial purposes. The company states that these motors are being installed to operate machinery for which motor drive has heretofore been considered either undesirable or impracticable and believes, therefore, that this bulletin will be of particular interest to the owners of plants of various kinds throughout the country.

MOTORS FOR ROLLING MILLS.

The direct-current electric motor herewith illustrated is being introduced by the Crocker-Wheeler Company, Ampere, N. J., to meet the demands of rolling-mill service which requires a completely enclosed motor for intermittent but heavy work. It is known as the "W" motor and is built for 25, 50, 75 and 100 horsepower.

The parts are very heavy, corresponding approximately to the parts of ordinary motors of about twice the rated capacity. Inclosing has been carried to the extent that the ends of the bearings are sealed so that dust cannot enter. The motors will operate in either direction under ordinary overloads without sparking. The field frame is of steel and is divided horizontally so that the upper half can be readily removed. The shafts are of forged steel and much larger than for other types of motors for a similar output, and as the commutator is keyed to a sleeve extension of the flange forming one end of the armature core it can be readily removed without disconnecting the windings. The air gap is made large to minimize the trouble due to wear of bearings and displacement of the armature. The bearings are of heavy cast iron cylinders split horizontally and lined with babbit. They are of the ring-oiling type and have diagonal grooves for distributing the oil over the area of the bearings. Asbestos is used liberally in the windings in the place of vegetable substances on account of the heat of the atmosphere in which they are expected to work.

We are informed that these motors are in use by the follow-



Motor for Rolling Mills.

machines are two ball-bearing forges, a hand blower with high-speed gear running underneath the surface of an oil bath and a direct-drive blower.

American Carbon & Battery Company, East St. Louis, Ill.—This company has issued a new list of prices of stationary motor and generator carbon brushes, effective January 1, 1907. The catalogue lists and shows illustrations of a new form of motor brush which it has made to meet the special requirements of street railway use and a new form of pig tail, with which connection it is stated, it is possible to save from 10 to 20 per cent on pig tails used on small machines.

Atlas Engine Works, Indianapolis, Ind.—General bulletin No. 134 briefly lists, with illustrations and specifications, the complete line of this company, which, it is believed, is the largest exclusive builder of steam engines and boilers in the world. The company manufactures a very complete line of engines and boilers of various types and maintains branch offices and warehouses in all parts of the United States in order to be able to promptly fill rush orders for equipment of the sort manufactured by it.

Cincinnati Rubber Manufacturing Company, Cincinnati, O.—The Cincinnati Rubber Manufacturing Company was incorporated under the laws of the state of Ohio to purchase the extensive rubber business formerly owned by the Whitman & Barnes Manufacturing Company, of Akron, O., and retains the same management, superintendent, foremen and other employes, with such additions as have been made necessary by increased business. The lines of manufacture of the company include belting of all kinds and for all purposes, hose for all classes of service, packings and other rubber specialties which are described in a substantial 100-page catalogue containing various useful formulae.

Allis-Chalmers Company, Milwaukee, Wis.—This company is about to distribute a revised edition of Bulletin No. 1045, which is descriptive of Allis-Chalmers rotary converters. The publication includes 16 pages with numerous illustrations and describes the characteristic features of converters of various capacities. Bulletin No. 1040 describes the line of polyphase induction motors,

ing companies: Bethlehem Steel, Carnegie Steel, Illinois Steel, Lorain Steel, National Tube, Pennsylvania Steel, Shelby Steel Tube and Youngstown Sheet & Tube.

Exhibit of the H. W. Johns-Manville Company at Chicago's Second Annual Electrical Show.

At the second annual electrical show in progress at the Chicago Coliseum, the H. W. Johns-Manville Company, whose headquarters are in New York, has an extensive exhibit. Among its numerous electrical specialties a line of Victor direct-reading instruments is shown. These include Victor direct-current volt and ammeters, Victor combination meters of both the switchboard and portable types, as well as a special Victor combination meter for automobile use.

The manufacturer states that the Victor combination meter is the only direct-reading electrical instrument of its kind on the market giving a simultaneous reading of volts, amperes, watts and horsepower on one dial. It consists of a volt-meter and ammeter and is therefore practically two separate and complete instruments, which are combined in one case and so arranged that the indicators cross each other, each acting independently of the other as far as volt and ampere readings are concerned. The readings in watts and horsepower are obtained from the point of intersection of the two indicators. The Victor has a wide range of uses. As it is probably the only practical switchboard instrument giving a reading in watts and horsepower it adapts itself to use on the smallest switchboard panels.

Among the other materials exhibited is J-M friction tape, the friction material being well worked into the fabric and running true to gauge throughout the entire roll. The tape is made for extremely long service under all conditions.

Noark subway and service boxes are shown of one, two and three-pole construction and 250, 600 and 2,500-volt capacity. These boxes are water-tight, being designed and tested to withstand a pressure of 25 pounds per square inch without leaking, and accordingly suitable for most severe conditions. Other lines shown are the Noark national standard fuses, blocks and accessories and J-M overhead line material.

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The people of Easton, Pa., know a good deal more about municipal ownership than they did when they joyfully celebrated the inauguration of municipal electric lighting a few years ago. The knowledge gained by experience has cost something between \$4,000 and \$5,000 per year paid out of taxes for deficits in operation—

An Example of Municipal Ownership.

but the lesson has been thoroughly learned. Incidentally the outages have grown so frequent that the "lighting" has been recently little if any superior to total and unmitigated darkness, so that women and children have been warned not to go about after dark. Now the leading business men have petitioned the city council to dispose of the plant to a private corporation and pending arrangements for that purpose to let it be operated by contract with some private individual or corporation. Thus does another municipal enterprise pass to its inevitable and inglorious end.

At the recent meeting of the executive committee of the American Street and Interurban Railway Engineering Association the question of rail corrugation was brought up and disposed of by reference to the secretary of the American Street and Interurban Railway Association, who volunteered to collect data relating to the subject. In the latest issue of the Electrical Age, Mr. H. H. Nichols, engineer of maintenance of way, Philadelphia Rapid Transit Company, relates the result of certain investigations as to the causes of rail corrugation. Four different causes are suggested—the vibration or lateral bending of the web of the rail itself; the rails being loose upon their supports; the ties being loose on their foundations; the vibration or movement of the foundation immediately under the track structure. These four causes seem capable of being resolved into one primary cause—the greater or less freedom of the rail to vibrate in a lateral direction, which freedom would exist in a decreasing ratio through the four conditions named. That the reason stated for the formation of corrugations is a plausible one appears from Mr. Nichols' experiments in which the vibrations were caused to cease and the corrugations gradually to disappear by the application of a 30-foot fishplate

Corrugated Rail and Plenty of Tie Rods.

bolted to the outside of the rail. As stated in the account referred to, this method of correction would be expensive and therefore impracticable. The facts, however, suggest a remedy that should be at least partially effective. It appears from the papers presented at the recent meeting of the Street Railway Association of the State of New York, and frequently in the discussion thereupon, that a liberal use of tie-rods and steel ties is requisite to a smooth-riding and easily maintained track. Though the matter of corrugation was not brought up, there is little question but, if Mr. Nichols' theory is correct, the same cause that contributes to corrugation would also contribute to a general unsatisfactory condition involving unnecessary expense of maintenance. It is therefore suggested that corrugations as well as many of the other ills to which track is subject may be cured or relieved by the liberal use of tie-rods, for the reason, if for no other, that the forces supposed to contribute to vibration act upon opposite rails in opposite directions at any given time.

In its ideal form, whatever that may be, the steel tie should assist to serve the same purpose. The proper use of a proper form of steel tie should cover the second and third causes of corrugation as named by Mr. Nichols, viz.:—the looseness of the rails upon their supports and the looseness of the ties upon their foundations. The fourth cause, the vibration or movement of the foundation immediately under the track structure seems in these days of 10 to 12-inch solid concrete foundations too remote to warrant extended consideration. But the looseness of rails upon their supports when the latter are wooden ties and the method of fastening is the ordinary spike, is a rather universally existing condition. To obviate it requires constant attention and care on the part of the maintenance of way department. On the other hand, if there is any one feature of the steel tie which should commend it primarily, it is that the fastening between the rail and the tie can be made absolutely secure and kept so with a fraction of the labor required with the wooden tie and the spike fastening. Second only to the security of the connection between the tie and the rail, is, according to Mr. Nichols, the security with which the tie is held in its

Steel Ties and Rail Corrugations.

bolts to the outside of the rail. As stated in the account referred to, this method of correction would be expensive and therefore impracticable. The facts, however, suggest a remedy that should be at least partially effective. It appears from the papers presented at the recent meeting of the Street Railway Association of the State of New York, and frequently in the discussion thereupon, that a liberal use of tie-rods and steel ties is requisite to a smooth-riding and easily maintained track. Though the matter of corrugation was not brought up, there is little question but, if Mr. Nichols' theory is correct, the same cause that contributes to corrugation would also contribute to a general unsatisfactory condition involving unnecessary expense of maintenance. It is therefore suggested that corrugations as well as many of the other ills to which track is subject may be cured or relieved by the liberal use of tie-rods, for the reason, if for no other, that the forces supposed to contribute to vibration act upon opposite rails in opposite directions at any given time.

foundation. Whether the latter is gravel, broken stone or concrete, it appears beyond discussion that a steel tie is better adapted to be made of a section that can be held in place so long as the foundation maintains its integrity, than is the wooden tie of ordinary section. In fact, there is a serious question as to the propriety of embedding a wooden tie at all, especially in concrete, on account of the possibility of a dry rot which would afford an additional element of risk against the holding power of the spike. It goes without saying that all methods of avoiding corrugations in the rails will fail if the web of the rail is inadequate to the support of its load. Buckling of the web of the high girder rail was referred to at the meeting of the New York association as one of the reasons for expressing a preference for the T-rail. Corrugations due to this cause are, according to Mr. Nichols, difficult to remedy without considerable expense, but may be avoided in the beginning by the use of a thicker web. The data which Secretary Swenson has undertaken to collect should be of much interest in the way of throwing light on a matter about which little is actually known and in which every operating and maintenance officer is concerned. It may well be that in removing the causes of rail corrugation the entire track structure will undergo an improvement.

LIMITED INTERURBAN SERVICE.

By the institution of limited service an interurban line attains a standing which no merely local system can ever enjoy. Provision for fast through travel is one of the most prominent tendencies of the times in electric railway practice, and in some parts of this country, notably in the central states, the development of limited car or train service has reached a remarkable stage of efficiency. The running of such cars as those between Dayton and Toledo, where through cars cover 160 miles in six hours, making but 14 regular stops en route, or from Cleveland to Toledo, where 120 miles are covered in four and one-half hours, with 12 regular stops, involves a very high degree of operating responsibility, since the maximum speeds must fall close to a mile a minute on clear stretches of track.

It is a little singular that this class of service has thus far not been generally attempted on many of the interurban lines in other parts of the country, considering the success which it has attained in Ohio, Indiana and other states in their vicinity. Doubtless, the fact that even the limited service of the central west has not been thoroughly standardized in detail has been influential in retarding the development of express passenger service in other sections; but no one can analyze the tendencies of interurban practice at the beginning of this new year without feeling that the time is not far distant when limited cars will be demanded by the long-distance traveling public, regardless of the section in which the roads in line for such service are operated.

Comparatively few interurban roads are as yet double-tracked throughout their entire length, and the excellent records thus far made with limited cars have almost exclusively been accomplished under the difficulties of single-track operation. On many lines having limited cars in regular service the fast movements are alternated with the locals, giving an hourly headway in each direction. In other cases the limiteds are sandwiched in between the regular hourly locals. With half-hourly headway on single tracks cars pass one another every 15 minutes, so that extraordinary care is necessary for safe operation, and only the most rigid rules followed with intelligent appreciation of their applicability to all emergencies, insure the safe movement of limited cars among the large number of locals always present on the system. Just when it is best to double-track an interurban line is a matter about which there is no little difference of opinion at this time. If limited cars are to be operated at very high speeds on roads sending cars over the line on

30-minute intervals in each direction, the advisability of double-tracking is to be seriously considered, just as it is high time to think of getting away from single-track limitations when it becomes necessary to run cars on 15-minute intervals in each direction.

Among eastern interurban lines the population density tends to warrant double-tracking at a comparatively early period, so that it is almost certain that limited service would be both profitable and safe if inaugurated on broad-gauged lines. It would seem that a line like the Boston & Worcester, which is now being double-tracked in the last five miles of its entire length, ought to offer a most attractive field for the limited car. The local running time between these two cities, 49 miles apart, is 2 hours and 15 minutes against one hour by the parallel steam line's express. The fares in the electric service are practically half those of the steam line, the latter having lately reduced its passenger tariff to 90 cents each way after many years of operation at \$1. The institution of limited service on the completed double-track line, which has something like 30 miles of private or reserved right of way, ought to result in securing a large share of the business traffic which at present patronizes the Boston & Albany steam service, on account of its fast express service. Judging from what has been accomplished in other sections it would seem that a limited schedule of possibly one and one-half hours at certain times of the day might be well worth attempting in the case cited as illustrative.

Many of the interurban lines of the east are operated upon the public highways with relatively short distances between adjacent cities. Speeds are therefore limited to a maximum of from 30 to 40 miles per hour at the outside, and with the absence of long, clear stretches of interurban track through sparsely settled territory, it is difficult to inaugurate a service with few stops. With the frequent headway maintained in these populous communities it is, of course, a question how far limited service would be desirable. As far as the provision of through cars of superior design, comfort and equipment goes, the various foreign cars entering Boston, Salem, Lexington, Lynn and other points partake of the nature of limited service, and for such populous communities perhaps this is the nearest approach to it that is possible. But one might as well face the fact that for runs of from 20 miles and upward steam competition for the money of those whose time is most valuable cannot be met without genuine high-speed service, not necessarily record-breaking maximum spurts, but giving high average schedule speeds through the elimination of all but the most important local stops.

The question of fares on limited cars is one of no little difficulty, but if the service is distinctly superior to that of the locals, if more expensive equipment and more luxurious fittings are used, there is certainly reason for at least a slight additional charge. Stiffening the rates somewhat for through business tends to discourage short-distance riding from town to town and thus helps in the maintenance of fast schedules. Under eastern conditions, however, it is doubtful if excess fares for express service would be generally acceptable to the public, which has been educated to standards of car frequency and fixedness of fares only possible in the most thickly settled districts. Experience alone in the different parts of the country is capable of determining the ultimately best policy in regard to limited rates. It goes without saying that the fares must be enough to pay for the service given, and in a rough sort of way this means an earning of from 30 cents per car-mile upward. Forty or 50 cents per car-mile is much nearer the line of assured profit when one attempts to estimate the increased fixed charges accruing upon limited cars on account of their high standard of attractiveness, the extra cost of motive power capable of running the car at 60 miles per hour maximum speed, the cost in some cases of additional power station and distrib-

uting facilities, improvement in roadbed and possible delays to local traffic by limited cars when off schedule.

TRANSFORMER TESTS ON ELECTRIC RAILWAYS.

The testing of power plant and substation equipment on an electric railway is necessary for two principal reasons: to make sure that contract requirements are met by the manufacturers and to locate any unusual losses which may be seriously impairing the efficiency of the mechanical and electrical system. In many cases it is sufficient to send a representative of the road to the factory to carefully observe the tests of the manufacturer's engineers and to deduce from the figures so gained the degree with which the specifications have been followed. Other instances arise in which the best policy is to defer final acceptance until tests have been made upon the equipment under actual service conditions.

The importance of the transformer in electric railway operation is so great at the present time that detailed knowledge of its behavior when set up under service conditions is well worth securing on any system which aims to reduce its power cost to the minimum. On account of the somewhat involved relations existing between the transformer, primaries and secondaries, fewer tests have been made on this equipment by operating engineers than upon steam engines, turbines, gas engines and generators. The modern large-capacity transformer is a remarkably efficient device operating close to 98 per cent at full load and there is obviously little hope of improving its economy further. It is none the less desirable, however, to find out exactly what the efficiency is in a given transformer; to measure the temperature rise under various conditions of loading; to test the insulation of the windings, the potential ratios of windings and taps, the polarity and the regulation in voltage under various loads. These are the essential data which it is desirable for an operating company to have, but if more detailed analyses are desired tests may be made of core loss, copper loss, impedance and circulating current on transformers which are intended for parallel operation.

Probably the simplest and best way for an electric railway company to test its transformers is to actually place them under full-load or partial-load conditions with water rheostats as energy absorbers. From the standpoint of power cost it is, of course, more expensive to dissipate energy in this way than to adopt the so-called "pumping-back" methods of the manufacturers' testing departments which consume only the energy required to make up the core and copper losses.

The actual loading method carries the merit of extreme simplicity; it avoids complicated connections, obviates the necessity of bearing in mind a rather difficult course of reasoning during the tests and calls for no intricate adjustment of the rather limited supply of instruments available on the electric railway system. With an engineering department sufficiently skilled in making electrical tests it may work out in some cases that the best plan is to carry out "pumping-back" tests, but under average conditions the simple expedient of loading the transformer and measuring the quantities wanted is certainly the straightforward way to solve the problem. The larger the transformer the more expensive it becomes to make heat runs upon it at full load and the more probable it is that the engineering staff will have the time and skill necessary to make the "pumping-back" test.

Transformer efficiencies are readily obtained by dividing the output in watts on the secondary winding by the input of the primary as determined by various loadings by wattmeter located on each side. Voltmeter, ammeter and frequency readings are desirable to show that the conditions are normal. Temperature rise may be measured on exposed surfaces by thermometers wrapped in wick, but the only accurate way to get at the temperatures of the inner coils is by calculation

from the rise in resistance. Resistance measurements should be made at least every hour for this purpose on both primary and secondary windings, cutting the transformers out of circuit as short a time as is possible.

Regulation is easily determined by comparing secondary voltage readings with varying loads. In the absence of a special insulation testing set, two other transformers, carefully insulated, may be disconnected from the line and placed with their primaries in series and secondaries in parallel, the latter being excited either from a third transformer secondary or from some other source. Double normal voltage may thus be applied between the primary winding and core or frame, or between the primary and secondary windings. In the "pumping-back" method of testing the heating due to the core loss may be determined by open-circuiting the primary and applying normal voltage to the secondary, and the heating due to the copper loss is obtained by short-circuiting the primary and applying just enough voltage to the secondary to overcome the impedance and cause full-load current to flow in both windings. With air-blast transformers separate open-circuit and short-circuit heat runs give almost the same temperature rise for core and copper respectively, as when the two tests are applied together. Oil transformers do not give as consistent readings in this respect, hence the full-load test is preferable. In testing air-blast transformers the speed of the blower motor and air velocity should, of course, be recorded at frequent intervals, as well as the weather conditions.

Report of Treasurer of American Street and Interurban Railway Manufacturers' Association.

The report of Edwin H. Baker, treasurer of the American Street and Interurban Railway Manufacturers' Association for the period from February 9, 1906, to December 28, 1906, has just been published. It shows receipts and disbursements as follows:

RECEIPTS.	
By balance from 1905.....	\$ 350.26
Assessments at \$35.....	9,590.00
Sale of extra space at 5 cents per sq. ft....	2,558.60
Sale of extra badges at \$5 each.....	1,110.00
Revenue from other sources.....	54.64
	\$13,663.50
DISBURSEMENTS.	
Director of exhibits:	
Expenses for preparing buildings and grounds for convention—	
Labor and material.....	\$1,420.12
Incidentals	332.87
Local committee:	
Expenses for preparing convention hall—	
Removing and replacing booths, electric lighting, labor and material.....	1,240.78
Entertainment committee:	
Badges	600.00
Printing bulletin	338.50
Reception and ball, October 16, 1906.....	363.00
Shubert and Great Southern theaters, October 17, 1906.....	2,000.00
Reception Arlington Country Club, October 18, 1906	56.00
Vaudeville entertainment October 19, 1906	581.58
Printing committee:	
Printing three issues "List of Members and Guests" and admission cards.	570.11
Administration Expenses:	
Secretary's salary	1,000.00
Secretary's expenses	336.71
Printing, stationery and postage.....	440.85
D. M. Brady's expense account as chairman, 1903 to 1906.....	282.70
Incidentals	51.00
	\$9,614.22
Balance on hand December 28, 1906	\$1,019.28

Attached to the report is a certificate from Patterson, Teale & Dennis, certified public accountants, of New York, stating that the foregoing account of the treasurer's receipts and disbursements "is in accordance with his record and that proper and sufficient vouchers have been produced to us for all disbursements." Also "that the balance of cash on hand agrees with the certificate given us by the bank where the funds are deposited."

SHOP PRACTICE AT MEMPHIS.

The extensive improvements that are being made by this company include additions to the power house and car barns, a new car storage house and rearranging the tracks and special work leading into these buildings. The building now occupied by the offices, shops and car houses is 375 by 320 feet

sides of the property. This wall, which is shown in one of the engravings, is built of concrete mixed to the proportions of 1-3-5. It is 4½ feet thick at the bottom, and is battered to a thickness of 2 feet at the top. A pipe railing surmounts this wall. The new building is 205 by 372 feet in floor dimensions and has side walls 18 feet high. The materials of construction consist of concrete for foundations, brick for the



Shop Practice at Memphis—Wheel with Form for Winding Coils, Also Wire-Cleaning Press.

Shop Practice at Memphis—Method of Storing Field Coils and Armatures.

in floor area. This structure, erected several years ago, has, as a result of the rapid growth of the system, become too small to accommodate the large amount of rolling stock which has since been acquired. In view of this condition it has been found necessary to make the changes and additions as described herewith.

superstructure, steel trusses and tile roofing. The foundations have been sunk deep enough to allow pits to be excavated under the tracks, should it be necessary to do so.

New Car Storage House.

The new car storage house now under construction is

The building is divided into three equal-sized bays, by two brick partitions. The roof of each bay is independent of the adjoining roofs. In the east wall at a height sufficient to allow the free passage of cars under it a box girder has been in-



Shop Practice at Memphis—Pendulum Pile-Driver.

Shop Practice at Memphis—View in Pit Showing Car Body and Pit Hoists in Use.

located immediately south of, and across the street from, the present building. The ground on which this building stands is about 11 feet above the streets to the south and west. This necessitated the building of a retaining wall along the two

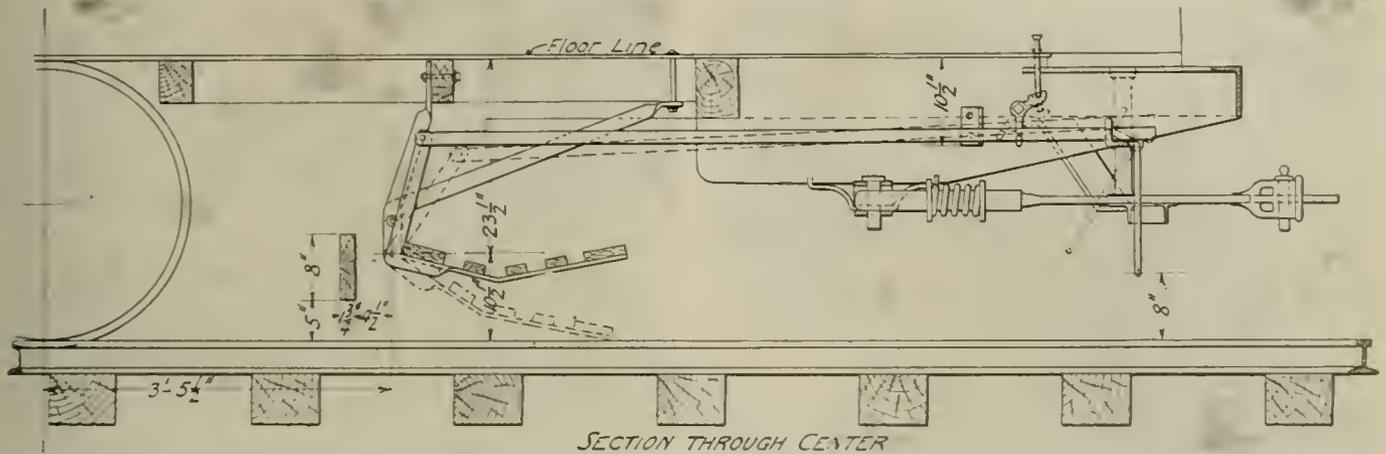
served in the brick wall so that if necessary entrance curves can be put in at this end.

A general ground plan shows the relative location of the

shop and storage buildings. With the completion of the new buildings the tracks nearby will be relaid so as to provide double-end entrances to the shops. This work presents an interesting arrangement of curves and special track work. The tracks now occupying Spring street, just south of the shops, are to be taken up and thrown back of the south property line of the street and a third track is to be laid from which will

valves and unions so that they can readily be disconnected and repaired in case of leakage.

The car-body and armature hoists are shown in detail in the accompanying illustrations. The main cylinder of each type of hoist is 10 inches in diameter. Inside the cylinders of the car hoists are plungers 4 feet long, made of 6-inch pipe filled with hard wood to a point 12 inches from the top. At the



Shop Practice at Memphis—Section Through Lower Front of Car Showing Automatic Fender and Trip in Normal and Lowered Positions.

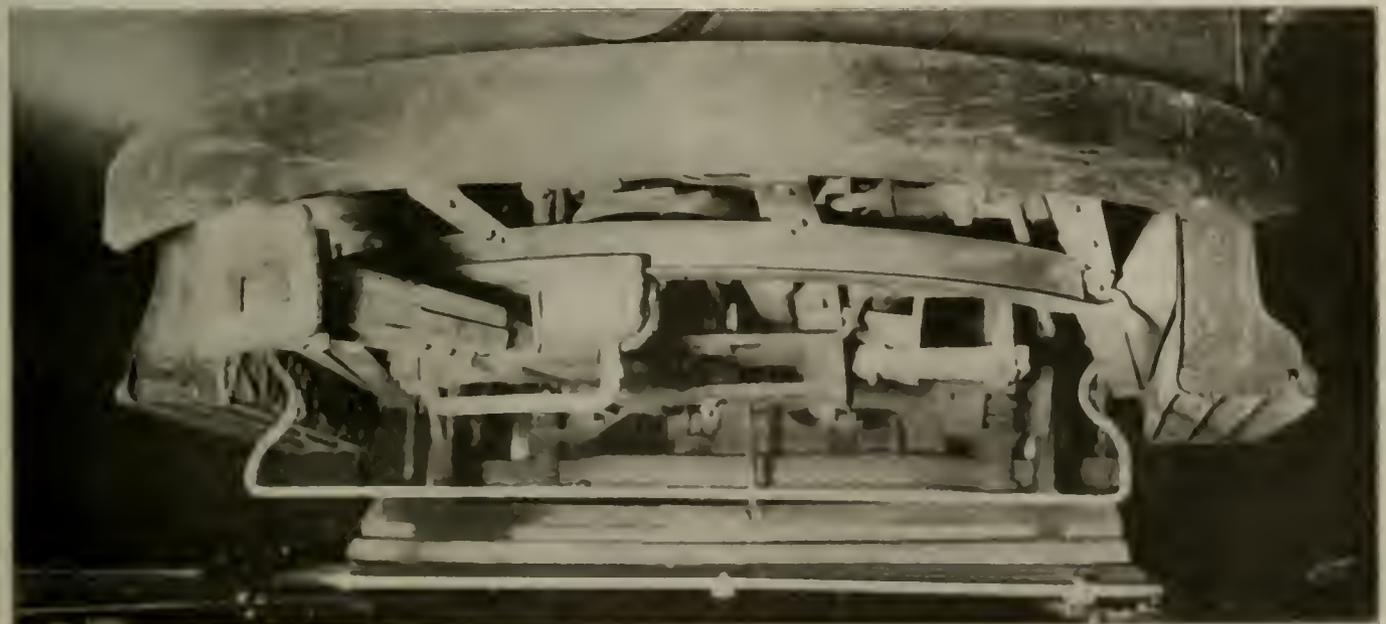
lead all switches to the shops and barns. This layout is intended to facilitate the switching of cars without interfering with traffic on the street. In developing the double entrance to the main building it was necessary to tear out the south wall and leave open this entire end of the building.

Shop Methods—Air Hoists.

The shops and pits throughout the old buildings are provided with air hoists. The air supply is furnished by a National Electric compressor of 200 cubic feet of air per minute capacity. It is connected direct to a 5 by 18-foot reservoir

bottom of each plunger is a leather gasket locked with a cast iron washer. A square head, bolted to a 5-inch pipe which fits in the 6-inch pipe and rests on the block filling, serves as a cap to the plunger. This cap may be removed when the hoist is not in use. Air is admitted at the bottom of the cylinders by a 3/4-inch connection. Four such hoists, constituting a set, are placed at such points in the shops where heavy repair work is done.

As will be noted from the illustrations the armature hoists are very similar in design to the car-body hoists. They have



Shop Practice at Memphis—Front of Car Showing Radial Draft Rigging and Automatic Drop Fender.

on which a uniform pressure is maintained by the use of an automatic governor.

The shop air-supply main leading from the reservoir is 2 1/2 inches in diameter. This line extends through the machine and carpenter shops. Branch lines connect with the main and furnish air for operating the air lifts, car body hoists and the armature jacks in the pits. The main and branch leads have

10-inch cylinders, 6-inch plungers and have a lifting range of about two feet. These hoists are set on trucks and may be run to any part of the pit space.

Armature and Field Coils.

The winding-room practices are of unusual interest inasmuch as the expense of maintaining this department is exceedingly low. All armatures and fields used on this com-

pany's equipment of about 300 cars are wound and kept in running order by three men. The conditions that make this possible are due not entirely to the efficiency of the work turned out in this department but particularly to the thorough method of motor inspection that is in vogue on this property. On page 117 of this issue will be found an inter-

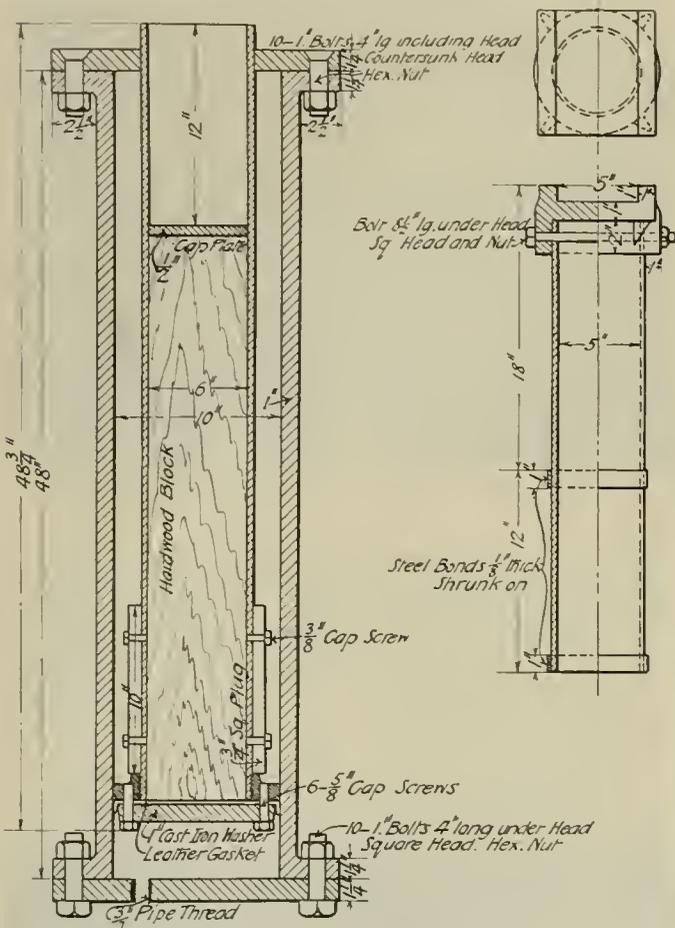
be taken as a fair illustration of the work done each month in this department, follows:

Report of Winding Room.

	Number of men, 3.			Month of December, 1906.				Total
	G.E. 800	G.E. 1,000	G.E. 80	G.E. 67	G.E. 57	AA-1	AA-4	
Armatures brought into winding room.....	104	0	0	7	57	0	3	171
Armatures for mechanical trouble.....	74	0	0	7	56	0	3	140
Armatures for electrical trouble.....	7	0	0	0	1	0	0	8
Armatures for inspection.....	23	0	0	0	0	0	0	23
Armatures wound.....	3	0	0	0	0	0	0	3
Armatures O. K. in stock.....	15	4	0	4	3	1	1	31
Commutators renewed.....	6	0	0	0	0	0	0	6
Commutators turned.....	83	0	0	8	24	0	2	117
Armatures to wind.....	0	0	0	0	0	0	0	0
Field coils O. K. in stock.....	101	14	0	71	4	0	0	190
Field coils wound.....	0	0	0	0	0	0	2	2
Field coils repaired.....	10	0	0	0	0	0	2	12
Field coils used.....	46	0	0	0	0	0	0	46
Controller magnets repaired.....								12
Controller magnets wound.....								3

Field Coils.

In western Tennessee February is considered as one of the most severe months for motors, but it is an interesting fact that since August, 1905, only 67 field coils have been lost on the Memphis lines. However, in anticipation of trouble, the company plans to have in stock a large number of field coils that can be pressed into immediate service. These are made at times when other work in the winding room is light.



Shop Practice at Memphis—Working Drawing of Air Hoist for Lifting Car Bodies.

esting description of the inspection methods as used at these shops.

The motors used include 260 G. E.-800, 18 G. E.-1,000, 96 G. E.-80, 144 G. E.-67 and 156 G. E.-57. About one-half of these motors are in daily use. Notwithstanding this fact the shop records show that from August 1, 1905, to January 15, 1907, only 86 armatures were rewound. These were divided as follows: Three of type-67, six of type-57, seven of type-1,000, and seventy of type-800. These figures do not include the armatures that were repaired by patching or by the use of jumpers, but only those that it was necessary to break down and wind with new coils.

Armature Repairs.

The foreman of the winding room keeps a book record of all work done in his department. This enables him to make a detailed monthly report to the master mechanic.

When an armature is sent to the winding room for repairs it is classed under the head of mechanical, electrical or inspection troubles, according to the nature of the defects. The mechanical and inspection heads are closely allied, but are segregated merely to designate the armatures that have mechanical defects from those demanding nothing more than a cleaning or a coat of paint.

The report for the month of December, 1906, which can



Shop Practice at Memphis—Firing End of Sand-Drier.

On January 15, 1907, the company had in its winding room 88 field coils for type-800 motors, 71 for type-67 motors, 12 for type-57 motors and 14 for type-1,000 motors.

The method of winding field coils is unique in many respects. Between the layers of wire forming a coil, Standard varnish is applied with a brush and sheet asbestos is used in filling. After the winding has been completed the terminal plates are soldered on and insulated, and the coil is

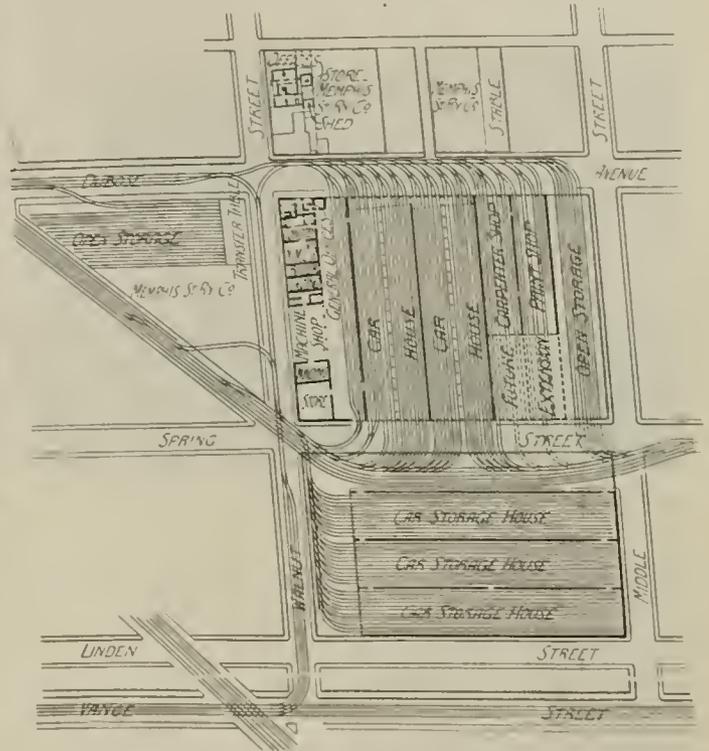
thrown into a pan of Standard varnish where it is allowed to soak until the insulation is thoroughly saturated. The coil is then placed in the bake-oven and subjected to a temperature of 195 degrees F. during the night. The following day the coil is again dipped in varnish and allowed to air-dry. The webbing is then applied, the terminal plates covered with asbestos tape and the coil dipped in a vat of Sterling black, air-drying varnish where it is left until bubbles cease to appear. It is next hung near some hot-water heating pipes and allowed to dry. Later, it is again dipped in the air-drying varnish and air-dried after which it is ready for service.

All armature coils are wound with double cotton-covered wire. In winding coils for armatures of motors types 67, 57 and 50, each coil is insulated separately by an application of insulating varnish and a layer of fish paper. The forms for these types are worked on the face-plate of the field-winding lathe.

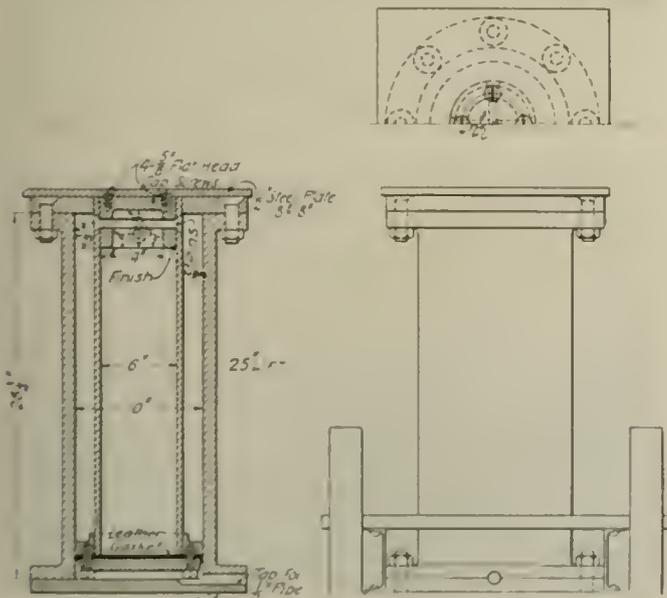
The forms for winding the coils for the armatures of motors types-800 and 1,000 are used at the work-bench, which is located along one side of the shop. After coils of these types are wound clips are applied to hold them rigidly. The part of the coil that fits in the armature slots is then dipped in a pan of varnish, after which it is baked for four hours under a temperature of 195 degrees. When taken from the bake-oven the clips are removed, the coil is placed in a shaper and given the required form. This shaper is made of wood and is composed of two parts, male and female, shaped properly to form these types of coils. It is worked by foot lever. After coming from the shaper the coil is wrapped in oiled linen and is taped. It is then passed to a lead-shaping machine composed of two adjustable rollers and thence to the table where the leads are tinned. The coil is then dipped in a vat of M. I. C. compound No. 3, after which it is air-dried. After passing through a hand-press shaper and being again dipped in paraffine it is ready for use.

In making coils for type-1,000 armatures the practice of

it is not considered necessary to subject them to heat after they have been assembled in the armature laminations. In winding the 800 and 1,000-type armatures mica strips are used at the corners where the coils break over the frame. Otherwise the usual methods of winding are followed. In capping the rear end of the armature five layers of paraffine paper and four of mica are inserted under the shield. At the



Shop Practice at Memphis—Layout of Offices, Shop and Car Houses at Walnut Street and Dubose Avenue.



Shop Practice at Memphis—Working Drawing of Air Lift with Truck for Use in Pits.

letting the short lead come out from the center of the coil has been discontinued and it is now brought out at the side in a manner similar to that of a type-800 coil. By this practice it has been found that the cost of labor per coil can be reduced and it is claimed better results are also obtained.

Contrary to usual practice the newly wound armatures are never baked. As stated in another paragraph, much care is taken in seasoning the armature coils as they are made and

commutator end of the armature, tape is applied to the sharp corners of the laminations and a good grade of drilling used as a wrapper. The bands are then wound on over strips of mica and after the armature is painted it is ready for service.

The armature banding is done in a small lathe. An ingenious tension roller has been devised to facilitate the banding work. This tension device consists of a casting about 5 by 10 inches, on which 8 rollers 1 inch in diameter are bolted into two parallel rows. The roller frame is designed to be fastened to the bed of the winding lathe. When the banding work is begun the band wire is led from the roll to the tension roller and wound around as many of them as necessary to furnish the desired tension to the band.

Sand Drier.

A very satisfactory sand drier, as illustrated, is in use at the Memphis shops. The sand room occupies a building, 15 by 25 feet, that is separate from the other buildings and near the main tracks in front of the shops. The firebox of the drier is a 12-foot length of 30-inch cast-iron water pipe which rests on a foundation of brick. At the rear end of the pipe is a brick chimney which extends from the ground to a point a few feet above the roof. A sand hopper made of sheet steel and having a capacity of about six cubic yards of sand stands on top of the firebox. The sides of the hopper extend below the center of and about 1/2-inch from the outside surface of the pipe or firebox. A window in the south side of the building admits of sand being shoveled from a car or wagon directly into the hopper.

When the drier was first built no provision was made for distributing the heat in the firebox and it was difficult to keep the flames from going up the chimney. Since that time, however, two baffle plates have been inserted near the rear

of the tubular firebox. These give the fire a down draft and materially aid in getting the largest amount of available heat from the fire. As sand dries it sifts down from the hopper into the sand room through the $\frac{1}{2}$ -inch space between the sides of the hopper and the pipe. The sand used is obtained from the bed of the Mississippi river.

In addition to the regular track-sanders with which each car is equipped, a sand car is operated. This car distributes

sides of the vestibule, thus giving the bar a lateral motion the width of the car. Under the carrier is a safety guard which prevents the drawbar from being forced down sufficiently to injure the springs which hold it in position. It requires a weight greater than 200 pounds to compress the springs.

When the drawbar is in normal position, the carrier relieves the coupling links of the weight of the drawhead and



Shop Practice at Memphis—Coil-Winding Bench with Storage Above.



Shop Practice at Memphis—Arrangement of Dripping Vats and Drying Coils.

sand as it is taken from the river to those tracks laid on grades. The car leaves the barn at 3 a. m. daily and is kept busy during the early hours. The sand is shoveled by hand into the hoppers which lead to the rails.

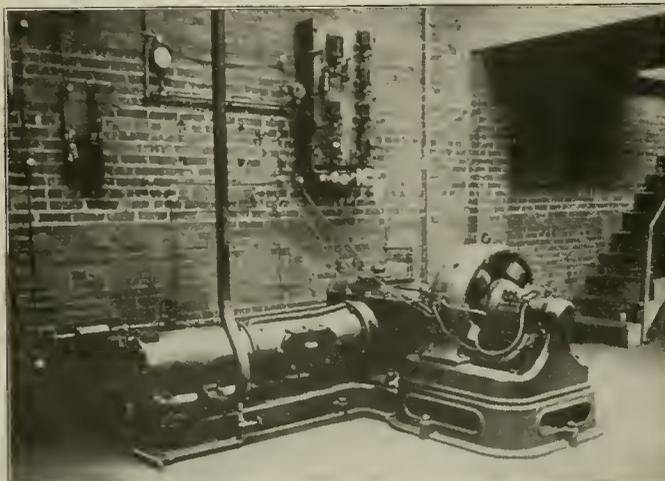
Automatic Drop Fender.

An automatic fender which, when in action, trips and drops to the rails, is shown among the illustrations. This fender is a product of the Memphis shops.

A radial drawbar carrier has been adopted for use in arranging the draft rigging of all of the double-track motor and trailer cars in use on the system. The device was made in the shops of the company. The essential parts of the car-

always gives the heads a square bearing with each other thus preventing the uneven wearing away of any of the parts. In handling heavy trailer cars this rigging has proven very efficient. Van Dorn drawbars, No. 5, are used by this company.

The Memphis Street Railway Company has a number of pile trestles to maintain on some of its lines, and has for use in this work a "pendulum" pile driver, built in the company's shops; with this type of driver piles can be driven with a batter, which is desirable in this class of bridge work. The driver is mounted on a 32-foot flat car in such a way that the leads and lead-supports can be lowered to the deck without trouble. The main leads are made of 4 by 4-inch timbers, 22 feet long, and are faced with 2-inch oak strips which serve



Shop Practice at Memphis—Shop Air-Compressor with Regulator.



Shop Practice at Memphis—New Car Storage House with Retaining Walls.

rier consist of two hollow cast-iron carrier castings ($6\frac{1}{2}$ inches long, $3\frac{3}{8}$ inches high and made of $\frac{1}{2}$ by 2-inch cast iron), inside of which are located two 2-inch coil springs, made of No. 3 gauge wire, and a drawbar yoke with sets on the springs. The yoke is given an up and down motion of about three inches. The draw-bar rigging passes through this yoke and is bolted by a tail-bob pin to the draught timbers. The two carrier castings are bolted together with the upper side loosely clamped to a radial I-beam track that extends to the

as guides for the hammer to travel in. The hammer weighs 2,000 pounds. This is raised in the guides by means of manila ropes attached to the drum of a $5\frac{1}{2}$ by 8-inch hoisting engine, made by the American Derrick & Hoist Company. The "A" brace shown in the illustration is made of 4 by 5-inch timbers. A snake rope is provided for lifting the pile into position for driving. When the driver is not in use or when it is being shifted from one point to another the derrick is lowered onto

the car. The car is hauled as a trailer by one of the four-motor cars. On the Raleigh Springs line the company has a trestle over the Wolf river, 1,300 feet long which it is often necessary to repair. The driver has proven invaluable in doing the work.

The Memphis (Tenn.) Street Railway Company is controlled by Isadore Newman & Sons, but it is operated independently of its affiliated properties also controlled by the same bankers. The officers of the Memphis Street Railway Company are: J. H. Tutwiler, president; J. H. Watkins, vice-president; W. H. Burroughs, secretary and treasurer; E. W. Ford, general superintendent, and Ford Bacon & Davis, engineers.

STANDARD RAIL SECTIONS FOR PAVED STREETS.*

BY C. GORDON REEL, GENERAL MANAGER, KINGSTON CONSOLIDATED RAILWAY.

Before enumerating the many advantages of standard rail sections for paved city streets it will be instructive to consider for a moment the history of the so-called girder rail which, by the way, is now happily obsolescent.

In the horse-car days strap rails were used which were spiked directly to wooden stringers, these in turn being carried on cross-ties. The shape of the strap rail then used was very similar to the top of the girder rail, and inasmuch as this strap was supported throughout its entire width the design did not violate any fundamental principle of mechanics. These principles were immediately violated, however, when the web and base were added to the strap rail, thus producing the girder rail, because the web was placed beneath the middle of the top which brought it directly under the gauge line. The general result is that these rails have the following bad features:

1. By reason of the unscientific arrangement of the metal in the rail section the head is shallow, resulting in short life, and the flangeway is necessarily shallow, which is very objectionable as regards the operation of interurban cars; furthermore, the projecting wagon tread makes the rail difficult to spike. It is safe to assume that fully 50 per cent more metal is required in such a section than is required in a standard section for a rail of equal carrying power and life.

2. The web being over on one side of the head the weight is carried on a sort of projecting cantilever which results in an absolute inability to maintain joints. There is not a railroad man here who does not know that it is impossible to hold girder rail joints, however heavy the rails may be, or however elaborate the system of splice-bars and bolts. Every large city system which has used heavy girder rail has demonstrated this fact beyond the possibility of contradiction.

3. The wheel load being carried over to one side of the web causes the rail to tend to move out from the center of the track when the load is on it. The only way this tendency can be overcome is to use numerous tie-rods and thus hold the rail bodily from moving sideways. Correct engineering would require a section with no such tendency to lateral movement. The effect of this lateral movement is that the tracks get wide gauge and the pavement is loosened generally.

4. When a heavy wheel-load is impressed upon the head of a girder rail there is an inevitable bending moment which must be overcome in the structure of the web. No amount of tie-rods can prevent this stress in the web and in fact the greater the number of tie-rods the weaker the web becomes and just where it should be strongest—similarly when a heavy truck wheel bears down on the end of the projecting flange-way the bending moment is in the opposite direction. Where traffic is heavy these alternate stresses have so "fatigued" the metal that longitudinal cracks have appeared along the middle of the web.

Advantages of T-Rail Sections.

All of the foregoing difficulties evaporate into thin air upon the introduction of T-rail sections. The advantages of using T-rails are without number. It is simply the substitution of a correct design for an incorrect design, an intelligent section for a clumsy section which can only carry present wheel-loads when weights per yard run up to almost 150 pounds, whereas the very heaviest steam railroad equipment is easily carried on standard rail sections weighing less than 100 pounds to the yard. A few of the principal advantages of the T rail might be summarized as follows:

1. Its symmetrical section, the load coming directly over the center of the rail, its full deep head, ensuring long life, and the unlimited flangeway, also the fact that it is easily spiked to the tie.

2. The long angle-bar joint with T-rail sections is practically perfect.

3. The load being symmetrical there is no tendency for the

tracks to get wide gauge or to move around in the street, and therefore no tendency for the pavement to become loose along the tracks. It is clear that the construction which requires least repairs is best for the company as well as the community which it serves.

4. The flangeway being gritty a vehicle turns out of the tracks with the greatest ease.

5. T-rail tracks are less noisy. In Montreal the residents have insisted on T-rail for this reason.

From the foregoing it is evident that there can be no question as to the great advantage of T-rails over girder rails.

We will now consider for a moment the still further advantages which the standard rail sections possess over the high T-sections:

1. The standard sections are more substantial in every way. They have a larger head, a thicker web and a wider base; and as has been demonstrated by years of service, they realize the maximum efficiency in rail design.

2. The all-important question of joints, for, after all, the life of any construction in a street is measured by the life of the joints, is solved to the best advantage with the standard sections.

3. Some city engineers, while approving of the high T-sections, have objected to the standard sections on the theory that these latter are not sufficiently deep for paving, but, as we all know, there is nothing in this objection because there is no reason why the pavement cannot extend below the base of the rail. We are all familiar with such construction—it is standard in many cities where deep block pavement is used. With brick or asphalt pavement, of course, the objections of insufficient height cannot be raised.

4. The standard sections not being so slim and topheavy have a way of staying where they are put to a much greater extent than the high T's.

5. From a standpoint of economy—since the mills are able to produce standard T-sections at a considerably less cost per ton than the high T-sections in a ratio of 28 to 36, we are enabled to buy a 90-pound standard section for the same price as a 70-pound high T-section, and by using the standard section get a track which will outlive the high T twice over. If we now assume that a 90-pound T-rail is equivalent to a girder rail of 50 per cent more weight (which assumption is by no means extravagant when we consider the question of eccentric loading as compared with symmetrical loading, and the impossibility of maintaining the joints of girder rails as compared with the practically perfect joint of the standard rail) and then apply the ratio of cost per ton we find that a better result is obtained with a standard section than with a girder section costing something like 93 per cent more than the standard. This money might better be spent some other way than literally sunk in the ground.

When a company proposes to lay T-rail to replace girder it is apt to meet with some opposition on the theory that ruts will wear along the rails. This objection seems reasonable on the face of it, but the fact is that in spite of all predictions of ruts they fail to appear. There seems to be no greater tendency for a rut to form along a T-rail than along the outside edges of a girder rail.

The best argument in favor of T-rail construction is that there is not a single instance on record, where it has been properly laid, that it hasn't proven satisfactory to the city authorities. On the contrary, wherever tried it has been adopted, as the accompanying information from engineers of large cities throughout the country proves:

Data on the Use of T-Rail.

Amsterdam, N. Y.—F. E. Crane, City Eng.—70-lb. T-rail with brick block, concrete foundation, 6 years service, no tendency to wear ruts.

Battle Creek, Mich.—E. N. Hunt, City Eng.—6 and 7-in. T-rails. Rails should be at least 5 in. high.

Brooklyn, N. Y.—J. H. Calderwood, Brooklyn Rapid Transit Co.—Has no T-rail, a T-rail best to maintain. High T gets out of gauge. Standard 80 or 90-lb. T high enough.

Brunswick, Me.—E. D. Reed, Lewiston Brunswick & Bath Ry. Co.—With Belgian block would use T-rail on concrete stringer 12 in. wide, 14 in. deep, the straps 5 ft. apart.

Buffalo, N. Y.—T. W. Wilson, International Traction Co.—T rail used exclusively in several large cities in central west. Milwaukee permits no other.

Cincinnati, O.—6 and 7-in. T rail on blocks resting on sawed ties, 3-ft. centers laid in concrete, with ordinary block paving.

Cincinnati Northern Traction Co.—80 lb. T rail ties, brick filler against web.

Dayton, O.—Robert E. Kline, City Eng.—T-rail satisfactory and standard for all paved streets.

Davenport, Ia.—Street Railway Journal, Permission granted for T-rail, all streets.

Delaware, O.—J. S. Dilke, City Eng.—4 in. T rail on 1 in. block special flange—block and filler bricks. "Better than grooved rail."

Denver, Colo.—John A. Boeder, Denver City Tramway—1" x 6 in. 72 lb. T rail in concrete. Rail 60 ft.; low 24 in. centers, gravel 8 in. below ties; double row toothed blocks out 1/2". Single row beveled blocks inside. "Do not favor 7 in. 70-lb., too light in flange and web."

Erie, Pa.—B. E. Briggs, City Eng.—80 lb. T rail, several years service, entirely satisfactory.

*Presented at the quarterly meeting of the Street Railway Association of the State of New York, Buffalo, January 11, 1907.

Glens Falls, N. Y.—D. E. Van West, Hudson Valley Ry. Co.—Used 5-in. T-rail 3 years with special block; very satisfactory.

Hamilton, O.—E. H. Berry, Eng. Roadways.—Several miles standard T-rails in Hamilton; good results.

Indianapolis, Ind.—Blaine H. Miller, City Eng.—Uses 90-lb. T-rails in improved streets; saving in repairs vast improvement over old girder and grooved rails.

Kansas City, Mo.—Street Railway Journal; Kansas City Ry. & Lt. Co.—Adopted 80-lb. T-rail for brick-paved streets. No more girder, special flange-brick.

Kingston, N. Y.—E. B. Codwise, City Eng.—If T-rail is high, no great objection, can be paved against; objects to low T-rail. Mauch Chunk, Pa.—Franz Mackl, City Eng.—Uses 70-lb. T-rail, special bricks inside; outside bitulithic blocks.

Memphis, Tenn.—J. A. Omberg, City Eng.—Favors 90-lb. T-rail, special blocks.

Milwaukee, Wis.—C. J. Poetsch, City Eng.—“We use T-rail on all streets.”

Minneapolis, Minn.—Andrew Rinker, City Eng.—Street railways now use T-rail exclusively; public interests best subserved; latest type is 80-lb. T-rail, wooden ties bedded in concrete; satisfactory.

Montreal, Can.—John R. Barlow, City Surveyor.—T-rail reduces vibration; uses 86½-lb. T-rail 5½ in. high on concrete, no ties.

New Haven, Conn.—Calvert Townley, Elec. Expert, New Haven System.—T-rail used on greater portion of tracks and used exclusively on all new work in Connecticut except in Hartford. State commission endorses T-rail.

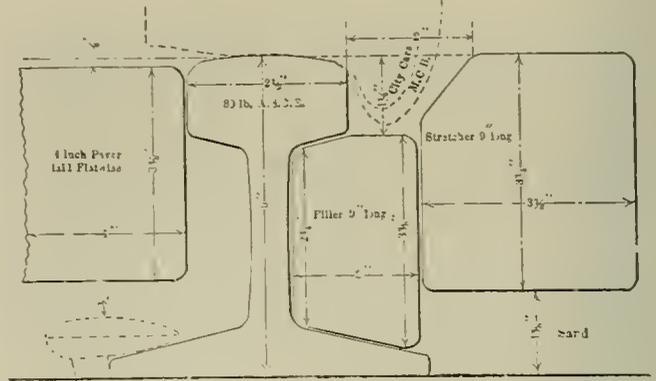
Ottawa, Can.—Newton J. Ker, City Eng.—7-in. 80-lb. T-rail, ties with 8-ft. centers, no tie rods; sandstone blocks for paving. 5 in. deep on a 6-in. bed of concrete with 1-in. sand cushion between. Later use 90-lb. 62 and 64-ft. T-rail. Blocks cut to fit under head.

Rochester, N. Y.—Richard E. Danforth, Rochester Ry. Co.—Uses standard 70-lb. T-rail in Sandusky, O., which is now in per-

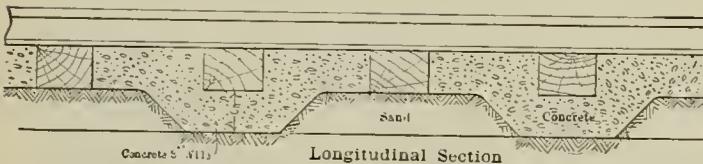
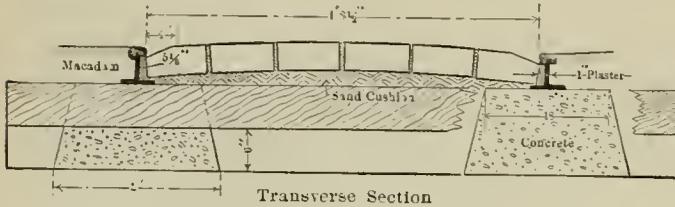
NEW YORK STREET RAILWAY ASSOCIATION.

(CONTINUED FROM PAGE 81.)

In introducing the paper on “Standard Rail Sections for Paved Streets,” Mr. C. Gordon Reel, general manager, Kingston Consolidated Railway, said that it had been proposed to lay the T-rail in Kingston in the belief that it was the best



Standard Rail Sections—Section of Special Filler and Stretcher Brick for 80-Pound Rail and Four-Inch Paving, Cincinnati Northern Traction Company.



Standard Rail Sections—Sections of T-Rail Construction with Special Paving Brick in Union Avenue, Schenectady, N. Y.

fect condition. Girder rails not allowed by the city; 5-in rail is satisfactory with standard vitrified brick pavement with a ½-in. cushion.

Schenectady, N. Y.—J. Leland Fitzgerald, City Eng.—Paving against T-rail with molded brick makes a solid construction; no excessive wear on brick at point of contact. Schenectady Railway has about 500 ft. of experimental track laid with 85-lb. T-rail.

Scranton, Pa.—Henry Jifkins, City Eng.—Considers T-rail the best for paved city streets. Has about 2 miles of 5-in. 56-lb. and 5 or 6 miles of 6-in. 65-lb. T-rail laid in concrete.

St. Paul, Minn.—L. W. Rundlett, Eng. Public Works.—T-rail used exclusively on paved streets; special-cut block with a groove for the flange bedded in concrete; very satisfactory.

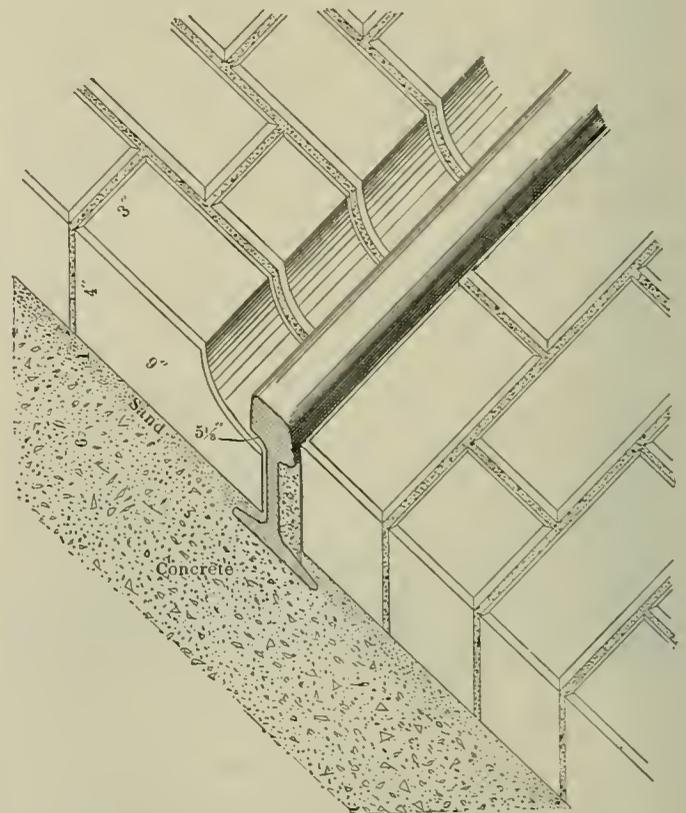
Tacoma, Wash.—Frank L. Davis, City Eng.—No girder, uses 6-in T-rail on all paved streets, 60-ft length; satisfactory.

Toledo, O.—F. J. Consaul, City Eng.—Heavy T-rail construction with special rail blocks properly fitted, superior to girder rails, because rigid and causes less frequent disturbing of pavement for repairs.

Worcester, Mass.—E. A. Engler, Worcester Polytechnic Institute.—T-rail is preferable to girder rail, because the metal in it is better distributed in the cross-section and weight of car is almost directly over the web. E. G. Connette, Consolidated Ry. Co.—90-lb. T-rail with vitrified paving blocks best, because continuity of rails is less easily disturbed at joints; lessens wear and tear to streets.

New York, N. Y.—Street Railway Journal.—Paving can be maintained better with T-rail; wear on paving is reduced; lessens number of collisions; reduction in broken wheels and axles on vehicles; stronger structure with less metal; reduction in joint troubles; easier riding track; less noise; less trouble caused by snow, ice and dirt; benefits villages and cities, because interurban cars can enter; refusal to permit T-rails on streets direct obstacle to the progress of a community. Milwaukee, Minneapolis, Denver, Indianapolis, Cincinnati, Dubuque, Ia., Battle Creek, Kalamazoo, New Haven and Montreal (Can.), are examples of satisfactory results obtained by the use of T-rail.

construction that could be put in the street. The usual opposition on the part of the civil authorities was met. During the last year data had been collected to prove the company's position. When the construction was proposed it was thought the company had a good case, and on looking into it further, it was believed there could be no opposition in the face of



Standard Rail Sections—T-Rail Construction in Montreal.

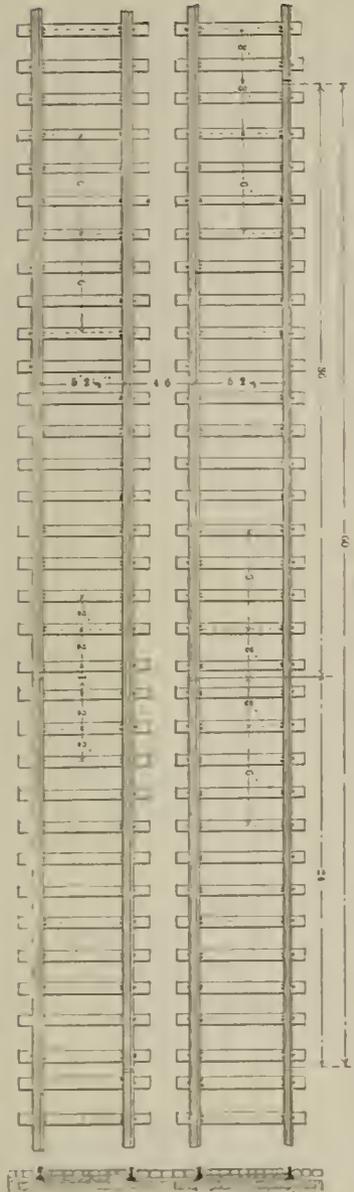
the data secured. He said he had written to nearly every large city in the country, and found this construction used exclusively in some of the most progressive and largest cities. If he should attempt to produce what he could in the way of evidence that would bear on the desirability of the

T-rail, there would not be an opportunity to do much else during the session.

(Vice-President Wilson in the chair.)

Mr. Reel presented his paper, as appears elsewhere, and at its conclusion explained several blue prints, which are reproduced herewith.

One engraving showed what it was proposed to use in Kingston, what had been used to some extent, and what had been arranged with the city authorities to go ahead with in the spring. Where they were going to put in T-rail in the present tracks, before the city objected, they proposed a style of construction using the present shallow block paving, as shown, and using a longitudinal brick along the rail. That kind of construction was not desirable. Any proper construction had the brick coming under the head of the rail up to the web. That was to be used until such time as the city will permit the use of the other paving. It now had macadam outside, and that would give a straight line to pave against. He also stated that the city engineer said he would not stand for that kind of a rail, because in the future, while the city used brick at present, they wanted to use deep stone paving and they could not do it if that kind of rail were used. The sketch was made to show how it was perfectly feasible to carry that rail on any depth of pavement. It would be reinforced concrete, but the reinforced concrete could be put into any depth, and the blocks go down as deep as desired. Another view was described as showing the construction that would be used when the city paved permanently, reinforced concrete beam and occasional steel rivets in the bed of concrete, with the rods down low out of the way and a form of brick which always come up to the web of the rail.

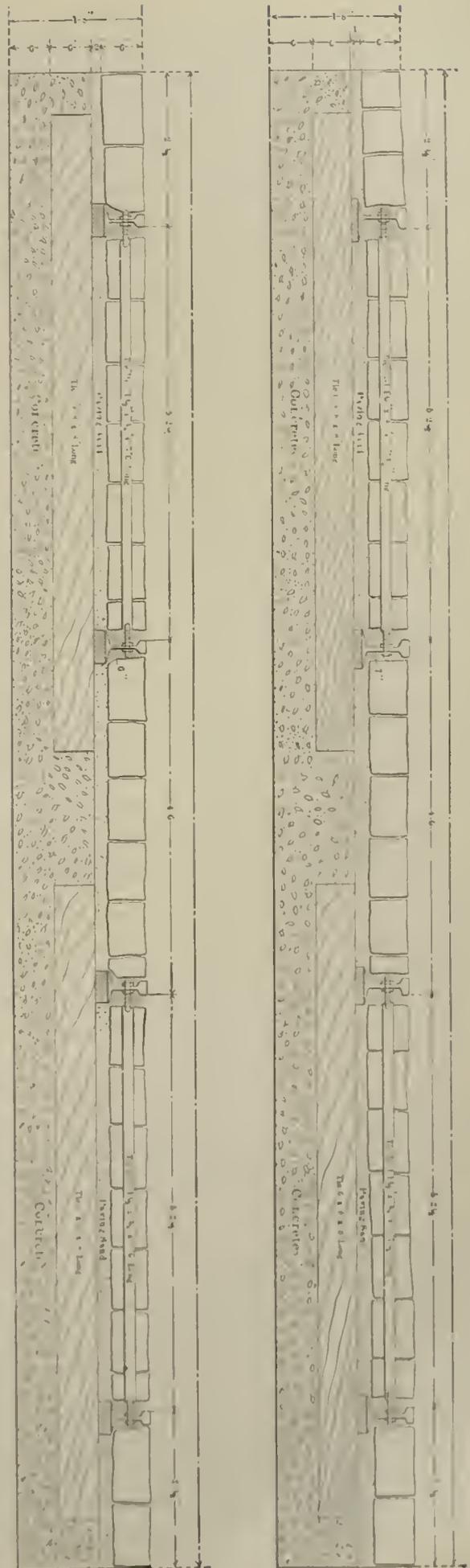


Another view shows a construction used by the Cincinnati Northern in Cincinnati. Mr. Reel thought for a permanent construction that was not the proper way to pave. They used two pieces, and he did not think that desirable. The sketch of the construction used in Montreal, where they have 86.5-pound standard rail in all streets, shows the use of what they call scoria block, which he thought a splendid block for the purpose.

The sketch from Cincinnati was brought to show how often all the block paving would go down below the base of the rail. The rail is carried on a block, and the stone paving projects below the base of the rail.

In connection with the paper Mr. Reel read letters from engineers in Montreal, Saranton, Schenectady and other cities, which are reproduced elsewhere.

Vice-President Wilson (in the chair) said that Mr. Reel had tackled the subject with more courage than almost anybody he had heard take the matter up before. Mr. Wilson gave in a few words his criticism of the T-rail style of construction. As far as the accommodation of the cars went, it was all right, but the fatal point in T-rail construction was the paving. He had had occasion to examine some track in



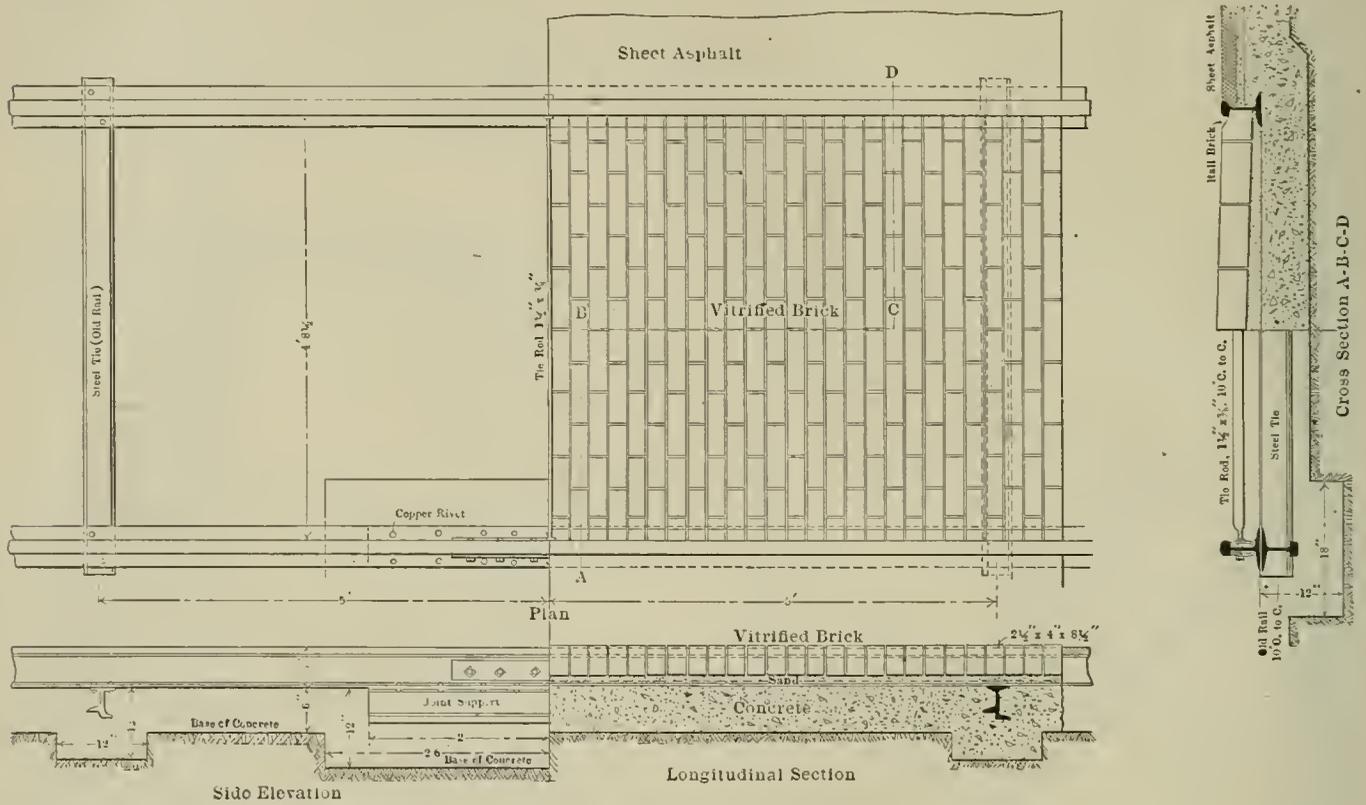
Standard Rail Sections—Section of Standard Six-Inch and Seven-Inch T-Rail Construction, Cincinnati Traction Company.

Chicago on Archer avenue, about a mile of double track. One track was laid with the Trilby-rail section and the other was laid with a T-rail. He believed at the time he examined the track it was about one and a half years old. The portion of the track that had been built with T-rail had the paving stone worn down next the gauge-line of the rail, and it was not worn down evenly, but in ruts, and in his opinion that paving would have to be reconstructed very shortly. That was his objection to the T-rail construction, especially in cities that have a large amount of team travel, heavy drays, etc.

In Buffalo there was an illustration of that same kind. On North Main street, above Cold Spring, the paving stone was the best there was in these parts—Medina sandstone. The paving was worn down to the lip of the rail. It did not wear any further, because the lip of the rail caught it at that point. Down in South Park avenue, where they did not lay a new rail and the old rail was considerably worn, he said the paving stone next the gauge line was all worn out, he-

in the two streets in Buffalo was heavy, the rail sections comparatively light. The sandstone was soft stone. The use of granite, he said, did away with a great deal of the wear on an ordinary city street. He thought Mr. Reel right in saying that T-rail was best for the average street in the average city. Properly laid, it was cheaper for the railway, because it offered less obstruction to ordinary vehicles and was less unsightly. Improperly laid, it was worse than any section of girder rail ever laid.

Mr. F. A. Bagg followed up what Mr. Danforth said by stating that in Johnstown, Gloversville and Amsterdam he used the T-rail. The first section laid was 6 inches and later some 8-inch and also some 7-inch rail was laid. The pavement was brick, asphalt block and bitulithic pavement, with Medina standstone laid inside and outside the rail. These were cities of 15,000 to 25,000 inhabitants, and the team traffic was not heavy. This form of construction was satisfactory. There was not much wear along the head of the



Standard Rail Sections—T-Rail Construction for Paved Streets in Scranton, Pa.

cause the lip of the rail was not sufficiently heavy to protect it. Not only that, but the lip of the rail itself was worn down. He thought that was the idea that all the large cities had in mind in designing and designing heavy girder sections. In the case of the 11-pound rail which is used in Philadelphia, for the last six years they have been gradually getting the rail heavier in the lip, to take care of the team travel. In the new section designed for Chicago, practically the same section as is used in Philadelphia, except that it weighs 129 pounds to the yard, the groove is not quite so heavy. It seemed to him that the fatal objection in large cities, at least in the congested portions of large cities, was the wearing of the paving.

Mr. R. E. Danforth (Rochester Railway) thought Mr. Wilson had covered the large city end of the argument in very good shape. The roads in the Middle West found that the T-rail laid in stone-paved streets was satisfactory, except the streets where there was very heavy vehicle travel, and they preferred it even there to the use of girder rails improperly designed to carry the load. The traffic mentioned

rail, inside nor outside. They formerly used a special brick for the flange-way inside. This was unsatisfactory; the corner of the brick broke off and crumbled. It might have been due to poor brick. Lately the ordinary brick was used, starting the brick under the head of the rail, and curving it up and over to the under side of the head of the other rail.

Mr. Clark said he had the same ideas as Mr. Wilson, until he visited Milwaukee, St. Paul and Minneapolis. Their standard construction is high T-rail. Milwaukee used a 90-pound T-rail with 3-inch head. He had failed to see any of the difficulties that Mr. Wilson spoke of. He said that in Minneapolis they used sandstone block, which they got in the west, and they chipped this block off to make the groove. They did not have a standard brick for putting under the rail. They chipped it off and had no trouble at all with the pavement, although he thought they would have that trouble in Cleveland. In Minneapolis they had taught the drivers of vehicles to keep out of the car tracks.

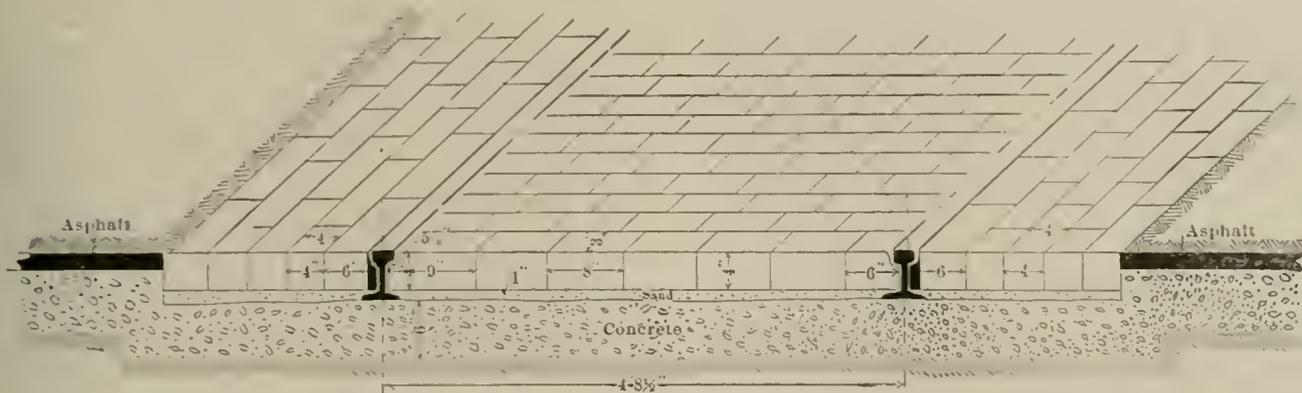
Mr. Reel, in connection with Mr. Bagg's remark, read a letter from Mr. F. E. Crane, city engineer of Amsterdam, to

show what he had to say about these roads. Amsterdam had the oldest piece of T-rail construction in the state of New York; it had been in seven years.

Mr. Bagg said that in Gloversville there was some that had been in ten years.

Mr. W. R. W. Griffin (Rochester & Eastern) related that

secured for putting double tracks in the street, whereas the T-rail was in such condition that it would last four or five years to come. This work was paved in with good old fashioned cobble pavement. Of course, this was a type of paving that heavy teams would naturally keep away from, so that perhaps the team argument would not apply in this case.



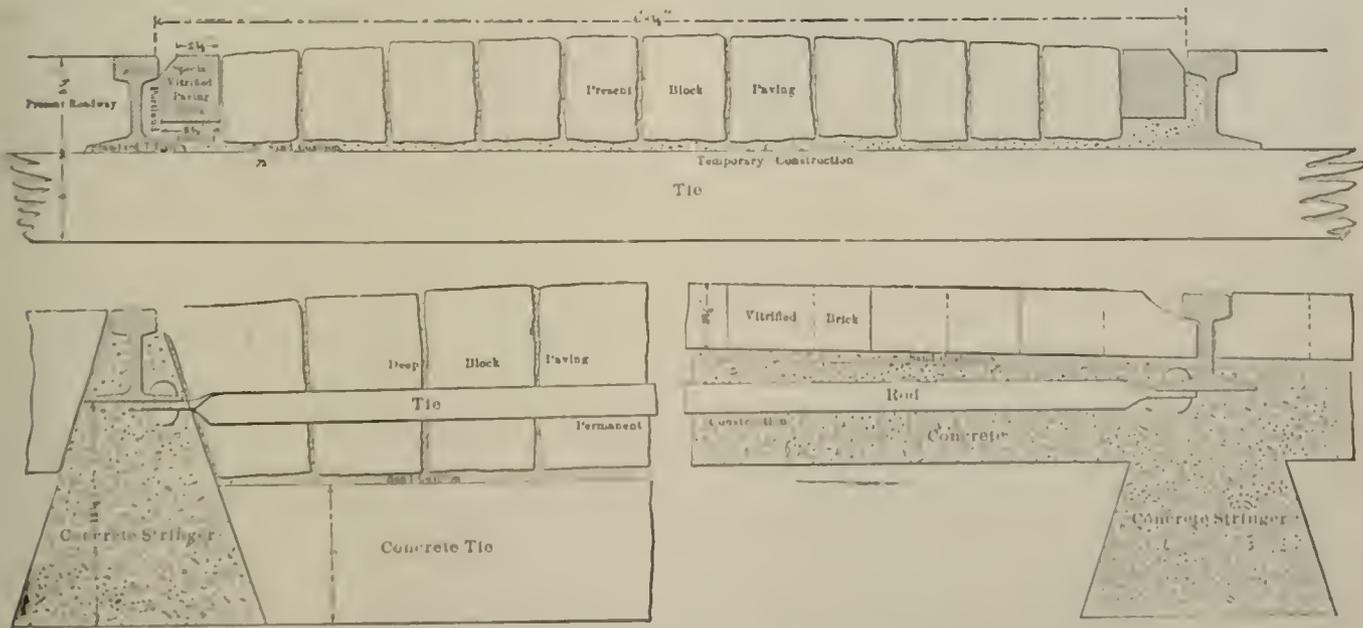
Standard Rail Sections—Section Showing T-Rail and Scoria Block Construction in Montreal.

In 1901, in Bellevue, O., a town of 5,000 inhabitants, they laid the 70-pound T-rail, and the pavement was put in at that time. There was no concrete used, nothing but a sub-grade, and a buffer of sand rolled down. They used nose brick that went underneath the rail. Last summer he examined it and could not see where the pavement had rutted—could not see but that the brick anywhere near the rail was in as good shape as any other part of the street. The town did not have any extraordinary heavy teaming; but the pavement was light because of that fact.

Mr. M. J. French stated that there was some 70-pound T-rail in Utica that was laid in 1894, and previously, and also

Last year there was laid on a portion of Genessee street about 1,800 feet of double-track T-rail construction, using a 7-inch T-rail weighing 95 pounds to the yard, and the Arthur hump block, made by the Metropolitan Brick Company. This rail had a 3-inch head. It was laid with the permission of the city engineer, and with the idea of making an argument to the city to allow the use of the high type of T-rail in all city work in the future.

Mr. Stuart Wilder (Peekskill Light & Railroad Co.) stated that in Peekskill there was some 7-inch high T-rail, the Johnson section and the Trilby section. There were some very good hills there, and it was found that the cars could be



Standard Rail Sections—Track Construction with 90-Pound A. S. C. E. Rail, Kingston, N. Y., and Present Paving Block, with 10 1/2-Inch Paving Block and with Vitrified Brick.

on the same street there was the Pennsylvania section 201-6 9-inch train-head rail, weighing 90 pounds to the yard, and these had been subjected to exactly the same conditions of traffic. The cars on this street were the heaviest traffic cars, weighing 28 tons, and had been operating for four or five years. The glider rail was absolutely worthless, in such a bad condition that it should have been taken out two years ago, and would have been if a franchise could have been

held much better on the T-rail and on the Johnson rail than on the Trilby rail.

Mr. Joseph D. Evans (J. G. White & Co.), from personal observation of conditions in places where he had constructed tracks, preferred a 7-inch T-rail. In many small towns it was insisted upon that the glider rail should be laid, for the reason, apparently, that some other town had a glider rail. In many of these cases he had gone to the city authorities

and got them to change over to a T-rail. To make a T-rail satisfactory, he said, the paving that goes against it should be of the very best material and construction possible.

Mr. Reel asked Mr. Evans why he preferred a 7-inch high T-rail to a 5½-inch or a 6-inch heavy standard section?

Mr. Evans replied that he liked to get the paving where it would not be interfered with by the ties. It could be laid better and cheaper, and he thought it was a better job.

Mr. Brown said he had been advocating using a 5½-inch, 90-pound T-rail, and using a beveled brick so as to bring it under the head of the rail. He found from experience with the beveled brick that there seemed to be less wear than with the compressed curved brick, and the vehicles were enabled to turn out of the track much easier.

Mr. C. H. Clark questioned in running city cars with 2¼-inch tread, and every half hour a half dozen lines of suburban cars on the same route with 3-inch tread, whether the wide head rail was the proper thing, or should the rail have a sloping back?

Mr. T. W. Wilson said he was just considering the advisability of changing the standard rail. Up to this year he had used a 94-pound grooved girder, Lorain section, 94-313. That is the rail section in Buffalo. The head is 2¼ inches, and he thought it too narrow to take care of interurban cars, and also to take care of any prospective tread that might be figured on using in the future. A new section, just designed for use in Chicago in the reconstruction, weighs 129 pounds per yard. It has a 3¼-inch head, the last ¾ inch of which is beveled. Then there was a new section of rail which had been designed for San Francisco, as they were going to reconstruct all the lines in San Francisco. That rail appealed to him very much, with one exception; the lip seemed to be too light for team travel. He had drawn in on the rail a standard 7/8 inch interurban flange, and also a standard M. C. B. wheel and they were accommodated very nicely. He thought the base of the rail, instead of being 6½ inches, could be made 6 inches and the extra metal taken from the base could be put in the lip. He was just having a design made for that. The lip seemed to be too light. He showed a diagram of the standard rail used in Philadelphia and also of one adopted in Albany for all reconstruction. It was supposed to accommodate an M. C. B. wheel, but when he applied a template of the M. C. B. wheel to the rail, it showed that when the tread of the wheel was riding on the head of the rail the flange was riding on the lip. It weighed 141 pounds to the yard, and he did not see why they would introduce such a heavy rail unless they were figuring on carrying freight in the future. He said it was a grave question as to what section of rail should be adopted as a standard. In nearly all cities it was necessary to cut out the T-rail, as it was against the city ordinance.

Mr. Wilson thought he had been misunderstood in some of his remarks. He said he was not against the T-rail, but believed in it for certain sections and cities. He used it in Lockport, 100-pound rail, but there was no team travel. The same construction would be out of place in Main street, Buffalo, or Niagara street, and probably in streets of Cleveland, Philadelphia and New York City. It seemed to him very largely a question of the locality in which the rail was to be laid.

Mr. Bagg asked if that was solid concrete construction with 100-pound T-rail.

Mr. Wilson replied in the affirmative and said wooden ties were put in that street, with 3-foot centers, with 6 inches of concrete between the ties and under the ties. Mr. Bagg asked if he had any objection to steel ties, to which Mr. Wilson replied that when that track was laid steel-tie construction had not been altogether satisfactory, and had been but very little used. As to the paving, he thought Mr. Reel was entirely right about paving brick. To have a good job

it must go in against the web of the rail. Instead of having a corner on the brick, he would have a slant.

Mr. Reel admitted there was a chance for an argument between standard sections and high T-sections, and while he believed that standard sections in a few years would be used exclusively on street railroads, as on steam railroads, he could see there was a chance for an argument on the paving feature. When it came to the question of T-rail against girder rail, from the fact that the T-rails had been adopted exclusively in big cities like Denver, Milwaukee, St. Paul, Minneapolis, Montreal, Indianapolis and dozens more, he did not see, if the rail was properly paved against with a granite block, as in St. Paul and Minneapolis, why the rail would not give satisfactory results in a city like Buffalo. The difference between Minneapolis, Milwaukee, St. Paul and Indianapolis was not very great. Where they get such satisfactory results from the construction indicated, Buffalo with the same construction should also give satisfactory results. Any manager who would use a girder section willingly, unless he was sure that the T-rail would positively not answer, in his opinion, was not not doing the best he could for the public and for his company. Girder joints could not be made to hold, and because of the necessity for tearing up the streets, the public lost along with the company in the fact that the street could not be restored to its original condition. The life of the T-rail is the principal argument in its favor.

Mr. E. P. Roundey (Syracuse Rapid Transit) asked Mr. Reel if he could hold the joints of a T-rail better than the joints of a girder rail. He said steam roads could not hold their joints together any better than street railways. Mr. Reel thought steam railroad joints were not battered down like street railroad joints. The heavy rails in New York were distorted at the joints, battered down, and could not be restored. They did not batter down on the tracks of the New York Central Railroad two or three inches, as the girder rail did.

Mr. Wilson answered Mr. Danforth's remarks about Medina sandstone pavement, saying it was a great question which wears longer, sandstone pavement or granite. The track in Chicago which he examined was granite paving, and showed considerable wear. The city engineer of Buffalo and a number of his assistant engineers believed that on account of the brittleness of granite, sandstone would wear longer. There were streets in Buffalo which had been down for thirty years in sandstone pavement and they were in good condition.

Proposed Electrification of Baden State Railways.

According to a notice in the German technical press, tests are being made on a large scale with a view to electrifying the Baden state railways. Current is to be supplied from a power station under construction at Wyhlen-Augst, where a turbine with an output of 1,500 horsepower is to be rented. It is calculated that an aggregate of 2,400,000 kilowatt-hours will be required to supply the energy necessary for the electric operation. Three schemes have been suggested. That of the Siemens-Schuckert Works provides continuous current operation at 3,000 volts, with 40-ton, four-axle locomotives driven by 150-hp. motors at two main speeds. The scheme of the Allgemeine Elektrizitäts-Gesellschaft provides single-phase current with three-axle locomotives at only one main speed. The former company estimates the cost of installation at 2,720,000 marks (about \$680,000) and the working expenses at 331,087 marks (about \$83,000), while the corresponding figures given by the Allgemeine Elektrizitäts-Gesellschaft are 2,281,000 and 349,700 marks (about \$570,000 and \$87,000) respectively. It may be said that the present cost of steam operation is 363,522 marks (over \$90,000). It is expected that electric service will commence at the end of 1909.—Scientific American.

CAR HOUSE AND SHOP EMPLOYES.*

BY A. D. M'WHORTER, MASTER MECHANIC, MEMPHIS STREET RAILWAY

An economical and efficient force for car barn and shop work should be thoroughly systematized in every respect, and separated into departments that are also systematized in every detail of their work.

The Night Foreman.

The most important department for the good of the operation of a street railway company is the night force, when the inspection is done at night; and this is the case with most street railway properties. The night force should be under the supervision of a thoroughly competent and broad minded man. To be a competent night foreman a man should be educated for this position by practical experience while taking care of each class of work that is done at night. With this experience he will be able to judge the amount of work that should be done by each man under him.

To get the best results the night foreman should rate the positions in the shop according to their importance, and he should instill into each man the importance of the position he holds and the responsibility that rests on him. Also that it is in his power, to an extent, to make the operation of the road a success. This thought should be carried down the line from the best position to the one of the least importance. Any shortcomings of the workmen should be brought to their attention at once. The night foreman should get a report each night of the trouble that has shown up during the day on the cars for which he is responsible. Each man should know that he is performing the part for which he is held responsible, and that upon the efficiency of his work depends the successful operation of that part.

Breaking-in New Men.

In employing new men for shop work they should be thoroughly instructed as to what they are to do. It should be explained to them that they will have to start at the bottom, in case they are inexperienced, and that they will gradually be promoted to better positions and better pay as they become familiar with the work and that the rate of promotion will be governed by their interest and good work.

If a foreman adopts this system and puts all of his new men through the different classes of work that are done at night, he will gradually be surrounded by a class of men who are termed as "all around" street car men. This will enable the foreman to be more independent than if he should keep one man on one job indefinitely. The writer has known of cases of this kind, where a shop was operated by a, so-called, good lot of men, but there were no two men in the shop who could exchange places and give any degree of satisfaction until each had become familiar with the work of the other. This, as can be readily seen, places the foreman in an embarrassing position if he should lack a man, or a number of men, and be obliged to arrange the force to suit the conditions. The particular job to be filled would not receive the proper attention in the absence of the regular man, even if it were possible to fill the vacancy.

To the writer's mind the best results can be obtained by classifying the men and encouraging them to take all the interest possible in the work and letting them know that they will be promoted to better positions and better pay. With these conditions the most reliable men can be selected for promotion. If the men are thoroughly familiar with all classes of work, and have had practical experience in each department, they may be of invaluable service to a new employe as well as to the foreman and company.

In the writer's mind it is more necessary to have a good, competent, night foreman than a good, competent, day foreman, if both are not to be had, as it is possible for the master mechanic to keep in closer touch with the operation of the day force.

Handling Inspection and Repairs.

To get the best results all operating cars should be put over the pits and thoroughly inspected every night (or day in case of all night cars). The pit inspectors should each have certain pits to work in and certain cars to inspect, and the same cars each night. They can be held responsible for their work in this manner and it makes it possible to tell which man is not keeping his work up to the standard. Where the pit room is limited it is impracticable to hold the cars over the pit for any considerable length of time, when the cars are coming in off their runs. In case more work is required than can quickly be disposed of it is best to shift such cars to storage track and put them over the pits for

such work as is necessary after the rush is over, or it may be necessary to hold the work for the day force.

The writer has under his supervision the care of 45 double-truck quadruple equipments and 109 double equipments handled and inspected in the above manner in one car barn, having eight pits 200 feet long. The inspecting and cleaning are done by 33 men.

The average number of cars in the shop for repairs during the day does not exceed 5 per cent of the operating equipment. It may be added that a record of the inspection of each part of each car is made by the several inspectors and filed in the master mechanic's office.

The method of educating and handling night men holds good for the day force in the same manner as it does for the night men. The day force should be divided into departments, according to the number of cars operated. The machine shop and car barn forces also should be divided into departments, having a competent, economical and broad minded foreman for each department who should report to the general foreman.

There should be foremen for the carpenter shop and paint shop who should report directly to the master mechanic. The number and class of men in these departments should be governed by the class and amount of work that is being done.

This system in a car shop, together with a wide-awake foreman in each department and a master mechanic who never ceases trying to bring his men up to a higher standard will produce excellent results, but it cannot be what it should if the master mechanic spends only his office hours with his men.

COPPER-WELDED RAIL BONDS.

Two methods that present interesting solutions of the bonding problem have recently been perfected by the Electric Railway Improvement Company of Cleveland, O. These methods, known as the "welding" process and the "brazing" process, employ the usual types of ribbon bonds and vary only in the method by which they are attached to the rail.



Copper-Welded Rail Bonds—Joint with Two No. 0000 Electrically-Brazed Bonds.

By either process the copper of the bond is closely united with the steel of the rail and the bond itself may be placed on the ball of the rail, the web or the base.

Electric Welding.

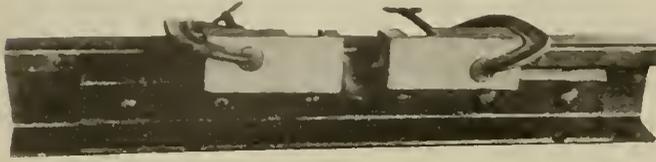
The electric welding or brazing of the bonds is done by the Thompson method. All rights for employing these methods in connection with the bonding of track work have been leased by the Electric Railway Improvement Company.

The accompanying illustration shows one of the cars equipped for doing both classes of bonding work. Power for the operation of the car and its apparatus is taken from the trolley wire and fed to a 15 kw. rotary converter mounted on the car floor. This converts the 500-volt direct current into alternating current suitable for use with an electric welding transformer. This transformer is also shown mounted on the rear end of the car. It takes the current for its primary side from the slipring side of the rotary converter and its secondaries deliver current to the points of contact for welding at from five to seven volts and up to 2,000 amperes. The current is led from the secondary terminals of the transformer by two heavy cables connecting with bonding clamps which have special carbon contact points. The contact points are mechanically joined so that when a bond is to be brazed to the rail it is held firmly in place while the temperature is

*Read before the Newnan Properties Association.

being raised by the flow of heavy current. After clamping the bond, either on the head or the web of the rail, the current is fed to the transformer and being regulated by resistance in series with the primary a proper degree of heat is obtained to raise the temperature of the copper bond and the brass cap with which it is provided to such a point that the copper ribbons will unite with the steel of the rail, as in the more usual forms of brazing.

It has been found that bonds placed in this way are so



Copper-Welded Rail Bonds—Clay Molds in Position for Cast Welding.

firmly attached to the rail that it is impossible to remove them except by laborious chipping and then one must mutilate the rail or the bond before they will separate.

It is interesting to note the records of low cost that have been made in Cleveland under varying conditions of weather, labor and schedule of cars on tracks being bonded.

With the Railway Employees.

Car No. 1 operated by employees of the Cleveland Electric Railway on December 17, 1906, between 12:30 p. m. and 3:30 p. m. in freezing weather with regular 2½-minute service operated over the track bonded, completed placing 28 No. 0000 bonds (14 joints) which were electrically brazed to the ball of the rail. The street in which this track is laid is paved with block-stone. The bonding gang comprised three men who opened and closed the pavement and cleaned the rail ready for the bonds and three men who operated the bonding car. It was necessary to remove the bonding car from the track 14 times during the three hours required for placing the 28 bonds. The actual cost of labor for placing these bonds was reported as \$3.30.

On another occasion the same car, with a night crew of the same number and with regular cars passing on half-hour schedule, placed on 29 joints, 58 No. 0000 bonds, applied as in the other case, at an actual cost for labor of \$5.50. This work was done in freezing weather December 18, 1906, from midnight to 5 a. m.

With Improvement Company Employees.

In the summer of 1906 a night crew of the Electric Railway Improvement Company comprising four men and work-



Copper-Welded Rail Bonds—Clay Mold Removed Showing Extra Copper Ready for Trimming.

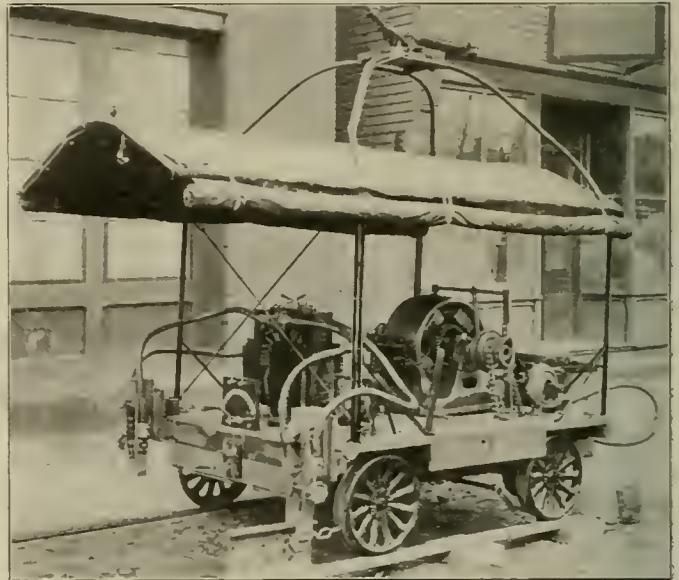
ing from 7 p. m. to midnight while cars passed on five-minute intervals and from midnight to 5 a. m. while cars passed on one-hour intervals, electrically brazed to the ball of the rail in block-stone pavement 105 No. 0000 bonds in the same number of joints. In doing this work it was necessary to remove the bonding car from the track 50 times. The cost for labor, however, was only \$8.00 for opening, bonding and completing the pavement at 105 joints.

Copper Welded Rail Bonds.

The second bonding process perfected by this company

consists of joining to the rail the usual types of ribbon bonds, by means of cast welding. The outfit necessary for carrying on this work comprises a car much the same as that shown in the illustration except that in place of the rotary converter there is a Marine type gas engine. This offers the advantage that it makes the outfit available for use on roads under process of construction and not yet provided with a working trolley. As in the case of the electric welding outfit the engine is geared to the axles of the car through a chain and friction clutch so that the unit is self-propelled. Such cars have six coke furnaces, each capable of melting one crucible of copper. Blast for the furnaces is furnished by a blower-fan driven by the gas engine.

When bonding the rail is first ground smooth and bright at the points of application of the bond terminals. Graphite molds which hold the bond as shown in one of the accompanying illustrations, next are clamped to the rail. These molds have their inner aperture recessed to such shape that a much larger amount of white-hot copper can be poured into them than is necessary to cast-weld the ribbons of the bond to the steel of the rail. In this way with the large mass



Copper-Welded Rail Bonds—Self-Propelled Car Equipped for Copper Cast Welding and Brazing.

of metal the temperatures can be better ganged. After the molds have been removed the extra copper which does not come in contact with the steel is chiseled off, leaving the terminal strands of the bonds welded to the rail.

The cost of welding with this process is said to vary not greatly from that of the brazing method as earlier described. It has the apparent advantages that the bonding work may be carried on before the overhead construction is in working order and that the work is flexible and may be applied for connecting feeder cables, cross-bonds and third-rail terminal bonds, as well as bonding running rail and third-rail joints.

An interesting feature in the construction of the cars used for this work is the inverted jack placed under the center of the car floor and having for its bearing surface a round steel plate. This jack may be raised and lowered by means of cranks extending under the car floor and outside of the track. When it is desired to remove the car from the rails these cranks are turned in the proper direction until the jack resting on the plate has raised the entire car so that the wheels are free from the track rails. Then the car can be swung to a position at right angles with the track and either rolled off on to the pavement in cities or on temporary wooden strips when on private right of way.

ANNUAL MEETING, CENTRAL ELECTRIC RAILWAY ASSOCIATION.

The first annual meeting of the Central Electric Railway Association was held at the Claypool Hotel, Indianapolis, Ind., on January 24. This gathering, which marked the end of the first year since the consolidation of the Ohio Interurban Railway and the Indiana Electric Railway associations, was a successful one. The programme for the day included a business meeting, several interesting papers, annual election of officers and the annual dinner.

The association was called to order at 11 a. m. by President E. C. Spring. After the routine business had been completed G. H. Kelsay, superintendent of power, Indiana Union Traction Company, presented a paper on "The Cost of Power for Rental Purposes. Developing a Demand for Renting Power. Does it Pay?" Mr. Kelsay's paper will be found on another page of this issue.

At the close of the paper the author stated in reply to a question that the figures presented in his argument had been taken from actual problems on operating roads, but that it should be noted that in each instance the percentages of interest and depreciation had arbitrarily been given him.

T. C. McReynolds (Kokomo Marion & Western) stated that his company is now supplying current for lighting purposes to the towns of Swazy and Greentown. The transmission line carries 60-cycle current at 10,000 volts potential. At Greentown, current at this potential is stepped down for lighting use to 208 volts by a transformer mounted on a line pole. This method of supporting the transformer, however, is not to be recommended. At Swazy the company has a rotary-converter substation in which is a transformer of the type mentioned, supplying current for 16 arc lights and a commercial circuit. The arc lamps are furnished under a 5-year contract. The speaker did not consider this business very profitable. He suggested that in estimating the costs of current for rental purposes there should be added the item of retolling expense, maintenance of secondary distribution lines, also the cost and maintenance of the lamps and their accessories. While his experience has been limited it was expected that within a year a good load might be built up.

Adjournment for luncheon.

Afternoon Session.

The first paper of the afternoon session was that by Ellis C. Carpenter, claim agent, Indiana Union Traction Company, entitled "The Handling of Accidents and Claims." This paper appears elsewhere in this issue.

In reply to questions Mr. Carpenter said that the percentage of gross receipts paid in the settlement of claims by the Indiana Union Traction Company for the past year was slightly more than 2 per cent. This included settlements for

the more common forms of accidents, personal injury, property loss, lost baggage, attorneys' fees, surgeons' fees, retainers for company doctors, but not the loss to the company from damage to rolling stock or other property.

President Spring announced that the proceedings and papers of the meeting would in the near future be printed in pamphlet form and distributed to the members.

W. H. Evans, master mechanic, Indianapolis Traction & Terminal Company, next read a paper on "The Model Car for Long Travel." He exhibited blueprints showing sections and floor plans of types of cars suitable for interurban service. The paper appears elsewhere in this issue.

The author in reply to a question by Mr. Henry stated that a car 60 feet long is generally required on lines operating hourly schedules. Such a length is also required to provide for the baggage compartment. He saw a disadvantage in having doors on one side only and, in fact, recalled some cars (thus built which had had a second door cut in the baggage compartment. Some day the lines may be so double-tracked that single-sided cars can be operated.

Arthur W. Brady (Indiana Union Traction) inquired as to a suitable method of ventilating cars. This, Mr. Evans said, was an important point that had been overlooked in the paper. As yet dependence must be placed on a deck-sash, but auxiliary ventilation should be used. He favored the ejector type, as it created much less draft. He stated that the Indianapolis & Northwestern car, as exhibited at Columbus, weighed 75,000 pounds.

Cale Gough (Street Railway Journal) described the new ventilator system being installed by the Chicago City Railway. Such ventilators consisted of deflectors 18 inches by 12 inches placed in the front of the deck and slanted to force the air to the ceiling. Their capacity was 40 cubic feet per second which kept the air in a car carrying 100 people as pure as that of the ordinary

schoolroom. R. C. Taylor (Indiana Union Traction) suggested that the deadweight of a car per passenger should be less. On his request a motion was passed that a committee of four be appointed by the chair to report as to plans for a lighter standard car.

R. C. Taylor, superintendent of motive power, Indiana Union Traction Company, next read a paper entitled "Car Lighting," which will be found elsewhere in this issue. In the discussion of this paper the author stated that the novel method proposed for maintaining an even voltage on the car lamps would cost less than \$100 per car, and that a saving of \$100 per car per year would be gained.

Secretary Millbolland then read four applications for membership, which were noted upon favorably. Chairman Wilson of the nominating committee, reported the following list of names as nominations for officers for the year 1907, and a unanimous ballot was cast for them.



H. A. Nicholl, President-elect.

President, H. A. Nicholl, general manager Indiana Union Traction Company.

First vice-president, Frank D. Carpenter, general manager Western Ohio Railway Company.

Second vice-president, R. I. Todd, vice-president and general manager Indianapolis Traction & Terminal Company.

F. D. Norvell, general freight and passenger agent Indiana Syndicate Lines.

A. A. Anderson, general manager Indianapolis Columbus & Southern Traction Company.

Charles Murdock, vice-president Ft. Wayne & Wabash Valley Traction Company.



Interurban Rolling Stock Exhibited at Indianapolis Meeting.

Treasurer, W. F. Millholland, treasurer Indianapolis Traction & Terminal Company.

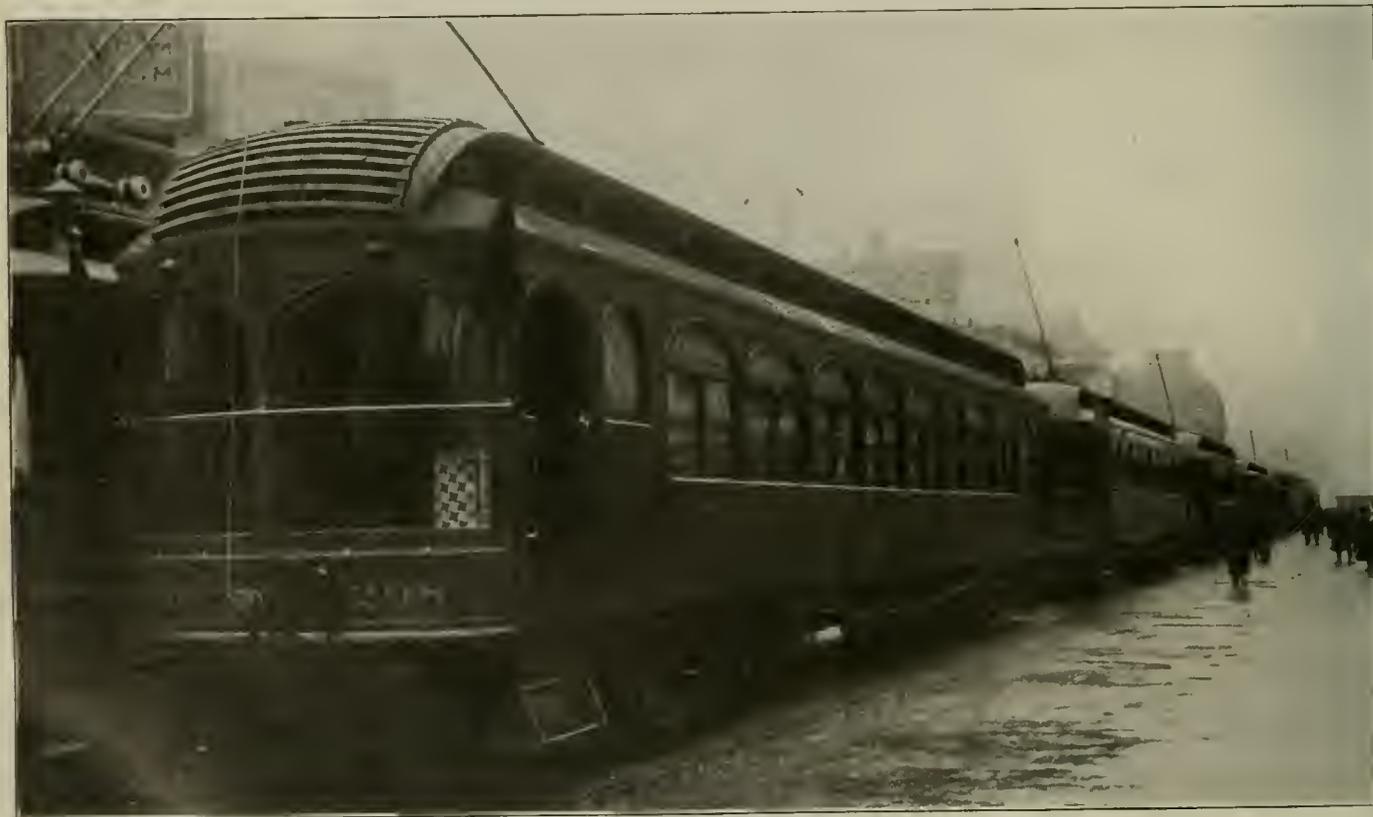
Executive Board.

Harrie P. Clegg, president Dayton & Troy Electric Railway Company.

F. J. J. Sloat, general manager Cincinnati Northern Traction Company.

C. D. Emmons, general manager Ft. Wayne & Wabash Valley Traction Company.

C. C. Reynolds, general manager Indianapolis & Northwestern Railway Company, Indianapolis & Eastern Railway Company, Richmond Street & Interurban Railway Company, Indianapolis & Martinsville Rapid Transit Company, Indianapolis Coal Traction Company, Indianapolis & Western Railway Company.



Interurban Rolling Stock Exhibited at Indianapolis Meeting.

L. C. Bradley, general superintendent Scioto Valley Traction Company.

E. C. Spring, general superintendent Dayton Covington & Piqua Traction Company.

C. N. Wilcoxon, general manager Cleveland & Southwestern Traction Company.

President Spring read a letter of regret from President-elect Nicholl, who was unable to attend the meeting on account of illness.

Several members of the association, including Charles

L. Henry, E. C. Carpenter and Arthur W. Brady, next discussed the advisability of broadening the field for interurban express. It was stated that several old-line express companies were desirous of entering into contracts with interurban rail-

Annual Dinner.

About 175 members and guests attended the annual dinner held at the Claypool Hotel. The association was welcomed by Mayor Bookwaller, of Indianapolis, who, in the



Interurban Rolling Stock Exhibited at Indianapolis Meeting.

ways. The Central Passenger Association has decided to countermand its rule regarding the exchange of tickets so that from now on electric interurban and steam roads may be more closely associated in handling passengers.

Then followed a discussion of the advantages and disadvantages of forming a mutual express company, which would

course of his interesting speech, felicitated the interurban managers on the rapid progress that had been made in their field.

President Spring then presented his annual address.

President's Annual Address.

President Spring in his address first reviewed the rea-



Interurban Rolling Stock Exhibited at Indianapolis Meeting.

operate over the interurban lines and solicit an exchange of business with the present companies operating on steam lines. It was voted that a committee of three be appointed to study this question more thoroughly

sons for the organization of the two state associations, that of Ohio and that of Indiana, and the considerations that led to the consolidation which was effected a year ago. In commenting on the work of the past year Mr. Spring said

The establishment of the permanent secretary's headquarters with a permanent secretary was an innovation among similar associations, but the experiment has proved itself one worthy of our efforts. It is almost impossible adequately to state the exact accomplishments which the permanent secretary's office has accomplished during the year, as the work required has been of such a nature, that not only one interest has been served, but many. The office has been the headquarters not only of railway officials, but of the supply men when in Indiana. The office has been a complete bureau of information, not only for members of our association, but for interests outside. The loyalty, interest and enthusiasm regarding the secretary's office are shown by responses to letters sent out from the secretary's office on December 1, 1906. Thirty-five circular letters, requesting information as to the manner of heating interurban cars were mailed. Twenty-nine responses have been received and, on the bottom of one of these responses was a notation made by the manager of the road, which read: "Give me this information quick and forward to the head of this particular department for the information desired." Another demonstration, made recently, was a request upon the companies, members of the Interchangeable Coupon agreement, for information regarding the issuing of a new bulletin. Every road responded readily. Requests have come from the various adjoining states and from Canada for information on different subjects, which have been discussed at our meeting. During the last year, upwards of 6,500 letters, answers to inquiries, etc., have been sent out from the office, also over 8,000 legislative circulars. The giving of information of various character, the sending of circular letters for different companies, the asking for information upon various subjects, and the answering of inquiries from all over United States and Canada, are some of the few matters that have been handled by the secretary's office.

The office has brought about a great fraternal feeling between the companies, which could not have been done through any other medium. The tabulating of the interchangeable coupon tickets has been of great interest to the various companies; the tabulation shows an average of \$7,500 a month collected through the interchangeable coupons.

The recognition which our association received during the annual meeting of the national association was very marked. Our secretary at that time was enabled to give great assistance to the secretary of the national association. I might go on and name many other instances, which would tend to prove the benefits derived from the permanent secretary's office, but time will not permit.

At the last of the year our secretary was attracted to other fields of work and resigned his position. The rest of the year, the office has been under the charge of Mr. Milholland, our treasurer, and, I take the opportunity at this time to publicly thank and compliment Mr. Merrill, our past secretary, for the work which he did in instituting this new office. I also wish to publicly thank and compliment Mr. Milholland upon the magnificent support which he has given the association and for his untiring energy in looking after its affairs. The members of the executive board I wish at this time to thank for their personal interest in the affairs of the association and for their help and their counsel in administering its affairs during the past year.

We have reason to congratulate ourselves and feel proud of the record made by this association. The association stands today pre-eminent, head and shoulders above any other organization, outside of the national association. Its acts and its works are being watched closely and copied by various associations. Other states are being stimulated into activity by the work of our association, realizing that in an association of this kind, a closer relationship can be had between the various properties. With the consolidation of interurban roads into great systems, as has been done during the past year, making it possible to ride in electric cars for distances of three and four hundred miles, has been brought about a large development of through passenger traffic over these interurban lines, which has made the daily operation doubly remunerative. Doubly remunerative because the present local traffic is already highly profitable, and because this additional through traffic, while swelling the gross earnings, will add but little to the cost of operation. The interchanging of one line with another, both in passenger and freight traffic, has been more successfully carried out, and the obstacles met with more pleasantly adjusted, through the working of our association, and I consider that this has been the grandest work as well as the most beneficial that the association has done.

In concluding Mr. Spring congratulated the association upon the selection of officers for the ensuing year and urged

that each member bear in mind the need of enthusiasm in attaining a high ideal.

President Spring next introduced Charles L. Henry, president and general manager, Indianapolis & Cincinnati Traction Company, who acted as toastmaster. During the course of the evening the following gentlemen addressed the association and complimented it highly: Joseph A. McGowan, Indianapolis Traction & Terminal Company, Indianapolis; John F. Ohmer, Ohmer Fare Register Company, Dayton, O.; Charles W. Miller, ex-attorney-general of Indiana; Matthew Slush, Detroit, Mich.; D. J. Evans, Rail-Joint Company, Chicago; A. W. Brady, president, Indiana Union Traction Company, Anderson, Ind.; Colonel W. T. Durbin, ex-governor of the state of Indiana; C. N. Wilcoxon, general manager, Cleveland & Southwestern Traction Company, Kamms, O.; Rear Admiral George Brown, U. S. N., retired, Indianapolis; E. W. Olds, superintendent of rolling stock, The Milwaukee Electric Railway & Light Company, Milwaukee, Wis.; D. M. Parry, Indianapolis, Ind.

Entertainment Features.

Through the courtesy of the Indianapolis & Cincinnati Traction Company a number of attendants at the convention enjoyed a trip to the Rushville power house of this single-phase electric road.

The accompanying illustrations are views of the exhibit of interurban rolling stock equipment that was shown during the day on Kentucky avenue near the headquarters. This was probably the most complete exhibition of the various types of interurban cars and locomotives that has ever been seen in this country.

ELECTRIC RAILWAY UNION STATION FOR HAMILTON, ONT.

A contract has been let by the Hamilton Cataract Power Light & Traction Company, for the erection of a building on the southeast corner of King and Catharine streets, Hamilton, Ont., for a terminal station for electrical railways. The station proper will be 112 feet long by 72 feet deep. The building will be placed 12 feet east of Catharine street, and on this 12-foot strip will be erected a covered shelter leading from King street back to a large theater which is to be built at the rear end of the lot at some future time. This shelter will also serve as an exit for passengers from the trains. The office building will be four stories high, with a basement, and will be erected of Indiana limestone for the first two stories, while buff terra cotta fireclay brick will be used for the upper stories, finished off with terra cotta balusters. The building will be thoroughly fireproof, and will be built of reinforced concrete for columns, beams and floors.

The ground floor will be laid out for station purposes, the ceiling being 20 feet in height, and the floor covered with mosaic and the walls lined up 8 feet high with Italian marble. The accommodation includes a main lobby in the center, entered from the street through large double doors. To the right is a marble staircase to the upper floors and the elevator. The main lobby leads to the ticket wickets, behind which is the vault, etc. On the right is the ladies' waiting-room, and on the left the general waiting-room. In the rear of the general waiting-room is the conductors' room. The second floor will be occupied as offices by the Hamilton Cataract Power Light & Traction Company, and the third and fourth floors are to be divided into offices. The company's stores department will be located in the basement.

The Hamilton Radial Railway, the Hamilton & Dundas Electric Railway, the Brantford & Hamilton Railway, the Hamilton Grimsby & Beamsville Electric Railway, and the Hamilton Guelph & Waterloo Railway, will have their terminals in the building. The architect is C. Mills, Hamilton, and the contractor is the Canadian White Company, Montreal. The contract calls for the completion of the building ready for occupancy by August 1, 1907.—Railway & Marine World.

HANDLING OF ACCIDENTS AND CLAIMS.*

BY E. C. CARPENTER, INDIANA UNION TRACTION COMPANY.

There are about as many ways of handling accidents and claims as there are claim adjusters and general managers; very few operating along the same lines; each working along whatever line he has found practical for his company and the conditions under which it is operating.

The best way to handle accidents is to prevent them, and it is wise—and dollars are saved—to employ the best and most intelligent men to be had in the various departments of the service, thus securing the best results from every standpoint, but, as accidents will happen, we shall treat the subject somewhat as the auctioneer who still had "one more left."

In a general way, accidents should be handled according to the policy of the company. Should there be no policy in these matters, then the adjuster should work along fairly liberal lines and determine what is best for his company, and gradually establish his reputation in the communities with which he comes in contact.

In the handling of accidents, every claim department should have a system of blank reports concerning the various classes and kinds of accidents that will be suited to the peculiar conditions of the individual company. For instance, where a company is operating interurban as well as city lines, the general forms of report should be prepared to cover all such conditions as nearly as possible. Then there is the "trouble-report" blank for troubles occurring on cars, such as ejections, controversy over fares, or assaults by either passengers or trainmen; blanks for securing names and addresses of witnesses; an employe's blank for accidents to employes in shops, substations, machine shops, track construction, etc.; stock reports for stock killed or injured; telephone reports for use of the dispatcher in case of serious or fatal accidents, in securing short and concise information when accident is first reported; delayed-baggage report blanks for agents' used in securing immediate report where baggage is delayed in transit; the usual release blanks covering the various kinds of claims on the part of employes, passengers, other persons, or property, that may be made under the laws of the state in which you are operating; indices for keeping accurate record of accidents, both daily and alphabetically, etc. Thus equipped, the claim department is ready for active work.

The prompt reporting of all accidents, bad, slight, trivial, and those of seemingly no importance, and the securing of accurate information regarding them, is of the utmost importance in the proper handling of those matters; and right here is where the transportation department, as well as the others, should exercise the utmost care, and adopt vigorous measures to see that employes shall make immediate reports of all accidents, and see that such reports are promptly forwarded to the claim department, and proper discipline should be administered for failure to obey; and, further, that information concerning accidents must not be given to any one except the proper officials of the company.

The growing tendency upon the part of injured parties to rush off to attorneys and sue the company for real or imaginary injury, makes it of great importance to have all accidents reported in detail most promptly. This will give the claim department the opportunity for prompt action in such cases, as may be necessary. Usually, it is the blind or unreported cases, or the cases which, in the opinion of the conductor, do not amount to anything, and are too trivial to report or go to the trouble of taking witnesses, that give the most trouble. Fakirs are usually smooth enough to mislead the conductor and have this kind of a story, then afterwards appear with more witnesses than the company, with the result that the case is either compromised or, if tried, a liberal verdict found for the plaintiff, where, had the matter been treated as serious and promptly reported, Mr. Fakir would go a begging.

Another class of claims that deserves attention, and which seems to be growing, and which may be a source of considerable loss, is that of claims for delayed or lost baggage. There will be more or less of this class of claims so long as the present imperfect system of checking is in use. There should be a more perfect system adopted so as to enable each company over whose line baggage is routed to accurately trace each piece delivered to it. The only thing that can be done by the claim department, under existing conditions, is to keep the amounts paid on these matters as low as possible, and this can best be done by using a "delayed-baggage" report, as illustrated. This form is placed with the

agents, and as soon as a person presents a baggage check and it is ascertained that the baggage is lost or delayed, the blank is filled out, giving the name and address of the person holding the check, the firm and address represented, check number, where checked, destination, via what route, and value, including contents; this constituting the first part of the report. Suppose baggage is delayed for two or three days—finally reaching destination—the party holding the check calls for baggage, the agent, who still has the report, fills out a receipt, which is the second part of the report, showing condition in which baggage is delivered, date and hour of delivery, and secures the signature of the owner. This determines accurately the condition and time of delay, and reduces the opportunity for making a claim to the shortest possible length of time, as well as showing, under signature of the owner, the exact condition of baggage. After this is done, the agent fills out the third part of the report which gives the agent's report as

INDIANA UNION TRACTION COMPANY.			
DELAYED BAGGAGE.			
Name	Address	Station	
Representing	Address	No. and city	
Kind of baggage		How many pieces	
Shipped from	to	via	
On	190	Check No.	
Value, including contents \$.		Date.	190
Received of INDIANA UNION TRACTION COMPANY all of the above described baggage and contents in same condition as when delivered to said Company, except as hereinafter stated:			
Dated			
	190	A M	
		P M	
		Signed	
AGENT'S REPORT.			
Cause of delay			
If damaged, describe condition			
Forwarded to Claim Department			
	190	A M	
		P M	
		Signed	
Received by Claim Department			
	190	A M	
		P M	
		Signed	

New Delayed Baggage Report Blank.

to the cause of the delay, and makes any remarks he may desire upon the condition of baggage, marks the time of forwarding to the claim department, and signs it and sends it in. In this way, all information needed is secured from interested parties under the most favorable circumstances.

Reports of accidents sent to the claim department usually do not give all the information needed, but are merely the starting point or foundation for the investigation which must follow, and this should be done as quickly as circumstances will permit.

We have found, in the investigation of accidents (except in cases of clear liability, such as collision cases where passengers are injured), that a splendid rule to follow is, first secure as full information as possible from the train crew or employe in charge, taking signed statements; then if possible, procure the signed statement of the injured party, showing his version of the matter, thus getting at both sides of the question, and nothing what will be necessary to be covered by

*Read before Central Electric Railway Association, Indianapolis, January 23, 1907.

disinterested evidence when the signed statements of the disinterested witnesses are procured. In this way, you can gather the facts in a tangible manner, so the merits of a claim can be determined with reasonable certainty. A shrewd investigator can inquire regarding the vital matters of an accident and quickly develop all the witness knows, and, in reducing the subject-matter to writing, if he will carefully follow the line of the conversation and use the peculiar expressions and language of the witness as far as possible, omitting immaterial matters, it is seldom indeed that a witness will refuse to sign a statement. Afterward, should the witness testify in court to a state of facts materially different from the statement, he can be confronted with the signed statement and his testimony discredited.

In the investigation of accidents, it is absolutely essential for the investigator to have a sufficient knowledge of the law to know what constitutes negligence, not only of an injured person, but the company as well. He should also have a general knowledge of every department of the service, for the reason that the rules of negligence differ in cases of employes, passengers, or a person who is neither an employe nor passenger. He should be sufficiently competent to so frame his sentences as to state facts clearly and concisely, and avoid the use of statements that are not clear or are misleading. When one has a witness who knows the facts about an accident, put these facts in such a way that there can be no misunderstanding, and such a statement will be doubly strong in refreshing the recollection of a favorable witness, or of contradicting an unfavorable one, in court. These points, we believe, demonstrate the advisability of employing men of sufficient capacity to grasp the situation under investigation.

We have thus indicated a general plan pertaining to the investigation of accidents, but there is one class of accidents—those resulting in death—where a different line of investigation should be followed: In this class of cases, the company's employes should be required to report at the office of the claim department immediately after such accidents, and before information of any kind is given to any person, where full details should be secured by the claim department, after which short affidavits covering the main facts of the accident—free from objection—should be prepared, so that the employes can be taken by the claim adjuster before the coroner and an affidavit sworn to by the employes. As a rule, coroners are satisfied with a general statement of fact, and they should not be misled, but coroners are usually doctors, and they are very likely, if left to their own resources, to ask about minor matters and secure statements from employes that would be embarrassing in court and hard to explain away, as such statements are reduced to writing and sworn to by the employes. It is far easier to prevent employes from making embarrassing statements in this way than to have to explain them away after they are made. The claim adjuster can signify to the coroner his willingness to assist in the investigation, thus placing himself upon friendly relations. Investigation should, of course, be conducted independently of the coroner, so as to develop the facts rapidly, and, where desirable, the names of reputable witnesses can be placed before the coroner (whose signed statements have already been procured by the claim department), who will corroborate the employes and relieve the company from criticism. While ostensibly, as well as in fact, aiding the coroner, the investigation can be retarded sufficiently to enable the claim department to first interview all witnesses, thus developing the names of the proper persons to place in the coroner's hands.

This gives some idea as to the manner in which accidents should be handled with reference to the investigation.

The question might aptly be asked: Can the claim department be of any service to the company in the investigation of accidents, aside from the mere development of facts upon which to enable the adjuster to make a settlement or reject a claim? We believe it can.

The claim department is, or should be, the one disinterested department in the investigation of accidents, and every facility should be given to enable it to have the fullest information regarding matters about which it is necessary to inquire. An accident occurs, perhaps a derailment, the transportation department, anxious to be relieved from responsibility, claims a faulty track; the track and roadway department says, bad judgment of train crew in rounding a curve; or, perhaps, trolley came off and pulled down wires,—transportation department claims overhead work in bad condition, not lined up properly; or headlight or trolley base out of order, etc., the electrical and motive-power departments say, no, the trouble was due to fast or reckless running or some other cause. The claim department should pursue the matter as carefully as possible, and, when the real facts are

known, make report of same to the general manager for his information.

Then, again, in investigating accidents in the various departments of the service, weak places will develop to which attention can be called and considered by the proper officers. For instance, some dangerous machine in the shops is not properly guarded as the law requires; there may be an exit needed from a dangerous place where men are required to work about the boiler room or elsewhere; foremen or heads of departments may not understand fully the necessity for properly instructing employes regarding the hazards of the work for which they are employed, or of giving additional instruction to employes where they are assigned to work more hazardous than that for which they were employed; the incompetency of conductors or motormen, or others, for one reason or another, may come to the attention of the claim department, and in all such matters valuable service can be rendered by promptly reporting them to the proper officials. It will be necessary, however, for the claim department to show by its work its disinterestedness and its willingness to place above every department, its own included, the good of the company which it serves.

Settling of Claims.

This part of the subject assumes that there has been some one chosen to handle claims, and we will assume it to be the claim adjuster. I have heard of instances (I am pleased to say it has not been my personal experience) where the hands of the adjuster were so tied by foolish requirements that he is not able to get good results. Some managers have so little confidence in the ability of their adjuster that they compel him first to ascertain what a claim could probably be settled for, then report back to the general manager or general attorney, then go back to the claimant and see if he cannot do a little better, then report back to the real adjuster, the general manager or general attorney, and get instructions to settle at one-half to two-thirds of the amount the adjuster had reported, again making trips to see the claimant, until all parties become so disgusted that the claimant goes to his attorney and brings suit, with the result that, in cases of liability or of close question, the company pays double what the adjuster could have settled the case for in the first instance.

If the officials of any road do not have confidence in the ability and judgment of their adjuster, they had better kick him out and get some one in whom they have confidence, and it will prove a benefit to both of them. By all means, if you expect good results, do not hamper the claim agent in his work by any such foolishness. No one but the adjuster can appreciate the delicacy of a situation when it reaches the critical stage, and he knows, or should know, better than any one, when he has gone the limit in the settlement of a claim, or when the claimant has reached the lowest sum at which a settlement can be made. Then is the time to settle, instead of going back for instructions, giving the claimant the opportunity to change his mind.

An adjuster is not necessarily a peculiar individual, but he should possess some qualifications to fit him for this work. At the recent convention at Columbus, O., this question was asked: "What qualifications shall a claim agent possess to be successful?" One of the answers given was the following: "Prepossessing appearance; a personality that attracts; level-headed, with a sufficient fund of common sense to readily adjust himself to surroundings; good judgment (especially of human nature), and with morals and character above reproach." While I am sure many of us do not fill all requirements suggested, the more nearly we approach the ideal, the more successful we will be.

The settlement or adjustment of claims must, necessarily, be governed by the policy of the particular company represented. To my mind, there is but one right policy, and that is, every case should stand upon its merits; if the company is liable for an injury done, pay what is reasonable; if not liable, or unjust demands are made, stand upon the rights afforded by the law.

There are cases, of course, which should be treated somewhat more liberally: For instance, in case of death from an accident where no liability exists, many times settlement can be made for reasonable funeral expenses. This should be done. A serious accident resulting in permanent injury, possibly the loss or partial loss of an arm or leg, can at times be settled for actual hospital and surgeon's bills; it is wise to do this, especially in cases of minors. It is also a good policy to be somewhat more liberal in settlement with employes than with persons having no connection with the company. If employes understand that they will be treated with a reasonable degree of liberality in these matters, law suits from this class of cases will be very few.

In cases where there is a question as to whether or not the company is liable for an injury done, you have about even chances with the claimants before the matter reaches the court, although in court you must expect that the sympathy of the court and jury is likely to be with the plaintiff, for many times the courts treat cases much as the justice of the peace in Kentucky, who said: "Of course the plaintiff had a good case, or he would not have brought it." It is necessary, in view of the prevailing conditions, to make a very clear defense before a corporation can escape a judgment for the plaintiff. In this class of cases, before a suit is instituted, the adjuster can discuss the merits of a claim with the claimant, or his attorney, with a far greater degree of confidence than in liability cases, and usually secure a reasonable settlement.

In cases where the company is clearly liable, about the only ground the adjuster has upon which he can stand is to know his man; touch him in his vulnerable spot; ascertain what the real injuries are; appeal to the claimant's sense of fairness in the most effective way, and make the best settlement he can that is satisfactory to both parties.

In cases of non-liability, where the facts are clear, as a rule, there should be nothing paid. It is this class of cases it pays to contest in court and win. This will give the company a reputation for fair dealing and only contesting cases where unjust demands are made; and with this sentiment prevailing, a corporation will have more nearly even chances in the class of cases where large amounts are demanded for trivial injuries when it becomes necessary to take chances in court. The effect is that other claimants, who hear of these results, will come direct to the company for the adjustment of their claims.

Just here, I would offer the suggestion that there is too little attention paid to giving publicity through the medium of the daily press to cases tried in court with favorable results for the company. It should be a part of the work of the legal department, through local counsel, to see that the local papers publish these matters with other news items.

In cases of injury to stock, or property damage, it pays to be reasonably liberal in the adjustment, as the amount involved is usually small; and, should suit be brought, it would likely be before a justice of the peace, which means a judgment against the company every time, necessitating an appeal to the circuit court, and taking chances on defeating the case there. The expense necessary for defending the matter being as much, or more, than would have been paid in settlement in the first instance.

There is one class of accidents in which the adjuster should be "Johnny-on-the-Spot"; in collision cases where passengers are injured. There are but few matters that will so thoroughly shake a company, from the president down to the train crews doing the damage, as a serious collision between trains where many passengers are injured. Thousands of dollars are involved. It may be a critical time in financial matters with the company, and might mean a receiver. It is in cases of this kind where the attorneys for the company get "cold feet" and say, "Settle; settle at any price," and they are usually seconded by the management. Here is where the adjuster must show his nerve. If he is big enough to handle the situation, and the officials have confidence in him, well and good; if on the other hand the adjuster cannot master the situation, and is forced to call upon all the officials for assistance, many of whom may be unfitted and inexperienced in such work, then the situation is deplorable. A green hand at adjusting can make some mighty dangerous mistakes, and do it unintentionally. There are few of the officials outside of the legal departments (and this is not casting any reflection upon their ability in their own departments) who understand how fully a claimant's rights extend under the law, and how to prepare a release covering all matters growing out of an injury. Take the case of a minor, even though the person injured be past twenty years, but not twenty-one, the personal signature would not bind the claimant, and he would still have the right to sue the company within two years after he reaches the age of twenty-one. The same rule applies to all minors. Cases of this kind can only be settled in Indiana by a next friend by proper proceedings. Then the parents have a claim for loss of service, expenses, care, nursing, etc., which must be considered. In the case of a married woman, not only the claim of the injured party is to be considered and settled, but the claim of the husband for loss of his wife's services, expenses incident to the injury, etc.

In talking about an injury, the conversation is largely confined to the extent of the injuries, and when the amount is agreed upon it is easy to make a general statement that this is to cover all matters growing out of the injury, and prepare the release accordingly, securing the signature of husband or parent as well as the claimant. Should the re-

lease cover only a part of the claims growing out of an injury, the settling of one part amounts to an admission of liability as to the others and suit can be instituted for whatever is unsettled. Should this matter be taken up again, looking to the adjustment of some portion of a claim left unsettled, it is always more difficult to secure a reasonable settlement than had it been done in the first instance.

Quick action in the cases of clear liability is more desirable and in most cases settlement should be agreed upon at first meeting. In cases of very serious injury, this is not possible, as it is not expected that seriously or permanently injured persons will settle for a trivial sum; and even if they did, the settlement could be set aside.

The larger companies have a decided advantage over the smaller ones in this class of cases. They usually have more men in the claim department upon whom they can call in cases of emergency, using their investigators in the adjustment of the minor claims. In collision cases where possibly 100 or more persons may receive more or less injury, it is best to put just as many competent persons as are available at work securing settlement before ambulance-chasing lawyers have time to get at work, thus covering the ground quickly; and, where settlements cannot be made, to establish friendly relations with injured persons.

The manner in which the last serious collision on the lines of our company was handled will illustrate this in a practical way, if you will pardon the personal part of the illustration:

On September 3, last, two sections of a train collided in a curve near Peru. Three cars, well filled with passengers (over 200 in all), were in the wreck. A large number were more or less injured; many received serious injury; a few escaped without injury; no deaths have resulted. The names of 166 of the passengers were secured by train crews. Most of the doctors in Peru were called, and some from Kokomo were pressed into service. The writer was in Detroit, Mich., when he first learned of the accident. On reaching home, as quickly as possible, an alphabetical list of passengers, with a memorandum of injury, was prepared, and a letter of inquiry at once mailed to each, inquiring as to injuries and requesting prompt reply. This quickly developed those who had sustained injury, either serious, slight or trivial, as the next day replies began coming in and the department was in touch with the individuals who needed attention, and, judging from the wording of the replies, the cases needing most prompt attention were quickly looked after. Lists were prepared and a force of three men (a dozen would have been better) were put to work, each taking his own list so as not to conflict in the work, with the result that in 10 days 67 releases had been secured; by the close of September 119 had been settled with (this number exclusive of 39 other releases in other matters taken during the month), and by November 141 settlements had been made. A tabulated statement at that time was prepared, in which was shown the party injured, nature of injury, amount paid in settlement, and the probable amount of verdict had the matter been contested in court, and we had at that date made a net saving from the one accident of over \$15,000, not including any attorneys' fees or costs incident to the matters.

Since that time, several of the more serious cases have been settled. Only five suits have been filed on matters growing out of this accident, one of which has since been settled, and, so far as we know up to the present time, settlement has been made with all but six persons, including the four in suit.

We can demonstrate with reasonable certainty that we have saved the company on this one accident alone over \$20,000.

What should the attitude of the claim department be toward the lawyers? Our experience has been that lawyers, as a rule, should be treated fairly, and they should be protected in settlements made, except in cases where lawyers are known "ambulance-chasers" and in bad odor. These deserve no consideration, for their only motive is to secure blood-money, and they will resort to almost any means to get it. Most lawyers are inclined to be fair in their dealings, though high in price. They usually have the ability to make injuries appear fully as bad as they really are and allowance must be made accordingly. In matters of clear liability, it is better to beat them to the case and get it settled before the lawyer is consulted.

What about the doctor? He is the power behind the throne. Doctors usually have more influence with their patients and can do more with them than any one else. Fortunately, reputable doctors often look upon the legal profession with an eye of suspicion and will, if protected in their bills, assist in legitimate ways in securing settlements. Make friends with the doctors.

The claim department has been dubbed, "the rat hole of

the treasury." In one respect, all money paid out is a clear loss. In what department, however, is there a greater opportunity to save money? Take the cases of serious trouble,—if properly handled, there can be a larger per cent of saving than in many of the other departments. The competent adjuster will guard the dollars in the treasury as carefully as though they were his own. He should have every encouragement to keep the "rat-hole" as small as possible, and, in order that this may be done, no bill chargeable to the claim department, large or small, in court or out, should be paid without the approval of the claim adjuster.

Where a claim department is conducted along the lines indicated, the result should be a small per cent of the gross receipts paid out, and a large saving for the company.

THE COST AND SALE OF RAILWAY POWER.*

BY G. H. KELSAY, INDIANA UNION TRACTION COMPANY.

Cost of Power for Rental Purposes.

As to what factors should be involved when estimating the cost of power for the purpose of sale, there exists a difference of opinion:

First: Cost covering only fuel, labor, repairs, lubricants, wastes and miscellaneous material.

Second: Cost covering in addition to the above, interest, taxes, depreciation on equipment and we might justly include legal expenses in connection with damages arising from the generation, transformation and transmission of such power. These costs truly and logically belong to each and every kilowatt hour of power sold and each unit of power so disposed of without due regard to such items will surely make it that much harder for a company to make a good power plant showing.

Interest and Depreciation.

Then the question arises as to what per cent interest and depreciation shall we add to the fixed charges, such as labor and material, insurance, taxes and all other expenses logically arising from the operation of a power station and transmission line.

The rate of interest is quite easily determined and on this there is not much room for discussion. On the other hand, the rate of depreciation will depend on the class of equipment and the portion of the power of transmission system which is being considered in the particular problem involved, such rate being necessarily of a variable quantity, ranging from practically zero to, in certain electric railway apparatus, as high as 15 or 20 per cent.

On this subject railway men will express different opinions. Some will say that what we take as a depreciation charge should truly be a daily maintenance or repair charge, or that we should keep our equipment up to a standard at all times, while others will say that such depreciation may finally be taken care of by the increased earning capacity and increased value of the franchise of a property. However, a certain per cent should be allowed when selling power to cover what may be termed depreciation, for there will surely be a day of reckoning when we will require new and better equipment or must replace miles of transmission pole line.

To illustrate by an example; on account of the depreciation on a transmission line, the arms and insulators were obliged to be replaced when such arms had been up only six years. This would indicate that 16 per cent should have been allowed each year to take care of the renewals of the arms and insulators so that it would not be such a heavy burden on the road for one season.

The same principle will certainly apply to most all details of the power equipment of the road, but what this rate of depreciation should be is a very much debated question and on which there has not been enough consideration.

Not all managers would care to operate their roads, buying their power and renting transmission lines and distribution circuits from another company, paying for such power a reasonable rate for interest on investment and a fair rate to cover depreciation on the plant and lines, taxes, insurance and all other expenses chargeable in addition to labor and material charge for such power; primarily because a fixed rate to cover depreciation has not been regarded as one of the charges in the operation of a power equipment and to add a conservative rate to the cost of power would very materially increase the per cent of operating expenses of a road as against the showing that is now being made.

Many times statements are made as to what power is really costing, mentioning such figures as 4½ mills, 5, 6, 7 or 8

mills per kilowatt-hour as the case may be, which covers only labor and material charges.

Quoting from one of our recognized authorities on electric railway engineering who writes as follows: "There is a great difference between the cost of power computed from fuel and labor alone, as is often done by those who like to deceive themselves, and the cost with all the items of interest, repairs and depreciation relentlessly footed up. It is not unusual to find the item of depreciation deliberately neglected in computing the cost of power and in other estimates. Street railways have been particularly prone to this sort of financial juggling—it is so convenient to increase the capital account for "improvements" instead of withholding dividends really unearned or shouldering a genuine deficit."

You will note it is not extremely hard to interpret this gentleman's views as to the propriety of a depreciation charge. We are not justified therefore in making a price for the sale of power without giving due regard to a certain per cent to take care of certain expenses, calling them depreciation charges or call them what we may.

Size of Plant and Cost of Power.

In small plants the labor charge is proportionately large and fuel is also large on account of the inefficiency of small units. In larger plants of 1,000-kw. output equipped with approved machinery, the labor and fuel charge decreases very slowly by an increase of the size of the plant, which, however, depends to a large per cent on the character or demand factor of the load which it must handle.

(The author exhibited a curve showing the effect of the increased size of plant on the cost of power per kilowatt-hour at the busbar, this including only fuel, labor, repairs, lubricants, waste and miscellaneous material.)

You will note (curves exhibited) three curves plotted showing cost of power in plants ranging in capacity to as high as 2,500 kilowatts. These curves are given, showing costs per kilowatt-hour for an average output with 40, 50 and 70 per cent of the normal working capacity. These curves are plotted assuming coal worth \$3.00 per ton delivered at coal bins and interest and depreciation are grouped together at 10 per cent per annum. This is somewhat higher than the price ordinarily paid for coal in this locality, but the curves as plotted show some very important facts; that the cost for power per kilowatt-hour at the switchboard is very much higher when including interest and depreciation and is very materially affected by the load power factor.

Cost of Power at Distribution Points.

An estimate of the cost of power at some particular point on a railway system involves some very nice calculation and deals with somewhat uncertain factors, unless proper recording and indicating instruments are at hand for making some determinations.

The true labor and material cost of electric power at power plant busbars is very easily estimated, but a great amount of actual data from existing stations are often valueless on account of not being carefully and completely worked out, and it can readily be shown that there is a great difference between the cost of power, computing only fuel and labor and material items as against the cost of power with all the items of interest, taxes, and depreciation carefully footed up.

Possibly the most practical way to determine the cost of power at any point on a railway circuit is to take the cost at the busbars of the plant as a basis for calculation. This can readily be determined, as a definite sum covering all costs chargeable to the production of each kilowatt-hour of power, by dividing by the efficiency of transmission and transformation to the point of delivery and adding all the costs chargeable to the transmission and transformation of power, such as labor and material charge on lines and substation equipment, taxes, interest and depreciation on all apparatus from power station busbar to point of delivery.

If the power station and substation are equipped with wattmeters for carefully measuring all power, the material and labor cost of direct-current power at any substation on a railway system is fairly well determined by dividing the total labor and material charge for generation, transformation and transmission by the total output of all substations for a given time. This cost will be different at different substations on account of length and size of high-tension line and character of load on high-tension line and substation.

If power is sold at a point midway between substations, losses in the direct-current feeder will be of some magnitude, depending on the railway load and the size of feed copper and the distance between substations.

In figuring cost of direct-current power as delivered to a consumer when located at a point on the railway line some distance from the substation, there should enter into the cal-

*Paper read before the Central Electric Railway Association, Indianapolis, Ind., January 24, 1907.

calculation on such estimated cost, quite a number of elements as follows:

1. Loss in direct-current feeder and track to substation.
2. Rotary and static transformer losses and battery losses where same are installed.
3. High-tension transmission losses.
4. Power house transformer losses.
5. Labor and material costs in maintenance of line.
6. Operation and maintenance of substation.
7. Operation and maintenance of power house.
8. Fuel charges for power house.
9. Interests, taxes, insurance, depreciation and any miscellaneous expenses on all power station and substation apparatus and transmission line.

The efficiency of a railway system from the power station busbar to the car or to a power consumer located at a point some distance from the substation is an element which enters into the cost of power to a degree oftentimes greater than at first thought, ranging from possibly as high as 85 per cent on a direct-current system with ample feeder capacity and medium loads to as low as 50 per cent on an alternating current system with heavily loaded high-tension line, lightly loaded substation and heavily loaded direct-current lines.

The following figures which are of considerable value were calculated by Mr. A. S. Richey and given in a very comprehensive paper on cost of electric railway power production and transmission in the state of Indiana, before the meeting of the Indiana Electric Railway Association in January, 1905.

These values are estimated from a total of all railways generating and transmitting an alternating current, at that time operating in the state. The figures show the per cent of efficiency of the various portions of apparatus from power station busbar to the car consuming the power.

	Per cent.
Efficiency of step-up transformers.....	94
Efficiency of transmission lines.....	97
Efficiency of step-down transformers.....	93
Efficiency of rotary converters.....	80
Efficiency of direct-current distribution.....	80
Combined efficiency	54

The efficiencies appear at first sight very low, but a little consideration will show them to be very logical and represent very close actual conditions when considering an average of all roads operating in the state two years ago.

(The speaker referred to a sketch showing the general method and results obtained in determining the cost of power at the busbars of a certain substation when the power station was equipped with two 50-kw. units with an average load of 63 per cent of one-half of the maximum capacity.)

In the calculation, depreciation which was taken at 7½ per cent was figured on 63 per cent of the total cost of the plant and interest was estimated at 5 per cent on the total cost of the plant. Depreciation was figured on a transmission pole line and substation at the rate of 7½ per cent exclusive of copper on which there was no depreciation charged. Interest was charged on transmission line and substations at the rate of 5 per cent.

In estimating the cost of transmission of power to a substation only that portion of the expenditures on the pole line should be considered which were made necessary on account of such transmission line; that is, that portion necessary to carry the transmission circuit that is not required to support trolley wire, feeder and telephone line.

The results as obtained by the calculation show that \$0.257 should be realized per kilowatt-hour on direct-current power sold at the direct-current busbar at the substation.

Another calculation of the cost of power at the direct-current busbars at a certain substation located 10 miles from power station showed such costs, including all labor and material charge, 5 per cent interest and 6 per cent depreciation, to be very close to \$0.27 per kilowatt-hour.

A similar calculation to determine the cost of power delivered at 15,000 volts 10 miles from a power station realizing all labor and material charges and a conservative rate for interest and depreciation figured such costs to be \$0.16 per kilowatt-hour.

At times a power load may be added to a plant when the price realized for such power be but little above the net labor and material cost, not even paying a good rate of interest on the investment, on the theory that such amount as is realized over and above the labor and material cost reduces by just that amount the cost of power for the railway load. This results in a better showing for the power plant, and greater earnings for the railway company.

This certainly is not a logical way to make a price for power and finally will result in a poor investment.

Developing a Demand for Rented Power. Does It Pay?

The development of a demand for the rental of railway power necessarily depends on the service that the railway

company can give and the adaptability of such power for the consumer. The time when service is obtainable from a railway circuit includes, on most all railways, all hours except from two to four hours in the morning. These hours are the ones during which the consumer will prefer to do without service if he has a motor load, but result in a disadvantage if he is a light consumer. With a properly developed power and lighting load the railway companies should very profitably furnish all-night service over their entire lines except at such intervals of time as are required for linemen to make repairs on the high-tension line, or other interruptions in the service which are beyond the control of the railway company.

The kind of power that a railway company can make a successful proposal to furnish, covers practically every demand for power that can be asked for, where such demand will warrant the installation of the necessary apparatus. Five hundred-volt motor service can be handled at all points along the lines of a railway company where the voltage on the feeder is sufficiently free from fluctuations to permit such a motor to operate.

A very successful alternating-current motor service can be furnished at any point along a railway line where there is a transmission circuit and where the load will warrant the investment in the necessary step-down transformer apparatus.

Lighting from railway circuits may successfully be accomplished in the small towns through the medium of step-down transformers and local distribution at any common operating voltage with either two or three-wire system, furnishing 25-cycle current for such lighting, or, by means of motor-generator set in addition to the step-down transformers, approximately 60-cycle current can be furnished and all the advantages obtained as furnished by our local lighting companies. There may arise a question as to the service obtained by incandescent lighting from 25-cycle current, but such lighting is being done at a great many places without any complaint from customers on account of the low frequency of such current.

Incandescent lighting service can be accomplished through the medium of step-down transformers and low-tension alternating-current distribution circuits, the railway company experiencing but a small per cent of loss from the high-tension line to the consumer and proportionately small first cost on equipment. Such an installation would not require constant attendance.

Arc lights can be furnished directly from direct-current feed-wires, operating five or six lamps in series; thus giving excellent service where the voltage regulation on such circuits will permit such lamps to operate, or if the direct-current lamps cannot be used, 60-cycle arc lamps can be furnished and operated through the medium of a motor-generator set at any town through which the high-tension power line passes.

Nernst lamps operating on 25-cycle current will give very satisfactory results as is reported by the manufacturers, and as has been proven by a number of installations at various places in the east. Successful operation of Nernst lamps requires good voltage regulation, but the efficiency of a Nernst lamp is very high and deserves consideration when contemplating a lighting plant from a railway circuit.

Railway companies should, when going into the business of supplying power for lighting, provide their power stations with regulators so as to obtain more even voltage conditions on their transmission lines. However, a careful study of the voltage conditions on a great many power lines will show better regulation than is furnished by a great many lighting companies.

Smaller towns where the people are not acquainted with the advantages of electric lights will necessarily be a little slow in taking hold of a proposition that might be offered them, but if railway companies will establish a few such lighting plants, giving the consumers the advantage of a very good rate, which the company can certainly afford to do, a demand for such service will certainly grow with little effort on the part of the railway company.

The fundamental question is, does it pay to take up trolley and lighting business along a railway line.

When the railway companies can deliver power to the direct-current busbars of any substation at a net cost ranging from 2 to 3 cents, paying all costs for the generation and transmission of such power and a fair rate of depreciation and interest, or deliver alternating-current power from the high-tension lines directly to the small towns along their lines for a price ranging from 1½ cents to 2 cents or 2½ cents per kilowatt-hour, paying all costs chargeable to the furnishing of such power, they should by adding a reasonable per cent to such cost handle all the lighting business along their lines at a profit to themselves and at the same time give the consumer the advantages of enjoying the privilege of electric light and power.

CAR LIGHTING.*

BY R. C. TAYLOR, INDIANA UNION TRACTION COMPANY.

Few subjects in electric railway equipment have received less attention and deserve more than the question of the proper illumination of electric railway coaches. The modern interurban car carrying passengers over long distances should have its lighting arrangements so designed as to provide



Night View Showing Comparative Headlight Illumination.

sufficient light at all times to give the passengers an opportunity of being able to read with comfort.

The car should also be provided with a headlight burning with sufficient brilliancy to enable the motorman to have a clear view of the roadway far enough ahead to be able to run his car at high speed in the darkness without danger or discomfort to the passengers on his train.

Headlight Requirements.

The car should also be provided with sufficient light for danger signals on the rear end sufficiently bright to enable the motorman on a car approaching on the same track to stop in time to prevent a rear-end collision.

The headlight should be an arc headlight with large reflector so designed, arranged and constructed as to be a permanent part of the car's equipment and if set above the line of vision of the motorman will give a clearer view of the track and more satisfactory light both near the car and at the limit of its range.

The mechanism of the headlight should be strong and simple and reliable with carbons arranged to burn at least six days without renewal. In cities where the ordinances require the screening of the light while passing through streets, a screen of the ordinary type should be arranged as a permanent part of the lamps and facilities provided in the motorman's cab for shifting it to either one or the other of its positions at will.

The headlight should be designed to give a clear view of the track on a clear night, of 3,000 feet. During fog or rain or driving snow this range of vision is liable to be cut down to 500 feet which will be just about as short a distance as a high-speed car can be stopped. This range of headlight view will probably call for an expenditure of energy at the lamp terminals of 5 amperes at 80 volts. This design will provide sufficient light for the "unfavorable" conditions of atmosphere and weather, as it is usually during such unfavorable conditions that an accident or collision is most

liable to occur. The headlight of a high-speed car is considered one of the most important features of its equipments and hence the reason for advocating as strongly as possible and with earnest emphasis the arrangement of keeping one headlight for each operating end of a car.

Tail and Classification Lamps.

Most interurban cars are being fitted up for single-end operation and when so arranged should be supplied with electric tail-lights. These should also be arranged as a permanent part of the car's equipment. Two eight-candle power lamps behind ruby lenses give a very satisfactory set of tail lights. These should be wired up in connection with a clear light when the trolley is removed or the line current interrupted for any reason. Classification lights equipped with colored lenses may also be fitted up on the front end of the car in the same manner as the two tail lights in the rear and be ready for use at any time it may be necessary to run the car as a classified portion of a train.

Lighting the Interior.

The arrangement of lights in the interior compartments of the car should be of such a character as to produce a pleasing effect on the minds of the passengers. Most of our high-speed cars have been designed to attract passenger traffic formerly handled by steam railroads. Our managers have made commendable efforts in designing and furnishing their best cars so as to equal or excel the best rolling stock of other railways and there is perhaps nothing that will enhance the appearance of the car and conduce more to the comfort of the passenger than comes from riding in a well-lighted coach. There are a great many reasons too self-evident for discussion why a car should have plenty of light at every part of the trip.

The fact that out of nine interurban lines running into Indianapolis, the interior lighting arrangements varies from 20 lights to 65 lights per car seems to indicate that there is still room for discussion on the best method of electric car lighting. The performance of these lights on the road and the quantity of light given out seem to indicate there



Night View Showing Comparative Headlight Illumination.

may be room to advocate some improvement in their arrangements.

Arrangement of Circuits.

The usual method of car lighting is to connect five incandescent lights in series and put as many circuits in the car as its architecture will permit, or the fancy of its designer may suggest. The arc headlight is then connected across the

*Paper read before the Central Electric Railway Association, Indianapolis, Ind., January 24, 1907.

line in series with enough iron-wire resistance to cut down the line voltage to 70 volts across the arc.

Power Required.

With this arrangement, assuming a car with seven circuits or 35 lamps, we then have the following energy consumption per car:

Arc headlight and resistance.....	2,700 watts
Thirty-five 16-candlepower incandescent lamps.....	1,965 watts
Total energy consumption for lighting.....	4,665 watts
Energy consumed in light by the arc.....	315 watts
Energy wasted in heat in the arc.....	2,355 watts

In other words there is energy enough wasted through the resistance of the arc to furnish more than sufficient light for the interior of the car.

Resistance and Regulation.

Since the arc lamp as at present arranged seems to be the pivot point around which any suggested improvement might be made, let us assume that enough incandescent lamps are inserted in the circuit to take the place of the resistance and furnish the interior lights. We have a net saving of 1,965 watts per car while the lights are in service. So long as the line voltage remains constant and the resistance of the lamp filaments remains constant, with this arrangement the interior lighting effect in the car will be quite satisfactory; but unfortunately it is very difficult with the very best possible design of feeder arrangement, without involving enormous expense, to maintain anything like a constant voltage over the entire system or even a fair average, and especially is this true on long interurban lines and the results are in a great many cases that the interior lighting of the car becomes very unsatisfactory, indeed. The obvious remedy for this fluctuating line voltage would be to insert in the light circuit some form of regulator or other apparatus to maintain a constant potential on the light circuit irrespective of the fluctuations on the line. Several suggestions for the accomplishment of this desirable condition have been advocated, but so far as known none of them has met with a very conspicuous success. A design for this purpose has recently been brought to my attention in which a portion of the current from the headlight resistance is used in regulating the lighting circuits and the balance of the resistance current is used for lighting a number of specially designed arc lamps for lighting the interior of the car. This system seems to merit full consideration and I believe is on exhibition at this convention.

Another regulator for railway lighting circuits has been designed, which short-circuits a number of the lights in the car, maintaining a constant voltage on those left burning. This regulating system was applied to a car several years ago with quite satisfactory results. There is certainly a demand for such a device for interurban service and it seems quite reasonable to expect that it will soon be on the market.

Use of the Compressor Motor.

In the event of no satisfactory regulator being produced to meet this service this matter of constant potential on the lighting circuit is sufficiently important to warrant the adoption of an independent motor-generator set for car lighting. It is a well-known fact that either the life or efficiency of an incandescent lamp will be very greatly affected if run at a very small percentage either above or below normal voltage. In the design of a new car this detail could be very nicely cared for in connection with the compressor motor. This motor could be designed to maintain a constant speed at a variable voltage and of such capacity as to run the air compressor and lighting circuit. The lighting generator could be mounted on the motor shaft and no additional bearings or frame would be required. On the compressor gear would be mounted an automatic air-operated clutch. The operation of this machine would then be this: When the lights were burning the motor and generator would run continuously, and the automatic air-operated clutch would throw the compressor part of the device out and in to meet the demands for compressed air. When the lights were not required the operation of the compressor would be the same as at present, starting and stopping the motor. This device is so extremely simple, efficient and of such low cost and its results so prolific of beneficial results in giving satisfactory illumination and long life to the lamps, that it should speedily be adopted.

New Lamps.

From the earliest days of electric railroading the time-honored incandescent carbon-filament railway lamp has been the medium of interior car lighting but it seems quite reasonable to expect that further economy and better light for the same or less energy may very soon be looked for by the selection of some form of more efficient lamp. Experiments

have been conducted and incandescent lamps have been manufactured and tested during the past year, having their filaments made of the metals osmium, tantalum or tungsten, with the result that the tungsten lamp has raised the standard of efficiency of incandescent lighting three times as high as the present standard and exceeding in efficiency every form of incandescent or arc lamp except the vacuum tube and flaming arc. Combined with its virtue of high efficiency the tungsten lamp possesses the merit of the simplicity of the present railway lamp and it is hoped may even exceed it in durability. Given, therefore, a high-efficiency lamp that may be made in small units, offering unlimited opportunities of correct distribution, and a constant potential on the lighting circuit the proper illumination of a luxurious interurban car becomes a very easy problem for the engineer. Whether the high-efficiency incandescent lamp or a specially designed arc be employed in the illumination of the modern interurban car they should be surrounded with a frosted or opalescent globe backed up with reflectors against a white background giving a soft, pleasant diffusion of the light in all parts of the interior of the car.

With the car lighting arrangement as outlined the potential of the lighting circuit may be made that which is most suitable for the headlight and the interior lights may be designed for that voltage. This will effect the saving of the energy dissipated through the headlight resistance. The interior lamps may be designed for high efficiency and the total aggregate saving of energy will be the difference between the present practice, 4,665 watts, and the suggested arrangement, 1,850 watts, or a total net saving of 2,815 watts per car. The suggested arrangement therefore presents the pleasing prospect of affording an abundant supply of constant light for the headlights, tail-lights and interior and at the same time effects a very handsome financial saving per car per year over the accepted practice of the present system of car lighting.

A MODEL CAR FOR LONG TRAVEL.*

BY W. H. EVANS, INDIANAPOLIS TRACTION & TERMINAL CO.

In discussing this topic, it might be well to say that it is not my purpose to present a lengthy discussion, but rather to mention a few points which occur to me as being novel and possibly in the way of improvements necessary to meet the requirements of a constantly increasing demand for a better and longer service on our interurban lines. This topic is an interesting one to all connected with the traction interests, and, as presumably it appeals more to those directly connected with the handling of passenger traffic, it is largely from this point that the subject is to be considered.

Limiting Conditions.

It may be well at first to direct attention to a few of the things which largely have prevented the designing and equipping of such as might be called a model car. This applies particularly to the width of cars for interurban service which has so far been limited to 8 feet 6 inches over all. This in turn compels the use of narrower seats and narrower aisles than are used in similar service on the steam-road cars where they are built from 9 feet 6 inches to 10 feet 6 inches in width. It usually occurs that at some point over the line, on which it is desired to run interurban cars, the distance between track-centers is too narrow. In some instances this point is in cities where the streets have been improved and paved, thus making it a very expensive operation to have the so-called "devil-strip" widened. But it would appear that this is something that should be corrected in the near future and at least should very carefully be guarded against in locating new tracks or in rebuilding old lines.

This also applies to curves at right-angle turns and other congested points which interfere with the operation of cars of sufficient length to accommodate the business. While there would appear to be some logical excuse for such restrictions in cities of the larger class, this trouble is frequently found in small towns and villages, where, with a comparatively small additional expenditure for right-of-way, the curves could be made of sufficient radius to permit of the easy operation of any class of equipment that it is reasonable to expect the traffic will require.

Overhead Clearance and Track Gauge.

In this connection, I would also desire to call your attention to the limited overhead clearance under bridges and viaducts, particularly where steam roads cross above the interurban lines. As this is a time when the subject of track elevation is being actively taken up in a large number of cities, it appears extremely important that traction companies should use every effort to get as high an overhead clearance as is

*Paper read before the Central Electric Railway Association, Indianapolis, Ind. January 24, 1907.

possible, keeping in mind the fact that the conditions are rapidly changing. Later it will be necessary to have more overhead clearance and at this time it is impossible to tell what the development of a few years will require in the way of overhead-trolley arrangements to properly take care of the heavier cars and higher voltage. Structures that formerly served for the ordinary city street car to pass under with safety are insufficient to take care of even the larger and later improved types of city-service cars of today, to say nothing of the interurban types.

It is well to bear in mind the type and section of rail which is placed in the improved streets in cities, and above all to insist that the tracks be laid to standard 4-foot 8½-inch gauge.

Present and Possible Routes.

The question of suitable cars for long distance travel is one which is rapidly requiring our best attention, and it will be but a short time until through lines will be operated, on which cars will run from five to ten hours, and possibly more, in one direction. At the present time in the vicinity of Indianapolis this service is operating to Ft. Wayne, Dayton, Lafayette, and Connersville, with the expectation that the latter line will be extended to Cincinnati and through service inaugurated. Also that the other lines will be considerably extended, with the prospect of through service from Indianapolis to Louisville, Terre Haute, Toledo and Columbus, and at each of these points connected with the traction system radiating from those centers.

Suitable Operating Cars.

The type and style of car which appears to have become the most popular with traction companies is similar to the cars at present in service on the Indianapolis & Northwestern system. These cars have been running for some time and those who have been connected with their operation are enthusiastic over this style of car for both local and limited service. Throughout the middle states this style of car is being used, I think, by the majority of the lines. It is usually arranged to run in one direction, but with a control arrangement on the rear platform to facilitate switching and backing up, should occasion require. These cars are seldom shorter than 50 feet nor longer than 67 feet.

These cars are 61 feet 6 inches over buffers and 8 feet 6½ inches over side sheathing. They are composed of three compartments. The forward compartment serves for the motorman's vestibule and accommodates the baggage and express as well as the hot water heater. It is 11 feet 3½ inches long. Directly in the rear of this is the smoking compartment, 13 feet 4 inches long, with seats for 16 passengers. The passenger or coach department is at the rear. It is 27 feet 4½ inches long, with seating capacity for 38 passengers and a roomy platform at the rear, which can be entirely enclosed, the step and door openings being on either side. These cars are liberally supplied with glass in the partitions and there is little to obstruct the view looking forward, depending largely, however, on the amount of baggage being carried.

It is a question in my mind, whether, with the increase of traffic and the carrying of baggage and express on our longer runs and the fact that a large number of commercial men are making use of the interurbans and require that their baggage and sample cases arrive at their destination with them, it may not possibly (in order to accommodate this business) be necessary to have two cars; one to provide liberally for baggage and express and a smoking compartment, and the other to be strictly a coach. So far, however, the car mentioned has taken care of this question as well as anything that has yet been devised in a single car.

A car, very much on the same plan as this, is being operated on one of the Ohio systems, I understand, quite successfully, but it is designed to run with the coach department ahead, the baggage compartment being at the rear of the car, as in ordinary service. This car is 67 feet long over buffers, 8 feet 5½ inches over sheathing and 8 feet 8 inches wide over all. It has parlor chairs and accommodates 29 people in the coach department and 10 in the smoker, with separate toilets for ladies, the men's toilet being located in the rear vestibule at the rear of the baggage room. This places the hopper at the extreme rear end of the car and clearing the trucks, the entrance being through the baggage room. The motorman's cab is at the front end and is so constructed as to obstruct the view of the passengers as little as possible, giving practically all of those seated in the coach department a clear view ahead. The entrance and the exit of the car are at the front end for both motorman and passengers. There is also an entrance at the rear of the car. The doors and steps of this car are placed all on one side, the left-hand or pole-side of the car being entirely free from any door openings whatever, and thus forming a very sub-

stantial and solid construction. Particular care has been taken, with the bottom frame of this car. It consists of six steel I-beams running the full length of the car, and the floor is triple, the bottom being steel plates fastened to the sill, covered with yellow pine flooring and that covered with a floor of hard maple. The passenger compartment in this particular car is covered with carpet.

I am aware that this is to a certain extent quite a radical departure from the usual operation of cars of this character, and while from an operating standpoint, there may be some things which would condemn this practice, there are features which would appear as commendable. Principally among these is the fact that the passengers boarding the car and leaving it are under the direct supervision of the motorman. An arrangement could be devised whereby the motorman would open and close the door, thus preventing passengers from alighting from the car, except at the proper designated stations, and also avoiding numerous accidents from people alighting from the car while in motion. This applies particularly to cases where the conductor is required to go forward and flag a railroad crossing, which frequently results in accidents to passengers at that time. Having the smoking room in the rear is also an advantage, as it is entirely separated from the coach department and the fumes of smoke are never carried into it. This arrangement, however, makes it necessary for the conductor to look after the baggage, which I presume would by some be considered a disadvantage. But it would appear to me that this would be offset by the safety secured by passengers boarding and alighting from the car, under the eyes of the motorman.

There is no question but that being able to view the country from the forward end is a decided attraction for most passengers on interurban lines, and it would appear to have a considerable advantage over the practice of having the observation space on the rear of the train, so long in vogue on the steam-road lines. Particularly in the summer time and in pleasant weather this arrangement should appeal to travelers.

The Future Car.

Being able to look ahead is also quite a relief to passengers who become sick on the cars. This can largely be attributed to looking out through the side windows at passing objects. The motorman is located in a small vestibule which is enclosed with glass windows, thus separating the motorman entirely from being interfered with by the passengers, at the same time offering very little obstruction to the forward view.

It is important, however, that the forward or pilot-end of the car be made as substantial as possible and thoroughly braced and strengthened in order to withstand any impact from collision which might occur. In fact, this is a matter which requires very serious attention from all those who are connected with the designing of traction equipment, particularly so on cars which are to be used on high-speed lines. A considerable improvement has been made in this direction within the last few years with the introduction of steel into the bottom framing, and while this leads to a somewhat heavier car, the tendency is in the right direction, in the way of securing substantial cars, which should be aimed at rather more than cars of elaborate finish or expensive interior arrangement. In fact, it will not be surprising in the next few years to see the all-steel car in common use on interurban roads, judging from the rapid advancement made in this line with subway and elevated railway cars.

It is possible that the car for longer travel will require considerably more conveniences than has been the practice, particularly in the way of toilet and lavatory facilities, and it is pleasing to note that recently considerably more attention has been given to this. Toilet rooms of more liberal dimensions are being designed and in some cases water-flushing hoppers have been installed as well as lavatories. These latter, while they considerably increase the cost and trouble of maintaining the equipment, afford a convenience on the long-travel cars, which we shall probably be required to furnish, notwithstanding the fact that on electric lines very little of the dust and dirt and other inconveniences are experienced incidental to a trip on steam lines having locomotives that burn soft coal.

I would recommend as far as possible that sliding doors be superseded by swinging doors. This will permit of a considerably more substantial framing and bracing at the partition of our longer cars, as the sliding door takes up a space which would otherwise be used to considerable advantage in securing a stronger car.

The governor of Michigan in a recent message to the legislature advocates state supervision of electric railways.

LAKE SHORE ELECTRIC RAILWAY ANNUAL REPORT.

At the annual meeting of the Lake Shore Electric Railway at Cleveland, on January 15, President E. W. Moore gave his annual report to the stockholders, which contains the following statement of the earnings of the company for the calendar year 1906:

	1906.	Increase over 1905
Passengers	\$795,719.12	\$55,197.98
Chartered cars	3,687.56	796.47
Freight	37,454.66	12,831.93
U. S. mail	2,168.20	183.61
Milk	1,949.07	91.40
Advertising	2,130.00	330.00
Car mileage	11,336.69	4,961.21
Interest and discount	1,633.39	*1,173.28
Miscellaneous	4,641.36	*757.63
Gross income	\$860,720.16	\$72,451.69
Operating and taxes	476,257.85	47,669.62
Net earnings	\$384,462.31	\$24,782.07
Interest paid	254,198.34	
Surplus	\$130,263.97	
Other income	6,250.00	
Net surplus	\$136,513.97	\$21,683.63
		Or 18 per cent.

*Decrease.

	1905.	1906.
Per cent operation to income.....	55.33	54.37
Car miles	3,355,661	3,024,393
Gross income per car mile.....	25.65	26.06
Operation and taxes per car mile.....	14.19	14.17
Net earnings per car mile.....	11.46	11.89
Passengers carried	4,761,421	4,337,009
Earnings per passenger.....	15.97	18.17

Earnings Per Mile Track.

	Miles.	1906.	1905.
Cleveland division	60.44	\$7,044.00	\$6,335.00
Toledo division	62.25	5,092.00	4,654.00
Sandusky-Norwalk division	16.30	3,177.00	2,900.00
City lines	11.14	5,937.00	5,239.00

Comparative Statement of Gross Earnings Since 1901.

	Gross Earnings.	Increase.	Increase Per cent.
1901.....	\$358,180.35		
1902.....	466,051.35	\$107,870.67	30.01
1903.....	616,484.23	150,432.88	32.28
1904.....	659,873.21	43,388.98	7.03
1905.....	788,268.47	128,395.26	19.45
1906.....	860,720.16	72,451.69	9.19

The company operates 150.13 miles of track, and has 9.87 miles of sidings and storage tracks. The total bond issue is now \$7,000,000, of which \$1,908,000 are outstanding.

During the year 1906 15½ miles of second track was constructed between Rocky River and Lorain, which, together with the sidings, completes the double track between these two points. The company owns and has now in service 54 double-truck interurban cars, 25 single-truck city cars operating in the cities of Sandusky, Norwalk and Lorain. In addition to 29 work cars, making a total of 108 cars. Ten 50-foot interurban cars were purchased during the year, and contracts have been let for 12 additional cars of the same size.

Holding Power of Railroad Spikes.

The Forest Service of the Department of Agriculture has completed a series of tests to determine the holding power of different forms of railroad spikes. The tests were made on ordinary commercial ties of loblolly pine, oak, chestnut and other woods. The spikes used were of four kinds: common driven spikes, a driven spike which has about the same form as the common spike with a lengthwise channel on the side away from the rail; screw spikes of the American type; and screw spikes similar to those in use on European railroads, and differing from the American spike mainly in the manner of finishing the thread under the head.

The common and the channeled spikes were driven into the ties in the usual manner to a depth of five inches. A hole of the same diameter as the spike at the base of the thread was bored for the screw spikes, which were then screwed down to the same depth as the driven spikes. The ties were then placed in the testing machine and the force required to pull each spike was recorded.

The average force required to pull common spikes varies

from 7,000 pounds in white oak to 3,600 pounds in loblolly pine and 3,000 pounds in chestnut. The holding power of the channeled spike is somewhat greater. For example, about 11 per cent more force, or 4,000 pounds, is required to pull it from the loblolly pine tie. The two forms of screw spike have about the same holding power, ranging from 13,000 pounds in white oak to 9,400 pounds in chestnut and 7,700 pounds in loblolly pine.

There is a marked difference between the behavior of driven and screwed spikes in knots and in clear wood. Knots are brittle and lack elasticity, so driven spikes do not hold as well in them as in clear wood. In the case of common spikes in loblolly pine the decrease of holding power in knots is as great as 25 per cent. On the other hand, screw spikes tend to pull out the whole knot which they penetrate. This increases the resistance so much that in loblolly pine the increase of holding power of screw spikes in knots is about 35 per cent over that for clear wood.

ANNUAL REPORT OF THE CLEVELAND & SOUTHWESTERN.

The following data in regard to the earnings and expenses of the Cleveland & Southwestern Traction Company, for the calendar year 1906, are included in the report of President F. T. Pomeroy, presented at the annual meeting of the stockholders on January 15. The comparative statement is as follows:

	1906.	Inc.
Gross receipts	\$645,849.95	\$102,623.20
Operating expenses	363,856.39	49,602.55
Net	\$281,993.56	\$ 53,020.65
Interest and taxes.....	\$179,251.70	\$ 26,559.01
Net to stock.....	\$102,741.86	\$ 26,461.64
Expenses per cent of operation.....	56.33	
Gross receipts per day.....	\$1,769	Inc. \$281
Operating expenses	996	136
Net	\$ 773	\$145
Interest and taxes.....	491	73
Net to stock.....	\$ 282	\$ 72

Earnings.

	1906.	Inc.
Passenger earnings	\$567,412.48	\$ 92,567.27
Electric package	26,517.59	6,138.52
Freight	23,778.13	4,399.63
Norwalk Electric	16,797.36	62.95
Miscellaneous	11,344.39	*545.18
Mail	2,085.23	
Car lease	800.00	
Car advertising	2,320.50	
Rents	1,401.04	
Weighing machines	125.49	
Power scales	923.17	
Leased car	3,587.96	
Bridge service	100.00	
Total	\$645,849.95	\$102,623.20

*Decrease.

Passengers Carried.

1906	Paid Passengers Carried	Car Miles Run
January	343,278	201,071
February	278,043	184,963
March	300,697	200,096
April	327,461	202,840
May	373,554	231,009
June	403,684	239,783
July	426,305	247,431
August	424,505	247,125
September	410,743	240,358
October	380,680	224,617
November	364,656	205,261
December	364,951	214,342
Total	4,365,557	2,651,896

Increase over 1905, 333,996; increase over 1906	553,112
Average fare per passenger (cents).....	.148
Average expense per passenger.....	.083
Average net per passenger .....	.065
Average interest and taxes per passenger .....	.041
Average net for stock per passenger.....	.024
Average fare per car mile.....	.213
Average expense per car mile.....	.137
Average net per car mile.....	.076
Average interest and taxes per car mile .....	.068
Average net for stock per car mile .....	.008

PIPING AND POWER STATION SYSTEMS.—XXVII.

BY W. L. MORRIS, M. E.

Condenser Cooling Water Supply.

The economy secured by the use of condensing machinery is such as to warrant considerable outlay in providing a sufficient supply of water and the apparatus necessary for condensing purposes. Ordinarily a condenser equipment will save from six to eight pounds of steam per horsepower-hour. At this rate for a 1,000-horsepower unit the saving would be about 10 tons of coal per day which, at \$1.50 per ton, would amount to \$5,475 per year. If the engine were run only half of the total time the saving would be more than \$2,500 per year which, at 12 per cent for interest and depreciation, would justify an expenditure of \$20,000 for condensing apparatus. In most cases, however, the condensing apparatus would not cost more than the amount that it would save in fuel if it operated one-half of each day for a year's time. In other words, a 1,000-horsepower condensing unit operating under the conditions as stated would save about \$2,000 per year after the proper amount for interest and depreciation had been deducted.

If the supply of water for condensing purposes is reliable the initial cost of condensing apparatus may be considered from an entirely different standpoint. The total cost of buildings, boilers, piping, engines, etc., necessary to develop one horsepower may approximate \$50; then the cost of condensing apparatus, including waterways, apparatus, etc., would be somewhat less than \$4 per horsepower capacity of the total plant, or about \$12 for each horsepower furnished by the condenser. It will be noted that the cost per horsepower for any installation is less for a condensing plant than for a non-condensing one, which will permit the use of less boiler and engine horsepower if the plant is built for condensing. It is safe to state that if water is obtainable for condensing from any other source than city waterworks the saving in installation and operation will justify the expenditure necessary for condensing apparatus. Many plants are run non-condensing with an abundance of water only a short distance away. This fact would seem to show entire unfamiliarity with the subject of condensing, and for this reason if the subject were better understood power plants would be located with more regard to water supply conditions.

The water supply should be the deciding factor in determining the elevation of the power plant. There is, for every water supply, a certain relative elevation most desirable for locating a power plant. One of the troublesome conditions which must be taken into account in determining the datum for the power plant is the amount of variation in the level of the water supply. This is often a condition that cannot be overcome and so the plant must be designed to accommodate the variation in level. An extreme variation is quite objectionable, although a change of level of four or five feet can usually be provided for with but little difficulty.

In Figure 239 (11-1) a power plant with high and low level of water supply is shown in cross-section. In studying the water-supply problem for such a plant the following points should be considered: The distance, *a*, should be as short as possible and not over 16 feet; this is on account of pump suction and expense for deep waterway. The distance, *b*, should be not less than three feet, which will allow the suction pipe to be two feet in the water when it is at the low level. By making *b* about three feet it would be possible to operate the plant, even though for any reason the water should drop a foot or so lower than the previous low-water level. The distance, *c*, is the extreme variation between high and low-water levels. The distance, *d*, should be as much more than *c* as possible so as to give ample fall for sewers. If it is necessary to make this but 12 inches more than *c*, then there should be a sewer valve, *e*, that

can be used in case of higher water level than that established. The distance to the top of the hotwell, *f*, should be sufficiently greater than *c*, to prevent any unusually high water level (more than *c*) from causing an overflow of water into the building.

Choice of Location.

In considering the location of a power plant it would be well to make preliminary drawings of a typical station that would suit the requirements of the load and with this as a basis the value of the more probable sites can be weighed against each other. Some other features that should be given consideration when selecting a power plant location are the switching facilities for receiving coal, location with respect to the center of electrical distribution and the labor question.

If the power plant is to furnish current for an inter-urban railway too much weight should not be given to the apparent necessity for locating alongside of a railroad. It may be found more economical to use sidings connecting with two or more railways crossed or tapped by the electric line and thus handle the coal supply in freight cars drawn by an

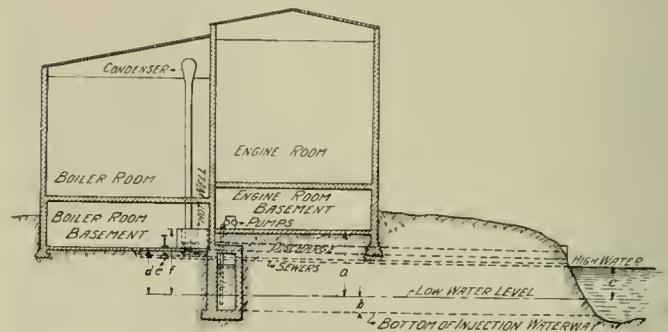


Figure 239-(11-1).

electric locomotive. The availability of two routes for obtaining coal will assure the plant a more probable supply in case of mine troubles as well as afford a protection against indifferent treatment.

If the plant is for an electric railway but little difficulty should be experienced in securing operating men from the towns along the route.

Another feature upon which the relative economy of the plant may depend is its location with reference to other buildings of the same company. If it be located some distance from the administrative department, shops, etc., much time will be lost when repairs are to be made and many economies will be overlooked that otherwise would be secured if the plant were in closer touch with the management. If the various buildings can be centralized considerable more investment will be justified than under other conditions. It may even be found advisable to obtain the condenser-water supply from a considerable distance to permit of grouping the buildings. Such points should be considered on the basis of the investment necessary as the results of operation under the various conditions may easily be estimated.

Supply of Condensing Water.

A knowledge of the geography of the power plant locality is quite necessary when making plans for obtaining condensing water. The chief requirement in such a situation is "to get water." The amount required may vary, but a sufficient volume must always be available for condensing. Possibly no other feature of station engineering requires so much investigation, study and preparation as this one problem. Evidently there is no ideal condition of condenser-water supply. The nearest approach to the ideal is when the plant stands close to a deep, wide stream having but slight variation in its level. But such supplies are not generally to be had where plants are needed.

News of the Week

Interurban Mail Contract.—The Shawnee-Tecumseh Traction Company, of Shawnee, Okla., has been awarded a contract for carrying United States mail between Shawnee and Tecumseh four times a day. Willis E. Fertig, of Shawnee, is president of the company.

Ganz Car For The Erie.—On February 15 the Erie Railroad will receive a new motor car of the Ganz type, now being built by the Barney & Smith Car Company. The trucks, motor equipments, etc., have been received from the Ganz Company, Budapest, Hungary, while the car body has been built in the usual way in the shops of the Barney & Smith Car Company.

Transmission Wires Cut by Order of Mayor.—The transmission wires of the Winnebago Traction Company's interurban line between Oshkosh and Neenah, Wis., were cut last week by the Oshkosh city electrician, by order of the mayor. The city council last August passed a resolution ordering the removal of the high-tension wires and the company had made no effort to obey.

Bill for Cent-a-Mile Passenger Rate.—John F. Joyce, a member of the Indiana legislature from Vigo county, is said to have two bills which he will introduce in the coming session, affecting interurban railroads. One provides for a passenger rate of one cent a mile on interurban roads in the state, and the other requires the erection of passenger stations in cities of more than 35,000 population.

West Penn Railways Increases Wages.—Effective on January 1, the West Penn Railways Company, Pittsburg, Pa., voluntarily raised the wages of its motormen and conductors to 22 cents an hour for the first year, 23 cents for the second and 24 cents for the third year of service and thereafter. The men were also presented with new uniform caps, such as used on steam railroads, as a Christmas gift.

Electric Railway Terminal for Buffalo.—President H. J. Pierce of the Interurban Railway Company, of Buffalo, N. Y., has announced that within two years the company will erect a large passenger terminal for electric railroads, in the heart of the city, to be used by both city and interurban lines. By that time it is expected to be able to travel by electric cars from Buffalo to Erie, Cleveland, Rochester and Toronto.

Worcester Polytechnic Institute.—The annual catalogue of Worcester Polytechnic Institute, just issued, shows that the Institute now has a total registration of 437 students, of which 85 are in the mechanical engineering course, 60 in civil engineering and 92 in electrical engineering. Several new courses are offered. The new electrical engineering building is now nearing completion.

To Permit Cities to Own Street Railways.—State Senator Doris, of Oregon county, Mo., has presented in the senate an amendment to the state constitution to permit cities of 20,000 inhabitants or more to acquire street railways. The amendment provides for acquiring existing street railways or property to be used for street railways by condemnation proceedings, the value of the property to be determined by a petit jury. Funds for such purpose may be provided by a bond issue, to be approved by three-fifths of the legal voters.

A New Electrical Journal.—The second issue of Electrical Engineering, published every Thursday by The Kilowatt Publishing Company, 203 Temple Chambers, London E. C., has been received. Some well illustrated articles by prominent engineers are presented, including "The Designs of Small Motors for Manufacture in Large Quantities," by H. M. Hobart; "Some Points in the Design of Modern Power Stations," by John F. C. Snell, M. Inst. C. E.; "The Generating Station of the Marylebone Borough Council," and "Electrical Engineering in India," by J. W. Mears.

Association for Shop Foremen Proposed.—A number of shop foremen of the Public Service Corporation of New Jersey are taking the initiative in the formation of an association of electric railway shop foremen to hold meetings for the discussion of questions relating to shop practice. A constitution and by-laws are being prepared to be submitted at a meeting to be held in Newark, N. J., on January 29, for which invitations have been extended to all foremen in New York and vicinity. It is proposed to make the association principally a local one at first and to branch out to other cities later. J. R. Case, foreman of the South Orange shops of the Public Service Corporation of New Jersey, is interested.

Interborough Rapid Transit Mutual Benefit Association.—Vice-President E. P. Bryan, of the Interborough Rapid Transit Company, New York, has announced the formation by the company of a mutual benefit association for its employees, to give financial aid to its members in case of accident, sickness or death. The members are to be divided into three classes according to the amount of their salary, the first class composed of those who receive \$35 or less per month, the second those who receive between \$35 and \$75, and the third those who receive \$75 or more. The members will make monthly payments of \$.75, \$1.50 or \$3.00, according to the class in which they are enrolled. The company will assume the payment of any deficit in the relief fund. The management of the association will be assumed by a superintendent and an advisory committee, in the choice of which the employees who are members and the board of directors of the company will

have equal voice. All employees of the company at the time of the inauguration of this system, January 15, will be admitted to membership until July 1, 1907, without examination. At that time the examination system will be introduced.

Committee on Interurban Accounts.—Mr. Calvin S. Tingley, president of the American Street & Interurban Railway Accountants' Association, has appointed a Committee on Interurban Accounts, consisting of W. H. Forse, Jr., assistant treasurer Indiana Union Traction Company, Anderson, Ind., chairman; A. B. Bierck, auditor Long Island Railroad, New York, N. Y., and A. C. Henry, auditor Lake Shore Electric Railway. The committee will hold its first meeting in Philadelphia within a few days. It is the intention of the committee to discuss and plan a new classification of accounts for the use of interurban railways, as the one now in use has been found somewhat restricted and not always sufficient to cover the requirements of long-distance high-speed systems.

Bills Affecting Street Railways in Minnesota.—Two bills for the regulation of street railway companies have been introduced into the Minnesota legislature. A bill placing the electric railways under the supervision of the state railroad and warehouse commission was introduced by Oscar F. Christensen, of St. Paul. The bill provides that all companies now or hereafter operating electric railways for the transportation of passengers, baggage and freight in any city, village, town or county in the state, shall be subject to supervision and regulation by the railroad commission as provided for other railroads in chapter 10 of the new code. The commission shall have power to make reasonable rules and regulations for the operation of electric railways in city or country. A bill offered by A. G. Johnson requires the street railway companies to issue eight tickets for 25 cents.

Address at Purdue University.—Wilson E. Symons, president of the Pioneer Cast Steel Truck Company, 914 Postal Telegraph building, Chicago, addressed the Engineering Assembly of Purdue University, Lafayette, Ind., on January 21. Mr. Symons chose for his subject "Theory versus Practice in the Work of the Mechanical Engineer." Drawing upon an extensive personal experience, he presented his subject in a manner which was most interesting and instructive to his student audience. He described the helplessness of a man trained in theoretical matters only, discussed with care and discrimination the limitations which surround one whose entire stock in trade is his practical experience, and drew a fine picture of the opportunities which await the one who combines the theoretical with the practical. Such a combination he regarded as essential to the development of the ideal engineer.

Rewards to Employes for Satisfactory Service.—The Boston Elevated Railway Company, on December 29, distributed about \$60,000 in gold among its uniformed car service employes as special reward for good conduct and satisfactory service during the year 1906. Nearly 4,000 men each received a \$5 and \$10 gold piece. The rule of the company governing the distribution is that all employes who have been in the car service for six months or longer, and who have rendered continuous and satisfactory service throughout the year, will at the close of each year receive a reward of \$15. Conductors, motormen, brakemen, guards, station masters, starters, inspectors, and, in fact all who wear the uniform of the car service, including the special police officers, are included in the distribution. About 87 per cent of the total number of men who have been in the service as long as six months have been listed to receive the reward.

To Determine Value of Superheated Steam for Locomotives.—The Carnegie Institution of Washington, D. C., has made a grant of \$3,000 a year for a period of four years to Dean W. F. M. Goss of Purdue University, Lafayette, Ind., for the purpose of determining the value of superheated steam in locomotive service; first, in connection with single-expansion engines, and second, in connection with compound engines. This is the second grant which the institution has made to Dr. Goss. While given to him personally, its effect will be to stimulate and to make more effective the work of the Purdue locomotive laboratory. Funds thus received will be employed in supplementing the resources of the laboratory as derived from all other sources. The results of Dr. Goss' previous research under the auspices of the Carnegie Institution, which was for the purpose of determining the value of different steam pressures in locomotive service, is now in press.

Escalators for New York & Long Island Tunnel.—The New York & Long Island Railroad Company, which is building the so-called Belmont or Steinway tunnel system, has awarded a contract to the Oits Elevator Company for the two largest escalators ever built, to be installed in the Manhattan terminal of that system at Forty-second street, between Lexington and Third avenues. Trolley cars instead of trains are to be operated in this tunnel and by running on a short headway will have a large carrying capacity. It is estimated that the capacity of the tunnel will be at least equal to that of the trains of the Brooklyn bridge during rush hours and that the escalator equipment will be equal in point of capacity to the entire stairway equipment of the Manhattan end of the Brooklyn bridge. Furthermore, not only will the escalators be sufficient to handle any number of people up to the capacity of the cars of the tunnel, but they will also serve to marshal the crowds into streams of people moving uninterruptedly without coming into conflict with one another. The escalators will provide service between levels slightly over 55 feet apart and will be arranged side by side. Most of the time one will be operated ascending and the other descending, but during the morning rush hour both will be operated ascending. As an appropriation has already been made for a new Manhattan terminal to the Brooklyn

bridge, which is to be located underground, it will be interesting to note whether this municipally-owned enterprise will be as progressive as the privately-owned one in the matter of installing moving stairways. Neither the escalators nor any part of the entire terminal will possess any woodwork or other inflammable material. The escalator is the invention of Mr. Charles D. Seeburger, who is now head of that department of the Otis Elevator Company.

Cleveland Traction Situation.—President H. E. Andrews, of the Cleveland Electric and President A. B. Dupont, of the Municipal Traction Company, held a conference on January 18 to discuss various phases of the plan by which the Municipal Traction Company proposes to form a holding company to take over the Cleveland Electric property, under a leasing plan similar to that under which the Municipal company now operates the Forest City Railway. While no details were given out it was announced that fair progress had been made and that there is nothing to indicate that a settlement cannot be reached. Both presidents stated that there are no grounds for the reports that the matter of price is likely to prevent a settlement. Daily conferences have been held throughout the week, at which various other officers of the company have participated, and it is stated that several points in regard to the procedure to be adopted in determining on a valuation have been settled.

Electric Railway Express Company Retires.—The Electric Railway Express Company, of East St. Louis, Ill., announced on January 17 that it would go out of business as soon as its affairs could be wound up. It is not yet known whether it will be reorganized. The company operated over the East St. Louis & Suburban Railway, which owned the express cars and furnished the motormen and conductors. The winding up of the company's affairs is said to be due to dissension among its stockholders, most of whom are also interested in traction companies, and not on account of any financial difficulties. It has conducted a heavy express business in the last few months. New cars were ordered recently for the Alton line, which was opened two months ago. Two of these cars have not yet arrived from the shops. Depots are maintained at Broadway and the Levee, in East St. Louis, Alton, Belleville, Edwardsville, Collinsville, Lebanon, O'Fallon, Maryville, Caseyville and Edgemont. Superintendent J. F. Johnston has instructed the company's agents to accept no more business.

Interurbans Not Required to Erect Stations at All Stops.—Traction lines in Ohio will probably not be required to observe, literally, the section of the new Ohio railroad law which requires the erection of a passenger station at all regular stops, to be kept properly heated and lighted. Mr. O. P. Gethlin, member of the Ohio railroad commission, in an informal interview recently said that a strict interpretation of the law would be manifestly unjust to the interurbans, many of which are required by their franchises to stop at all street and road crossings and many farms along their routes, when there are passengers that wish to alight from or board the cars. Interurban roads that are not bound by such franchise provisions, Mr. Gethlin said, would undoubtedly omit many of these stops if the provision of the law were interpreted literally, as applied to them. Mr. Gethlin further said that if the question came up to the commission, to be decided on a complaint of any kind, it would probably interpret the law as applied to traction lines to include only principal stops in towns and villages through which they pass, holding the stops at cross roads or farms to be accommodation or flag stops. A number of interurbans are erecting small shelter houses at many of these latter stops.

Chicago Traction Situation.—There have been no especial developments in the Chicago street railway situation during the past week. Both the city council's official referendum petition and the one issued by the Referendum League have been circulated assiduously, but from latest reports there appears little probability of the requisite 86,000 names being secured before February 1. President T. E. Mitten, of the Chicago City Railway Company, on January 19 issued a statement of the company's position in regard to a referendum vote. He said that while he should be gratified to have the ordinances approved by a popular vote such a proceeding would delay the rehabilitation so that the improved service could not be secured by next winter. The board of supervising engineers must be organized and plans decided upon at once in order that the necessary contracts may be awarded in time to secure increased power before winter. The company has options expiring on February 1 for 300 new Brill cars of the most improved type and the options cannot be extended without the payment of a large premium. The company is now receiving 100 cars of this type which are put in service as fast as received. One of them was exhibited at the Electrical Show and received high praise from all who examined it.

Helpers for Conductors in Rush Hours.—The Pittsburg Railway Company has adopted a plan for relieving the conductors of some of their duties during rush hours and has employed 50 students from the Carnegie Technical School who act as helpers on the rear platform. The "trolley boys" duties are to keep an eye on the trolley wheel and replace it if it comes off the wire and to give the bell signals for the motorman to stop or start the car to take on or let off passengers, thus leaving the conductor free to remain inside the car and collect the fares. Incidentally to help the conductor to keep account of the new passengers. The benefits from the new system are manifold. With but one conductor on a car it was necessary for him to collect fares and direct the movement of the car at the same time. While working inside the car it was impossible for the conductor to see passengers getting on or off, and he had to depend upon passengers

on the rear platform to announce when everything was all right. This resulted in much delay and many serious accidents from the car being started too soon. Under the new system the "trolley boy" boards the car at the downtown terminus and relieves the conductor of the work on the rear platform until the car reaches Oakland, by which time the conductor has completed collecting fares and is able to give his attention to the operation of the car. Leaving the car at Oakland the "trolley boy" returns to the downtown district on the next car. In speaking of the new system James D. Callery, president of the Pittsburg Railways, said: "This has been an experiment, but I think it has been demonstrated that it is the safest way to operate the cars during the rush hours, and the innovation will be extended as rapidly as possible. The two-man system will become permanent if a thorough test shows that it is productive of better service to the public."

Is Car Running Along State Line Engaged in Interstate Commerce?—The Nashville (Tenn.) Banner prints the following statement in regard to a unique complication under the interstate commerce law which exists in Bristol, Tenn.: "Edwin M. Walker, manager of the Bristol Belt Line Railway Company, states that his company will not issue complimentary passes to anyone this year on account of the restrictions of the new federal rate regulation act. The attorneys of the company have decided that the electric line is an interstate railway and for this reason subject to the anti-pass provision. The situation is a decidedly unique one. The electric cars are operated almost entirely in Bristol, Tenn., except over State street. On this street the car line is astride the state line for half a mile, one rail being in Virginia and the other in Tennessee. This, it has been decided, makes it an interstate railway. However, it would be possible for the passenger to make the entire trip through the city without getting into Virginia, but in order to do this he would have to be seated on the south side of the car during the run through State street. Passes might be issued provided the parties thus complimented should agree to always cling to the south side of the car, but for fear of complications, no passes will be issued."

Bill to Give Eminent Domain to Interurbans.—A bill has been introduced in the Texas legislature to give the right of eminent domain to electric railways between cities and towns in the state. A right of way 200 feet wide is provided for. Section 3 provides that: "Such corporations shall have the right and power to construct their railways along, across and over any stream of water, water course, bay, navigable water, arm of the sea, street, highway, plank road, turnpike or canal which the route of such railway shall touch and shall have the right to erect and operate bridges, trams, trestles, or causeways over, along, across any such streams, water courses, navigable water, bay, arm of the sea, street, highway, plank road, turnpike or canal; provided however, that any such bridge or other structure shall be so erected as not unnecessarily or unreasonably to prevent the navigation of any such stream, water course, bay, arm of the sea or navigable water, and provided further that nothing herein contained shall authorize the construction of any such electric railway upon or across any street, alley, square or property of any incorporated city or town, without the assent of said corporation of said city or town, and that in case of the construction of any electric railway along highways, turnpikes or canals, such interurban electric railway company shall either first obtain the consent of the lawful authorities having the jurisdiction of the same or shall condemn the same under the provisions of the law."

Retail Merchants' Plan to Regulate Philadelphia Rapid Transit Company.—The Retail Merchants' Association of Philadelphia on January 21 submitted to the directors of the Philadelphia Rapid Transit Company and to the public a complete plan for improving the street railway situation in that city, which is said to be in a very serious condition on account of the financial difficulties of the company and its inability to secure funds for improvement. One of the principal reasons for the company's lack of credit is considered to be a provision in a city ordinance of 1857 which gives the city the right to take over the street railway property at any time on payment of the cost of construction. The plan of the Retail Merchants, in brief, is to repeal this ordinance, in return for which the company is to exchange its present unlimited franchises for a new grant running for fifty years, the city reserving the right to purchase the property at the end of that period. Under this plan the company and the city would enter into a sort of partnership contract by which the city is to share equally in the net profits after the stockholders have received lawful interest on their investment, from January 1, 1907. The company is to call in at once the balance due on its stock, \$12,000,000, to be used for improvements. The city shall have the right at any time after 50 years to purchase all the rights and property for the amount of the paid-in capital, \$30,000,000. This option is to be assignable or to be sold to the highest bidder. A sinking fund, to be taken from the gross receipts, is to be established, which, at 4 per cent will amount to at least \$30,000,000 at the end of the franchise period, to enable the city to acquire the property at that time. All improvements are to be financed on bonds running for not more than 50 years. All franchises for further street railways are to be first offered to the company. The mayor and two other city officials are to have the right to be present at directors' meetings and vote, but are not to incur any liability, nor shall the city incur any liability for the obligations of the company.

The Philadelphia Rapid Transit Company owns or controls about fifty subsidiary companies, comprising the entire street railway system of the city, most of whose franchises run for 99

years. The company is so overcapitalized that the rentals which it must pay to the leased companies imposes a very heavy drain on its earnings and it is unable to finance the new lines for which it has secured franchises in recent years and which are necessary to the city's development. The merchants' association believes that its plan will restore the company's credit so that it will be possible to make the needed improvements and at the same time give the city the desired control over its transportation facilities.

Long Journey of Private Electric Car.—The private car "Josephine" left Cleveland on Tuesday, January 2, at 4:30 p. m., for Indianapolis, carrying the officials of the Everett-Moore lines and a number of invited guests to the annual meeting and banquet of the Central Electric Railway Association, which was held at the Hotel Claypool on January 24. The route was over the Lake Shore Electric from Cleveland to Toledo; the Toledo Bowling Green & Southern to Findlay; the Western Ohio to Lima; the Ft. Wayne Van Wert & Lima to Ft. Wayne; the Ft. Wayne & Wabash Valley to Peru; and the Indiana Union Traction to Indianapolis. Those included in the party were: General Manager F. J. Stout and Secretary F. W. Coen of the Lake Shore Electric; General Manager Joseph Jordan and Assistant Secretary Smock of the Cleveland Plainville & Eastern; C. F. Franklin, president of the Toledo & Western; Allen Edwards, purchasing agent of the Detroit United Railways; C. F. Smith, general manager of the Toledo Bowling Green & Southern; F. D. Carpenter, general manager of the Western Ohio; C. D. Emmons, general manager of the Ft. Wayne & Wabash Valley; F. T. Hepburn, general manager of the Lima & Toledo; H. A. Nicholl, general manager of the Indiana Union Traction; Joseph Young, general passenger agent of the Toledo Railways & Light; H. C. Young, general passenger agent of the Lake Shore Electric; L. K. Burge, superintendent of transportation of the Lake Shore Electric; J. T. Ross, chief engineer of the Everett-Moore properties; John Witt, secretary to E. W. Moore, and T. H. Hogsett, counsel of the Lake Shore Electric.

Attorney General of Missouri Refuses to Bring Suit Against United Railways.—Attorney General Hadley, of Missouri, has declined a request made by Attorney Charles Fensky that he institute proceedings to forfeit the franchises of the various street railway companies formerly doing business in the city of St. Louis which have transferred their property and franchises to the United Railways Company, and also for the institution of a similar proceeding for the forfeiture of the charter and property of the United Railways Company. After a public hearing, which was attended by representatives of the United Railways Company and of the city council, Mr. Hadley has replied to Mr. Fensky, stating that in his opinion the statute under which the consolidation was effected is not unconstitutional, as claimed by Mr. Fensky, as it is not a special law but a general one, and as the constitutional prohibition against the consolidation of parallel and competing roads refers only to steam roads. In answer to the contention that the United Railways is using the streets of St. Louis for the purpose of carrying freight other than express, Mr. Hadley says that it was stated at the oral hearing that as a matter of accommodation the United Railways had carried dirt taken from excavations for buildings in St. Louis. The representatives of the railroad contended that this had only been done in a few isolated cases, and gave assurances that the practice would thereafter not be engaged in. In regard to the contention that the United Railways Company did not at the time of its incorporation have on hand the amount of money required by law or stated in the articles. Mr. Hadley says that Mr. Fensky has furnished no evidence in support of his claim, and that even if true it would not, in his opinion, at this late day, furnish a justification for the institution of ouster proceedings. Mr. Fensky states that he will next ask Circuit Attorney Sager to institute proceedings.

Metropolitan Street Railway Equipping Closed Cars with Vestibules.—All the closed cars of the Metropolitan Street Railway, of New York, are being equipped with vestibules as rapidly as the parts can be obtained from the manufacturers. Already there are about 200 vestibuled cars in use and new cars are being equipped at the rate of 15 a day. By the time the open cars are again put into service it is expected that there will be at least 1,200 vestibuled cars in daily use. The rest of the cars will be equipped during the summer, so that the next year all the winter rolling stock of the surface lines will be vestibuled. The policy of the company, as stated by General Manager Oren Root, is to equip systematically a certain number of cars on each of its lines in order that at the earliest possible moment all the cars on night service may be vestibuled. The cars in night service on the more exposed lines are now entirely vestibuled. The work of equipment is being done, under the supervision of the company's engineers, in the barn headquarters of the several lines. Mr. Root said: "It is not the expense, which is, however, very large, but other considerations which have deterred the Metropolitan from adopting vestibules long ago. We recognize, of course, their many good points, and the increase of comfort their use brings to the motormen and conductors. But we have also considered the well-known fact that with vestibules the danger of accident is largely increased in any event; and, furthermore, that what is true of vestibuled cars in general can be said of them with much more force when New York city is concerned, for here we have a whole set of traffic problems that are met nowhere else in the world. If we have appeared to hesitate in regard to the adoption of vestibuled cars it is only because our doubts as to their availability for our use, considering the extraordinary conditions existing here, have been outweighed by our care for the welfare of the men."

Construction News

FRANCHISES.

Brooklyn, N. Y.—The Nassau Electric Railroad Company has been granted a franchise by the board of estimate for a surface line in Livingston street. This line, when built, will relieve the congestion in Fulton street caused by the construction work on the subway extension. The board also authorized the issuance of stock to the amount of \$49,000 for improvements in Livingston street. The company agrees to pay the city 3 per cent of its gross receipts with a surety deposit of \$10,000.

Carbondale, Ill.—The Southern Illinois Transit Company is applying for a franchise for an electric road from Carbondale through Murphysboro, Carterville, Herrin and Johnston City, Ill.

Cody, Wyo.—A franchise has been granted to the Northwest Wyoming Construction Company to build a broad-gauge electric railroad connecting the town of Cody with the terminus of the Burlington railroad across the river. The company will begin construction inside of six months. It is proposed to extend the line to the sulphur works near town, and in time to connect Cody with the adjoining small towns and ranching settlements. Tracks will also be run through the alleys so that loaded freight cars can be transferred from the Burlington to the warehouses in town.

Connersville, Ind.—The city council has granted a franchise to the Connersville Street Railway, of which R. N. Burgess is vice-president.

Fremont, O.—The city council has granted to Webb C. Hayes, John F. Worst and Frank Heim a 25-year franchise for a belt line street railway, said to be in the interest of the Toledo Port Clinton & Lakeside Electric Railway.

Louisville, Ky.—The Louisville Railway Company has been granted a franchise to use the Bardstown road for the extension of its line to Fern Creek.

Pittsburg, Pa.—The committee on routes of the Pittsburg city council's rapid transit commission has approved the proposed routes of the Pittsburg Subways Company, as provided in the original ordinance submitted by the company. The executive committee has also adopted recommendations as to the compensation to be paid the city in return for a 50-year franchise, as follows: City to receive 2 per cent of the gross earnings for the first 10 years, 5 per cent for the next 15 years, and for the next 25 years an amount to be fixed by a board of appraisers, consisting of the mayor, the president of the company and a third person. At the end of 50 years the city is to have the right to purchase at an appraised value, which shall represent the cost of construction and equipment less depreciation without regard to earning power. If the city does not desire to purchase the franchise shall be given to the company offering the most advantageous terms, which shall have the right to purchase the property on the same terms as the city. The company shall file an indemnity bond of \$500,000. President Lovejoy, of the Pittsburg Subways Company, has announced that these provisions are not entirely satisfactory.

Toledo, O.—The city council has granted a franchise to the Toledo Port Clinton & Lakeside Railway, of Toledo, for a branch line to the state rifle range.

St. Louis, Mo.—The St. Louis Fern Ridge & Western Railroad has filed its acceptance to the modifications of its franchise with the county clerk. Its bond of \$5,000, required by the county court, was also filed. The company has a franchise to build a road from the city limits to Etzel avenue, west to the Olive street road, and out that thoroughfare to Studt's park, Creve Coeur lake. The promoters say that under the modified franchise no trouble will be encountered in financing the road. A great part of the amount required has been raised by the property owners along the route, who declare they will build the road at once.

St. Louis, Mo.—The Hillsboro Kimmswick & Southern Railway has been granted a 50-year franchise to build an electric line for freight and passenger traffic on the Lemay Ferry road from the southern city limits to the Meramec river with the following provisions: Freight may be carried from 8 a. m. to 6 p. m., but must not interfere with the passenger business; fare 5 cents; within 30 days from the acceptance of the franchise the company must file a bond for \$5,000 with the county and renew every five years, and within six months must be started on the line; a deposit of \$1,000 must be made to protect repairs on the roadway. W. Gutke, president; Lee A. Hall, secretary.

St. Louis, Mo.—The bill authorizing the St. Louis Electric Terminal Company to build single and double track lines in the city to give the Illinois Traction System terminal facilities in St. Louis, which has been before the municipal assembly for about six months, has been reported without recommendation by the committee on legislation. The bill will be considered by the assembly on January 29, at which time it is expected that several amendments will be offered.

San Francisco, Cal.—A franchise has been granted to the United Railroads of San Francisco for the extension of its Sixteenth street line, by the terms of which 3 per cent of the gross receipts for the first 5 years, 4 per cent for the next 10 years and 5 per cent for the last 10 years, goes to the city.

South Bend, Ind.—M. C. Welsh has been granted a franchise

by the county commissioners to construct an electric railway between South Bend and Raymond, Ind. It is stated the line will be built immediately and be in operation within a few months.

Spring Bay, Ill.—A franchise has been granted to the Chicago Milwaukee Peoria & St. Louis Railway Company for right of way through the village and a 40-foot frontage on Lake street. It is said that the company proposes to build an electric railway from Chicago to Peoria by way of Aurora, La Salle and Lacon, Ill. In return for the franchise the company will erect a depot at Spring Bay, the ground for which will be donated by Capt. C. A. Zellar, president of the village board. It is stated that the line will touch the towns of Magnolia, Hennepin and Lasant between Lacon and Spring Valley. H. F. Cherry, of Lacon, is interested.

Tacoma, Wash.—Merle G. Wightman and C. E. Muckler have accepted the franchise granted by the council on December 12 for an electric line between Tacoma and Seattle and have filed a check for \$1,000 with the city officials. The line must be in operation in two years.

Winterset, Ia.—A franchise has been granted to the Des Moines Winterset & Creston Electric Railway on the same terms as that granted at Creston. The company has now secured 60 per cent of its right of way and has made arrangements for terminal facilities in Des Moines. W. D. Skinner, of Des Moines, president.

INCORPORATIONS.

Central Interurban Traction Company.—Incorporated in Missouri to build electric railways in St. Louis to connect with the Hillsboro Kimmswick & Southern Electric Railway, incorporated last year by the same interests to build from St. Louis to Flat River. Capital stock \$50,000. Incorporators: Charles A. Gutke and John A. Laird, of St. Louis, and others. The company has applied for franchise in St. Louis over a route paralleling several of the lines of the United Railway on the south side of the city. A three-cent fare is stipulated.

Citizens' Railway Company.—Incorporated in Illinois to take over a line about a mile long running from State and Senate streets, Venice, Ill., to the Mississippi river, which has been purchased by the Illinois Traction Company from C. M. Clark, of Philadelphia. Capital stock, \$5,000. Incorporators: B. L. Bramble, C. A. Wright and C. E. Cox, all of Champaign, Ill.

Corn Belt Traction Company.—Incorporated in Illinois to build and operate an electric line between Bloomington and Champaign through McLean, Dewitt, Platt and Champaign counties. It is said the road has been surveyed as far as Leroy and will follow the general line of the Big Four Railroad. Capital stock, \$100,000. Incorporators, William McKinley, Peter W. Moore and Earl D. Riddle, of Leroy; Lewis B. Thomas and Henry C. Larsh of Bloomington, Ill. Officials of the Illinois Traction Company disclaim all knowledge of this company.

Detroit Jackson & Chicago Railway.—Incorporated in Michigan to take over the Detroit Ypsilanti Ann Arbor & Jackson Railway for the Detroit United Railway. Capital stock \$25,000. Incorporators: F. W. Brooks, Joseph Bampton, A. E. Peters, A. F. Edwards and Irwin Fullerton, all associated with the Detroit United Railway.

Ithaca-Seneca Falls Electric Interurban Railway.—Incorporated in New York to build an electric road with a capital stock of \$1,000,000 of which \$100,000 will be raised by local subscription. Officers: President, Jacob Rothchild, Ithaca; vice-president, C. S. Hood, Seneca Falls; secretary, J. N. Hammond, Seneca Falls; treasurer, F. M. Bush, Ithaca. Directors: Thomas J. Clary and Ole Williams, Seneca Falls; F. L. Hawes, Ithaca; William P. Biggs, Trumansburg; Ogden Wheeler, Romulus.

Nevada Mason & Los Angeles Railway.—Incorporated in Nevada with a capital stock of \$1,000,000 to build an electric railway from Wellington to Nahuaka, Nev. President Newton Evans, of Los Angeles, Cal.; secretary, F. W. Fairbanks; treasurer, J. G. Kaufman.

Seashore Municipal Railroad.—Incorporated at Albany, N. Y., to construct a five-mile electric road from Hempstead to East Rockaway, Nassau county. Capital stock \$150,000. Incorporators: P. E. Ames, Long Beach, M. H. Day, Brooklyn and H. E. Briatol, Rockville Center, N. Y.

South Carolina Public Service Corporation.—Incorporated in South Carolina to build an electric line in South and North Carolina and Georgia. Mr. Lawrence M. Pinckney, a representative of the company, has given out a general statement concerning the plans which are practically as follows: The road will extend from Charleston to Columbia, S. C., branching to Springfield and Alken, S. C., and Augusta, Ga. The northern division will run from Columbia by way of Winnsboro, Chester, and Rock Hill to Charlotte, N. C.; the western division by way of Lexington, Saluda, Greenwood, Anderson and Abbeville to Greenville. From the latter point the road will form a loop by way of Spartanburg and Union to a junction with the northern division at Chester. Another division will also start from Saluda and run to Newberry, Clinton and Laurens, S. C. The interurban passenger traffic will be handled by four large motor cars while the through passenger traffic will be cared for by express trains made up of two or more coaches with the multiple-unit system of control. The freight traffic will be handled in ordinary steam railroad freight cars for purposes of interchanging with steam roads. Electric locomotives similar to those used on recently electrified steam lines will be

the motive power. There will be three or more water-power stations and a steam plant near Charleston which will generate current at 33,000 volts. This will be transmitted by the high-tension transmission line to substations along the line where it will be stepped down to pressures suitable for the operation of cars and for sale to municipalities and industrial enterprises for lighting, heating and power purposes. The company is capitalized at \$10,000,000 and has general offices at 51-53 Broad street, New York. The officers are: President, Joseph J. Timmes; vice-president and general manager, Charles R. Van Etten; secretary and treasurer, John P. Bonney. Directors: Joseph J. Timmes, C. R. Van Etten, John P. Bonney, Joseph Bermei, Lawrence M. Pinckney, John C. Lott, Dow S. Smith, Frederick W. Schroeder and Robert H. Jennings.

Staten Island Midland Railway.—Incorporated in New York as a reorganization of the Staten Island Midland Railroad, of Stapleton, N. Y., which is now in the hands of receivers, S. F. Hazlet and Eugene B. Howell, 26 Broadway, New York. Capital stock \$1,000,000. Incorporators: Isaac A. Levy, M. K. Katz, and Joseph G. Switzer, of New York.

Waupaca-Green Bay Railway.—Incorporated in Wisconsin to build a line from Waupaca to Scandinavia, 11 miles. Capital stock \$150,000. Incorporators, A. G. Nelson, A. M. Penney and John Gordon, Waupaca; A. Aggerback and W. B. Johnson, Chicago.

Wisconsin Electric Railway.—Incorporated in Wisconsin with large powers to build, acquire and operate electric railways, lighting plants and other public service properties. Capital stock, \$50,000.

TRACK AND ROADWAY.

Brownsville Masontown & Smithfield Electric Railway.—This company has surveyed its line from Masontown, Pa., west to Riverview; also from Masontown north via Lardin to Edenborn, Lambert and Brownsville; and from Masontown via Martin to New Geneva, a total of about 15 miles, through a new coke country. W. J. Sheldon, of McKeesport, is president; E. L. Schmidt is chief engineer, and C. A. Smith, superintendent of construction. Capital stock \$150,000. Right of way has been secured for five miles.

Chihuahua, Mex.—The company owning the street railway system of Chihuahua, Mexico, which is now being operated by horse-power, will shortly change to electricity, using the overhead trolley system. Bids will be received in the near future for cars, rails, overhead fixtures, and machinery for the power plant. A liberal concession has been granted the company by the state government, and under this concession the company proposes to construct 20 miles of line, half of which will be constructed as soon as material can be obtained and the balance as traffic demands it. The gauge of the track will be 4 ft. 8½ ins., and 80-pound T-rails will be used. A. C. Nash is general manager.

Cincinnati Georgetown & Portsmouth Railroad.—It is reported that a contract has been let to Thomas Daulton, of West Union, O., for an extension from Russellville to West Union, 14 miles. H. Baluss, general superintendent, Cincinnati, O.

Columbus Delaware & Marion Railway.—This company has resumed work on its Bucyrus extension in Crawford county and expects to have cars running on the new line by July 1. There are still several pieces of right of way to secure in Marion county and when this is done work will commence on the Marion end of the extension.

Elgin & Belvidere Electric Railway.—The line from Elgin to Belvidere, 36 miles, was put in operation on January 12, when a party of officials and guests made a trial trip from Rockford to Elgin over the new line and the Rockford & Interurban Railway. Regular service will be started in a few days, as the track is in good shape. The cars will enter Elgin for the present over the Aurora Elgin & Chicago tracks. A continuous trip is now possible from Chicago to Freeport. Hamilton Browne, of Geneva, Ill., is president; George F. Faber, of Marengo, Ill., is superintendent.

Elk Street Railway.—W. S. Ravenscraft, Ridgway, Pa., is president of a company, which proposes to build an electric railway from Johnsonburg to St. Mary's, Elk county, Pa., 18 miles. The capital stock of the company is \$500,000.

Hamilton Radial Electric Company.—This company has applied to the Canadian parliament for authority to build electric railways from Hamilton to Toronto, Ont.; from Hamilton to the Niagara river and across a bridge to a point between Niagara Falls and Ft. Erie; from Brantford to Woodstock and Windsor; and to construct a ferry across the Detroit river.

Hickman, Ky.—Archer & Short, electric railway promoters, are making the preliminary arrangements for building an electric interurban road from Hickman via Union City, Fulton, Clinton and Mayfield to Paducah, Ky.

Houston Electric Company.—Manager David Daly, of Houston, has announced that the Stone & Webster Engineering Corporation has appropriated \$478,000 for extensions and improvements to be made in Houston during the present year. This work as outlined by Mr. Daly includes rebuilding many of the lines with the heaviest type of girder rail, and the reconstruction of much of the overhead work. Heavier trolley wire will be strung in some places, new feeder wires will be installed and some of the span wire construction is to be replaced by brackets. New curves, switches and special work are to be installed.

Jackson (Miss.) Railway Light & Power Company.—This company laid 7 miles of new track during 1906 and is planning to lay about two more miles the present year. 75-pound T-rails laid in rock ballast have been adopted as standard construction on this system.

Kanauga Traction Company.—This company has made surveys and has secured the right of way for its proposed line from Gallipolis, O., to Kanauga, W. Va., with branches. M. K. Duty, of Pennsboro, W. Va., is president.

Lake Superior Railway Construction Company.—This company, recently incorporated to build an electric railway from Marquette to Negaunee, Mich., has completed much of the preliminary work on the project and all the stock has been subscribed. Negotiations are now being made for terminal facilities, with the Marquette City & Presque Isle Railway and with the Negaunee & Ishpeming Railway. The city council of Marquette has been requested to appoint a committee to confer with the company in regard to a franchise.

Leroy & Southwestern Railroad.—It is reported that the Southern Construction Company and the Merchants' Bank, of Jackson, Miss., have purchased the entire issue of \$400,000 bonds of this road and will immediately begin the construction of 35 miles of road, between Bloomington and Leroy, Ill. Strang gasoline electric motor cars are to be used and the road is to handle both freight and passengers. A. H. Shelby, president, Bloomington, Ill.

Nauvoo, Ill.—Buffalo capitalists are reported to have made a proposition to build an electric line from Nauvoo to Niota, Ill., if the city will furnish the right of way on the streets, ground for a power house and car barns, and an electric lighting franchise.

Omaha & Council Bluffs Street Railway.—Vice-president G. W. Wattles has announced that it has been definitely decided to build a line from Omaha to the Iowa School for the Deaf. Some of the material has been ordered and work is to begin as soon as the weather will permit. It has also been decided to build an interurban line, the route of which has not yet been given out.

Omaha Lincoln & Beatrice Railway.—Construction material is being shipped for the tracklaying on the line between South Omaha and Sarpy Mills, Neb., which was graded last fall, and it is stated that work will begin about February 1. E. C. Hurd, general manager, Lincoln, Neb.

Richmond & Chesapeake Bay Railway.—This company, which is building from Ashland to Richmond, Va., has nearly completed the reinforced concrete viaduct over which the tracks will enter the city of Richmond. The viaduct when completed will be 2,810 feet long, and will run from Shedd street across Bacon and Oak streets, thence across the Seaboard Air Line Railway over to Moore street, and thence crossing respectively Williams, Leigh, Catherine, Clay and Marshall streets, and terminating about the middle of the block between Marshall and Broad. The height of the bridge at the Seaboard Air Line crossing and over the Bacon Quarter Branch will be about 67 feet. The greatest clear span will be 67 feet 4 inches. John T. Wilson has the contract and the work is about 95 per cent completed. Frank J. Gould, of New York, is president. C. P. E. Burgwyn, of Richmond, chief engineer.

Richmond, Ind.—A number of prominent capitalists from Hamilton, O., together with several local men, held a conference on January 18 for the purpose of perfecting plans for building a traction road from Richmond to Hamilton, where connections will be made for service through to Cincinnati.

San Bernardino Valley Traction Company.—This company has secured the right of way and completed surveys for an extension from Colton to Riverside, Cal., 7 miles. A. C. Denman, Jr., of San Bernardino, Cal., is president and general manager.

Sandusky Norwalk & Mansfield Electric Railway.—Tracklaying between Plymouth and Shelby, O., was completed on January 19, thus completing the line from Norwalk to Mansfield. The first section of the line, from Norwalk to Plymouth, was put in operation last year. This line makes a through connection from Cleveland to Bucyrus, as it joins the Lake Shore Electric Railway and the Ohio Central Traction Company. As soon as crossings over the Baltimore & Ohio and Cleveland Cincinnati & Chicago & St. Louis tracks are put in and the remainder of the wires strung the line will be ready for operation. S. S. Burtsfield, of Toledo, is president and general manager.

San Francisco & Napa Valley Railway.—L. J. Perry, vice-president and general manager, Napa, Cal., writes that grading is in progress from Napa to St. Helena, Cal., 18 miles, with 12 miles completed, from Napa to Oakville. The route is entirely in Napa county and includes Yountville, Oakville, and Rutherford. Surveys have been made for an extension from St. Helena to Calistoga, 9 miles. The power house and substations are completed. The equipment is of the Westinghouse single-phase type. The over-head construction is of the catenary type. W. F. Botsford, president, Los Angeles, Cal., C. H. Wallace, chief engineer, Napa, Cal.

Southwest Missouri Railroad.—This company has filed with the county clerk at Carthage, Mo., plats and profiles for two extensions, from Duenweg to Joplin and from Villa Heights to Joplin. The line from Duenweg will complete a loop through Joplin, Webb City, Duenweg and Carterville. A. H. Rogers, president, Webb City, Mo.

Spokane & Inland Empire Railroad.—This company has placed an order with the Carnegie Steel Company for 7,000 tons of 60

and 70-pound rails to be used during the year for several extensions of the system, including the extension of the Spokane & Inland Railway from Palouse, Wash., to Moscow, Idaho, 16 miles, an extension of the Coeur d'Alene & Spokane Railway to Liberty Lake, Idaho, 2 miles, and possibly from Hayden Lake to Lake Pend d'Oreille, Idaho. It is also proposed to build a new line from Spokane south to the Nine Mile bridge if a pending franchise for a subway through the business district of Spokane is secured. Material for the completion of the Spokane & Inland Railway from Waverly to Colfax and Palouse, Wash., is being delivered on a former contract as the work progresses. Grant & Smith, of Spokane, has the contract. Jay P. Graves, president; A. M. Lupfer, chief engineer, both of Spokane.

Stranger Valley Electric Railway.—W. Laming and others, of Tonganoxie, Kan., are working on a project to build an electric railway from Kansas City to Topeka, via Tonganoxie and Lawrence. Surveys have been completed and much of the right of way has been purchased.

Toledo & Chicago Interurban Railway.—This company has begun condemnation proceedings to obtain the right of way for 9 miles of its proposed line from Auburn to Waterloo, Ind.

Tri-City Railway & Light Company.—General Manager J. F. Lardner, of Davenport, announces that the company intends to continue its plans for the rebuilding of the system, begun last year, for which J. G. White & Co. has the contract, until there is not a foot of old rail in either Rock Island or Moline. Right of way is now being secured under the title of the Moline Rock Island & Eastern Traction Company, a subsidiary organization, for an interurban line which will run from Silvis through Moline and Rock Island to a point in Mercer county 12 miles south of Milan. The exact objective point is not announced but it is promised to have 12 miles completed and in operation within 12 months from the time the essential rights are obtained.

Union Traction Company.—An official report from President D. H. Siggins, of Coffeyville, Kan., states that grading has been completed from Coffeyville to Independence, Kan., 20 miles, and that a line is being surveyed from Coffeyville to Cherryvale, 30 miles.

Utica, N. Y.—Henry J. Coggeshall is president of a company organized for the purpose of building an electric road from Clinton to Waterville, N. Y., and from Deansboro to Hamilton, via Oriskany Falls. The headquarters will be at Utica.

Vicksburg (Miss.) Railway & Light Company.—This company is rebuilding 4,000 feet of city track where paving is in progress. During the past year the company has built a two-mile extension to the National Military Park.

Waco, Tex.—It is stated that nearly all of the right of way has been secured for the proposed electric railway from Waco to Marlin and Temple, Tex., and that an engineer will arrive in a short time to begin the surveys. It is estimated that the line will cost \$1,000,000. Cleveland, O., capitalists are said to be backing the project.

POWER HOUSES AND SUBSTATIONS.

Fitchburg & Leominster Street Railway.—This company has recently equipped a new power plant at Mitchellville, Mass., as an auxiliary to the main power house at Fitchburg. At present the capacity of the auxiliary plant is 150 horsepower, but new machinery will be added to bring it up to 500 horsepower. W. W. Sargent, general manager, Fitchburg, Mass.

Gulfport & Mississippi Coast Traction Company.—This company is soon to install another turbine unit in its power house at Gulfport, Miss. The plant now has two 500-kilowatt Parsons turbines to care for the railway and power load but these are not of sufficient capacity to care for the rapidly increasing demand that is being made by commercial and lighting interests. The new unit is to be of 1,000 or 1,500 kilowatt capacity. The company is operating the street railway and lighting plant of the Gulfport Development Company and is constructing an interurban line from Biloxi via Gulfport and Pass Christian, 32 miles. The section from Gulfport to Beauvoir has been in operation for some time. F. B. McCutcheon, of Gulfport, chief engineer.

Houston Electric Company.—Manager David Daly has announced that \$75,000 has been appropriated for the installation of a new engine, generator, condenser and a 1,300-foot eight-inch artesian well at the power house in Houston. The unit will consist of a most recent type of the Crocker-Wheeler generator, direct connected to a Hamilton-Corliss engine. This installation will nearly double the capacity of the present street railway power station. The generator has already been shipped to Houston and the engine and miscellaneous equipment are expected to arrive early in February. In connection with the installation of the new generator, orders have been placed with the General Electric Company for several new switch panels which are to carry out the plans of the company in conjunction with the rearrangement and extensions to the feeder system. This will enable the power for the operation of the cars to be controlled and maintained in the most efficient manner. Bids are being received from local contractors for the installation of the artesian well, and within the next two weeks the contract will be awarded and work will commence on this eight-inch well. This well is to be driven to the 1,300-foot strata, at which depth the most satisfactory water for boiler purposes is obtained, and it is expected that a capacity of at least 250,000 gallons a day will be available.

Personal Mention

Mr. Harry Wherland has resigned as superintendent of transportation of the Spokane Traction Company, Spokane, Wash.

Mr. James T. Hutchings, superintendent of the electrical department of the Rochester, N. Y., Railway & Light Company, has been appointed assistant general manager.

Mr. J. E. Sewell has resigned as general manager of the Connecticut Railway & Lighting Company, of Waterbury, Conn., which was recently acquired by the Consolidated Railway.

Mr. R. W. Brown has been appointed superintendent of the Adrian Street Railway Company and agent for the Toledo & Western Railroad, with headquarters at Adrian, Mich., effective on February 1.

Mr. Harry G. Ault has been appointed soliciting passenger and freight agent of the Indiana Columbus & Eastern Traction Company, with headquarters at Columbus, O., with jurisdiction over the Columbus, Columbus & Springfield and Grove City divisions.

Mr. Walter P. Read, who recently resigned as superintendent of railway service of the Utah Light & Railway Company after 17 years' service, was presented, on January 15, with a silver loving-cup as a token of esteem from his former associates, the employes of the company.

Mr. Arthur B. Smith, who was recently appointed traffic manager of the Consolidated Railway Company, which controls the electric lines of the New York New Haven & Hartford Railroad, was born in Boston, Mass. He received his education in New England. He entered railway service with the Chicago Burlington & Quincy Railway, at Omaha, Neb., and continued in the service of that company for 21 years, nine years in the engineering and maintenance of way departments and 12 years in the traffic department. In 1904 Mr. Smith became connected with the Yellowstone Park Association and a few months later entered the traffic department of the Northern Pacific Railway at St. Paul, Minn., as assistant general passenger agent, which position he has held up to the present time. His appointment in charge of the traffic of the Consolidated Railway becomes effective on February 1, after which date he will have headquarters in New Haven, Conn. The lines of which Mr. Smith takes charge embrace about 1,800 miles in southern New England and have an earning capacity of between \$16,000,000 and \$17,000,000 per annum, which is susceptible of considerable expansion.



A. B. Smith.

Mr. John H. Crawford, formerly superintendent and purchasing agent of the Groton & Stonington Street Railroad Company, Mystic, Conn., has been appointed superintendent of transportation for all the lines of the Ft. Wayne & Wabash Valley Traction Company, with headquarters at Ft. Wayne, Ind., succeeding Mr. C. F. Shelton, resigned.

Mr. J. A. Barry informs us that the announcement of his election as president of the Jamestown Chautauqua & Lake Erie Railway Company of Jamestown, N. Y., to succeed Mr. Frank L. Chase, as published in the Review for January 12, was an error. Mr. Joseph H. Mayer, of New York, was elected president. Mr. Barry is local manager at Jamestown.

Mr. W. H. Forse, assistant treasurer of the Indiana Union Traction Company, Anderson, Ind., has been appointed chairman of the Committee on Interurban Accounts of the American Street and Interurban Railway Accountants' Association. The other members of the committee are Mr. A. B. Bierck, auditor of the Long Island Railroad, New York, N. Y., and Mr. A. C. Henry, auditor of the Lake Shore Electric Railway, Norwalk, O.

Mr. Carl Alden Sylvester has been appointed assistant general manager of the Lexington & Boston Street Railway, Newton Street Railway, Norumbega Park Company, Newton & Boston Street Railway, Natick & Cochituate Street Railway and the Westboro & Hopkinton Street Railway, all controlled by the Boston Suburban Electric Companies, with headquarters at Newtonville, Mass. Mr. Sylvester has been heretofore assistant to Mr. M. C. Brush, vice-president and general manager of these companies.

Mr. M. R. Dickey has been appointed auditor of the Toledo & Western Railroad Company, effective February 1, succeeding Mr. C. E. French, resigned. Other recent appointments are as follows: Mr. T. V. Franklin, purchasing and freight claim agent and chief clerk to the president, Mr. A. L. Bennett, trainmaster,

Mr. R. L. Harrison, superintendent of telegraph and chief dispatcher. The jurisdiction of Mr. Ira P. Schofield, superintendent of motive power and equipment, and J. S. Delter, roadmaster, has been extended over the lines of the Adrian Street Railway Company; all with headquarters at Sylvania, O.

Mr. Theodore Perry Shonts, president of the Isthmian Canal Commission, in charge of the Panama Canal construction, and president of the Toledo St. Louis & Western Railroad, has been elected president of the Interborough-Metropolitan Company, of New York, N. Y., succeeding Mr. August Belmont. The Interborough-Metropolitan controls the New York City Railway and the Interborough Rapid Transit Company, and through them practically all of the subway, elevated and surface street railway lines in New York City. Mr. Belmont will remain as chairman of the board of directors of the various subsidiary companies composing the system. Mr. John B. McDonald has been elected vice-president and superintendent of construction of the Interborough-Metropolitan and Mr. E. P. Bryan, vice-president of the Interborough Rapid Transit Company, has been elected president of that company, in place of Mr. Belmont. Mr. Shonts' resignation as president of the canal commission has been accepted by President Roosevelt, to become effective on March 4, and he will not assume the active duties of his new office until that time. He was born in Crawford county, Pa., in 1856, and graduated from Monmouth College in 1876 with the degree of B. A. In 1879 he received the degree of M. A. from the same college. He entered railway service in July, 1881, as superintendent of the Iowa Construction Company and from May, 1882, to January, 1902, he was connected with the Indiana Illinois & Iowa Railroad, successively as general superintendent, general manager and president and general manager. On January 15, 1904, he was elected president and general manager of the Toledo St. Louis & Western and since April, 1905, he has been also president of the Isthmian Canal Commission and president of the Panama Railroad.

Financial News

Cleveland & Southwestern Traction Company.—The annual meeting was held on January 15. President F. T. Pomeroy, in his annual report to the stockholders, submitted figures showing that the gross receipts of the company for the calendar year were \$645,849, an increase over 1905 of \$102,623. Net earnings were \$363,856, a gain of \$53,020. During the year the company purchased 15 new cars which, including the 15 purchased the year before, made a total new investment in rolling stock of \$225,000. The stockholders re-elected former directors, and voted approval of the acts of directors in important steps recently taken for the enlargement of the system.

Cleveland Southwestern & Columbus Railway.—The directors of the Cleveland & Southwestern Traction Company, who are working out the details for a consolidation of that company with the Cleveland Ashland & Mansfield Traction Company and the Ohio Central Traction Company, have decided on the above name for the merger company, which indicates the intention of extending ultimately to Columbus, either by building new lines or acquiring existing roads. The three lines to be merged, which are owned by the same interests, form a continuous line from Cleveland via Ashland, Mansfield and Galion to Bucyrus. The capital stock of the new company will be \$10,000,000, with a bond issue of \$10,000,000.

Indianapolis Columbus & Southern Traction Company.—At the recent annual meeting the officers and directors were all re-elected.

Louisville & Eastern Railroad.—At the recent annual meeting two new directors were elected, James Lippincott, of Philadelphia, and Davis Brown, of Louisville. The other directors and the officers were all re-elected. It was announced that the extension from Louisville to Lagrange, Ky., should be completed in a month and the line to Shelbyville in October or November. Percival Moore, of Louisville, is president.

Northern Indiana Railway.—It is stated that the deal was completed in New York last week whereby this company has been transferred to the Dietrich syndicate, of New York, the Murdock brothers of Lafayette, Ind., Ex-governor Durbin of Indiana and Hugh J. McGowan, of Indianapolis. The price is said to have been \$1,000,000. The Northern Indiana Railway runs from Goshen, through Elkhart and South Bend to Hudson lake, and from Laporte, to Michigan City. It is said to be the intention of the new owners to build a line direct from South Bend to Chicago by way of Michigan City. In addition, the local systems in the cities through which the line is to be built will be reconstructed and put in first-class condition.

Northern Ohio Traction & Light Company.—The annual meeting was held at Akron, O., on January 13. The officers and directors were all re-elected. The report of President Everett gave a detailed statement of the transaction whereby the company purchased the Canton-Akron Railway, the Canton-New Philadelphia Railway and the Tuscarawas Traction Company from the Tucker Anthony syndicate of Boston. This added 97.41 miles of track to the system, making the total mileage at the close of the year 294.12 miles, which is exclusive of the Wadsworth extension not yet completed, which will amount to six miles. This will be completed by the first of March. At the close of the year the com-

pany was absolutely free of debt. The annual report for the calendar year, 1906, as compared with the previous year, is as follows:

	1905	1906	Increase
Gross receipts	\$1,560,047.11	\$1,703,399.98	\$143,352.87
Operating expenses	900,718.93	1,006,802.31	106,123.38
Net earnings	659,328.18	696,597.67	37,229.49
Interest		483,173.85	
Surplus		213,423.82	

Rochester & Eastern Rapid Railway.—At the annual meeting in New York last week it was decided to remove the auditing and accounting offices from Canandaigua to Rochester, N. Y. The officers elected were as follows: President, Horace E. Andrews; vice-president, W. K. Vanderbilt, Jr.; secretary, J. C. Collins; assistant secretary and auditor, A. L. Linn, Jr.; treasurer, E. L. Rossiter; assistant treasurer, C. A. Tucker.

Rochester Railway.—At the annual meeting in Rochester last week John J. Stanley, and W. N. Kernan were elected directors in place of C. J. Bissell, and A. G. Hodenpyle. Officers were elected as follows: President, Horace E. Andrews; vice-presidents, William K. Vanderbilt, Jr., John J. Stanley, R. E. Danforth; secretary and auditor, J. C. Collins; treasurer, E. L. Rossiter; assistant treasurer, C. A. Tucker; assistant secretary and general auditor, A. L. Linn, Jr.; general manager R. E. Danforth. The company is controlled by the Rochester Railway & Light Company.

Rochester Railway & Light Company.—At the annual meeting of the stockholders at Rochester, N. Y., last week Charles T. Chapin was elected a director in place of H. D. Walbridge. The other directors were re-elected. The directors elected the following officers: President, Horace E. Andrews, Cleveland, O.; vice-presidents, G. A. Hollister and W. K. Vanderbilt, Jr.; secretary and auditor, J. C. Collins, Rochester; treasurer, E. L. Rossiter; assistant treasurer, C. A. Tucker; general auditor and assistant secretary, A. L. Linn, Jr.; general manager, R. M. Searle; assistant general manager, James T. Hutchings; members of executive committee, John Carstensen, W. C. Brown, G. A. Hollister, W. K. Vanderbilt, Jr., and John J. Stanley. The company is controlled by the Mohawk Valley Company, of New York.

Toledo & Western Railway.—This company which was recently purchased by a syndicate headed by J. R. Nutt, of Cleveland, has been refinanced. The capital stock has been authorized at \$2,000,000 and the bonds at \$2,000,000. Of these bonds \$1,250,000 are a first mortgage on the original Toledo & Western property. Another \$250,000 are a first mortgage on the Toledo Fayette & Western division. The remaining \$500,000 are a second mortgage on the combined properties. This last mortgage was originally authorized for \$2,500,000, of which \$1,500,000 were held in escrow for the underlying bonds, \$500,000 set aside for improvements and to pay floating debt and \$500,000 were to remain for future improvements. This mortgage, however, has been closed, and bonds to the extent of \$500,000 cancelled. No more bonds can therefore be issued under the present mortgage. The company has about 78 miles of track on a private right of way and the balance of the system is operated under franchises, either for thirty years or with no time limit whatever. The floating debt will be paid with the proceeds of the \$500,000 second mortgage bonds mentioned in the foregoing, leaving the \$2,000,000 stock in the hands of the Nutt syndicate. C. F. Franklin, Sylvania, O., president.

Toledo Railways & Light Company.—The annual meeting of the Toledo Railways & Light Company was held at Toledo on January 17 and the directors and officers were all re-elected. The stockholders authorized the lease of the Toledo Ottawa Beach & Northern Railway, which extends from the Casino to Ottawa Beach, and which will be operated as a part of the Rail-Light system. The annual report submitted to the stockholders by President Henry A. Everett shows that the gross receipts of the company for the year 1906 were \$2,047,610.75, being an increase over 1905 of \$134,154.69. The operating expenses were \$1,071,733.33, 52.34 per cent. Interest charges on funded and floating debt were \$509,607.12, leaving a net income of \$466,230.30, 3.89 per cent on the capital stock of the company. The following comparative statement of gross earnings of the properties now owned by the Toledo Railways & Light Company for the years 1897 to 1906, inclusive, shows not only the wonderful growth of street traffic in Toledo, but is a fair index of the growth of the city itself:

	Gross earnings.	Per cent increase.
1897	\$ 897,361.06	
1898	968,516.59	7.93
1899	1,069,279.88	10.40
1900	1,182,516.83	10.59
1901	1,311,084.25	10.88
1902	1,459,091.39	11.29
1903	1,663,794.03	14.03
1904	1,752,833.67	5.35
1905	1,913,456.06	9.17
1906	2,047,610.75	7.01

The bonded indebtedness of the company is now \$10,866,000. During 1906 there was operated 107.64 miles of track, earning \$1,536,524.64, being earnings per mile of track, \$14,274.66.

United Traction Company (Albany, N. Y.)—This company has purchased the Forest Park Railway, of Troy, N. Y., which was building a 2-mile road from Troy to Forest Park cemetery, and will complete the construction of the line. E. S. Fassett, general manager, Albany.

Manufactures and Supplies

ROLLING STOCK.

Rockford & Interurban Railway, Rockford, Ill., is building two interurban cars in its own shops.

Cincinnati Milford & Loveland Traction, Cincinnati, O., is getting prices on one new equipment.

Western Ohio Railway, Lima, O., expects to place an order next week for 10 or 12 interurban cars.

Worcester Consolidated Street Railway, Worcester, Mass., is in the market for 25 new equipments.

East St. Louis & Suburban Railway, East St. Louis, Ill., has placed an order with the Inter-State Car Company for 200 wooden coal cars of 80,000 pounds capacity.

Ferrocarriles del Distrito Federal, Mexico City, Mex., operated by the Mexico Electric Tramways, Ltd., has ordered 25 double truck cars from the St. Louis Car Company.

Southern Light & Traction Company, Natchez, Miss., will purchase three or four cars during the coming summer. The specifications for the cars have not yet been approved.

Detroit United Railway, Detroit, Mich., has placed an order with the Cincinnati Car Company for 50 large double-truck cars for city service and 10 interurban cars.

Oklahoma City Railway Company, Oklahoma City, Okla., is reported to be building seven new cars at its own shops, four of which are for interurban service and three for city service.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis., is having 10 cars built by the St. Louis Car Company. These cars will have a steel floor plate and underframe reinforced with steel.

Ft. Wayne & Wabash Valley Traction Company, Ft. Wayne, Ind., has recently placed an order with the Cincinnati Car Company for six semi-convertible cars to be used on the city lines in LaFayette, Ind.

West Chester Street Railway, Philadelphia, has placed an order with the J. G. Brill Company for three 50-foot double-truck compartment cars of the semi-convertible type, each having four G. E. motors of 40 horsepower.

Chicago & Milwaukee Electric Railway, Chicago, has placed an order with the Jewett Car Company for 20 interurban cars, 10 of which are for May and 10 for September delivery. These are duplicates of cars now in use on this line.

Memphis Street Railway, Memphis, Tenn., was reported in the Electric Railway Review of January 19 as soon to order 25 new cars for early delivery. We are informed that these will be 42-foot cars with bodies 30 feet long, full vestibuled and equipped with airbrakes and four-motor equipments.

Citizens' Railway Company, Lincoln, Neb., was reported in our columns last week as about to order six new cars. We are informed that an order has been placed for eight single-truck, full-convertible cars of the Brill patented type, with 20-foot bodies, vestibuled, mounted on 21 E Brill trucks and equipped with G E 54 motors and K 10 controllers.

Peoria Railway, Peoria, Ill., has ordered 15 cars from the American Car Company for city service. These cars are to be 43 feet long, equipped with airbrakes, electric heaters, pilot, interior finish of cherry and mahogany, rattan seats, and are for delivery on June 1. A lining throughout with steel as a safeguard in case of accident is a special feature of these cars.

Spokane Traction Company, Spokane, Wash., was reported in the Electric Railway Review of January 19 as having ordered ten cars. This order has been increased to 15 cars to be built by the St. Louis Car Company, all of which are for March delivery. They are of the Detroit type, 41 feet in length, will have a seating capacity for 125 persons, and will be equipped with four motors of 40 horsepower each.

Terre Haute Traction & Light Company has placed an order for 8 interurban cars with the Jewett Car Company. The specifications include the following:

Seating capacity	60 persons	Height—	
Weight	70,000 lbs.	Inside	7 ft. 7 1/4 in.
Length, over vestibule	50 ft.	Sill to trolley base	8 ft. 5 1/2 in.
Over all	51 ft. 6 in.	Track to trolley base	12 ft. 6 in.
Width, over all	8 ft. 5 in.	Body	Wood

Special Equipment.

Airbrakes	Westinghouse	Journal boxes	Symington
Center bearings	Symington	Markers	Lintern
Control system	G. E. multiple unit	Motors, type and number	G. E. 73-4
Destination signs	Van Dorn	Paint	Paint. Green body, white upper
Fenders	Hunter	Sanders	Nichols-Lintern air
Gongs	Pilots	Heywood Bros. & Wakefield	Trolley poles and attachments
Heating system	Multiple stroke	Wilson retrievers	
Headlights	Hot water	Trucks	Baldwin
Interior finish	Crouse-Hinds		
	Natural oak		

Norfolk & Portsmouth Traction Company has ordered twenty double-track motor passenger cars, one double-track motor passenger and baggage car, two closed trallers, six, 14-bench open trail cars and one freight motor, of the J. G. Brill Company, for

the Norfolk Railway division and twenty 14-bench open trail cars, all having double trucks, of the J. G. Brill Company, for the use of the Norfolk & Atlantic Terminal Company.

Gulfport & Mississippi Coast Traction Company, Biloxi, Miss., will purchase four or five cars at an early date. It is proposed to build two single-truck cars for use on the city lines at Gulfport and the balance will be double-truck cars for interurban service.

Eastern Wisconsin Railway & Light Company, Fond du Lac, Wis., has placed an order with the Cincinnati Car Company for three 40-foot cars. They are of the semi-convertible type, can be used for either city or interurban service, being geared for 40 miles an hour. They will be equipped with quadruple Westinghouse 101 B motors, K 28 controllers, Brill 27 G trucks, Peacock brakes, Root scrapers and will be heated by hot water.

SHOPS AND BUILDINGS.

Anderson (S. C.) Traction Company.—This company is preparing plans for a large modern car barn and machine shop at Anderson, to cost about \$3,000, which will accommodate all of the company's cars, both city and interurban. The building will be of corrugated iron and mill construction. Work has commenced on the foundations. George E. Coughlin, of Anderson, is general manager.

Consolidated Railway.—This company has contracted for the construction of a 100 by 114-foot addition to its car house at Oxford, Mass., which will make the building 280x114 feet when completed.

Louisville & Eastern Railroad.—The directors at the recent annual meeting approved the plans for the erection of a terminal station in the central part of Louisville, Ky., and negotiations are being made for the purchase of a piece of property near Fifth and Jefferson streets. The Lagrange and Shelbyville extensions are to be completed this year and for that reason the present station at Fifth and Green streets will soon prove inadequate. Percival Moore, president and general manager, Louisville, Ky.

Mobile Light & Railroad Company.—A contract has been let to the Interstate Construction Company for the construction of a car shed at Monroe Park, Mobile, Ala. The building will be of reinforced concrete, 225 by 47 feet. A contract has also been awarded for a frame car barn with cement floor at the southern end of Monroe Park, to S. E. Dupree & Co. This will be 176 by 46 feet.

Walla Walla Valley Traction Company.—This company has commenced the construction of a brick car house and machine shops at Walla Walla, Wash., which will cost in the neighborhood of \$7,500 and will accommodate from 8 to 10 cars.

TRADE NOTES.

Standard Underground Cable Company, Pittsburg, Pa., has recently opened branch offices at Atlanta, Ga., and Seattle, Wash.

Falkenau Electrical Construction Company, Chicago, has been incorporated with a capital of \$20,000. The incorporators are: Victor Falkenau, W. A. Burroughs, and H. A. Strauss.

Pneumatic Machine Manufacturing Company has been incorporated in New Jersey with a capital of \$200,000, for the purpose of manufacturing pneumatic tools of various kinds. The incorporators are New York people.

Crane Company, Chicago, announces that it now has its new steel foundry in full working order. The company will make a specialty in this department of steel valves and fittings and these additional facilities are such that orders can be filled promptly.

R. Woodman Manufacturing & Supply Company, Boston, reports a very busy season. It has become necessary to work a night force of men in order to keep up with the increasing demand for its goods. Money orders are being received from foreign countries.

S. J. Collins has accepted a position with the Rail Joint Company of New York and Chicago. Mr. Collins was formerly with the Quincy, Manchester, Sargent Company, Chicago, prior to which time he was general superintendent of the eastern division of the Southern Railway.

Massachusetts Chemical Company, of Walpole, Mass., reports an unprecedented success for its No. 280 Dryfield cable tape during the last year. There is a great demand for this tape for street railway coils, and it is used in large quantities by manufacturers of cable and insulated wire. Increasing demands are reported for No. 50 insulating compound, which is a new permanent plastic armature and field coil varnish.

Colonel John T. Dickinson, who for the past several years has been connected with the Consolidated Railway Electric Lighting & Equipment Company, has tendered his resignation and accepted the position of vice-president of the Bilas Electric Car Lighting Company of Milwaukee. Colonel Dickinson's headquarters will be in New York at the new offices of the Bilas Electric Car Lighting Company in the Night & Day Bank Building, Fifth avenue and Forty-fourth street, opposite Sherry's and Delmonico's. The Chicago offices of the Bilas Electric Car Lighting Company will be in the Monadnock Building, and Mr. W. M. Lator, who was formerly also with the Consolidated Railway Electric Lighting & Equipment Company, will be in charge of the Chicago office as assistant general sales manager. The extensive additions to the large plant of the Bilas Electric Car Lighting Company in Milwaukee will be completed by February 1, which will afford ample

facilities for the manufacture and prompt delivery of electric car lighting and train lighting equipment batteries and supplies.

American Car & Foundry Company, St. Louis, has appointed Joseph G. Johnston district manager at Detroit, Mich., and Patrick H. Sullivan assistant district manager to succeed Wesley R. Mason, who was recently appointed general manager of the Dominion Car & Foundry Company with headquarters at Montreal. Both Mr. Johnston and Mr. Sullivan have been in the employ of the company for over 20 years, Mr. Johnston being promoted from the office of superintendent and Mr. Sullivan from lumber inspector.

Charles N. Wood Company, 79 Milk street, Boston, Mass., the eastern representative of the International Register Company, reports that it has just delivered a complete equipment of badges for motormen and conductors of the Boston Elevated Railway. These are the well-known Heeren badges and are much larger in size than those formerly worn by these employees. The railway company wished to have a badge large enough so that all the passengers could see it at a distance. The badge of the motorman is made with a black ground and white letters; the conductor's has a white background with black letters. These badges were so conspicuous that the Boston Herald devoted a half column of its paper to complimenting the railway company on the change.

S. F. Bowser & Company, Incorporated, Fort Wayne, Ind., owing to a large increase in its business during the year 1906, a business which it states was 75 per cent greater than 1905 and three times larger than 1904, has found it necessary to open a branch office at 299 Broadway, New York City. This office will be in charge of W. T. Hatmaker, formerly manager of the mail order department of the Boston branch. The company states further that this is only one of the many additions that has been made in the past year and reports that the factory in Fort Wayne has been increased 125 per cent and the office accommodations at Fort Wayne have been quadrupled. The company has completed a new \$25,000 factory at Toronto, Can., and has added a large number of salesmen.

H. J. Lamborn has been appointed superintendent of power and plant of the Yale & Towne Manufacturing Company to succeed F. A. Waldron, who resigned about a year ago. Mr. Lamborn will have charge of all steam and electrical plants, the supervision of new buildings and the general care and repair of the plants. Mr. Lamborn is a graduate of the Towne Scientific School of the University of Pennsylvania in the course of mechanical engineering, since which time he has held various positions, which have given him a varied experience with mechanical matters. S. E. Dauchy, who has been acting superintendent of power and plant during the past year and for several years has held the position of assistant superintendent, will continue in the latter capacity under Mr. Lamborn.

Western Electric Company exhibited at its booth, at the Electrical Show at the Coliseum, Chicago, Ill., January 14-26, a very large and handsome water color painting of its new 110-acre plant at Hawthorne, Ill. This plant is equipped with modern labor-saving devices in the way of machinery for executing its work, and the general ground plans are arranged so as to minimize labor in the handling and assembling of the electrical apparatus manufactured. The exhibit included American transformers, Thomas high-tension insulators, Electros Insulating material, Western Electric Company's arc lamps and direct and alternating current motors, its series of multiple lamps for both alternating and direct current. The company makes a specialty of a direct current indestructible lamp, the magnets of which are wound with Delta-abeston magnet wire and will give a demonstration of the heat resisting qualities of this wire as compared with cotton-covered magnet wire. Another interesting feature was that of a series alternating equipment in full operation including switchboard, regulator and transformers. A new 1907 line of fan motors and a switchboard equipped with some recently perfected devices was also shown.

ADVERTISING LITERATURE.

David B. Crockett Company, Bridgeport, Conn.—This company, which is a maker of varnishes, has sent out to its friends an artistic calendar for 1907.

A. O. Schoonmaker, 221 Fulton St., New York.—A. O. Schoonmaker, who is the importer of India and Amber mica, has issued his price list of those materials for 1907.

Universal Portland Cement Company, Chicago.—This company has reprinted the second chapter of "Concrete, Plain and Reinforced," by Taylor & Thompson, and given it the title, "The Process of Concreting." The publication is handsomely bound and should be of material service to those interested in concrete work.

Sprague Electric Company, New York City, N. Y.—"The Electric Equipment of a Modern Hotel" is the title of an interesting illustrated bulletin issued by this company. The modern hotel referred to is the "Hotel Gotham" in New York and the equipment described includes that for electric light and power generation, the switch boards, electrical equipment for the laundry, for water service and for the vacuum cleaning system.

Wright Truck Company, 727 Walnut Street, Philadelphia, Pa.—A printed catalogue comprising principally engravings from working drawings showing two styles of trucks, which it is said can be constructed and repaired in an ordinary car shop without the use of costly dies or special tools. One of these is the equalizer type with rolled steel channel trunnions and sides, cast pedestals and

equalizers, springs placed apart and located adjacent to the journal boxes and spring hangers. The other is the pedestal spring type with rolled steel channel transoms and sides, cast steel pedestals with necks detachably secured upon the vertical ends of the channel side pieces and helical springs above each journal box designed to cushion the entire frame.

Cooper Hewitt Electric Company, New York.—A well-executed pamphlet, 7 by 10 inches, describes in some detail the conspicuous features of the Cooper Hewitt system of mercury vapor lamp lighting with illustrations showing its application in industrial uses.

L. S. Starrett Company, Athol, Mass.—A copy of the "Vicksburg American" containing an account of the manner in which a supposedly fool proof steel bar installed in the Warren county, Mississippi, jail was cut through in four hours by one of the company's No. 250, 12-inch hack saws.

Crouse-Hinds Company, Syracuse, N. Y.—"Just a Few Condulet Suggestions" is the title of two publications issued by this company. Both of these are constituted almost entirely of engravings from drawings illustrating the useful manner in which this company's various types of condulets may be used in wiring. The publications are not only an effective advertisement of the company's products, but contain many useful suggestions for those installing electrical equipment of all types.

Milliken Brothers (Inc.) New York.—This company is issuing a convenient handbook showing sections which its new steel mill at Milliken, S. I., is capable of rolling. The product of the plant at present consists of open-hearth I-beams, slabs, channels, angles, Z-bars, etc., and special attention is called to 18-inch channel sections, believed to be the largest channel now rolled. This section is intended specially for heavily-loaded columns and bridge chords where a large radius of gyration is essential to economy.

J. G. Brill Company, Philadelphia.—Volume 1, No. 1 of Brill's Magazine has been issued under date of January 15, 1907. It is published in the interest of J. G. Brill Company, Philadelphia; G. C. Kuhlman Car Company, Cleveland, O.; American Car Company, St. Louis; John Stephenson Company, Elizabeth, N. Y. The publication is standard size 6 by 9 inches with 24 pages replete with engravings from photographs and drawings. Various types of modern car construction are shown and described. The publication also deals with other rolling stock and rolling stock equipment.

General Electric Company, Schenectady, N. Y.—This company continues to publish its series of pamphlets descriptive of manufactures of its various departments. The recent publications of the railway department include Bulletin No. 4474 descriptive of GE-76 railway motor, which in general appearance is somewhat similar to the GE-66 box frame motor, but is more substantial in construction, has longer bearings and commutator, wearing surface for armature heads and seats for gear case lugs. The pamphlet describes the various parts in detail and presents characteristic curves. Bulletin No. 4479 describes the Toledo & Chicago interurban single-phase railway, the author of the paper being John R. Hewett.

WESTINGHOUSE 10,000-KILOWATT TURBO UNITS FOR BROOKLYN.

Electric generating units of 10,000-kw. capacity, complete in a single machine will soon be built to fulfill a contract recently executed between the Transit Development Company of Brooklyn, N. Y. and the Westinghouse Machine Company of Pittsburg. The new equipment will consist of five 10,000-kw. turbo-generator units and a large amount of converting, transforming and controlling apparatus, all to be manufactured by the Westinghouse interests.

The new unit will establish a new standard of compactness. The combined unit will measure approximately 48 feet, 6 inches in length, 15 feet in width and 12 feet 3 inches in height, above the floor level, equivalent to .075 square feet per kilowatt rated, or .049 square feet per kilowatt maximum. That a striking advance has been made within recent years toward securing greater compactness in prime movers is shown by the accompanying curves.

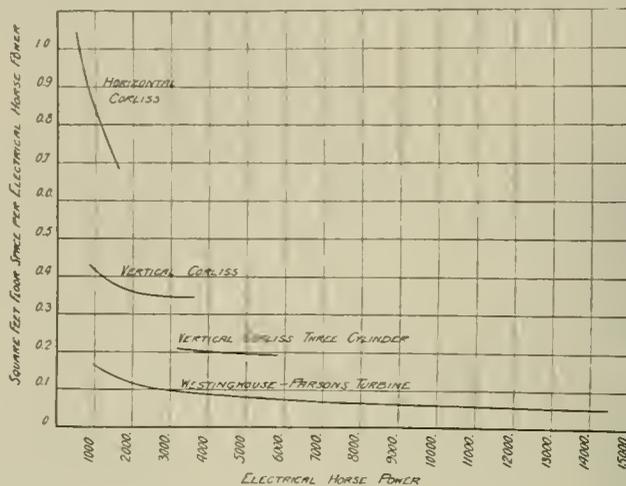
The turbine equipment is designed for a steam pressure of 175 pounds at the throttle, 100 degrees superheat and 28 inches vacuum. Under the assumed conditions of operation the units will sustain their full rated load continuously with a temperature rise of 35 degrees C. with the power factor ranging from 90 to 100 per cent. In the event of loss of vacuum, accidental or otherwise, the turbines will automatically "go to high pressure" carrying their full rated load without the assistance of a condenser. This feature will be obtained through the use of a secondary admission valve of construction similar to the primary valve and operated by the governor in such a manner as to automatically come into operation when the overload upon the machine reaches a certain point. The action of this valve is to raise the pressures in the various stages and thus increase the capacity of the machine. Speed variation may accurately be adjusted by a distant control mechanism attached to the governor and operated from the switchboard.

In the construction of the generator the standard rotating-field design will be employed with the frame entirely enclosed to facilitate forced ventilation and incidentally obviate the noise emanating from high-speed turbines. Current may be delivered at 6,600 or 11,000 volts pressure according to the method of connecting the windings.

A good feature of the horizontal-type turbine is the excellent disposition which may be made of the condensing apparatus. In spite of the compactness of these large units, the surface con-

denser will be located, as usual, directly beneath the turbines in the power house basement together with all of the condensing auxiliaries, thus giving a clear engine room floor. This arrangement likewise permits of affectively carrying out the "unit system" in power plant design which is so important in securing the best arrangement of the boiler plant.

It is significant that this new power equipment will be eventually installed in the new Kent Avenue station, Brooklyn, where two large turbine units made by the same builders and a third of another make, but similar design, have been in operation for



Horsepower—Area Curves for Prime Movers.

some time. This station then will be devoted entirely to turbine machinery.

A DISPLAY OF STORAGE BATTERIES AT THE CHICAGO ELECTRICAL SHOW.

The Electric Storage Battery Company, of Philadelphia, with a Chicago office at 1425 Marquette building, at the Chicago Electrical Show demonstrated the variety of batteries manufactured by it, ranging from a tank with a capacity of 4,800 amperes for one hour down to a cell with a capacity of 2½ amperes for one hour. All of these batteries are of the Chloride Accumulator type and include the R-73 elements in R-85 tank, 2,600 of which cells are now being installed by the New York Central & Hudson River Railroad Company in its electrification. Cells of this type will be used at the Gary, Ind., plant of the Indiana Steel Company now under construction. The G-51 tank is quite generally used by street railway companies through the country, and the other types shown were the F-21 for lighting and telephone work, both in wood tanks and in glass tanks; the F-15, E-13, D-7 and C-5, all in glass jars. The Electric Storage Battery Company also showed a number of its Exide batteries. This type of battery is used for automobile work, both for propulsion and ignition. A feature of the exhibit was the 7-33 Exide signal cell, 10,000 of which are in use on the Harriman lines.

The Electric Storage Battery Company makes a specialty of ear-lighting work and the exhibit included its two-compartment tank and a variety of accessories for railway ear lighting. In addition to the above this company exhibited its cell-filling device and its automatic-signaling hydrometer which is in operation. The company was represented by Charles Blizard, third vice-president, G. H. Atkin, manager of the Chicago office, and Messrs. J. M. S. Waring, district engineer, W. F. Bauer, W. F. Rath, H. B. Marshall, F. W. Hyde and George Neth.

ALLIS-CHALMERS COMPANY'S EXHIBIT AT THE ELECTRICAL SHOW.

The exhibit of the Allis-Chalmers Company, of Milwaukee, at Chicago's second annual electrical show, included a new 75-kw. self-contained AB alternating-current generator, a 10-hp. induction motor-generator set, a 15-hp. high-speed engine-generator unit, a line of new type K motors of 1 1/3 to 20 hp. for direct current, and six induction motors of from one to 20-hp. capacity. With the induction motors potential starters were shown for all sizes from five horsepower upward. A model showed both the movable and stationary rings of blading of a 500-kw. Allis-Chalmers steam turbine. The booth of the company was finished in the mission style and the company distributed catalogues, bulletins and other advertising matter showing electrical apparatus, steam engines, gas engines, hydraulic and steam turbines, saw mill machinery, pumping machinery, power-transmission machinery, timber-preserving machinery and other lines of machinery manufactured by it. The exhibit was in charge of C. A. Tupper and S. R. Kerr, assisted by J. W. Gardner, manager of Chicago district office of the Allis-Chalmers Company; W. S. Heger, assistant to the president; G. B. Foster, W. M. S. Miller, manager of the price department, and a number of salesmen, including Messrs. C. H. Melvey, C. S. Buell, Ervin Dryer, F. L. Webster, J. M. Denniston, E. R. Jacobs, D. K. Chadbourne, H. I. Keen, A. W. Catlin, L. St. J. Smith, P. C. Van Zandt, Geo. Voigt, L. M. Harvey, E. Timm and C. H. Howe.

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A feature to be considered in the selection of a site for a power plant which is worthy of very careful study is the purity of the water. While it is not of quite the same importance to have pure water for cooling as for the boiler feed, unlimited trouble may be caused through the corrosion of condenser tubes; or if the water

contains quantities of salts and solid matter which are difficult to settle or filter out, the efficiency of the condensing surface may be seriously affected through a deposit on the water side of the tubes. For these reasons in locating a plant, the engineers should thoroughly investigate any brook or river which might seem to be a favorable location. To do this the course of the stream should be followed up a considerable distance to ascertain what manufacturing plants are located on its banks, and the nature of any refuse which they may discharge into the stream. Having become assured that the nature of all wastes emptied into the stream is harmless, it would be well to have some samples of the water analyzed as a final precaution and to determine whether it will be suitable for boiler feeding as well as for condensing purposes. Much annoyance was recently caused a railway plant because these points were neglected. The trouble in this case was the excessive priming of the boilers and marked signs of corrosion. Upon investigation these were found to be caused by large quantities of fat which were dumped into the brook by a tannery a couple of miles up stream.

As has been pointed out in a recent paper by Mr. W. R. McRae, master mechanic of the Toronto Railway, too little attention is paid to the methods of keeping shop records of repairs made to the rolling stock. As he suggests, many of the repairs now made would be avoided if detailed records of all repairs were properly kept. It is highly probable that the same cars are too often run into the shops for repairs, because of the need of a thorough overhauling. This results in frequent car shortages as well as an additional number of reserve cars needed causing a direct loss to the company through interest on a new investment and the money wasted on unnecessary temporary repairs. Another point to which attention is called is the need for a perfect adjustment of the brushes, to the

lack of which most of the troubles with the motors can be traced. The life of both the brushes and commutator is increased by proper adjustment and it will be found an advantage to stagger the brushes on alternate brush arms, thus causing the commutator to wear more evenly and avoiding the usual ridges to be found on the average commutator. To secure the accurate angular spacing desirable, Mr. McRae has designed a jig on which all the brushholders, whether new or old, are mounted and spaced before being put on the motors, and no doubt the expense and trouble of this adjustment are fully warranted by the results obtained.

In a recent discussion of taxation in Michigan, Mr. Wallace Franklin, secretary and assistant treasurer, Grand Rapids Grand Haven & Muskegon Railway Company, says: "I am willing to make the prediction that as long as the taxes on electric lines in this state remain as high as they are now not a single electric line will be built within its borders for the next four years, no matter how many are planned on paper." In amplifying his prediction, Mr. Franklin says that eastern capitalists will not pay in taxes for the privilege of developing the state from 6 to 8 per cent of the gross earnings of properties. Two years ago the company with which he is connected paid for taxes 8 per cent of its gross receipts. The property was assessed at the rate of \$12,000 per mile and the right of way was assessed separately. The following year the state tax commission reduced the assessment to \$8,000 per mile, but this year it has been raised again to \$10,000. Mr. Franklin states: "We pay more taxes on a two-rod wide strip of land running through a farm of 160 acres than the owner of the place pays on the entire farm with all his improvements included." The company devoted to taxes in December, 1906, \$1,975, which was 6.4 per cent of the gross receipts for the month. Conditions in the money market make it difficult in these times to raise capital for new enterprises at a moderate rate of interest, and communities which encourage the construction of electric railway lines will find themselves better repaid by the natural developments which follow electric railways than if they squeeze exorbitant taxes from the companies. The benefits which accrue from intelligent electric railway construction are much greater than the comparatively slight return received by overburdening

companies with taxation. Mr. Franklin has done a public service in calling the attention of his community to this situation.

SOME FUNDAMENTAL CONSIDERATIONS IN DEPRECIATION.

If an individual buys a carriage he may, as occasion requires, paint it, varnish it, re-upholster, set new tires, replace a shaft or spring, and make other repairs, but there still remains a wear for which he does not provide. In time the carriage gets beyond its usefulness and he gets rid of it and buys a new one. If an accounting record was kept and the original cost still stands upon the books the amount of the new purchase cannot be added, for then there would show more property than is possessed. The new carriage has to be provided for as an expense. If the owner has been wise, he has cut down the value shown upon the books a little each year as the property wore out, so that what was received for the old carriage would cancel the account. Then the cost of the new carriage could properly be placed on the books as an original investment. Or, perhaps the owner has done better and each year, from his income, has put in the bank, at interest, a small sum, and when the old carriage had become worn out had an amount sufficient to buy the new one. In either case he has provided for the depreciation.

What is true in a simple illustration like this is equally true of as complex a property as an electric railway. And its complexity does not exempt the electric railway from depreciation or the need of providing for it. Complexity involves the problem, but the big, basic principle is the same. There is no use to wave aside the question of depreciation; it exists and must be considered. Every day's delay makes the consideration harder. The depreciation is going on and will make itself felt; it must be provided for and the earlier, the easier. In the youth of an art consideration of this matter seems unnecessary, but, no matter what the offsetting compensations, the time comes when further postponement presages sure trouble, and, if long continued, ruin.

It is true that in the electric railway art there have been many offsetting compensations and there are today—the great advance in the cost of materials used in the art, for instance. This has tended to keep the book value at a figure somewhat near the market price, less proper depreciation allowance. The industry profits today from that fact, but it cannot continue to do so indefinitely—nor, indeed, for long—and any attempt to take advantage of it much longer must ultimately result in reorganization. Suppose prices had gone the other way! Those managers and owners who regard the discussion of depreciation as a bugbear should realize that it must come; that “a stitch in time saves nine”; that consideration at this time gives a chance to approach the practical workings gradually instead of coming to the realization of the need with a sudden jar. One need not look far in any business to find instances where the awakening came too late, with the result of bankruptcy, reorganization, or “scaling down,” none of them pleasant occurrences.

To know whether or not net depreciation (that is, with appreciation allowed for) has occurred to require accounting, an accurate, impartial appraisal of the property is needed. If the total footing of this equals the total footing of the investment accounts, then depreciation has been offset and only the future need be provided for. So far as the appraisal value falls below the investment accounts the past management has erred and the future management should bear this burden in addition to its own.

Fundamentally, there are two methods of accounting for depreciation: (1) By a charge upon the earnings to provide for a liability account or a fund (asset), or by the lowering of asset accounts. (2) By charging sufficient

betterments and extensions or renewals to equal in amount the estimated depreciation. European practice in the industry preponderately favors the first method; so, for the most part, do manufacturing and general business concerns. There is excellent authority for the second, notably the American steam railways. The propriety of this so-called American theory is a new subject of investigation by the Interstate Commerce Commission.

Right here a word may be said about European methods which were discussed at some length in the *Electric Railway Review* for November, 1906. While these are enlightening and worthy of study, we are not to assume that a failure to follow foreign practice demonstrates that we are in the wrong. The method is purely incidental; the basic principle is the agreement between the value of the property as it exists and as it appears in the investment accounts. Many methods are different abroad. For instance, in English municipal undertakings the property is not considered as owned until all indebtedness is paid and, as in American town and city financing, a certain part of the debt is paid each year. However much greater the asset is than the amount outstanding against it, it cannot be further borrowed upon. It naturally follows that depreciation must be provided for under the first of the methods named.

It is this fact that caused Mr. G. W. Holford in his discussion of “Depreciation and Renewal Funds in Relation to Tramways Undertakings” (*Electric Railway Review*, November, 1906, page 906) to consider only the depreciation and renewal of permanent way, excluding rolling stock, buildings and overhead equipment on the ground that these portions of tramway equipment outlast the periods for the repayment of loans specified by the Board of Trade. In reply to an inquiry the assistant secretary (railway department) of the British Board of Trade, advises us that it is the practice of the Board to allow the following periods for the repayment of money borrowed for tramways by municipal authorities: Permanent way and buildings, 30 years; electrical equipment, 20 years; cars, 15 years.

The second method of accounting referred to may accomplish the object ultimately but not in an accurate manner. The charging of betterments or renewals to expense may be far greater in one year or term of years than the depreciation for the period would amount to, or may be far less. In either event it is unfair; in the first case it is to the detriment of the stockholders for that period, and in the second case it is in their favor.

The instant the property is in use or completed the natural deterioration commences. It is ordinarily as much the first day as on any succeeding day, but the repairs at first are little or nothing. In absolute justice to the owners or stockholders in every accounting period an amount should at once, and then at regular intervals afterwards, be set aside to represent as nearly as possible the wear and tear during that period. Then the owner at any time receives all that is justly due him and only that. The charges against income then become actual and not haphazard. A careful accountant would not charge the cost of insurance for the year into the expense of one month; he would pro-rate it over the whole year. So, for instance, track repairs—in most of the country—can be made only in a few months of the year; yet the wear is going on, proportionately to the service, as much in the months when work is suspended as when the repairs are being made.

For the ideal handling of the accounts representing assets subject to wear and tear there would be determined in advance, say each year, what the deterioration would be for the period and apportionment of it made among the months according to the amount of service or of income. Then before the end of the year these apportionments would be adjusted to approach as nearly as possible to the actual wear which had taken place. Thus the accurate expense of each

month would be as closely approximated as possible and the accountant would be relieved from explaining that "this month we made an unusual amount of repairs upon the Bee street line," etc. Accounts which are most customarily pro-rated for the monthly expense statement are those whose yearly totals are easily determined in advance (for example, insurance). It is, then, only a question of ease in determining the ultimate total, since, if the principle is good with one such account, it is with all.

So it is with depreciation. If the manager wishes to know his actual costs for any period—month, year or decade—he must know, not only the value of power used, wages and salaries paid, miscellaneous expenses incurred and interest and taxes accrued, but also, as near as may be determined, the wear and tear which has occurred. The amount expended for repairs or renewals in the period has nothing more to do with the expense for the period than the actual cash payments made for interest or taxes. Exactly as the total of the monthly—or quarterly—pro-rated amounts charged in for interest should equal the interest accrued during the year, so the account or fund provided for depreciation should equal the decrease in value that has occurred.

In practice, however, it would be more usual and, on the whole, quite as satisfactory to provide a fund or account for depreciation which would care for the heavy renewals, while the ordinary day-to-day repairs are charged directly to expense. Then it becomes a question what shall be the limit in amount to charge to repairs. This will vary in every case, since it hinges on the regularity of the expense. Charging into expense renewals of cars each year as they are bought might be practicable on a large road, while on a small road if one car for renewal were bought on an average each five years, to charge it into expense the year when bought would unduly burden the statement for that year to the great advantage of the four preceding years. This is the crux of the matter: Depreciation should be accounted for as it occurs and not when it has accumulated to the limit.

If a concern were manufacturing a marketable product, in order to determine its selling price it would compute its cost, including not only expenses, interest and taxes, but an amount for depreciation as well, and then add a reasonable measure of profit. The cost of transportation per passenger should be figured in no different way. Unfortunately, perhaps, the amount a passenger shall pay for his ride is fixed—5 cents. But if the cost of transportation, computed as explained, exceeds that figure the passenger should be willing to have his ride somewhat shortened, his transfer or other privileges somewhat curtailed, or the frequency of service somewhat reduced. If, on the other hand, such cost fall below the 5-cent unit, it is justice that the passenger should have a longer ride for his 5 cents or more frequent service or a reduced rate ticket. In either case he should allow depreciation as a part of the cost, and it is quite time that owners and managers insist that he does.

It may be urged that the passenger will not consent to this. Is not that the fault of the manager or promoter who has misled him as to the cost? And should he not be set right about the matter? Clearly, the public stands in its own light if it does not allow an ample provision for depreciation to enter into the cost of its transportation, because there comes a time when, if the public is not fair, new capital can no longer be secured to pay for renewals, and before that time arrives the service and the physical condition of the property have become so poor that patrons are not getting in exchange for their 5-cent pieces what the public in another locality, where a reasonable cost has been allowed, receives.

Depreciation is too important a factor in the cost of transportation to be ignored. If its recognition in the electric railway business is not at this moment necessary it soon will become so, and the sooner it is foreseen and provided for the more stability the investments in this industry will

have. The managers or directors or stockholders who refuse to consider this question are attempting to fool themselves—if unsuccessful, no good is accomplished—if successful, the result is disastrous.

THE COPPER MARKET.

The copper market is attracting more attention at present than that of iron or steel. The steadily advancing price, the small increase in production, the large demand and the possibility of speculative hoarding are all matters which occupy a place of unusual prominence in the market reviews and in the metal and mining trades journals. The present high price of copper with the probability of a still further advance is a matter of serious concern to the electrical industries. Production, consumption and prices of copper in the past years are not for business purposes matters of such prime importance. Supplies for the coming year at prices which are not prohibitive are questions of more immediate interest and more recent statistics do not give much encouragement.

The production of copper in the United States in 1906 was 58.6 per cent of the total production of the world. The increase for the United States was less than 5 per cent over the previous year, while the consumption increased nearly 20 per cent. In recent years Germany, Holland, France and England have taken 50 to 60 per cent of the domestic production and their demand is increasing, while the United States is now consuming more than the entire production in 1899. Imports of copper to the United States are principally from Mexico and Canada, the former sending about twice as much as the latter. The total for the two countries for 1906 was 90,000 tons. The visible supply of copper in England and France at the end of the year 1906 was 17,000 tons and at that time there were practically no unsold stocks held in America. The copper account for the United States for the year 1906 balances as follows:

	Tons.
Production	420,756
Import	102,232
Total	522,988
Less export	217,600
Balance for domestic consumption.....	305,388

Montana is the largest copper-producing state reported for 1906,—137,824 tons, which is less than that for the previous year, but the hostilities which have so long limited production in the Butte and Silver Bow districts have been settled, and it is expected that Amalgamated will produce this year 100,000 tons. Arizona now occupies the second place as a copper producing state, having increased its production in 1906 to 119,643 tons, and Michigan, which previously occupied the second place, remained nearly stationary at 100,000 tons. In the list, after these three great copper-producing states, there is a large drop to Utah which is next, that state producing in 1906 only 26,228 tons, and other producing states Tennessee, California and Idaho, still less. The only other portions of the United States which make any pretention of copper production are New Mexico and Alaska. It is expected that Utah will largely increase the production during the coming years.

The present high price of copper, 25-26 cents per pound, was attained by two sudden and spectacular advances during the last four or five months of 1905 and 1906. While the average for 1901 was 13 cents and for the first half of 1905, 15 cents, it advanced rapidly from July to December, reaching 18.9 cents and averaging for Lake copper in New York 15.73 cents in 1905. In 1906 the price did not reach 19 cents until September, when it rapidly advanced and reached 25 cents the latter part of December, the average for the year being 19 6 cents for Lake copper. While the present high

price is stimulating production it should be remembered that it did not exceed 19 cents until late last year and it will require a year or two before the capacity of the mines and smelters can so be increased as to make a substantial impression or protection. The scarcity of labor and material is a serious obstacle in making these improvements and in fact it is now preventing much gain in the operation of present plants.

A general review of the situation would indicate that there is no relief in sight if business in general continues to prosper and some of the leading authorities in the copper trade express the belief that the average price of copper this year will not be less than 25 cents.

Complaints are made that there is a combination to maintain high prices by storing away large quantities of copper, but no definite statement as to the name of any company operating in this way has been made. It is more probable that the working of the ordinary law of supply and demand will be sufficient to maintain high prices. Both Lake and Electrolytic copper are now being sold for delivery as far ahead as May and June at 25 cents and producers are refusing to make contracts further ahead than four or five months. The result of this is that manufacturers who use large quantities of copper are unable to make contracts for machinery for delivery late in the year as they are unwilling to take chances on the price of copper and are unable to find copper producers who will sell for August and September delivery.

INTERSTATE COMMERCE COMMISSION INQUIRY INTO RAILWAY ACCOUNTING.

The Interstate Commerce Commission has taken up the consideration of the accounting methods of the steam railways in regard to depreciation, renewals and betterments. In its Circular No. 5, Accounting Series, dated January 15, 1907, a comprehensive inquiry is outlined, the circular being in part as follows:

1. This branch of accounting calls in question the use made, or which should be made, of the following terms:

Transportation cost.
Repairs.
Renewals.
Replacements.
Betterments.
Improvements.
Additions.
Construction.

(a) Which of the above-named terms are used in the records and accounts of your company? If other terms are used, name them. The purpose of this question is to obtain an exhaustive list of the terms employed by the carriers in their treatment of such expenses or expenditures as make their appearance along the border line between operating accounts and capital accounts, and to determine the nature of expenses or expenditures charged to those accounts.

(b) Define the terms employed by you in the accounts of your company, so as to make clear the manner in which they are used. The purpose of this inquiry is to learn what current practice is respecting this branch of accounting.

(c) State what terms, in your opinion, should be used in an authorized system of accounting, and what meaning should be attached to each. The purpose of this request is to secure from each accounting officer a comprehensive and analytic statement relative to this branch of accounting.

2. In general, it may be said that current practice allows for depreciation by including "renewals" or "replacements" in operating expenses, and, consequently, railways do not keep a formal depreciation account. It is at least open to question whether or not this is an appropriate method of procedure, and, as will be observed from the opening paragraph of this circular, its abandonment is suggested. For the purpose of collecting information necessary for a satisfactory conclusion upon this point the following inquiries are submitted:

(a) Do you keep a formal depreciation account of any kind or of any sort, or do you place exclusive reliance upon charging renewals and replacements to operating expenses in order to maintain the integrity of your property account? If a depreciation fund is kept, explain in detail the accounting

procedure respecting it and the basis for computing the amount assigned to the fund.

(b) In case a formal depreciation fund is not kept, do you, in practice, make any use of the theory of depreciation in assigning sums from time to time for particular purposes? If so, explain your practice in this regard, especial care being taken to indicate the class of property for which renewal funds are kept, and the rules or methods followed in computing the amounts to be assigned to such special funds.

(c) You are also requested to consider this general question of depreciation accounts, and to state your reasons either for or against the continuance of the present practice of providing for depreciation. In case your views are, in general, favorable to the continuance of the present practice, while at the same time special applications of a depreciation account appears to you tenable, state in detail the kinds of property which would be affected thereby.

MASSACHUSETTS RAILROAD COMMISSION REPORT.

The thirty-eighth annual advance report of the Massachusetts Railroad Commission was submitted to the legislature on January 17. Returns were received from 90 street railway companies, but on account of consolidations there were at the end of the year, September 30, 1906, 86 existing companies. During the past year 10,228 miles of line and 14,682 miles of second track were added, making 24.91 additional miles of main track. There were also added 2,004 miles of side track. The Massachusetts companies now own 2,230.02 miles of street railway line, 420,124 miles of second track, and 153,478 miles of side track, making 2,803,622 miles of single track. Of this mileage, 19,526 miles are located in Rhode Island. The total miles of main track operated are 2,736,052,—an increase of 67,551 miles over the previous year. All the track operated is located in the state except 52,954 miles located in Rhode Island and New Hampshire.

The gross assets of the companies, on September 30, 1906, were \$156,478,140.97,—an increase of \$4,735,908 over the preceding year. The gross liabilities, exclusive of sinking and other special funds, were \$149,672,263.44,—an increase of \$4,069,021. The aggregate surplus, including premium on sales of stocks and bonds, and sinking and other special funds, was \$6,805,878, the percentage of surplus to capital being 9.56. The aggregate stock of the 90 companies was \$71,216,925 on September 30, last—a net increase of \$889,940 over the preceding year. The total amount of dividends declared last year was \$3,554,073,—an increase of \$379,568 over the preceding year. Out of the 90 companies, 37 paid dividends between 2 and 10 per cent, and 53 companies declared or paid no dividends. The dividends figured 4.99 per cent on the total stock. The gross debt, funded and unfunded, was \$78,455,388, an increase of \$3,179,080. The net debt was \$68,008,122—an increase of \$5,097,569. The total capital investment (capital stock and net debt) was \$139,225,047, an increase of \$5,937,509.

The average cost of the street railways of the state per mile of main track, including the cost, but not the length of side track, was \$28,974 for construction; \$10,211 for equipment, and \$13,616 for lands, buildings and other permanent property, making a total average cost of \$52,802 per mile of main track.

The principal statistics of income, expense and traffic were:

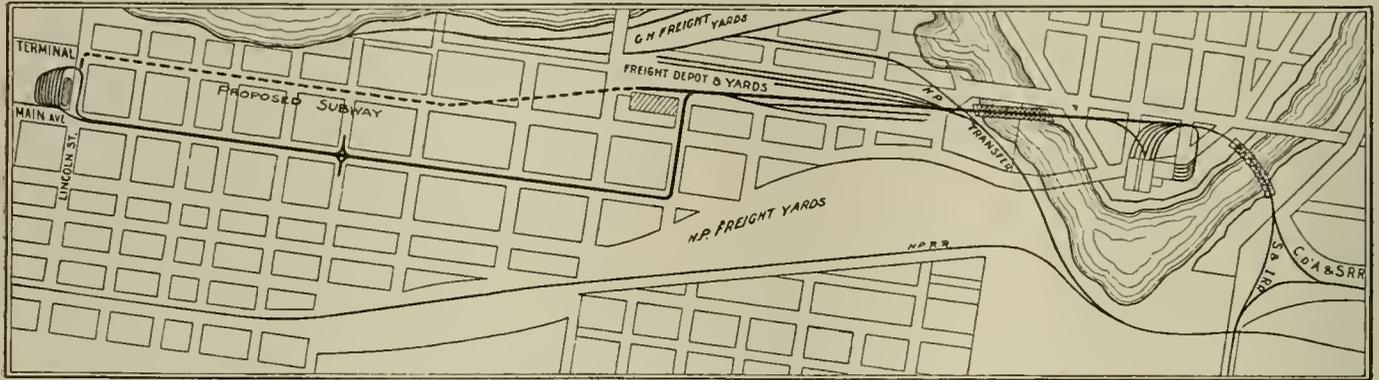
Gross earnings from operation.....	\$29,563,892
Rentals from lease of railway.....	1,337,751
Income from other sources.....	335,804
Total income.....	\$31,237,447
Operating expenses.....	\$19,954,000
Interest on debt and loans.....	3,164,687
Taxes.....	1,923,846
Rentals of leased railways.....	1,518,262
Other charges on income.....	516,580
Dividends paid.....	3,554,073
Total expenditures.....	\$30,631,448
Surplus for the year.....	\$605,999
Increase over previous year—	
Gross earnings from operation.....	\$2,522,601
Total income.....	2,599,195
Operating expenses.....	1,684,741
Total expenditures.....	2,375,382
Surplus for the year.....	222,813

THE SPOKANE ELECTRIC TERMINAL.

The Spokane Electric Terminal was erected early in 1906 by the Spokane Terminal Company, a subsidiary company of the Spokane & Inland Empire Railroad, for the use of the entire Inland Empire system. The system now comprises the Spokane & Inland Railway, which is in operation from

is huff brick and terra cotta, a product of a local manufacturer.

On the first floor are the waiting rooms, ticket office, news stand and parcel room. At the north end are the express and baggage room and the baggagemaster's office, and in the south end the offices of the immigration department of the Inland Empire system are located. The woodwork



Spokane Electric Terminal—Map of Terminal Property Showing Proposed Subway.

Spokane to Waverly and under construction to Colfax and Palouse City; the Coeur d'Alene & Spokane Railway, which connects Spokane with Coeur d'Alene and Hayden Lake, Idaho; the Spokane Traction Company, which operates the city lines of Spokane, and the Spokane Terminal Company, which owns the freight and passenger terminals of the system. In addition to providing passenger terminal facilities for the different roads of the system the building contains 30 offices for the use of the various companies.

The building is located in the heart of the city at the

throughout the first floor is of golden oak with a marble wainscoting around the walls. The native marble used is from quarries in Stevens county and is of a beautiful wavy gray with white grain. The floor is of tile. The waiting room is of an especially elegant appearance. The ceilings are finished in heavy oak beam-work.

The main entrance to the building on the east side is separated from the waiting room by a glass partition extending to the ceiling. From the main vestibule a double flight of stairs leads to the second floor, where they meet on a com-



Spokane Electric Terminal—Interior Waiting Room.

corner of Main avenue and Lincoln street, in the block adjoining the site selected for the city's new federal building. The building is oval in shape, extending north and south. It is 50 feet wide by 160 feet long. The terminal grounds are 300 by 500 feet and the tracks are looped around the entire building to avoid switching cars.

The structural material for the exterior of the building

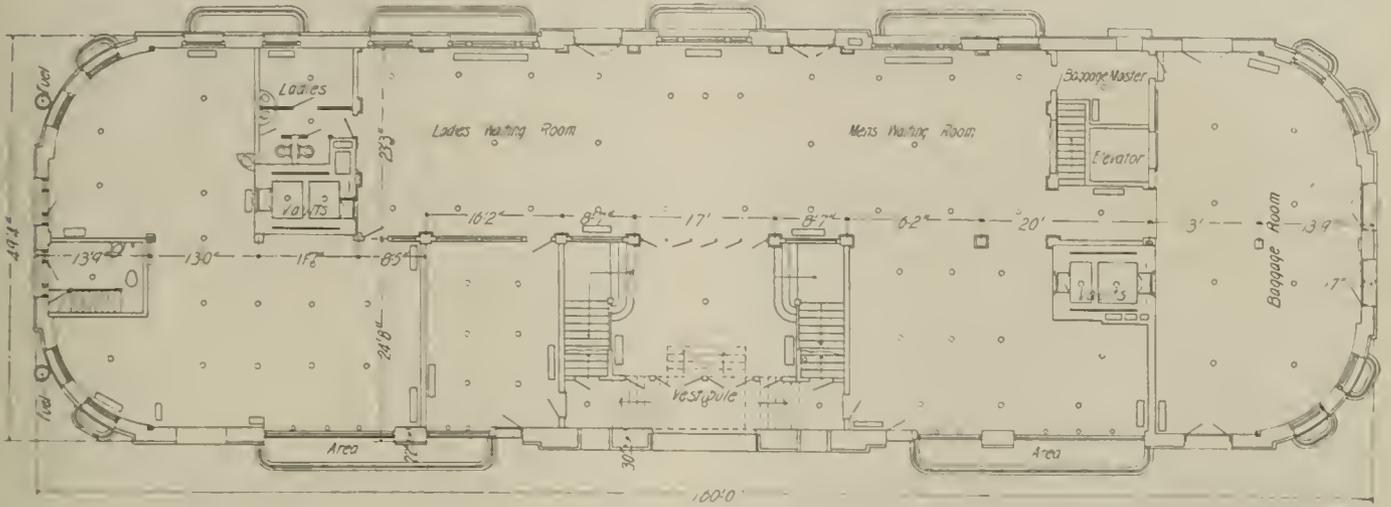
mon landing, from which they ascend to the second and third floors by a second double flight. The stairs are of native marble with iron railing, making one of the most effective features of the interior.

The second floor contains the executive offices of the Spokane & Inland Empire Railroad Company and the several subsidiary companies. The telephone exchange, which con-

nepts with each of the 30 offices in the building, is also on this floor. The offices are on each side of a long circular hall from which they are separated by a glass partition with a 3½-foot wainscoting. Thus all the offices have outside windows and are afforded an abundance of light.

On the third floor are the offices of the auditing depart-

mented about a mile from the passenger terminal. The company has recently applied for a franchise for a subway to connect the two terminals, providing for a double-track tunnel 28 feet wide and 22 feet high, from the passenger station at Main avenue to Front avenue under Lincoln street; thence from Front to about Center street between Bernard and



Spokane Electric Terminal—Plan of First Floor.

ment, the chief engineer, the department of publicity and the drafting rooms. Two lines of fireproof vaults extend through all three stories. These vaults are located near the ends of the building and are fitted with polished-steel vault furniture especially designed for the requirements of the different departments.

In the basement, which is conveniently reached by stairs

Browne; thence diagonally from Front avenue, coming to the surface in the freight grounds at a point between Division and Sheridan streets. The company has found that its through trains from outside the city lose considerable time between the city limits and the passenger terminal on account of the crowded condition of the streets. Also it is more or less dangerous to operate such heavy trains through



Spokane Electric Terminal—Exterior of Building.

descending from the waiting room, are the smoking room, men's toilet room, trainmen's room, the steam heating plant and the store rooms. A freight elevator operates between the basement and the first floor.

The building was designed by Albert Held, a Spokane architect, and cost approximately \$110,000.

The freight yards and terminals of the system are lo-

located in the city and it is desired to keep the heavy traffic and the fast through trains off of the streets. After careful consideration of the subject the company's engineers decided on a subway as the best method of improving the conditions, therefore land has been acquired for the purpose.

The construction of the subway will enable the company to bring all through trains to the passenger terminal with the

least inconvenience to its patrons and with safety, and will also permit the handling of freight in the business district, which is not allowed on the surface lines. The plans contemplate looping the subway around the passenger terminal at a depth of 30 feet and building elevators for connecting with the surface, both for passengers and express. It is estimated that the subway will cost nearly \$1,000,000 and will require two years to build.

THE SUBSTITUTION OF THE ELECTRIC MOTOR FOR THE STEAM LOCOMOTIVE.*

BY LEWIS B. STILLWELL AND HENRY ST. CLAIR PUTNAM.

[In its complete form this paper comprises four subdivisions: 1. Presentation of certain facts established by experience in the operation of elevated, subway and interurban lines by electricity. 2. Discussion of comparative cost of operation by steam and electricity applied to railways in operation, and including both passenger and freight service. 3. The importance of standardizing electric railway practice. 4. The question of frequency in the operation of railways by alternating current. The second subdivision and the discussion pertaining to it, will appear in a later issue. Eds.]

The purpose of this paper is four-fold: 1. To record certain facts relative to heavy electric traction which have been established by experience; 2. To present calculations of relative costs of steam and electric traction in railway service based upon these facts; 3. To point out the transcendent importance of standardizing electric railway traction equipment as rapidly as may be consistent with progress; 4. To raise the question whether a frequency of 25 cycles per second or 15 cycles per second should be adopted in railway operation by alternating-current motors.

Few subjects which are today engaging the attention of the engineering world are comparable either in scientific interest or in practical importance to the substitution of the electric motor for the steam locomotive engine. Three-phase and single-phase alternating-current railway motors are now developed to a point where they fairly challenge the steam locomotive, even in long-haul freight service, in which class of work the direct-current motor hitherto has found itself unable to compete with success. The direct-current motor has demonstrated impressively, and upon a large scale, its superiority to the steam locomotive, not only in operating single cars and short trains on lines of moderate length, but also in frequent and heavy passenger service in which the length of train is limited only by the length of station platform, while the motive power equipment far exceeds in power developed the limits hitherto established in steam passenger service.

On the Valtellina line and through the Simplon tunnel 70-ton electric locomotives with three-phase motor equipment, capable of developing a draw-bar pull of 28,000 pounds, have displaced the steam locomotive, with results showing both marked improvement in service and substantial economy in operating costs. In the New York subway eight-car trains weighing 320 tons are in operation, equipped with motors developing during acceleration a tractive effort equivalent to a draw-bar pull of 55,000 pounds.

The heaviest passenger locomotive used on the Erie system, weighs, exclusive of tender, 206,000 pounds, of which 55.8 per cent, or 115,000 pounds, is effective on drivers. Assuming the adhesion to be 20 per cent, such a locomotive exerts a draw-bar pull of 23,000 pounds. The motors of the eight-car electric train of the New York subway, therefore, exert a tractive effort equivalent to more than twice the draw-bar pull of this locomotive.

Managers and engineers of railways using steam are considering the possibilities of electricity. Naturally, the problem usually presents itself in reference to particular cases in which special conditions emphasize the advantages of electric traction; but a point has been reached in the development of electric railway equipment where it is evident that no absolute and permanent limits beyond which the motor may not go can be fixed; and it is not unreasonable to consider the possibilities of the electric motor not only in passenger service but also in freight service, not only in the operation of railway terminals, but also for the operation of railway divisions and even for trunk lines.

At the present time, what is needed is not prophecy but

facts, and particularly facts demonstrated by experience. A study of the relative advantages of steam and electric traction should rest as firmly as possible upon results attained in practical operation. Facts thus established and available to date are insufficient to justify conclusions which in detail may not have to be modified, but it is believed that they are adequate to permit comparative studies leading to deductions, which, as a whole, may be relied upon.

The answer to the question: "Will it pay to electrify?" involves consideration of both relative earnings and relative cost of operation; therefore, before discussing the comparative expenses involved, it is pertinent to refer briefly, even at the risk of repeating what has been said in papers hitherto presented by others, to the more important factors which co-operate in securing for electric traction an increase in earning power.

Passenger Service Factors Contributing to Increased Earning Power.

The more important considerations which affect gross earnings are:

1. Frequency of service.
2. Speed.
3. General comfort of passengers.
4. Safety.
5. Reliability of service.
6. Increased capacity of line.
7. Frequency of stops.
8. Convenient establishment of feeder lines.

1. Frequency of Service: The motor-driven, interurban car operating upon scores of lines in competition with steam railway service has convincingly demonstrated its ability, not only to attract business from competing steam lines but also to create new business. In almost every case where such competition has been encountered by the steam railway, a large part, if not practically all, of its local passenger traffic has been lost. In comparing results attained by the competing systems in such cases, it is impossible, of course, to state in terms of precision how far frequency of service is responsible for the remarkable results observed, since to these results a number of other causes also contribute. But without attempting to differentiate between these various factors, it is sufficient here to say that of the several causes contributing to the marked success of lines using electricity, the operation of train units or of single cars upon close headway is recognized to be especially attractive.

The advantages resulting from frequency of service become relatively less as the length of run is increased. It is recognized, however, that the operation of trains under close headway generally increases traffic, even where the haul is of considerable length, as shown by the experience of the Philadelphia & Reading Railroad in operating its fast trains upon one-hour headway between New York and Philadelphia.

2. Speed: The possibilities of operating by electricity at speeds exceeding the maximum which can be obtained safely in steam operation, owing to the elimination of unbalanced reciprocating parts of the locomotive, is well-known. It was strikingly illustrated in the Berlin-Zossen trials by the attainment of a speed exceeding 130 miles an hour. These tests demonstrated the ability of electric equipment to operate at a sustained speed more than twice as great as that of our fastest express trains on runs of any considerable length, and exceeding by about 50 per cent the maximum which can be attained even for a short distance by the steam locomotive with a reasonable degree of safety.

Even at speeds at which steam locomotives may be operated without great danger of leaving the track, as a result of the effect of unbalanced reciprocating parts, electric engines are far better able to maintain speed while drawing heavy trains. At speeds of 80 or 90 miles an hour, for example, it is extremely difficult to operate with satisfactory results two steam locomotives at the head of the train; while multiple-unit control places any necessary number of locomotive units absolutely and instantly responsive to the will and touch of a single operator. At high speeds, also, the economy of the steam locomotive falls off rapidly while that of its competitor remains practically constant.

The increase in average speed resulting from the relatively high acceleration obtainable in the use of multiple-unit electric equipment in service where stations are very close together, e. g., elevated and subway lines in cities, and in suburban service in the vicinity of large cities, has been frequently discussed from the theoretical standpoint and is well understood.

3. General Comfort of Passengers: The great advantages of electric traction in respect to comfort of passengers are well known. Cleanliness and improved ventilation made possible by the elimination of smoke and cinders; lighting prac-

*Extracts from a paper presented at the 213th meeting of the American Institute of Electrical Engineers, New York, January 25, 1907.

tically without heat and at low cost by a system which makes it easy to place lamps in any desired location, and heating apparatus effectively and conveniently controlled, are factors of very great importance in building up passenger business under conditions of competition. In operating through tunnels, ventilated with difficulty, the electric motor, in eliminating smoke and the gases of combustion, possesses an advantage which is frequently controlling.

4. Safety: So much has been said and printed in the daily press regarding the alleged dangers of electric traction, that it is well to place on record here a statement of the considerations which inevitably lead to the conclusion that electric traction, if the equipment be properly designed and installed, is essentially and materially safer, so far as the traveling public is concerned, than steam traction. The more important of these considerations are:

a. The fact that in case of a rear-end collision, which is perhaps the most frequent form of accident experienced in the operation of our railway systems, the energy which propels the electric train can be shut off generally with great promptness. On the other hand, the steam locomotive carrying in its firebox from 1,500 to 2,000 pounds of coal heated to incandescence, almost invariably sets fire to any broken cars, or other combustible material with which it comes in contact. Where the electric supply to trains is obtained at low potential from a third rail, the risk of short circuit, which may result in fire if the cars be not fireproof, is greater than it is in the case of overhead construction, even when the voltage employed in the latter case is very high. In fact, in the latter case it may be said that risk from the physiological effects of the current or from fire resulting from short circuit, is practically eliminated, except perhaps in tunnels of very limited clearance.

b. The elimination of the boiler carrying steam at high pressure, also means the removal of an element of risk which in many railroad accidents has destroyed life.

c. The absence of smoke in tunnels, and consequent ability to see signals clearly at all times, constitutes an advantage of the utmost importance for electric operation.

d. Cars drawn by steam locomotives must be heated either by steam from the locomotives, or by some form of stove carried on the individual cars. In the former case, steam from broken steam pipes becomes a serious source of danger in case of accident; in the latter the hot coals from the stove, even in the improved modern types which have greatly reduced the risk formerly encountered, are a source of danger. The substitution of the electric heater affords opportunity not only for ideal control of temperature of the cars but almost absolutely eliminates risk of fire.

e. The elimination of the gas tank and the oil lamp used for lighting in steam traction, and the substitution of electric lighting, also imply a material gain in safety.

f. The danger of derailment in the case of the electric locomotive is far less than in case of the steam locomotive, by reason of the elimination of unbalanced reciprocating parts which tend to lift the steam locomotive from the tracks. The hammer-blow also, in the case of the steam locomotive, is responsible not infrequently in cold weather for broken rails, as a direct result of which many serious accidents have occurred.

g. The electrification of railways where high-speed passenger traffic is involved, affords opportunity for improved methods of protecting trains by signal systems, automatic or other.

h. The ability to cut off power at will from a given section and therefore from trains operating upon that section under certain conditions, which arise not infrequently in railway service, may be availed of to prevent accidents. In steam railway service, when an operator at a tower having allowed a train to pass learns too late that another train is approaching in the opposite direction, he is powerless to avert the impending collision. Where the motive power of these trains, however, is transmitted by electricity, the power supplied to the section might be cut off and probably in time to prevent the catastrophe.

As against the considerations above referred to, all of which tend to make electric operation safer than operation by steam locomotive, the addition to the permanent-way equipment of an electric conductor conveying power to trains imposes in the former case a material risk not involved in the latter. If the power be supplied through a third rail, a guard should be used whenever possible to prevent accidental contact with the rail by employees or by others walking upon or crossing the track. Several effective forms of guard are available, of which at least one has been in service upon a connecting scale for five years.

5. Reliability of Train Service: Interesting evidence in respect to the relative reliability of steam locomotives, and of electric motors carried upon cars and controlled by the multi-

ple-unit system of train-control, is derived from the official records of the transportation department of the Manhattan division of the Interborough Rapid Transit system of New York. Upon the elevated lines, steam locomotives were used from the inauguration of the first constituent line of the ultimate system in 1872 until 1902, during which year and a part of the following year, electric equipment was gradually substituted. The locomotives were operated under exceptionally favorable conditions, were not overloaded, were of simple construction, and admirably maintained. The electric equipment that succeeded them is operating trains which average 5.3 cars as against 3.8 cars in the days of steam operation. The average speed is materially higher. The tractive effort during acceleration of a six-car train is 30,000 pounds, as against a maximum draw-bar pull of approximately 7,000 pounds exerted by the steam locomotive.

Accurate record is kept of the duration of every delay in the operation of the trains. The results for the months November, 1900, to March, 1901, when steam was used, and the corresponding months of the years 1905-6 under conditions of electric operation, illustrate in a striking manner the marked gain in reliability of service which has resulted from the adoption of electricity. For the five months of steam operation the aggregate car-mileage was 18,527,773 miles, and the aggregate delay 8,258 train minutes. The car-mileage per train-minute delay was 2,243.

For the corresponding period of electric operation, five years later, the car-mileage was 25,482,081, the aggregate train-minutes' delay 5,970 and the car-mileage per train-minute delay was 4,268.

It will be noted that the months involved in the above comparison are those in which the difficulties of operation, owing to weather conditions and number of passengers transported are at a maximum. Snow and sleet are among the greatest difficulties to be overcome in the operation of a third-rail system, when, as in the case of the Manhattan, the third rail cannot be effectively protected by reason of limitations in space available on the structure. In view of these difficulties and of the increase in density of traffic, the results obtained are remarkable.

6. Increased Capacity of Line: Electric traction as compared with steam traction enables us to develop much greater sustained tractive efforts with given weight on drivers, by reason of more uniform rotative effort. Even where electric locomotives are used, it also eliminates dead weight by abolishing the tender and facilitating construction under which practically the entire weight of the locomotive is carried upon the drivers. Where the locomotive is dispensed with, and the motors mounted directly upon trucks of cars constituting the train, the best results are obtained, the proportion of weight upon wheels driven by motive power being greater than is otherwise practicable. This increase in weight available for adhesion, in conjunction with the characteristics of the electric motor, makes it possible to attain in electric service rates of acceleration altogether impracticable in steam service; consequently trains in passenger service where short headway is desirable can follow each other at shorter intervals than is feasible where steam motive-power equipment is employed.

In the operation of freight trains, if it should ever become practicable to distribute electric locomotives throughout the length of the train and operate them by multiple-unit control, trains of length far beyond present limits could be operated. At present, the length of a freight train is limited by the strength of the draft-gear, and steam locomotives cannot advantageously be distributed at intervals throughout a very long train, as no means is available for controlling their effort simultaneously and satisfactorily.

Obviously, a system permitting distribution of the motive power at convenient intervals throughout the train, and simultaneously controlled by the hand of a single engineman, presents possibilities of increasing track capacity which under conditions now existing on many through lines should be of great value.

7. Frequency of Stops: The interurban electric line competing with the steam railroad for traffic between two cities possesses great advantage in the collection and distribution of passengers, from the ability of its cars to stop at any street intersection or other convenient point, instead of receiving and discharging passengers at a single railway station in each town. These frequent stops, however, operate to reduce speed materially, and but for the ability of the electric equipment to accelerate rapidly the limitation would be very serious. As speed between terminals is increased, the tendency to reduce the number of stops made to take on or let off passengers is noticeable in the development of many interurban lines.

8. Convenient Establishment of Feeder Lines: Frequency of stops for convenient collection and distribution of passen-

gers, and high speed between terminals, being considerations which are essentially opposed, the advantages of a four-track system permitting operation of local or collecting train units on two tracks, and express trains on the other two tracks, are obvious. The great expense of such a system, however, can be borne only where traffic is very heavy.

A natural development which during the last five years has been very rapid, is found in the use of comparatively short electric trolley lines in connection with steam express service for long-distance runs. This method of utilizing the advantages of local electric lines by the companies operating trunk-line systems is eminently wise, and in general should be highly advantageous to the properties concerned while increasing materially the facilities offered to the public. It may be pointed out, however, that were the trunk-line systems to utilize electricity for through traffic, the extension and systematic improvement of local feeders would be facilitated for a number of reasons, notably:

1. The fact that power developed in large amount, as for the operation of heavy through traffic, is produced at low cost per unit, and would be available at all points along the line for the operation of cars on local feeder lines.

2. The convenient possibility of attaching cars or short trains arriving on local lines to through trains at points of junction. The multiple-unit system of car equipment lends itself admirably to this method of operation.

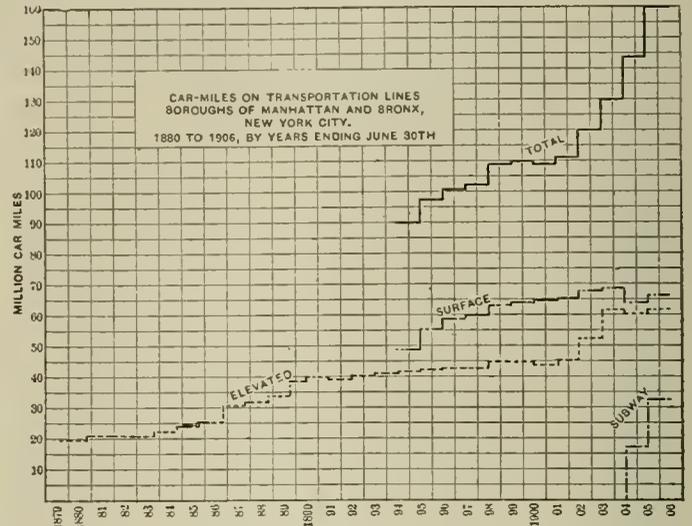
Illustrations of Passenger Business Developed by Interurban Electric Lines.

In a very comprehensive paper presented by Mr. J. G. White before the International Engineering Congress at St. Louis in 1904, the following striking illustrations of the advantages of frequent service are given:

"Cleveland-Oberlin Line: These cities are 34 miles apart. The competitors for passenger traffic between these cities and intermediate points are the Lake Shore & Michigan Southern Railroad (steam) and the Cleveland Elyria & Western (electric). In 1895 the total number of passengers carried by the steam railway between these cities and intermediate points was 203,014. This total decreased gradually after the competing electric line was opened to a minimum in 1899 of 71,755, from which it gradually recovered in 1902 to 91,761, but during this same year the electric road carried a total of about 3,000,000.

"Cleveland-Painesville Line: These cities are 39 miles apart. The competitors for passenger traffic are the Lake Shore (steam) and the Cleveland Painesville & Eastern Railway (electric). In 1895 the steam road carried between the terminals and intermediate points 199,292 passengers, but in

operating a double-track system between the cities of Scranton and Wilkesbarre, Pa., carried, during the four months ending October, 1906, 1,396,833 passengers. This railway, 18 miles in length, competes with two double-track steam railways having excellent terminals in both cities, and with a third double-track steam railway having an equally good terminal in Scranton, but a less favorably located terminal at the Wilkesbarre end of the line. The electric railway charges



Electric Motors Versus Steam Locomotives—Figure 2.

30 cents for the ride between the two cities and sells round-trip tickets for 50 cents. Except at certain hours, it operates its service upon 10-minute headway. At least one of the steam railways, in the endeavor to retain its passenger business, has reduced its rate to 40 cents for the round trip. It has also increased the frequency of its train service. We have been unable to ascertain the number of passengers carried by the competing steam lines during the four months above referred to, but the earning power of frequent electric service is strikingly demonstrated by the fact that this railroad operating in competition with three double-track steam railways of practically identical length and substantially equal terminal facilities, should be doing a business which represents an income of \$5.00 per capita per annum of tributary population, including that of the terminal cities.

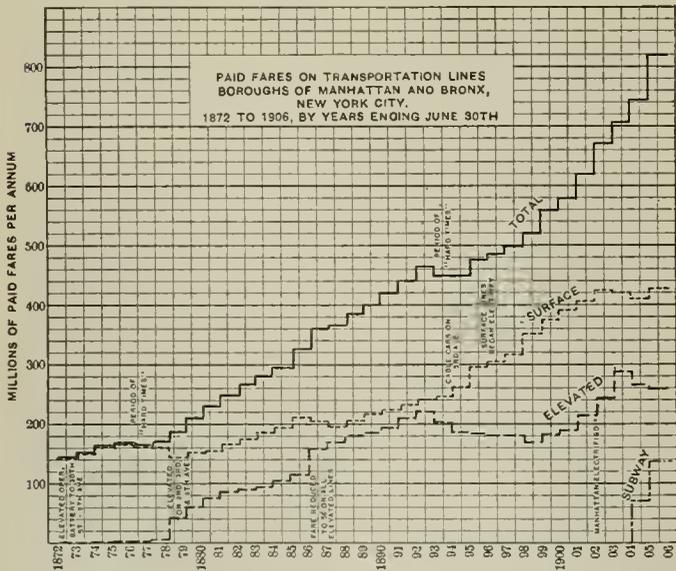
Electrification of Transportation Systems in Manhattan and The Bronx—Effect Upon Traffic.

A study of the transportation statistics of New York City, particularly during the last decade, is not only of great local interest, but is instructive as illustrating the effect of improvement in transit facilities upon gross receipts.

The data graphically summarized in Figures 1, 2 and 3 have been compiled from official records, those subsequent to June 30, 1883, being obtained from the reports of the Railroad Commission of the State of New York. The effects of improved service are clearly evident from an inspection of these figures.

In Figure 1, the line marked "Total" indicates for each year ending June 30, the aggregate paid fares collected by all surface, elevated, and subway lines in the Boroughs of Manhattan and Bronx. It will be noticed that the aggregate paid fares for the year ending June 30, 1894, and also for the following year, were slightly less than for the year ending June 30, 1893, this reduction doubtless being due to the hard times which then prevailed. With this exception, the aggregate of paid fares for all lines shows in each year an increase over the preceding year. Comparing the Manhattan system for the year 1893 with the same system for the year 1899, a decrease of 21 per cent in paid fares is shown. During the same period the paid fares of surface lines, which meanwhile in large degree had adopted electric operation, increased by 43 per cent. That the decrease in business on the elevated lines was not due to any decrease in the service, is shown by Figure 2, from which it will be seen that the car mileage operated increased steadily during this period. The unavoidable inference is that the diversion of traffic to the surface lines was a direct result of the improved service offered by the latter.

During the year ending June 30, 1901, the last fiscal year of steam operation on the elevated lines, the Manhattan system collected 190,045,741 fares. The surface lines collected



Electric Motors Versus Steam Locomotives—Figure 1.

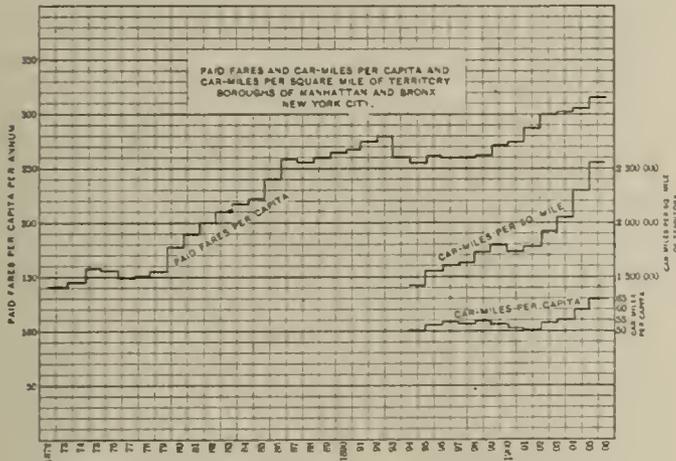
1902 it carried only 28,708 passengers, while the electric system carried 1,537,754 passengers.

"Cleveland-Lorain Line: These cities are 26 miles apart. Competitors are the New York Chicago & St. Louis Railroad (steam) and the Lake Shore (electric). In 1895 the steam road carried 42,526 passengers, but in 1902 it carried only 9,795 passengers, the electric road in the same year carrying 3,896,902 passengers."

The Lackawanna & Wyoming Valley Railway Company,

388,108,794 fares. During the year ending June 30, 1904, the Manhattan system, now operated by electricity, collected 286,634,195 fares, an increase of 50 per cent, while the surface lines collected 419,423,092, an increase of about 8 per cent. In the following year, 1904, the subway began operation, and both elevated and surface lines recorded a decrease in fares collected.

In Figure 4 are plotted curves showing the population of, a, Greater New York and, b, the Boroughs of Manhattan and



Electric Motors Versus Steam Locomotives—Figure 3.

The Bronx. The points which fix these curves from 1860 to 1900 inclusive, are from the United States Census Reports. For the years 1910 and 1920 the estimated population is based upon the average rate of change in the per cent increase per decade from 1860 to 1900. Up to 1905, the population as indicated in these curves is undoubtedly not far from the fact; for 1910 and 1920 the probable populations indicated are interesting, although the curves take no account of the effect of improved transit facilities between Manhattan and Long Island, and between Manhattan and New Jersey.

Notwithstanding the very rapid increase in population of the Boroughs of Manhattan and Bronx from 1890 to 1905, the paid fares collected by the several transportation systems have increased still more rapidly, as shown in the curve of paid fares per capita in Figure 3.

In the same figure are shown the increase in car-miles per capita per annum, and in car-miles per annum per square mile of territory served.

While it is not directly pertinent to this discussion, we would here call attention to a fact of great importance to those responsible for the development of the systems of transportation in the city of New York; viz., the fact that while for the year ending June 30, 1906, the subway carried 137,919,632 passengers, the aggregate carried by the elevated and surface lines was but 23,684,957 less than the aggregate carried by these lines during the year ending June 30, 1904, the last fiscal year before the subway began operation. In other words, comparing the year 1906 with 1904, the aggregate paid fares on elevated, surface, and subway lines, increased by 114,234,675, which is about three-fourths the ultimate capacity of the present subway. It is evident from inspection of these curves, that the existing systems are destined to be still further and greatly overcrowded before additional subways can be completed.

It is, of course, impracticable in studying the results of improved service in the electrification of elevated, surface and subway lines in New York, to attempt to differentiate the causes which have contributed to the increased traffic. While that increase has been due undoubtedly in large part to the improved service offered, it is also obvious that the number of passengers carried would have increased very materially by the growth of population, even had no improvement in the old conditions of service been effected. But it cannot be too strongly emphasized, that while from one point of view improved transit facilities are a result of increased population, from another and equally tenable point of view, increased population is a result of improved transit facilities.

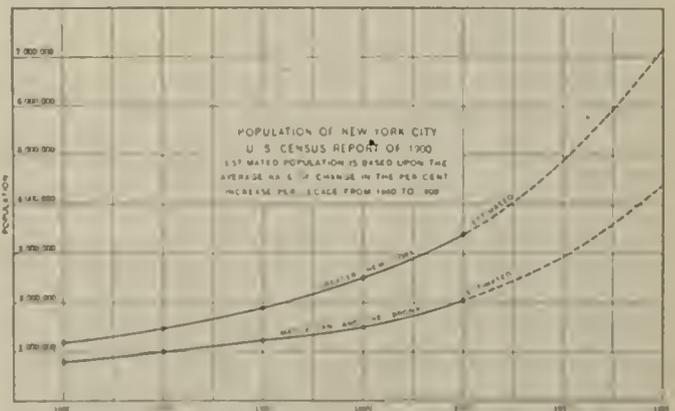
The Standardization of Electric Railway Traction Equipment.

Electricity, entering the field hitherto occupied exclusively by the steam locomotive, encounters conditions which greatly emphasize the necessity for prompt standardization of engineering practice. The management of our railways, beginning by electrifying terminals, tunnels, and mountain

grade divisions, will inevitably be led to extend these zones of electrification until they include divisions of very considerable length, and even trunk-line systems. To call attention to the transcendent importance of standardizing the location of such additions to permanent-way equipment as the overhead trolley conductor and the third rail, is to demonstrate its necessity.

Electrical engineers now generally recognize the great value of established standards of frequency and potential in plants installed for lighting and power purposes. In recent years, the Institute, through its standardization committee, has done splendid work for the manufacturer of electrical apparatus, as well as for the investor, by using its influence to promote the adoption of standards. Not many years ago, however, manufacturing companies, and consulting engineers, were in many cases prone to put forward or specify apparatus without reference to its ability to operate effectively in conjunction with other central-station equipment, even when the latter was in actual operation in the immediate vicinity of the new plant. Fortunately, this tendency was less marked in the United States than it was, for example, in Great Britain. What will happen from a failure to adopt standards of practice at an early stage in the development of an industrial art of this nature, is well illustrated by the problem now presented in London, where the engineering advisers of the London County Council are engaged in studying the problem of how to supply electricity in bulk to 62 central station plants producing electricity in bewildering variety of frequency and potential.

In the railway field, obviously, general principles are the same as in lighting; but wise foresight is more necessary and failure to exercise such foresight at this date less excusable. Moreover, the advocates of electric traction, unlike those who introduced the electric light into commercial service, are called upon to deal with a great body of trained engineers and experienced managers who are engaged in operating and extending systems of transportation which challenge admiration and respect. The rolling stock equipment of our railways, as a whole, is justly an object of national pride. The engineers and managers directing and controlling these properties are probably the equal of any body of men in the world as regards intelligence and experience. Obviously, it is of the utmost importance that they who accept the responsibility involved in the substitution of electricity for steam in the operation of certain parts of our great railways, should avoid fancies or fads and should in every way co-operate in the great work of evolving promptly standards of electric railway practice which shall withstand the test of time. The comparatively small beginnings of today will in all probability extend with a rapidity which we cannot now realize, and the confusion and loss which will inevitably result in the near future, if a variety of electric equipment be grafted at different points upon the existing railroad sys-



Electric Motors Versus Steam Locomotives—Figure 4.

tems now operating by steam, may be imagined. The trouble and expense caused some years ago by the existence of several gauges of railway track in America were as nothing compared with what may result from a failure to establish promptly standards of practice in the field of electric railway traction.

Where today are the "16,000 alternation" system of lighting, the "15,000 alternation" system of lighting, the "constant current alternating current arc light system," the "40-cycle system" and the "monocycle system?" Where ten years from today will be the 1200-volt, or the 1500-volt, direct current systems which have been suggested as substi-

tutes for high-potential alternating-current systems in heavy electric traction?

While emphasizing the great importance of the early establishment of standards in the field of heavy electric traction, it must be recognized clearly that further inventions are liable at any time to modify views based upon present knowledge. The work of standardizing, therefore, should proceed with caution; but surely if present knowledge, not only of existing apparatus, but of the lines along which applicable improvements must take place is not sufficient to justify conservative application of the principle of standards, it is not sufficient to justify the investment of the very large sums which are now being expended for electric equipment.

Engineers constituting the membership of this Institute owe it to themselves, as well as to their clients, to use every effort without prejudice and without fad, to prevent waste by opposing the introduction of apparatus which, from its limitations, cannot solve the general problem of railway electrification; and it is to be hoped that they will use their united influence to fix proper standards as rapidly as this establishment may be consistent with progress.

Fortunately, knowledge of the possibilities and limitations of electric apparatus today is a very different thing from what it was in the early days of electric lighting. At the present time we have available theory so complete that electric science is less exact only than the science of astronomy and in applying this science in constructive work agreement between results carefully predetermined by calculation and those realized in practice is far closer than in any other comparable branch of engineering. There can be no doubt that it is possible today, in passing upon such a question, for example, as that of best frequency for railway operation, to make a choice which shall withstand the test of time.

The necessity for proper standardization is obvious. Specifically, it would seem feasible and eminently wise to agree upon standards of practice in respect to the following:

- a. Location of third rail.
- b. Location of overhead conductor used with single-phase alternating-current system.
- c. Frequency of alternating-current traction systems.

It is equally desirable, but probably less easy, to agree upon a standard system of multiple-unit control for train operation.

The Question of Frequency.

While appreciating thoroughly and desiring to emphasize the importance of establishing and maintaining standards, it is also of the greatest importance that standards should be wisely chosen. The choice should be made, if possible, with full knowledge of the essential factors involved and correct perspective view of their relative importance. It is with the feeling that so far as the frequency 25 cycles per second may be said to have become established, considerations obvious at first glance, but not properly controlling, may have influenced unduly the choice that we desire to present for discussion, the very important question whether 25 cycles per second or a lower frequency; e. g., 15 cycles per second, is best adapted and should be established as a standard in the equipment of railways by electricity.

Final decision of such a question should be left neither to manufacturing companies, the management of which may be unduly influenced by commercial considerations, affecting its own immediate prosperity or convenience, nor should it be left to the individual consulting engineer. It is precisely the kind of question which the Institute should pass upon by the adoption of a recommendation carefully considered by its standardization committee. The manufacturing companies, which are largely and very influentially represented in the body of the Institute, will doubtless be willing to cooperate in the collection and study of the facts requisite to the formation of a well-grounded report.

While the adoption of a standard by the Institute has the force only of a recommendation, the American Railway Association perhaps might deem it wise to indorse the choice of the Institute. Such action on the part of these two bodies would go far definitely to establish the standard.

Comparing the relative advantages of 25 cycles and 15 cycles in railway service the salient advantages of the former are the following:

1. It is today in extensive use in plants developing and distributing energy for lighting and power purposes, and through sub-stations equipped with converters for the operation of many interurban lines. It has been adopted on a very large scale by such companies as the Interborough Rapid Transit Company of New York for the operation of its subway, surface, and elevated lines, by the Pennsylvania and Long Island Railway companies for the electrification of the

New York terminal service and operation over a considerable part of Long Island and by the New York Central for the electrification of its terminal service. It is also the frequency developed by all of the great power plants at Niagara Falls, and from this source of power it is possible for all railway lines within a radius of 150 miles, or an even greater distance, to procure an ample supply of very cheap power.

It has been adopted by the New York New Haven & Hartford Railroad Company, the pioneer among American railroads in the adoption of the alternating-current motor in heavy railway traction, and by the Grand Trunk Railway for the electrification of the Sarnia tunnel. Alternating current at 25-cycles is also utilized without the interposition of converters by the motor equipment on a dozen or more interurban trolley lines.

2. Our great manufacturing companies have drawings, patterns, and dies which enable them to manufacture conveniently and promptly practically all power-house and substation equipment required for 25-cycle apparatus. The weight of this consideration, however, is somewhat lessened by the fact that the march of progress—just now greatly accelerated by the general adoption of steam turbines—will undoubtedly cause a large proportion of existing drawings and patterns to be superseded probably in the very near future and certainly within the next five years.

3. The 25-cycle system is preferable to the lower frequency in the design of turbo-generators, since it affords wider range within which to select speed for units of various outputs. For very large units a frequency of 15-cycles, for example, requires either a 2-pole generator operating at 900 revolutions per minute, a large 4-pole generator operating at 450 revolutions per minute, or a 6-pole generator operating at 300 revolutions per minute. Reduction in the number of revolutions per minute implies increase in diameter of the revolving element of generator and turbine and in machines of output the diameter of the revolving element in turbines of certain types may become too large for shipment in view of the limitations imposed by tunnels.

4. A frequency of 25 cycles permits convenient and effective lighting of yards and shops by incandescent lamps. It is also more favorable than a lower frequency as regards operation of induction motors for shop purposes.

Should our railways in general be equipped for electric operation, it is to be expected that in many cases they would undertake to supply electricity for light and power purposes beyond their own requirements, and the higher frequency possesses important advantages with reference to such commercial service.

For lighting and general power purposes in cases where service for lighting purposes that shall be thoroughly satisfactory in respect to voltage, regulation and continuity is requisite, commercial supply at 25 cycles would be preferable. Through the interposition of motor-generator sets or converters in combination with storage batteries in such cases either frequency is applicable.

5. The higher frequency possesses some advantage in respect to the ratio of tractive effort to weight upon drivers. The best information available to date appears to indicate that the difference between 25 cycles and 15 cycles in respect to this consideration probably approximates 10 per cent. Further data from actual tests are desirable, and must be obtained before it is possible to estimate closely the weight of advantage possessed by the higher frequency.

6. The higher frequency is preferable for induction motors in railway service requiring a considerable range of speed adjustment. The force of this consideration depends upon the probability of using induction motors for traction purposes, and applies not only to the excellent three-phase motors, such as are in very successful use upon the Valtellina line, but also to the single-phase induction motor which, perhaps, is not beyond the range of probability. It is probable that in any general electrification of our railway systems, induction motors will play a part by no means unimportant.

Without attempting detailed discussion, it is evident from the foregoing brief statement of the more important considerations in favor of 25 cycles that extremely weighty reasons must exist if the adoption of a lower frequency, e. g., 15 cycles is justified.

While our object in raising this question of frequency is to present it for discussion with a view to securing additional data and, if possible, a careful consideration of this very important question by the Institute through its standardization committee, or a special committee, and while we desire to avoid anticipating the verdict resulting from such an investigation, it is proper to state here that consideration of the facts now available leads us to conclude that, notwithstanding the number and force of the arguments in favor of 25 cycles, a frequency of 15 cycles is preferable and should

be adopted for heavy electric traction. The fundamental and, as it would appear, controlling reason which leads to this conclusion is the fact that within given dimensions a materially more powerful, efficient, and generally effective single-phase motor can be constructed for 15-cycle operation than is possible if 25 cycles be selected.

Final decision of the question whether the advantages of the 15-cycle motor as compared with the 25-cycle motor in respect to dimensions, weight, efficiency, power-factor, and commutation are such as outweigh the many and important considerations which favor the higher frequency, requires more complete data than we have been able to secure up to the present time. That the difference is material, however, is established not only by general theoretical considerations of the effect of a reduction in frequency upon the design and performance of single-phase commutating motors, but also by the following facts:

1. In the case of multiple-unit equipment of passenger cars where locomotives are dispensed with and motors carried upon the car trucks, it is very important that the dimensions of motors be reduced to a minimum. Cars weighing say, 35 tons without equipment and operating on straight and level track at speeds of from 60 to 70 miles an hour, require but two motors, except as it may become necessary to employ four motors by reason of lack of sufficient clearance at cross-overs. The difference between a two-motor equipment and a four-motor equipment in such a case approximates \$2,500 per car, besides which the four-motor equipment adds materially to weight, practically doubles complication, and, for both of these reasons, increases cost of operation. The difference between the dimensions of a 15-cycle and a 25-cycle motor may easily be the controlling consideration compelling the adoption of the four-motor equipment.

2. In the application of single-phase commutating motors to locomotives in general railway service, the minimizing of motor dimensions is perhaps still more important although in this instance the limitations imposed by the space available are less obvious.

High-speed passenger locomotives at least should be gearless. For any assumed limits of weight per axle and length of wheel-base, that frequency is preferable which permits the construction of a motor which will exert the greater pull at the draw-bar, provided efficiency, commutation, and power-factors are substantially equal.

Those who are engaged directly in the design of single-phase motors are probably in position to contribute to the discussion of this paper data which will throw much light upon the subject; but it would seem probable that within given limits of dimensions, 15-cycle motors would materially surpass 25-cycle equipment in this respect. We are inclined to this opinion notwithstanding the probable advantage of 25-cycle equipment as regards the ratio of effective draw-bar pull to weight upon drivers.

3. There can be no question of the superiority of the 15-cycle motor in respect to the very important features, commutation, efficiency, and power-factor. Efficiency is obviously and directly important. Power-factor affects the efficiency of the entire system from the motor to, and including, the generator. Commutation, in view of the large and expensive commutators and the brush complication of this type of motor, is of great importance.

In order that the question raised may be looked at in proper perspective the following estimates based upon foregoing calculations will be useful:

For the equipment of the entire railway system of the United States as now existing an aggregate power-house output capable of supplying continuously 2,100,000 kilowatts would be required. Of the electric apparatus installed in the powerhouses, a change in frequency affects the generators, transformers, and a large proportion of the measuring and indicating instruments. It also affects the cost of the engine or turbine employed to drive the generator. At 25 cycles, the apparatus affected by frequency should cost approximately \$30 per kilowatt. At 15 cycles it would cost on the average perhaps \$32 per kilowatt. Cost of substation transformers would be increased approximately one-third, and, in round numbers, the total cost of turbines and electrical power-house and substation apparatus would be increased from \$70,000,000 to \$80,000,000.

If it be assumed that one electric locomotive will do the work of two steam locomotives, about 24,000 electric locomotives would be required to take care of the present railway business of the country. Assuming the cost of the average electric locomotive to be \$25,000 the aggregate cost of locomotives required would be \$600,000,000. Allowing for the increased cost of the 15-cycle transformers, it would seem that the difference in cost of the average locomotive should

be not less than \$1,000 in favor of the lower frequency, or for 24,000 locomotives \$24,000,000. This is more than twice the estimated difference in cost of power-house and substation equipment.

It seems entirely safe to say, therefore, that the aggregate first cost of electric equipment and of steam turbine will be decreased by a change from 25 cycles to 15 cycles. The operating cost will obviously be decreased very materially. At least three-fourths of the above estimated cost of electric locomotives, say \$450,000,000, represents cost of electric equipment. It will be seen, therefore, that of the apparatus which our electrical manufacturing companies may be called upon to furnish, more than 85 per cent is rolling stock. Obviously, any argument in favor of 25-cycle equipment which may rest upon existence of drawings and patterns and convenience in manufacturing should have comparatively little weight.

The use of 15 cycles instead of 25 cycles also secures considerable advantage in respect to the overhead trolley conductor and track return. With a given limit of voltage drop, this advantage may be utilized by reducing size and, consequently, the cost of the overhead copper and the copper used to reinforce the track return.

Under the plans which we have assumed as a basis for our calculations, the amount of copper required for feeder circuits, trolleys, and reinforced track-return, estimated at 20 cents per pound would cost approximately \$750,000,000 were the entire railway system of the country as existing in 1905 to be equipped for electric operation.*

We desire to acknowledge with appreciation, assistance kindly rendered in the collection of data for this paper by Mr. J. M. Graham, vice-president of the Erie Railroad Company; Mr. Theodore N. Ely, chief of motive power of the Pennsylvania Railroad Company; Mr. George Gould; Mr. E. P. Bryan, vice-president, and Mr. Frank Hedley, general manager of the Interborough Rapid Transit Company; Mr. G. Love, of the Railway Electric Power Company; Mr. Alvan Markle, president of the Wilkesbarre & Hazleton Railway Company; Mr. George C. Smith, vice-president of the Security Investment Company; Mr. H. J. Pierce, president of the International Railway Company; Messrs. Conwell, Shepard and McLaren, of the Westinghouse Electric & Manufacturing Company; and Messrs. Potter and Mahony, of the General Electric Company.

Discussion.

The discussion was opened by Mr. Frank J. Sprague, consulting engineer, New York City.

The authors have given us a very interesting resume of statistical information based almost entirely upon direct-current operation. They plead for standardization of electric railway apparatus, and if I read the report correctly for a standardization along the lines of operation, 11,000 volts, alternating-current trolley at 15 cycles. The authors ask where 10 years from now will the 600-volt, 1200-volt or 1500-volt—and I see my initials under all of them,—where will they be? Right here; just where the 500 and 600-volt operation of the past 19 years have been, right here. I do not believe you quite appreciate the modest work which is being done today by those who are actively developing the higher tension direct-current work.

I do not find it necessary, to come to any conclusions on the electric railway business, to generalize all the railroads of the United States. There are a lot of them in the hands of receivers, and some of the others ought to be. They could not be taken out of the hands of a receiver if they were electrified, and could not raise the money to be electrified if they wanted to be. I prefer to deal with the living, immediate question. There are now three great trunkline railroads in New York City which in the near future will be electrified, or terminated in New York City, to say nothing of those terminating in Jersey City and elsewhere. One of them is developing electrification along certain lines, and the others on somewhat different lines. There has been considerable discussion as to the wisdom of both. I have been guilty of some of the development on one, and I am not ashamed of it. I have criticized some of the development on the other, and I do not know that I am ashamed of that, but leaving these two out of consideration, where do we need to look for a typical trunk line division than the third road, the Pennsylvania, from here to Philadelphia; an engine run, and than which there is no more typical trunk line division in the world. I am going to venture, not a prophecy, but a statement. If that line were called upon to be

*In all our estimates we have included 0000 copper conductor in the return circuit, this being bonded to the rails at intervals for the purpose of preventing dangerous potential on track in case of a broken bond.

electrified today, it would not, in my judgment, be overhead, single-phase alternating-current equipment, whether 25, 15 or 1 cycle. It would be a half-cycle, and the cycle would be the length of time between two runs. I am going to make the prophecy, that on a large number of the lines which can by any stretch of imagination be considered as subject to a reasonable prospect of electrification, 1,200 or 1,500 volts will on any present development known, give better results in every way than alternating current, 15 or 25-cycle, overhead system.

The Proper Frequency.

Mr. B. G. Lamme, Westinghouse Electric & Manufacturing Company—As the time is limited, I will confine myself to the question of frequency alone. It may be of interest to consider the changes in frequency from the earliest time to the present, and see what Mr. Stillwell has had to do with such changes. Back in the early times of alternating-current work, 133 cycles per second was the common frequency. About 1889 or 1890, Mr. Stillwell, in going over the problem, saw that the larger work which was coming called for a lower frequency, and he was one of the strongest advocates in adopting 60 cycles as against 133. A few years later, in connection with the Niagara Falls first large generating station, the question of a still lower frequency came in, and Mr. Stillwell practically made the decision in favor of 25 cycles. At that time it was considered that the development of street railway work, and the use of rotary converters in such work, was such that it was more economical to use the lower frequency. He now comes forward with 15 cycles for heavy railway work on the basis that the field is going to be large enough to call for a new and more suitable frequency. It seems to me also that, considering the total amount involved in the electrification of the railroads of this country, about \$1,500,000,000, the problem is big enough to call for a frequency which is best suited for the work. The question is whether that should be 25 cycles or something lower.

Over four years ago I presented a paper before this Institute, in which I described the Washington Baltimore & Annapolis single-phase railway, and the frequency given was 16 $\frac{2}{3}$ cycles, a ratio of 2 to 3 to the standard frequency of 25. There were certain reasons for adopting that particular frequency, although 10 per cent higher or lower would not have been of very great importance, so far as the operation of the apparatus was concerned. It was found at the time that there was considerable opposition to the use of lower frequency, principally because most of the projects presented involved existing power plants, or it was necessary to tie the new plant to existing power plants. The projects were also relatively small. Because of commercial conditions we were practically forced to begin at 25 cycles. However, I still advocated the use of lower frequency when it came to heavier work, as will be found in my discussion of single-phase railway apparatus at the American Institute meeting at the St. Louis Exposition in September, 1904. At that time I said that I considered the heavy railway electrification of sufficient importance to warrant the use of low frequency, which is most suitable for such work, independent of any frequencies already in use. I still hold to that opinion.

The strongest reason which can be given for the lower frequency is the greater output than can be gotten from a given motor. For instance, with a first-class motor, built for 25 cycles, the operation may be above question, the machine may be considered perfect in its way, but take that same machine and operate it on 15 cycles and you can raise the induction from 25 to 40 per cent, which means that 25 to 40 per cent higher voltage can be applied with the same motor-speed, and you get 25 to 40 per cent greater output from the same motor, or 25 to 40 per cent greater tractive effort can be developed. That in itself is a controlling feature in the question. We have verified it by actual test. For instance, we have taken a 100-hp. 25-cycle motor, and obtained from it 125-hp. at 15 cycles. This motor has good efficiency, good power factor and good commutation on both frequencies, at the above ratings. It is therefore not a question whether the 25-cycle motor will work, for it will work successfully, but it is a question how much more you can get out of it by going to the lower frequency.

It may be questioned that if 15 cycles is better than 25 cycles, why is not still lower frequency recommended? The answer is that at 15 cycles we can practically saturate the machine, which practically fixes the output. At still lower efficiency we could gain in efficiency and power factor, but not much in output; and we lose in other things, such as the speed of turbo-generators and weight of transformers. So there is some point at which a compromise can be made, and it is my opinion, and has been for a long time, that this

compromise is considerably below 25 cycles and should be about 15 cycles. The increased output you can get from a motor at the lower frequency is of advantage principally in getting a smaller number of motors under a locomotive or car, which directly cheapens the cost; or, on a locomotive, keeping the same number of motors, we secure a bigger output for a given weight of locomotive. But there are some cases where we do not gain much by the use of lower frequency. For instance, where it is necessary to operate alternating current—direct current, requiring four motors in order to obtain series-parallel control, in most cases we do not get the full gain from the use of 15 cycles for we cannot reduce the number of motors. That is one of the conditions met in the New Haven railway equipment, for the direct-current operation on the New York end requires the use of four motors. There are many cases, where the power is purchased, in which it is necessary to use the higher frequency. Of course, the results are obtained at a somewhat lesser capacity or at an increased cost.

There is one point which Mr. Stillwell has not touched on, and that is the fact that the single-phase series-motor can be made to operate on both 15 and 25 cycles; for instance, a 25-cycle motor will operate beautifully at 15 cycles and at practically the same speed, because the speed has nothing to do with the frequency, and a 15-cycle motor, if well designed, will operate on 25 cycles fairly well, at its normal capacity, but at slightly reduced capacity will operate very well, so that, for instance, if a locomotive should be equipped with transformers suitable for operating at 15 cycles it could operate on both 25 or 15 cycles very well. By taking a 25-cycle equipment, nominally designed for 25 cycles, and putting a 15-cycle transformer on it, the equipment is adapted for operation on both 25 and 15 cycles. That is important in connection with the fact that 25 cycles will have to be used in a certain number of cases, but in other cases where the generating conditions can be made suitable, 15 cycles will work to better advantage.

In Mr. Stillwell's paper he speaks of some of the advantages of the higher frequency, one of which is the better ratio of tractive effort to weight on drivers. We have been making tests at East Pittsburgh on some electrical locomotives, at both 15 and 25 cycles, and it is very difficult to determine any difference in the ratio of tractive effort to the weight on the drivers. In some cases the tests are possibly in favor of 15 cycles, and in others in favor of 25; and the difference is probably no more than would be found in making two consecutive tests at any one frequency. If the motors are spring-connected or have some flexibility between the armature and the driver, which is true in most cases, especially where they are geared, the difference in the tendency to slip practically disappears.

In discussing this question of 15 cycles, we are asked where it is in use. I will call attention to the fact that quite a number of European companies have adopted 15 cycles for railway work. The Valtellina plant, put in by the Ganz company, with three-phase motors, uses 15 cycles and I feel safe in saying that a great deal of the success and good operation of that plant is due to the choice of this frequency. I think they could have made the apparatus a success with 25 cycles, but it would have required much heavier equipment, and with poorer efficiency and power factor, especially at low speeds. The manufacturers recognized that 15 cycles gave better conditions with the polyphase motors and adopted it regardless of the fact that that was not a standard frequency in Europe. That system is being extended on the Italian roads.

The Oerlikon company, of Switzerland, has gone into the single-phase work extensively, with 15 cycles as a standard. The Siemens-Schuckert company, of Germany, is also manufacturing series railway motors for 15 cycles. The Allgemeine company of Berlin, is the principal company which is adhering to 25 cycles, and that is largely due to its type of motors. They have a so-called "series-repulsion" motor, in which the characteristics of the motor apparently show to better advantage if the frequency is not too low. It is not directly due to the high frequency that they get better results, but to the fact that the motor should preferably run below the nominal synchronous speed and this condition is obtained to better advantage by keeping the frequency up.

Mr. Bion J. Arnold, being introduced by a reference to his pioneer efforts in single-phase work and to the fire which destroyed his first equipment on the eve of actual operation, said: I felt that unless the experimental machine was rebuilt and an attempt made to operate it, I might be misunderstood by my brother engineers, and the machine might be misunderstood. I therefore rebuilt it and operated it some six months later. That experiment cost me about \$50,000, but thanks to my good fortune, it cost no other man

a dollar. I believe I was instrumental in advancing the state of the art to such an extent that we have today two or three of our large railroads being equipped with the single-phase system, invented by others, to be sure, but I believe forwarded by my efforts some four or five years ago. If my efforts have done that, and I have been instrumental in advancing the art, I am glad that I spent the money, as I could not have spent it in any better cause.

As to the paper of the evening, had I had time to read and study it, I would like to discuss it somewhat more fully than I will be able to. However, if I had all the time necessary to study it, I would not attempt to go into a detail analysis of the various systems which are involved in the paper, because I think each system has its able champions, as we have seen indicated here tonight. I am also in a position where it makes no great difference to me personally which system wins, so long as we get a system of electric railroading in this country that we can put on our steam railroads and operate them for less money than we can operate them with steam. That was the principal idea I had in mind in starting out on the single-phase experiment, because in 1898 I was engaged in building the Chicago & Milwaukee Electric Railway, which I believe is considered the pioneer rotary-converter substation installation in the country, possibly in the world, at any rate to be driven by a steam station. I took much risk in that undertaking, risking my personal reputation and my financial resources, in order to demonstrate the success of that enterprise. That was a success, and as you know most of the suburban roads have been built on those lines since. I make no claim for the invention of any of the devices which entered into the systems. They were invented by some of the gentlemen here present and others, and began to come into commercial use, namely, the rotary converter principally, which made the system possible, but I took the responsibilities, engineering and financially, of making it go, and it went. When engaged in that work I felt that was not the complete solution of the electric railway problem, because the introduction of the rotary-converter substation necessitated men in the substations, and necessitated more investment than I thought the railroad systems of the country could stand. If they were to be attracted to electrical operation. That started me on the single-phase idea, and as many of you will recollect, we had various discussions on it and it was stated it could not be done. I maintained it could be done and had to be done, and it cost me money to find that out. It has been done since by at least two companies in this country, and two or three abroad, and seems to be coming into practice quite rapidly for steam railroad work.

I do not know that I agree entirely with the author of the paper that we should standardize at once, and thereby shut out the utilization of the talent and genius of the men who are members of this body and other bodies in this country, and other countries, or the prospect of developing something that may prove better than anything we now have. I am willing to concede, if we are going to use alternating-current railway systems, that it is probable that we should adopt a standard frequency, and so far as my investigation has gone, in conjunction with work with Mr. Stillwell, the Erie Railroad work, my own conclusion is to lean toward the 15-cycle frequency, although I do not want to definitely stand on that now. It seems to me it is the frequency we will come to on account of the fact that to get the requisite amount of capacity between the wheels of railway machines, the gauge being limited, it is necessary to get as much motor in there as possible, and we can do that with the alternating current by adopting 15 cycles and get more than we can with 25 cycles. It makes the weight of the machine practically the same as with 25, as it increases the size of the transformer, but reduces the size of the motor; the net weight is the same, but it gets additional power on the machine and that is what we must get, and we do not get as much power on the wheels with the alternating current as with the direct current. However, I personally believe that some form of high-potential overhead conductor is going to be the final solution of the railway question.

I believe in the third rail, where it is applicable, but I do not believe there are many places where it is applicable; in other words, I think the legislation of this country will come to a point where they will not permit the use of third rail, at any rate in exposed places, and that being the case I think it is up to the electric railway men of this country to begin to get ready to take care of the problem when that sort of legislation comes. There are certain types of third rail recently adopted which I believe are safer than anything adopted before—that, of course, removes a certain amount of objection—I refer to the rail Mr. Sprague is interested in developing for the New York Central work—but I do not

think the use of the third rail in yards and under the feet of men is what we are going to adopt as the final solution of the problem.

In the analysis of the Grand Trunk problem, which I have in charge so far as the engineering decisions are concerned, I chose the alternating-current system, overhead conductor, for tunnel work, for the reason that in the large yards at each end of the tunnel, where much switching is done, it seemed essential that the conductor be kept from under the feet of the men. That decision to use single-phase motors was made some five months prior to the New Haven road's decision to adopt the alternating current on its road.

Mr. W. B. Potter (General Electric Company)—I most heartily endorse the recommendation of the authors of the paper for a more perfect standardization of the systems and apparatus for railway work. The one thing, however, I think we must appreciate, is that standards are ordinarily secured where it does not cost anything to bring them about. So far as the known systems can be considered with respect to the different problems, they have to be considered so far as the railroads are concerned from the standpoint of the cost for each individual case. You could hardly expect that a road contemplating an equipment which would cost, say, \$2,000,000, for the sake of standardization and in anticipation, perhaps, of sometimes effecting a juncture with some other road at some distance, would spend \$3,000,000. Yet that is just what it would mean. That relates particularly to the question as between different systems.

Now, with regard to the question of frequency as affecting alternating single-phase operations, there is no question but that the motor, limited as it is by the space between the wheels, the car body on the clearance over the track, is the device to which all of the rest of the equipment must be subordinated in order to get the best results. A great deal would be involved in the substitution of 15 cycles for 25. It means considerable increase in cost for the generating apparatus, it means a frequency that would not be suitable for lighting the cars, even, and a frequency which for every other use than the single-phase motor itself, and incidentally the conductor system from the generating station to the motor, would possess no advantage. I do not think, however, that we can look for the ultimate development of the single-phase motor on 25 cycles. We can build, it is true, a motor that has good commutation, but it has a relatively small output for its size, weighing something like 25 per cent more than the direct-current motor having corresponding capacity. With 15 cycles, with the same degree of commutation, the motor would probably weigh from 10 to 15 per cent more, only. The efficiency and power factor would both be very much the same.

Mr. Stillwell made some mention of the maximum available tractive effort as between 25 and 15 cycles. Mr. Lamme also spoke of some tests they made in the same connection. The tests which we have made indicate in comparison with direct current,—that is, taking a given motor on direct current, on a truck and raising the car body so that the inertia of the car body or the friction due to its movement would be eliminated—that depending on the condition of rail, testing the same motor with direct current and then with alternating current at 25 cycles, we find that on direct current, assuming, for convenience, the tractive effort to be 100 per cent, on 25 cycles it varies from 80 to 90 per cent, and on 15 cycles from 70 to 80 per cent. The tests have been repeated a number of times, and while perhaps they are in a measure somewhat rough, they seem to be comparatively correct. There is in this connection, however, a fact of interest—that when the motor with direct current slips, the torque is maintained uniformly, the wheel rotates rapidly, and the torque falls off immediately to something like 20 or 30 per cent of the maximum. In alternating current, whether on 25 or 15 cycles, although the wheel slips at a lower point, it only falls off something like 10 or 15 per cent, due to the fact that the slip is a series of progressive or jerks which allow the wheel to grip the rail so that after the wheel has once slipped, it may take hold of the rail and have a higher maximum pull than before it first slipped, by reason of having cleaned off the rail. This is a condition you do not get with direct current. The average draw-bar pull after slipping with alternating current is perhaps 70 per cent greater than it is with direct current. Furthermore, except for freight work where the motor is geared so as to have a high torque per ampere, there is little probability that an alternating-current single-phase locomotive can be built sufficiently light that any one need have fears as to a lack of adhesion on the rails.

The question of 15 cycles is one which I think will have to be considered with respect to some given problem, but it 25 cycles alternating current, or 1,200 volts direct current, or

25 cycles alternating current, or 1200 volts direct current, or 600 volts direct current, should be required by anybody as suitable to meeting every case. Some reference has been made to the high-voltage direct current. I want to say with regard to that type of equipment and also with regard to the 600-volt direct-current motor as well, that motors are possible that are quite beyond the other motor as we commonly know it. We have always looked upon the commutator of the direct-current motor a good deal as a buzz-saw. By the addition of the commutating pole to the ordinary direct-current motor, that is building the ordinary direct-current motor magnetically of the same character as the single-phase motor, sparking at the commutator may be said to be eliminated. For instance, a motor designed for 600 volts can be run—I would not say it should be operated, because the insulation is not provided for that—but it can be run at 1,000 or 1,200 volts without showing any sign of arcing-over or sparking. A 1,200-volt motor would have reasonably the same margin, so that so far as commutation is concerned, there has been an improvement made in the direct-current motor that is comparable to the advance made when the carbon brush was substituted in place of the copper brush. That certainly will have more or less bearing upon the continuation of the use of direct current.

I was going to say a word with regard to the much-maligned third rail. We have not had a chance to malign some of the overhead construction yet, and I think it would be just as well to wait before passing a verdict.

Mr. W. S. Murray (N. Y. N. H. & H. R. R.)—I think the most interesting feature of the discussion is the question as to standardization. I am inclined to believe that the word standardization, although it is a pretty large word, looks to be a good deal larger than it really is. I hardly think the Interstate Commerce Commission reports are a fair basis to be a determining factor as to the establishment of standard frequency. The Interstate Commerce Commission report will include all the trans-continental lines, and there is no question but those lines which have been unassailed yet by electricity could be electrified upon a basis a very great deal cheaper upon the low frequency than upon the high. I do not think that should influence us. It is a misleading factor. We must not forget that the electrification we are going to consider now is in the eastern section of this country. It is possible that all of us may see a trans-continental road electrified. I think it is doubtful and I do not think that ought to influence us in the consideration of standardization. We must think of the fixed charges that have not been taken into account, namely, in the eastern section of the country where it will be necessary to re-equip all these plants and operate upon what may now be termed a standard frequency of 25 cycles. I think for transmission and power 25 cycles is very nearly to standard; the time element involved is the major consideration of our standardization. Our fixed charges can alter, be replaced by a proper depreciation, and after having taken care of those plants that are now operated on a 25-cycle basis, by that depreciation, which is good business and should be combined by engineering, then we can avail ourselves of the greater data which will be at hand and decide which is the standard frequency. We can also interchange these frequencies in operation just as well as the exchange of a station with a different design. It can be done. I have not the time to go into the detail, but I think any engineer can understand what it is to change the operation of any locomotive, so I am in favor of having more data, and in letting the future consideration of those data decide it for us.

Mr. O. S. Lyford (Westinghouse, Church, Kerr & Co.)—On January 22 the Erie Railroad ran its first electric train into Rochester. Power is transmitted 90 miles at 60,000 volts. The catenary trolley over the 34 miles of track is fed with 10,000-volt current from one substation. The operation is perfectly satisfactory. The system is necessarily operated at 25 cycles as the power comes from one of the Niagara Falls plants, which are all built for 25 cycles. The advantage of the lower frequency is apparent, however. Trucks of unusual size are entirely filled with 100-hp. motors. At 15 cycles motors of 150 hp. capacity could be used on the same trucks.

Mr. C. L. du Muratt (Consulting Engineer, New York)—The three-phase locomotive can give a great overload capacity without trouble, and it can give it without any drop in speed. Take a locomotive developing normally 1,500 hp., and motors working at 12 per cent slip, that locomotive can give five times 1,500 hp. with a slip of 10 per cent. If the normal speed is 68 miles per hour, it will drop to 63 miles. The curve of the three-phase locomotive while starting at practically the same traction at low speeds, will run out and then drop down to the maximum speed, for which the loco-

motive is designed. You can see the great advantage which the three-phase locomotive has over the alternating current, and more particularly over the steam locomotive. We might turn the problem around and instead of saying the three-phase locomotive should be able to carry any overload without any drop in speed, where both the direct current and single-phase and steam locomotive drop off, we might say that the three-phase locomotive will carry the same tractive effort up to any speed, from zero up to full-load speed, while the alternating-current locomotive will drop in tractive effort when the speed comes on, and similarly in a steam locomotive.

In concluding, I will convey to you the following general ideas which may be recapitulated as follows: The greatly increased traffic which the railroads have to handle is forcing us to use as high train weights and high speeds as possible. It is therefore quite natural that that locomotive which combines the greatest speed qualities and at the same time the greatest power in the smallest weight is the one which we want to choose for hauling our future traffic. The electric locomotive is quite surely superior to the steam locomotive in this respect, and therefore should be chosen, no matter whether electric service may cost more than steam service. The three-phase alternating-current locomotive is superior to any other electric motor in this respect, and I believe it should deserve more attention than it has thus far found in America.

Mr. N. W. Storer (Westinghouse Electric & Manufacturing Company)—It seems to me that the whole question of the electrification of steam railroads is one of dollars and cents, and a system which can be operated and installed for the least money is going to be the one which is going to win out. As has been said, there are many different ideas on the same question. Many engineers are working on designs of electric locomotives to meet the many adverse requirements. I have worked over them for some time past, and every time it comes up pretty nearly in the same form—the question of frequency, or the question between alternating-current and direct-current operation. It is a question whether the problem can be solved by the simple direct-current system, which our friend, the father of electricity, loves so well, or whether we must go up in the air with our trolley and with our voltage. Our experience is that it generally comes down to the question of a locomotive of the single-phase type. We have considered the direct-current locomotive, the three-phase locomotive, prayerfully and carefully, but it does not seem to us in the Westinghouse company that either one of these is the type of locomotive which will meet the requirements of the railways in this country. The direct-current locomotive as it has been designed certainly will not do it. The single-phase locomotive seems to offer the greatest possibilities. In speed characteristics, the single-phase locomotive, I am bound to say, pleases me much better than the three-phase, for application to electric railways. We can not only operate up to what might be called the normal speed of a locomotive, but you can go far beyond that. It is simply a question of applying higher voltage to the terminals of your motor from the transformer. The same locomotive can just as well be operated at 10, 15, 20 or 25 per cent above what might be called its normal voltage as the direct-current locomotive can be at its normal voltage. The question of commutation is not so much one of voltage as one of induction in the field, one of current which the motor is carrying, or, in other words, of the tractive effort which it is exerting.

There are a few points in the paper which I want to discuss very briefly. The question of frequency is to my mind the most important. Every time the single-phase locomotive is considered for heavy work, it very quickly brings up the question of frequency, which always, or nearly always, results in 15 cycles. It is just this: You can get larger motors within the limited space which you have and you can get at least 30 per cent greater output from your motors with 15 cycles than with 25 cycles. This means that at the limit you must have 30 per cent more motors if you are going to operate on 25 cycles than if you operate on 15 cycles. In the case of two-motor equipments versus four-motor equipments, you have double. There are probably many cases where two-motor equipments of moderate size will meet the requirements so that they will average fully as high a percentage for its locomotives. You then have the same limiting conditions for both, but in one case you have 30 per cent more motors. That not only increases the cost of motors very much, but increases the cost of all mechanical parts; motor trucks must be heavier than trail trucks and the entire equipment necessarily must be heavier. The question of efficiency alone is bound to influence the matter very largely. The 15-cycle motor approximates very closely the efficiency

reached by the direct-current motor, and there is so little difference that it can hardly be detected. In power factor it comes very close to the direct-current motor. You get up above 90 per cent throughout the entire range, in most cases, and that is so good that it is practically unity.

The question of cost of locomotives is mentioned here, the saving in cost which would be expected by using 15 rather than 25 cycles, and I am bound to say that the difference which is shown here in the paper is entirely inadequate to cover what in our opinion would be the difference. I should say that at least \$5,000 would be the difference, rather than \$1,000. That would make a difference which is overwhelmingly in favor of the 15 cycles. That amount would include the transformer and everything on the locomotive. The difference is due largely to the increase of the number of motors. The question of lighting the cars has come up, and I want to say here, as no one else has, I believe, that you can get very satisfactory lighting with 15 cycles by going to the low-voltage lamp having a heavy filament; a lamp designed for 15 volts will give just as good light and as perfect illumination as the ordinary incandescent lamp on 25 cycles. You can scarcely detect a flicker at all, and there will be no question about the lighting of cars. The many other questions which come up in connection with the railway installations will of course influence this matter very largely, but as I stated in the beginning, it is a matter of dollars and cents, whether the 15 cycles is going to be cheaper to operate than the 25.

Mr. William McClellan (Westinghouse, Church, Kerr & Co.)—Having passed through the experience of putting some of these 11,000-volt motors on cars and equipping with them, I am firmly of the opinion that the solution of the railroad problem is going to be by means of the high-voltage overhead trolley, alternating-current, single-phase motor. In spite of the fact that you have to have a heavier motor for the power developed, in spite of the fact that you divide your substation into pieces and carry it around with you, making a large amount of ton-miles in the course of a year, as a whole the system provides a better solution for the trunk line electrification than any other that has been in sight until the present time, particularly if we can bring the engineers to think that 15 cycles is better than 25. I for one after a very careful examination of every argument feel sure that absolutely nothing stands in the way of the standardization of this frequency. I should like to call your attention to one fact, and that is, although the steam railroads have not standardized as to details, they have standardized so that they can exchange cars, and we shall never electrify railroads as a whole until we get so that one railroad can exchange cars and equipment with others. Railroads today do very little exchanging of locomotives, and we might have one kind of trolley on this road running locomotives of one type, and another type here and get along pretty well, and if we cannot exchange cars it will be absolutely impossible for us to electrify the railroads of this country, particularly on the wholesale scale that Mr. Stillwell has suggested in his paper tonight. So therefore I suggest that it would be possible immediately to standardize certain features of our railroad practice, I hope by trolley, as he has suggested, locating the third rail in the almost unknown places where it will be adopted in the future.

But there is one very important thing—while I do not believe, as I will try to show, that the figures given are of very much value, I do believe there are particular lines on which we can approach any railway problem and hope to solve it with electricity, from the fact that we can separate our units and put them in a train, getting very much greater acceleration, which is of great importance in passenger work, or getting longer trains which would help us out in freight work. If we are to do that, it seems we must equip these cars with train lines, and in spite of the fact that the two great manufacturing companies in this country have two different systems in control, I see no reason why the train line should not be standardized and why it would not be possible to have one kind of train line for both systems. Certain things would have to be yielded, but very few. That would solve a great many problems in itself, particularly if the train line could contain the heater and light circuits, making thereby one jumper between the cars to be put in in addition to the albrake hose. That would solve one large factor in the necessary standardization, and I believe the only standardization that is possible or ought to be allowed at present, because anything else would stifle proper advance in the art.

Mr. W. L. Slichter, (General Electric Co.)—Among many interesting parts of the paper of the evening, I have been particularly interested in the subject of discussion of frequency, having studied that subject for 15 and 25 cycles, for single-phase work, and I think there is no question but that the lower frequency is very desirable for the single phase

motor. There seems to be a unanimous opinion that the output of the motor may be increased some 30 to 35 per cent by a decrease in frequency to 15 cycles. This will enable you in many cases to build a motor of sufficient power, in the limited space available on the trucks of a car, to obtain the results desired, whereas at 25 cycles it would be impossible, but we must, as Mr. Stillwell has pointed out, consider what it is going to cost us. The other parts of the system, except the transmission itself, are affected in the reverse way. I have some figures here. I considered first an interurban road in which the number of equipments operating were small compared with what would be considered on a large steam road, as discussed by Messrs. Stillwell and Putnam. For 25 cycles I found that the cost of the power house is 34.5 per cent of the total, substations 2 per cent, low-tension construction 14.8, and low-tension copper 12—I distinguish this because it is possible to save in one and not in another—high tension 5.4, bonding 7, and equipments 25 per cent. Turning to 15 cycles the power house cost was increased to 38, substation to 2.1, low-tension construction remaining the same at 14.8, and due to the lesser losses in the track, the copper could be decreased to obtain the same losses, to 11 per cent; the high-tension construction remained at the same, 5.4, bonding the same at 7, and the total cost of equipments 23, and making the total 1 per cent greater for the 15 cycles. Changing the scene to a road which approximates steam railroad practice, in which the cost of the equipments is increased approximately 100 per cent, with the cost of the power station in proportional increase the figures come out quite otherwise, and very closely as given in the paper, which shows that as we go toward the heavy railroad work there will be more demand for the lower frequency. In figuring these costs I have found that a great deal depends on the design of the generating station. The generator itself may increase in cost from 15 to 50 per cent. This is due to the fact that the speed of 15 cycles is going to be somewhat of a problem in connection with turbine work, whereas with slow speed engine-driven units it is not so much of a problem. It can increase the transformers by 20 per cent, and bring about a decrease in the distributing system of 10 per cent. There is one point that has not been discussed this evening—that although the output of the motor has been increased 35 per cent, that is the output during acceleration, that the continuous output of the motor is not correspondingly increased, and for passenger service with long runs and lesser acceleration, not so much is to be obtained by the lower frequency.

Prof. J. B. Whitehead, Jr., (Johns Hopkins University)—In considering an electrically-propelled vehicle, I take it we may consider that vehicle is best which possesses two characteristics to the greatest degree, other things being equal—you will observe this premise, other things being equal, is the place where all the discussion occurs. The two characteristics to which I refer are the manner in which the vehicle is self-contained and the greatest power that you can get into the space which is given to the motors. In speaking of the degree in which an electrically-propelled vehicle is self-contained, I wish to draw attention to the fact that we may consider an electric locomotive or car self-contained in so far as it requires the least attention from the outside, that is to say, from stationary apparatus. You will readily see the direction in which that thought tends, that is to say, the greater the distance between substations and the less complicated the apparatus at the substations, the better. We at once see the value of alternating current in the greater distance between substations, and the advantage which the alternating current has over the direct current in the substations themselves. I take it that if the advocates of the direct-current system will bring forth apparatus which would transmit and operate at the same voltages that the alternating-current system does, a great deal of this discussion would not have taken place. I think from the standpoint of self-containment we must look for something from the direct-current side before we yield the position taken by the advocates of the alternating current system.

It has been very interesting to hear the comments on the other aspect, that is to say, the great power which can be gotten into the space available for motors by reducing the frequency. If 15 cycles is the point at which the advantages of an increase of power within this space stops, being offset by the greater weight and greater cost of transformers, and the difficulties in the generating apparatus, that is the point where the question is going to stop. The promise I made—other things being equal—are the places where we will have to work. The question is to do the right thing in the right way, and if we can stretch out the distances between the points where the motor needs help from outside more and more, by using the alternating-current system, that is

the direction we will develop. The footnote suggests a danger from the rising potential of a broken bond, in the case of high-potential operation. I ask if there is any instance on record where there have been unpleasant results attendant upon a broken bond?

Mr. L. B. Stillwell—I will reply to Mr. Whitehead's question first, so far as I am able. We have assumed in our estimate the No. 0000 conductor in the return circuit, in order to avoid dangerous potential on the track in case of broken bond. We have not known of any case in which danger has occurred from that cause, but we desire to make our estimates eminently fair to the steam side of this argument and theoretically consider what is an element of risk unless the track return be reinforced.

I have been gratified by the discussion on the paper. I hope the members of the Institute who have concrete facts bearing on the important question of frequency will contribute these facts by letter. I believe that the great majority of engineers present admit that the question of frequency is settled decisively by the testimony we have had in favor of 15 cycles; the testimony of Mr. Lamme, Mr. Storer, Mr. Slichter, and other men who have invented and worked with these motors, to my mind is conclusive in respect to the frequency, and they have testified that the difference in favor of 15 cycles, as measured in drawbar pull, is very great. When you take that fact into consideration, in

A MODERN INTERURBAN LIMITED CAR.

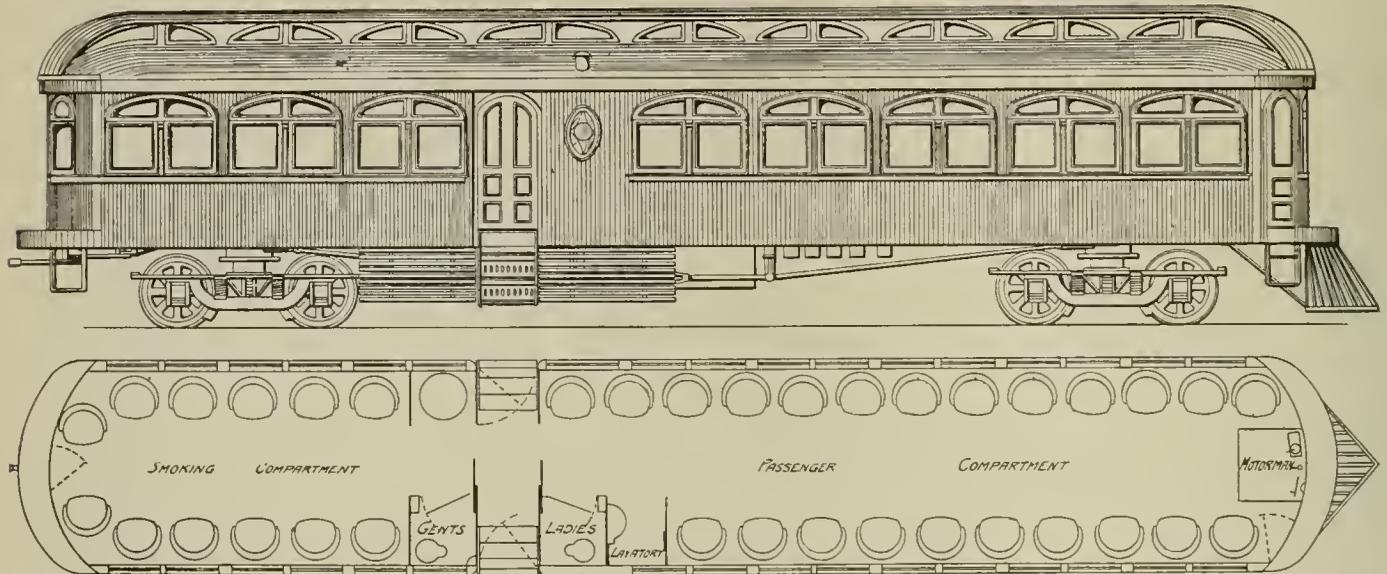
A new design for an interurban car suitable for limited service, as suggested by Mr. H. A. Nicholl, general manager of the Indiana Union Traction Company, is shown in the accompanying illustration. Definite dimensions are not exhibited as the design is intended only as a typical one and the detail dimensions would necessarily have to be worked out in particular for each road that would use such cars. In designing the car Mr. Nicholl had in mind the following advantages to be obtained:

1. It is strictly an observation car, every passenger in it being able to see the track either forward or backward.

2. The arrangement of the passenger compartment is such that women, children and non-smokers, who comprise the majority of passengers in railway cars, can ride in the front of the car instead of at the rear, as is at present in vogue on most railways.

3. It does away with the necessity for women passengers going through the smoking compartment or the smokers being compelled to go through the passenger compartment on entering or leaving the car.

4. There are toilets in both the passenger and smoking compartments and a lavatory in the passenger compartment.



Modern Interurban Limited Car.

view of the general perspective of the problem which I have endeavored to consider, the electrification of the country as a whole, it seems to me there is only one conclusion to draw. In our estimates we calculated the expenditure for rolling stock would be on the 25-cycle apparatus \$450,000,000. Mr. Storer said that the difference in favor of the 15 cycles would be at least \$5,000 per locomotive. Scaling that down to \$4,000, and applying that to 24,000 locomotives, the difference is \$96,000,000, which is ten times the difference in cost of power house equipment. I believe we are able to standardize frequency and the position of the overhead trolley. We certainly ought to do that.

The steam railroads have standardized everything in relation to the interchange of their traffic. We must follow that precedent, or we shall get involved in all sorts of trouble. Mr. Sprague explained why he has not the same kind of station that Mr. Murray has. When they meet at Albany, after having electrified the systems further back into the country, they will have some difficulty in making their systems fit, and that is what we want to avoid. Mr. Sprague has made such a great success in this development of the electrification of trolley and steam railroads, particularly in his invention of the multiple-unit system, I should be sorry to see him make a mistake, and I hope before he nails his flag to the masthead with 1,500 volts on the trolley, he will take into account all the evidence presented tonight and see whether he is right.

[That part of the discussion relating to the comparative cost of operating by steam and electricity will accompany its part of Mr. Stillwell's paper in a later issue.—Eds.]

5. The heater is railed off instead of being put in a cabinet, thus dispensing all of the heat through the car.

6. The car is safer because there is but one exit and one entrance, the doors of which can be closed as in a Pullman car. The front door is intended for the use of the motorman and the small rear door for that of the conductor.

In the planning of this car Mr. Nicholl has incorporated many advanced ideas, well-founded on the policy that every comfort should be afforded the passengers on long runs.

The Twin City Rapid Transit Company, of Minneapolis, Minn., controls and operates the city and suburban street railway lines of Minneapolis and St. Paul, as well as a line of steamboats on Lake Minnetonka. The passenger department of the company has been seeking for some time for a suitable trademark for the system and after examining a great many different designs has finally adopted the one shown in our engraving. This trademark will hereafter be used on all printed matter, blanks, timetables, newspaper advertising and other forms of publicity. It was selected from a large number because of its simplicity and because it would look equally well in all sizes and whether printed in one or more colors. The design represents a Spanish mission window, which is typical of the style of architecture to be used in the company's amusement resort at Big Island Park, on which work is now under way.



MEETING OF THE EXECUTIVE COMMITTEE—AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION.

The executive committee of the American Street and Interurban Railway Association met at the office of the association, 60 Wall street, New York, on Monday, January 28. Those in attendance were: John I. Beggs, president; James F. Shaw, second vice-president; Arthur W. Brady, third vice-president; C. L. S. Tingley, president of the Accountants' Association; H. H. Adams, president of the Engineering Association; S. L. Rhoades, president of the Claim Agents' Association, and Secretary B. V. Swenson. First Vice-President C. G. Goodrich and Vice-President W. Caryl Ely expected to be in attendance, but were prevented by business engagements from so doing. Past-President H. H. Vreeland was present by special invitation, as was also the following committee, representing the Manufacturers' Association: President J. H. McGraw, Major H. C. Evans, Howard F. Martin, E. M. Williams and Hugh M. Wilson.

One of the chief objects of the meeting was to consider the question of the time and the place to hold the next annual conventions of the several street and interurban railway associations. Boston, Atlantic City and Norfolk, Va., each extended invitations. Mr. R. H. Sexton, chief of the Bureau of Congresses and Special Events of the Jamestown Exposition, addressed the meeting and explained the advantages which Norfolk would have to offer next fall, during the exposition. His efforts were seconded by Mr. E. H. Hyman, representing the Greater Norfolk League, the City of Norfolk and the Norfolk & Portsmouth Traction Company. A letter was read from Mr. A. T. Bell, president of the Hotel Men's Association of Atlantic City, which set forth in detail the facilities and advantages which Atlantic City had to offer as a convention town. Mr. Bell's letter was supplemented by brief remarks from Mr. C. D. White of the Marlborough-Blenheim Hotel. The situation with regard to Boston, which was explained by Mr. Shaw, is at the present time somewhat indefinite, because it is impossible to determine at once whether or not Mechanic's Hall will be available for exhibition purposes.

It was generally recognized through the discussion of the availability of the several places proposed, that the accommodations for the exhibits would of necessity in a large measure be the determining factor in the selection of a place for the convention. The sentiment of those present was in favor of some Atlantic seaboard city.

In order that the question might be determined carefully, after thorough investigation a committee composed of Mr. J. F. Shaw, Mr. C. L. S. Tingley and Mr. B. V. Swenson, with President John I. Beggs as member ex-officio, was appointed to visit the several places under consideration, in company with a similar committee of three from the Manufacturers' subcommittee. This committee was given full power to act. The names of those who will represent the Manufacturers' Association have not yet been announced.

The committee appointed a few months ago to consider the matter of new offices for the association, reported that rooms in the Engineering Societies building, 29 West Thirty-ninth street, had been selected. These quarters consist of five rooms on the seventh floor, which are admirably suited in every way to the enlarged requirements of the organization. Secretary Swenson expects to move to the new location sometime during February.

President Beggs announced the personnel of several of the standing committees for the American Association for 1907, as follows:

Committee on Membership: H. H. Vreeland, chairman, president New York City Railway Company, New York City; C. S. Sergeant, vice-president, Boston Elevated Railway Company, Boston, Mass.; E. C. Foster, president, New Orleans Railway & Light Company, New Orleans, La.; H. J. Mc-

Gowan, president, Indianapolis Traction & Terminal Company, Indianapolis, Ind.; W. Caryl Ely, president, Ohio Valley Finance Company, Buffalo, N. Y.; James H. McGraw, president, Street Railway Journal, New York City; Hugh M. Wilson, president, Electric Railway Review, Chicago; W. G. Ross, managing director, Montreal Street Railway Company, Montreal; W. A. House, vice-president, United Railways & Electric Company, Baltimore; T. K. Glenn, vice-president, Georgia Railway & Electric Company, Atlanta, Ga.

Committee on Compensation for Carrying U. S. Mail: G. T. Rogers, chairman, Binghamton Railway Company, Binghamton, N. Y.; Capt. Robert McCulloch, vice-president, United Railways Company, of St. Louis, St. Louis, Mo.; Gen. G. H. Harries, vice-president, Washington Railway & Electric Company, Washington, D. C.; P. F. Sullivan, president, Boston & Northern Street Railway Company, Boston, Mass.; A. H. Stanley, general manager, Railway Department, Public Service Corporation of New Jersey, Newark, N. J.; A. H. Ford, vice-president, Birmingham Railway Light & Power Company, Birmingham, Ala.; E. K. Stewart, general manager, Columbus Railway & Light Company, Columbus, O.

Committee on Heavy Electric Traction: Calvert Townley, chairman, vice-president, Consolidated Railway Company, New Haven, Conn.; E. B. Katte, chief engineer electric traction, New York Central Railroad, New York City; L. B. Stillwell, consulting engineer, New York City.

The membership of the other committees, namely: "Promotion of Traffic," "Standard Code of Rules," "Subjects," "Car Wiring," "Standardization," "Insurance," "Municipal Ownership," "Public Relations" and "Welfare of Employees," while selected by President Beggs, is not ready for publication by reason of the fact that acceptances have not been received from all of those requested to serve on these committees.

Secretary Swenson, in an informal report covering the affairs of the association stated that since October 1, 1906, the active membership of the American Street and Interurban Railway Association had increased from 200 to 237 companies and the associate membership from 113 to 156. President Vreeland of the membership committee outlined plans which he had under consideration for an active campaign, looking to the material increase in the membership during the present year. While most of the important street and interurban railways of the country are represented on the membership rolls at the present time, there are a number of smaller but very important roads that have not joined, whose accession to the ranks is very much desired by the officers of the association. The number of associate memberships which might be added is large, in view of the fact that many engineers and manufacturers and people engaged more or less directly in the business of urban and interurban transportation are eligible to associate membership. Secretary Swenson expressed his belief that the number of associate members might easily be made 1,000, and he considered it certain that by the time of the next convention it would be 400.

The secretary estimated that the income of the parent association for the current year would amount to \$26,000, a revenue that would cover the expenditures contemplated under the plan of expansion now animating the association and its allied societies.

President Tingley of the Accountants' Association reported that at a meeting of the executive committee of that organization held in Philadelphia on January 21, the report and discussion on "Depreciation," which occupied an entire day of the Columbus meeting, had been revised and that the Accountants' executive committee recommended its publication in the annual printed report. This suggestion was adopted by the executive committee of the American Association and consequently this very important matter on the vital subject of depreciation will shortly appear in the printed proceedings.

Secretary Swenson explained that owing to the great volume of matter flowing from the deliberations at Columbus, and the time necessary for its proper revision, the print-

ed reports of the four associations had been somewhat delayed. The matter is now in the hands of the printer, however, and it is the secretary's expectation that the reports will be ready for distribution sometime in February. The four reports will aggregate a total of 1,400 pages, octavo, and will be issued in two cloth-bound volumes. One volume will contain the proceedings of the American and the Engineering associations and the other those of the Accountants' and the Claim Agents' associations. Company members will each receive one or more sets of these reports, the number being determined by the amount of the annual dues paid to the association.

The important report on "Municipal Ownership and Public Relations," like that on "Depreciation," above mentioned, will first appear in the official printed report.

It is the expectation of President Beggs that another meeting of the executive committee will be held in three or four months, to further consider and elaborate plans for the conventions of the present year.

ANOTHER SUBWAY PROJECTED FOR BOSTON.

A petition and bill for a subway in Boston between the present Park street station and the Back Bay district in the vicinity of the junction of Beacon street and Commonwealth avenue was presented in the Massachusetts legislature on January 19. The project authorizes the Boston Transit Commission to build a tunnel and subway for the accommodation of the two tracks especially for use by surface cars from Park street under Boston Common, and by such a route as the commission deems best to the new Charles river embankment at or near the Union Boat Club, and thence westerly under the embankment from Charlesgate east and the outlet of the Back Bay Fens basin to the junction above named. The cost of the work would be defrayed by the city of Boston, and a 25-year lease to the Boston Elevated Railway Company is assumed at an annual rental equal to 4.5 per cent of the cost of the subway, which would be called the Embankment subway in distinction to existing and already authorized underground routes.

The object of the bill is to provide improved transit facilities at the west of the city, and it is estimated that on account of the location beneath the Charles river embankment the new line could be built at not over 50 per cent of the cost per mile of any subway heretofore built in Boston. The principal items of expense in the construction of other subways have been the great cost of underpinning buildings, removing gas, water and sewerage pipes and wire conduits, the acquirement of locations for stations, and the constant maintenance of a superstructure by which traffic may be continued in the streets overhead during the time of construction. In building the proposed subway there would be little if any underpinning of buildings, only a few hundred yards of pipes or conduits to reckon with, no purchasing of land for stations and comparatively little maintenance of a superstructure in the streets to accommodate vehicles and surface car traffic. The tunnel portion under the blue clay and bowler clay of Beacon Hill could be driven at comparatively small cost, and no cofferdam would be necessary, as the Charles River Basin Commission is now building one. This commission has made its contracts with reference to the fact that the legislature of 1907 may pass an embankment subway act. The subway would necessarily be waterproofed, but this would be the case with any subway built under Commonwealth avenue or Boylston street. Waterproofing may now be accomplished by suitable cements at moderate expense, especially where the pressure is slight, as would be the case with the embankment subway.

If the proposed subway is authorized and built, it will accommodate a large number of cars collected from Brookline, Brighton, the Newtons, Waltham, Watertown and other suburbs lying immediately at the west of the city.

RESPONSIBILITY FOR TROLLEY INFLATION.

The public agitation which has sprung up in several states, notably New York, New Hampshire and Connecticut, over defects of the state railroad commission, is commendable and cheering in itself. But the cynical guide must be pardoned when one reflects how long this reformatory energy has had to wait, how often warnings have been uttered and exposures made by the so-called "technical" writers but without effect on either the public or the newspapers, and how the sins of omission and commission have gone on until now not a few of them are too late to rectify. These reflections, in the nature of afterthoughts, apply peculiarly to the state of Connecticut where just now there is a sudden and volcanic outburst against stock watering of the street railways. The immediate text is the disclosure of the huge volume of water transmuted into dividend-paying stock by the recent absorption of the Connecticut Railway & Lighting Company. The exposure is far from new. But it happens to be accented by a big deal carrying figures of sensational magnitude. Hence the spectacle of Connecticut newspapers which have been silent on the topic for 15 years, now denouncing trolley inflation and the state railroad commission which countenanced it, in scare headlines and double-leaded editorial type. This process of closing the doors after the escape of the animals has its elements of diversion; but, more seriously, it has some historical hints on trolley inflation in Connecticut which are not the less instructive because typical of other commonwealths.

The first trolley wave struck Connecticut in the year 1888, though as a mild surge; a dead-locked legislature two years later created a law-making hiatus of four years during which no statutory business of any kind was done. It blocked and in a sense dammed up trolley projects until 1892, when they burst on the legislature in a flood. The state was thus measurably the victim of somewhat exceptional conditions. The trolley craze grew to wildfire. Cities and suburbs, farms and the backwoods hailed the new motive force as a mighty local and economic helper. The steam companies at first resisted electric parallels successfully, later in vain. Fiscal aspects and ratios of capitalization were ignored and the state railroad commission continued to be the voluntary cipher that it had been before. Outside capital quick to see the profits of course rushed in, constructing street railways by bonds—often marketed below par—and "bonusing" the stock. It was a veritable trolley saturnalia that lasted almost a decade, during which new charters—if not paralleling steam lines—could be had for the asking, and the first speculators in old horse railroad territory got rich quick.

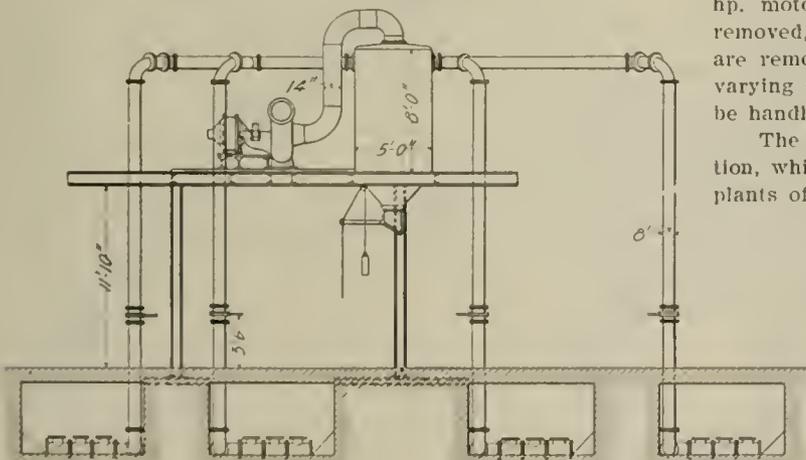
Now too late has come the disillusion. The economic mill, even in so exceptional a thing as the rise of electric street railways, grinds slow but it grinds sure and fine. Connecticut has awakened to a solid economic condition as contrasted with rash and thoughtless enthusiasm. The situation has been forced further by the threatened development of long-distance electric rivalry. This has compelled the steam interests to buy up the dropsical trolley systems one by one until they are now unified under one control, similar conditions existing in Rhode Island and lower Massachusetts. Water original, secondary and in some cases tertiary, is solidified into shares that carry their fixed charge on the purchaser, and, next, on the public. Honest capitalization that might in many cases have connoted a three-cent fare has become diluted capital exacting a five-cent fare. And who is to blame? Obviously the Connecticut citizen who blinded himself both to existing facts and to easy forecast; next a legislature equally negligent, but in which the current of intelligence could hardly be expected to rise above its source; and last, and, on the whole worst, a railroad commission supple, languid and inefficient always, only just now more vividly exposed as such. In other words, all three of the

civic elements charged with the prevention of a public evil were inert when they should have been active.

Where is the redress? Plainly nowhere as regards the past. Connecticut wakes up too late. She has forced her steam interests to self-protection, she has legalized under the signet of her own state officers securities bought by innocent investors, by trustees and savings banks, and she stands committed to a condition which she herself has created and for which she must endure the logical penalty. She has, however, one or two minor offsets. For example, she will gain some tens of thousands in dollars by taxation based on watered stocks enhanced in market value by the new merger and she probably has a few operated trolley lines that would be non-existent had speculative street railway building been at lower terms. For the rest she must "take it out" of a railroad commission made up of two politicians and an antique engineer now in his eighth decade. In the attacks now centering on that body in the Connecticut press one can find retributive justice and a measurable promise of future betterment. As to the general lesson its teachings reach far beyond the bounds of a small New England state which is far from unique in its experience of initial error and belated repentance.—The Railroad Gazette.

PNEUMATIC ASH-CONVEYOR SYSTEM.

In various boiler plants the problem of handling ashes is solved in many ways more or less economical. At the Evanston (Ill.) plant of the North Shore Electric Company



Piping for Pneumatic Ash-Handling System.

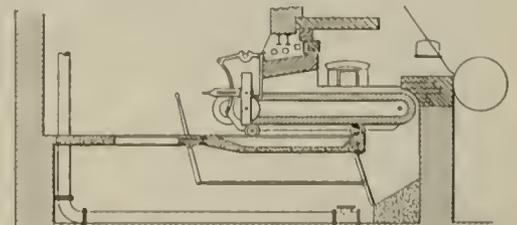
there is a pneumatic ash-conveyor system that has shown itself to be capable of disposing of ashes in a satisfactory and very economical way. The essential parts of this system for pneumatically handling ashes are a No. 7 Sturtevant exhaust fan direct-driven by a 40-hp. motor. A 14-inch pipe connects the fan with the top of a "separator." Leading into this separator are 8-inch wrought iron pipes which extend to the ash pits under the grates where openings are provided for allowing the ashes to pass into the pipes. On account of the expense which would have been necessary to place one ash-collector header through the row of ash pits, as in other installations, it was in this instance thought best to use more piping in the form of risers as shown in the drawing. The separator is mounted between two of the boilers and at the rear, at such an elevation that a wagon may be driven under it and loaded with ashes from a track. The small headroom limited the capacity of this separator to 8,000 cubic feet, but for installations in power plants of more modern design it is proposed to place a concrete ash biner just below the separator so that a large storage capacity may be had.

When it is desired to empty the ash pits the exhaust fan is started, thus creating a vacuum of about one pound per

square inch in the separator and the pipes connected with it. This vacuum rapidly draws the ashes that have accumulated around the openings in the ash pits into the pipes and through them to the separator, where, by means of a spray head and baffles they are wet down and discharged to the bottom of the separator hopper. Blast gates are provided in the lead from each ash pit so that if desired each pit may be cleaned individually. Due to the great difference in velocities of the air, which in the pipes connecting with the ash pit and serving to carry away the ashes is 18,000 feet per minute and in the separator but 500 feet per minute, there is no trouble from ashes passing the separator and damaging the exhaust fan. It is also observed that the ashes travel through the center of the space in the pipes, rather than along the sides. This is due to the greater velocity of the air in the center where the friction is less and thus the pipe work is free from the wear that would ordinarily be expected.

Before this system of handling ashes was installed at the North Shore plant it required four men 10 hours a day to keep the ash pits clean. It was first necessary to go into the hole, shown in the drawing, in front of the boilers and shovel the ashes from their piling place back 12 feet to a point under the hole; then they had to be handled again and thrown onto the boiler-room floor where a third handling was necessary to load them for carrying out of doors. With the new ash-handling equipment one man does the work of the four in one-fifth of the time or two hours; thus, the economy of the installation, which only requires about 25 hp. motor capacity during such times as ashes are being removed, is made apparent. As ordinarily operated the ashes are removed at the rate of 300 pounds per minute and by varying the speed of the motor both ashes and clinkers may be handled in quantities up to 500 pounds per minute.

The cost for handling ashes with this particular installation, which, it is understood, will be much improved upon in plants of later construction, is said to be 5 cents per ton of



A Simple Water Heater.

ashes handled or about 1 cent per ton of Illinois coal burned.

Some of the desirable features other than the low cost for removing ashes are, that with this ash-handling system a fire may be pulled hot and the ash pits cleaned immediately. The exhausting vacuum of one pound per square inch is sufficient to carry to the separator any clinker or fire brick that may pass through the intakes under the boilers. When clinkers pass through the apparatus they are broken into small pieces, making them much more suitable for ballast than as usually found. By means of this same system and a small amount of additional piping it is possible to utilize the same exhaust system for cleaning combustion chambers and the stack.

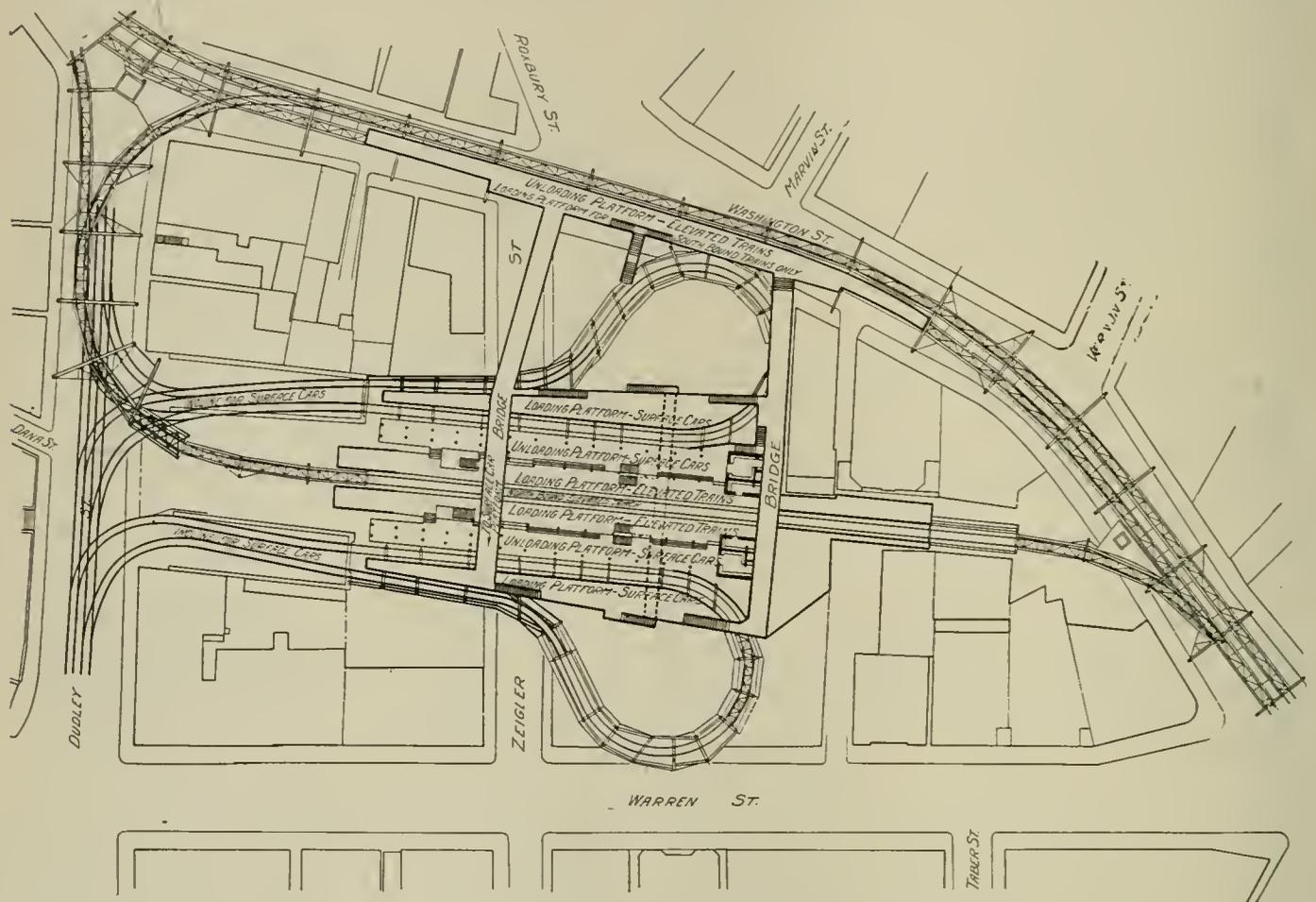
Hot water for the washbowls and shower baths in the shops and offices of the Nashville Railway & Light Company at Nashville, Tenn., is obtained by the simple means of passing the water through about 12 feet of coiled pipe placed in a large Round Oak heater. An explosion is impossible, for, should the water become too hot and form steam, it would simply force the water back into the city mains.

CHANGES AT THE DUDLEY STREET TERMINAL, BOSTON.

The Boston Elevated Railway Company's proposed changes at the Dudley street terminal, Roxbury, have been conditionally approved by the Massachusetts Railroad Commission, final approval being reserved until the mayor of Boston passes upon the plans with respect to the architectural effect and obstruction to light and air. Through the courtesy of Mr. George A. Kimball, chief engineer of elevated construction, we present a general plan of the proposed changes, which are to be made at Dudley street with respect to the extension in progress of the elevated lines to Forest Hills.

At the present time all southbound trains from Dover street station which carry passengers are run through the

the use of the station as a terminal for certain trains if traffic conditions make it desirable. The principal change at Dudley street is in connection with the platform arrangements, which will separate the loading and the unloading traffic in a manner which will doubtless do much to relieve crowding. The new layout involves first of all a new platform 350 feet long over the Washington street side of the terminal, which will serve as a stopping place for south bound trains. This platform will be connected with the main platform in the terminal for north bound trains with one now in use—and with the various surface car platforms lying between and to the east of the others, by two overhead bridges. Two new surface car platforms are planned, one for the inner side of each surface car loop. These loops are connected with the Dudley street level by two inclines, one at the east and the other at the west of the northbound elevated track. South



Plan Showing Proposed Changes at the Dudley Street Station, Boston Elevated Railway Company.

Dudley street terminal by a loop track which turns them back for the northbound trip. Passengers are loaded and unloaded upon the platforms at each side of the train as it stands in the station, and free bodily transfer is given between the train, the cars on the ground level and the lines of surface cars which serve the opposite sides of these platforms at substantially the same level. The longest trains at present consist of five cars, and the only separation of loading and unloading elevated traffic is that accomplished by the use of center doors for exit and end doors for entrance. Eight-car trains will be run at certain times of the day when the new Washington street tunnel route is completed, and at present the elevated stations in Boston are being prepared for this length of train.

The extension of the elevated lines to Forest Hills will in a sense turn the present Dudley street terminal into a way station, although the arrangement of tracks will permit

of the terminal, and not shown by the accompanying illustration, a third track is planned over Washington street, to give an opportunity for switching relay trains into the system with as little interruption to the service as possible.

According to the present plan the west elevated platform over Washington street will be connected with the ground level of the terminal enclosure by a flight of stairs which will enable out-bound passengers to reach the Forest Hills trains quickly from the street, and also will facilitate the exit of passengers from the city to the lower enclosure. The two overhead bridges will bring both southbound trains and surface cars into easy communication. It is planned to use the south bridge chiefly for transferring passengers from outward bound elevated trains stopping at the Washington street platform to the east and west surface car loop loading platforms. Direct stairways are to connect these platforms and the bridge, on each side of the elevated line through the terminal.

Passengers from the city proper, who at present continue their journey by loop cars to Dorchester, Grove Hall, Jamaica Plain, Brookline and other points will be able to make prompt connections by means of the overhead platforms. Passengers arriving at the terminal by surface cars which ascend the inclines will transfer to north bound in-town trains as at present. Trains from Forest Hills will be run through the terminal north bound. The two sets of platforms on each side of the central elevated track are connected by a mezzanine sub-passageway with suitable stairs, between the street level and the elevated level. Passengers from surface points wishing to go to Forest Hills will ascend directly to the north bridge from the surface car unloading platforms, and in general convenient access from any platform to any other can be had by the stairways, bridges or sub passages. The ground level of the terminal will remain as well connected by stairways with the upper level as it is already, with the addition of a stairway to each of the new platforms. Although there are seven platforms and two bridges in the new arrangement it is planned to make each transfer as simple as is possible. Two additional tracks will be installed at the foot of the west incline for surface cars coming from certain eastern points, which at present use the east loop. Exits to the street will be direct and convenient.

THE CHARLESTON & SUMMERVILLE ELECTRIC RAILWAY.

D. E. Baxter & Company, Inc., railroad contractors and engineers, 27 William street, New York, who have the entire contract for the Charleston & Summerville Electric Railway power plant, machinery, overhead work and rail-bonding, have completed specifications for the power and line equipment on which they are pushing construction, having two large gangs at work, one at Charleston and one at Summerville. The operating system is single-phase catenary. The power-house will be situated about nine miles from Charleston at a point where two steam railroads intersect. There will be two Snow gas engines of 800 horsepower with a maximum capacity of 920 horsepower, and two single-phase 25-cycle generators of 600 kilowatts capacity.

From Summerville to Charleston city limits the voltage will be 6,600. At the intersection of the city limits and the company's private right of way will be located a sub-transformer to supply a 550-volt current to the eight single-truck cars intended principally for city use. The south end of the road will enjoy the heaviest traffic in both freight and passenger service, as what are said to be the largest phosphate works in the world and other industries are located along the line. The power-house will be a concrete fireproof building in which will be installed the following named equipment:

- 2 800-horsepower Snow gas engines.
- 2 600-kilowatt single-phase 25-cycle generators.
- 2 70-kilowatt motor-driven exciter sets with transformers.
- 1 switchboard with bus pole at exciter panel.
- 1 lamp bracket and shade.
- 1 field motor
- 2 ammeters.
- 2 rheostat hand wheels.
- 2 double-pole single-throw switches.
- 1 double-pole double-throw switch for throwing battery on either exciter.
- 1 single-pole single-throw equalizer switch.
- 2 circuit-breakers with reverse-current relays for use with field exciter battery.
- Generator panels complete.
- Feeder panels, complete.
- Motor starting panel, complete.
- Exciter regulating battery. The exciter for the rheostat is to have proper range for use with Thrill regulator

The overhead work will consist of a special design single-pole bracket catenary system with 120 foot spans, No. 000 hard-drawn copper trolley wire, corrugated porcelain insulators, suitable stud-bracket, stud strain bracket, section brake and strain insulators.

The president of the company is anxious to complete this

road as soon as possible to take care of the summer travel. A spur will be run from the main line to the new Charleston navy yard. The contractors are increasing their forces that this end may be accomplished, and they are also assured by the Snow Manufacturing Company that the delivery of machinery will be prompt as agreed. This line will have a tendency to increase the population of Summerville, the summer resort for Charleston, as communication between these two points will be of such frequency that the business men of Charleston can reside in Summerville, attending to business and returning to their homes at night.

Power Improvements of the Lake Shore Electric Railway.

During the past season the Lake Shore Electric Railway Company has more than doubled the capacity of its Avon Beach Park power station. The additions include the extension of the south end of the building to accommodate the new machinery necessitated by the increased load caused by the double-tracking of the road from Rocky River to Lorain. A 2,500-kw. Westinghouse-Parsons turbo-generator has been added and is served by a Wheeler condensing outfit and a 67.5 kw. exciter set, also of Westinghouse manufacture. Four 500-hp. Sterling boilers equipped with Sterling furnaces and mechanical stokers have been installed in the boiler-house addition, which also has been fitted with coal and ash-handling and ash-storage facilities.

The track installed is sand-ballasted and the 80-pound T-rails have electrically welded bonds. To make the station a strictly high-tension installation two 400-kw. alternating-current generators have been ordered to replace the present belted direct-current machines, and to provide for the further growth of the business provision has been made for the addition of another 2,000-kw. turbo-generator, exciter, condenser and boilers at the company's power-house at Fremont during the coming summer. The installation of the above equipment and the design of the piping systems, etc., was carried out by the company's engineers.

We are indebted to A. V. Brown, chief engineer of the Avon Beach power plant, for the above information.

Chicago Elevated Railroad Traffic in 1906.

The statement of the traffic of the Chicago elevated railroads in 1906 shows that the four companies carried a total of 131,956,282 passengers, an increase of 8,297,997, or 6.28 per cent, over the year 1905. The growth of travel is counted as being about the normal average for a growing city, but officials of the companies contend that the gains could have been made even greater if the facilities for handling passengers were better. The following data show the number of passengers carried during the year by each of the roads:

	1906.	1905.	Increase.
Metropolitan.....	49,771,816	45,368,837	4,402,979
South Side.....	34,423,601	32,953,607	1,469,994
Northwestern.....	30,397,392	28,238,625	2,068,767
Chicago & Oak Park.....	17,453,473	17,097,216	356,257
Total.....	131,956,282	123,658,285	8,297,997

The significant points in the above are that the Metropolitan showed more gain than all of the other companies combined. The South Side company carried over 4,000,000 more passengers than the Northwestern, but the latter gained more traffic over the previous year than the former. This condition perhaps reflects the superior service of the Chicago City Railway surface lines, which detracted business from the elevated road, compared with inferior transportation furnished by the Chicago Union Traction Company, which lost heavily to the elevated lines on both the West and North sides of the city. Chicago & Oak Park's small increase for the year indicates that the company is doing well to hold its own.—The Economist.

News of the Week

Cleveland Traction Situation.

President H. E. Andrews, of the Cleveland Electric Railway, and President A. B. Du Pont, of the Municipal Traction Company, are still holding conferences in the effort to determine upon a valuation for the property and franchises of the Cleveland Electric Company, which will be made a basis for the proposed lease to the Municipal Traction Company. Attorneys representing both companies and the city were called in last week to assist in the discussion. Mr. Andrews announced that an agreement had been reached on several questions relating to the expiration of franchises. Several contractors and real estate experts have been called in to give advice on the value of the physical property. Secretary Davies of the old company and Mr. Du Pont are still at work on their figures for the amount the Cleveland Electric company is to pay the city, for the use of Central avenue and Quincy streets since the expiration of the franchises. The city council on January 28 extended until next Monday, February 4, the time in which they are to report. The Municipal Traction Company on January 26 announced a novel plan by which it expects to enlist the sympathies of the small investor in the low-fare movement. New stock of the Forest City Railway Company to the amount of \$100,000 is to be issued, in fractional parts of a share. Subscriptions will be taken as low as \$10 a share and no subscription will be taken in excess of \$30. The new issue is to be sold at par instead of at \$90 a share, the figure at which most of the present issue of \$750,000 was sold. This stock will be issued in the name of Fred C. Alber as trustee, who retains the voting power, and will probably be deposited with the banks which receive the subscriptions, as security for the fractional share certificates. The proceeds are to be used for the purchase of new cars and for the construction of extensions. President Du Pont announced on January 28 that he would at once order 50 new cars, to be constructed according to his own designs.

Contract for New York Subways.

The full draft of the contract and specifications for the New York subways was made public on January 24 by the rapid transit commission. In the light of the experiences with the first subway contract many changes have been made.

The contract provides for either construction alone or construction and operation, and is so worded that the contractors will be in every way subject to the control of the city authorities. Before this new contract is finally adopted the commission must hold a public hearing on it and the contract must be approved by the corporation counsel. The contract and specifications as they now stand take up 281 printed pages. The public hearing is to be held on February 7, and it is expected that bids for the Lexington avenue route will be advertised for about a week later. The commission's summary of the contract says in part:

"The specifications provide that the tunnels are to have a height of not less than 13 feet in the clear and a maximum width of 15 feet for each track, except at stations, curves, etc., where the width may be increased. The roof of the tunnels is generally to be as near the surface of streets as street conditions and grades will permit, but will be depressed whenever necessary to avoid grade crossings, as well as where approaching the Harlem river. The roof and sides of the tunnels will be iron or steel and masonry. Entrances to stations will in general be placed within private property, rights in which will be acquired for the purpose.

"Construction is to be generally carried on by means of tunneling or excavation under cover, except as may be otherwise specially provided in the contract, or in places where the board shall give express permission to construct by open excavation. The board has included in the detailed plans for construction provisions for pipe galleries, through and along the principal longitudinal streets.

"The motive power is to be electricity or compressed air, and it is provided that if the operating contractor fails to maintain the rolling stock at a standard demanded by the commission, the board may take possession of the road.

"The use of the subways for advertising purposes, or for any trade, traffic or occupation, other than required for the operation of the railroad, is forbidden."

Then comes this stipulation which gives to the municipal authorities complete supervision over the operation of the new subways:

"If the board shall at any time be of the opinion that any additions to the rolling stock or other equipment, or any additions or changes in stations are necessary, or that additional terminal facilities are required, or that any change in the mode of operating the railroad or conducting its business, is necessary in order to carry out the purposes of this lease, or to promote the security, convenience and accommodation of the public, the board may give notice thereof to the contractor, and at the same time, or at any future time, direct the making of such additions, improvements or changes as the board deems proper.

"If the contractor shall neglect or refuse to comply with the directions contained in such notice, then (without limiting or affecting any other remedy to which the city is or may be entitled), it is hereby agreed that in any legal proceeding instituted by the board or other public authority, either for a forfeiture of this lease, or for damages, or of specific performance, or otherwise to compel compliance with the obligations of the lease, the

burden of proof at all stages of such proceedings shall be upon the contractor to show that such improvements or changes are unjust or unreasonable."

Providence Open Cars to be Vestibuled.—General Manager A. E. Potter has announced that no more open front cars will be run over the tracks of the Rhode Island Company and that the company has decided to place vestibules on every car in operation.

Trolley Freight Plan Delayed.—The Massachusetts railroad commission has withheld its permission to the Boston & Worcester Street Railway to carry light freight and express over its lines because of the phraseology of some of the local grants. The company will at once apply for the required amendments.

Kansas City Viaduct Opened.—The Sixth street toll viaduct, connecting Kansas City, Mo., and Kansas City, Kan., was formally opened on January 30. Several of the lines of the Metropolitan Street Railway will be routed over the viaduct as soon as it is ready for street-car traffic. The viaduct is a steel structure, a mile and three-quarters in length, and was built in seventeen months.

Holyoke Street Railway Increases Wages.—The Holyoke Street Railway Company has announced that it would grant increases in pay to its motormen and conductors, about 200 in number, who petitioned the company recently. The new schedule is as follows: First-year men, \$2.20 a day; second-year men, \$2.25 a day; third-year men, \$2.30 a day; fourth-year men, \$2.35 a day; fifth-year men, \$2.40 a day; sixth-year men, \$2.45 a day; ninth-year men, \$2.50 a day.

More Electric Trains on New York Central.—The New York Central & Hudson River Railroad on January 28 began the operation of electric trains on the Harlem division. Thirty new trains were put into service between the Lexington avenue temporary station and Wakefield. As fast as the new cars are received they will be put into operation. Electric trains have been in operation on the Hudson river division as far as Yonkers for over a month.

Electrification of the Lackawanna Terminal.—The published report that the Delaware Lackawanna & Western is to take up aggressively the work of electrifying its suburban lines into the Hoboken terminal is premature. It has been known for some time that the company had electrification in ultimate view, but this will not be undertaken until the stupendous work of grade elimination, which now after several years is about half completed, is finished.

Proposed Electrification on the Delaware & Hudson.—The Delaware & Hudson has authorized the General Electric Company to make a preliminary investigation to determine the practicability of electrifying 37 miles of the company's line between Wilkesbarre and Carbondale and of operating 30 mines and breakers owned by the company in that region, from the same plant. President Wilcox informs us that the company is not in any way committed to electrification at present.

New Car Line in New York.—The New York City Railway Company on January 28 inaugurated a new car line, to be known as the Fourth Avenue and Williamsburg bridge line. These cars run from the Brooklyn Plaza of the Williamsburg bridge to the Grand Central station without change, and will be of benefit to those living in Brooklyn who are employed on Fourth avenue above Fourteenth street. The line transfers at most of the cross-town lines in Manhattan on the east side and the north and south lines east of Broadway.

To Investigate Freight Carrying by Philadelphia Rapid Transit.—The Philadelphia common council on January 24 adopted a resolution calling upon the street railways committee to investigate the right of the Philadelphia Rapid Transit Company to carry coal, building material, ashes and other freight over its lines in the city streets, which is said to be detrimental to the passenger service. It was urged in opposition that if the company were forced to give up this traffic the congestion of teams in the streets would be seriously increased.

Improvements at Ottawa Beach.—The Toledo Railway & Light Company has awarded a contract for the erection of seven new buildings at the company's new summer resort at Ottawa Beach, which is now being greatly improved for use the coming season. The new buildings include a circular dance hall, a bath house, a dining room, two smaller dining booths, and two lavatories. The buildings are to be built in the colonial style. A contract is to be let later for a two-mile board walk 30 feet in width. Men are now at work on the lagoons.

Bridge Loop Subway.—The New York board of estimate and apportionment voted, on January 24, in favor of a four-track subway loop to connect the Manhattan terminals of the Brooklyn and Williamsburg bridges, to be built by the city. The question of leasing the structure to an operating company will be considered later. This vote of the board of estimate puts an end to the long controversy between the advocates of a subway and those of an elevated structure. The action was taken upon the recommendation of the rapid transit commission. The plan agreed upon is that offered by John B. McDonald, the builder of the present subway, so far as his suggestion referred to Manhattan. It calls for a subway from Park Row and Center street north through Center street to Delancey, thence east to the Clinton street approaches to the Williamsburg bridge, a distance of 7,300 feet. The estimated cost is \$5,245,000, including \$500,000 to be ex-

pended on four stations. Two years and a half will be required for the construction, according to the estimates of the engineers. An alternative proposition for a two-track structure, over the same route, to cost \$2,590,000, was rejected by the board.

Altoona & Logan Valley Issues Monthly Tickets.—Beginning February 1, the Altoona (Pa.) & Logan Valley Electric Railway Company will issue 54-ride non-transferable monthly tickets for the use of its patrons on its lines from Hollidaysburg to Tyrone, Pa., at a 4-cent rate. The tickets are marked for the particular line over which they are to be used and are good for that division only. This will particularly benefit the shop and railroad men who use this company's lines to and from their work. The tickets are sold at the general offices of the company in Altoona.

International Exposition of Safety Devices.—An international exposition of safety devices and industrial hygiene was opened at the American Museum of Natural History in New York city on January 29 and is to continue for two weeks. The exposition has been organized by the American Institute of Social Service, of which Dr. Josiah Strong is president and Mr. Wm. H. Tolman, 257 Fourth avenue, New York city, is director. The aim is to call general public attention to the crying need for better protection to the lives and limbs of the workers in American industries.

Motor Cars on Railways.—Representative Bonwell of the Iowa legislature has introduced a bill requiring that where it is reasonably necessary for the convenience of the public the board of railway commissioners may order any railway corporation to operate motor cars in accordance with a reasonable schedule, considering the requirements of the traffic, upon any part of its line over which not more than one train per day is run in either direction. The measure also requires that where such motor cars shall be run they shall let off and take on passengers between the regular stations.

Technical Literature.—The first number of "Technical Literature," a monthly review of current technical publications, has just been issued. The paper includes a review and index of the more important articles and comment in the various high-class technical publications, reviews and announcements of new technical books, notes from technical societies and colleges, and original articles. It contains 64 pages, well gotten up typographically, and contains several interesting and useful articles on all branches of engineering. "Technical Literature" is published and edited by Harwood Frost, 220 Broadway, New York.

Georgia Railway & Electric Company's New Transportation Building.—The new transportation building of the Georgia Railway & Electric Company, at Atlanta, Ga., which has just been completed, is said to be attracting that attention of the street railway systems of other cities because of some features not generally met with in buildings of this kind. While the structure was planned principally as a clubhouse for the employees of the company and is fitted with a gymnasium containing all modern conveniences, the offices of the division superintendents, starters and other officials will also be located in the building.

Interborough Increases Wages.—The Interborough Rapid Transit Company, of New York city, has announced a voluntary increase in the wages of employees in the station and transportation departments, and the departments of the superintendent of car equipment, master mechanic, chief engineer and superintendent of motive power, effective on February 1. The increase does not apply to conductors until after the third year of service. The increases range from 10 cents to 35 cents per day of 10 or 12 hours, according to the nature of the employment. The increases will add about \$400,000 yearly to the expenses of the company.

Ordinance Requires Seats for All Passengers.—Mayor Mark M. Fagan, of Jersey City, N. J., has signed an ordinance passed by the board of street and water commissioners, providing that all corporations operating trolley cars in the city shall be required to run a sufficient number of cars from their terminals at the Pennsylvania and Erie Railroad depots between the hours of 5:30 p. m. and 7:30 p. m. to furnish with seats all persons from whom fares are demanded. The ordinance also requires that during the evening rush hours persons desiring transportation from these terminals "shall not be kept waiting longer than five minutes." The penalty for each violation of the new regulations is fixed at \$50.

Suit to Compel Steam Road to Establish Joint Rates with Interurban Line.—The complaint of the Cedar Rapids & Iowa City Railway & Light Company against the Chicago & Northwestern Railway, in which the electric line seeks to compel the Northwestern to establish joint through rates, was heard on January 29 before E. E. Clark, of the Interstate Commerce Commission, at Cedar Rapids, Ia. The Cedar Rapids Iowa City operates an interurban line between Cedar Rapids and Iowa City and contended that inasmuch as it receives freight destined to points out of the state and receives freight for points on its line originally shipped from points outside of the Iowa it is engaged in interstate traffic and is entitled to protection under the federal laws. The counsel for the Northwestern took the position that the interurban company cannot claim to be engaged in interstate traffic inasmuch as it is a purely local line, that it is in fact not of sufficient standing as a railroad to entitle it to the same concessions as are granted to other roads, as it has no freight cars of its own but must depend upon the steam roads to furnish same when shipments are made. A brief resume of the complaint of the electric road, as well as of the answer of the Northwestern which were filed with the commission several

weeks ago, was reported in the Review for January 12 page 57. A decision of the commission will be awaited with interest as the question is one of deep importance to electric railway industry and one which will have a widespread influence. No decision will be made by Commissioner Clark, who will take all the testimony before the entire commission, and a decision will probably not be reached for some weeks.

Fire Destroys Chicago Car Barns.—A fire early Thursday morning, January 31, gutted three of the five buildings occupied by the Chicago Union Traction Company on North Clark street, Chicago, including the car barn. Twenty-eight small single-truck motor cars and ten or eleven trailers were destroyed, mostly of an old pattern. A number of cars at the time of the fire were going through the repair shop, which was not injured. Several cars were transferred from the north and west side lines, but the service will be impaired for several days. One hundred new cars are expected from the St. Louis Car Company by February 10. The loss was estimated at \$30,000 on buildings and \$79,000 on rolling stock, a total of about \$110,000, of which about \$78,000 is covered by insurance. The fire followed the explosion of a tank of oil.

Chicago Traction Situation.—Jacob Baur, a small stockholder in the West Chicago Street Railway, has complicated the situation by asking the United States circuit court to enjoin the street railway companies from accepting the proposed ordinances or from taking any further steps looking toward settlement. Judge Peter S. Grosseup and Marshall E. Sampson, clerk of his court, are accused of entering into private negotiations with the city of Chicago in the interests of the company. It is charged that these negotiations have been conducted at the expense of the properties which are in the custody of the court. The bill is directed against all the underlying companies and the receivers. The referendum petition was filed on January 31 with the board of election commissioners and it is expected that the proposed ordinances will be brought before the city council on February 4. Mayor Dunne has secured a legal opinion from Benjamin D. Magruder, formerly justice of the supreme court, and Clarence N. Goodwin which criticises many points in the ordinances. Among other objections they hold that to fix a price for the traction properties amounts substantially to a waiver of the right of condemnation.

Bills to Abolish New York Rapid Transit Commission. Senator Foelker and Assemblyman C. B. Murphy, of Brooklyn, have introduced into the New York legislature a bill in which they seek to carry out the recommendations of Governor Hughes in his inaugural speech in regard to New York city's traction problems. The bill abolishes the present Board of Rapid Transit Railroad Commissioners and provides for a commission to be appointed by the governor to take its place. The new commission is to consist of the mayor and comptroller, as ex-officio members, and seven others, two from Manhattan, two from Brooklyn and one each from the Bronx, Queens and Richmond boroughs. They are to serve for five years and the salary shall be \$6,000 a year. The bill provides that a majority of the board may determine and establish a new railroad route instead of at least six members, as the present rapid transit law provides. Senator McCarren has also introduced a bill to abolish the present commission and to delegate its functions to the present board of estimate.

Side-Entrance Cars for McAdoo Tunnels.—The cars to be used on the Hudson & Manhattan Railway, the so-called McAdoo tunnel system, which it is expected will be in operation between Hoboken, N. J., and New York city by September 1, 1907, will have entrances at each end of the car and midway on the sides. The doors to both end and center entrances will be operated by compressed air under control of the guards at the ends of the car. As separate platforms will be provided for loading and unloading, passengers will enter from one side of the car while those within are leaving from the opposite side. Each car will seat at least 50 passengers, and 250 of these cars are being built. Instead of straps for standing passengers, metal posts will be placed from floor to roof at intervals along the sides of the cars in front of the seats. The floors of the cars will be laid with cement in which will be imbedded strips of carborundum to prevent passengers from slipping. Such a floor can readily be washed clean. It is estimated that the running time from the Hoboken station to Thirty-third street and Sixth avenue, New York city, will be 19 minutes, and from Newark to Thirty-third street, 29 minutes.

Plans for a Municipal Subway for St. Louis.—At the instance of Mayor Wells, of St. Louis, City Counselor Ester is now at work upon the draft of a bill providing for an amendment to the state constitution enabling the city of St. Louis to issue bonds for the construction of a subway. The plans are only tentative as yet and it may be some years before it is decided that the city requires a subway, but it is desired to enact the necessary legislation to make such a step possible. According to the mayor's plans, which he has advanced for discussion, it is proposed to build a subway with the proceeds of an issue of municipal bonds and to lease it to an operating company, at a rental which shall be sufficient to pay the interest on the bonds and leave something for a sinking fund to retire the bond. The mayor has investigated the municipally-owned subways in New York and Boston and believes that a similar system would be suited to the local conditions. Traffic is increasing at such a rate that it is evident that a radical improvement will be necessary at an early date and unless the necessary constitutional amendment is secured this year it would be several years before another opportunity occurs.

Construction News

FRANCHISES.

Columbia City, Ore.—The Seattle Renton & Southern Railway Company has applied for a franchise to extend its line from Rainier boulevard up Ferdinand street to Noble, from Noble to Holmes and from Holmes back to the boulevard line.

Fairfield, Ia.—A franchise has been granted for an electric line from Fairfield to Memphis, Mo. It is reported that this is part of a line which is to be built from Cedar Rapids to St. Louis. Work is to be started at once from Fairfield to Keosauqua, and the line is to be in operation by the first of next year.

Frankfort, Ind.—The Frankfort Delph & Northern Traction Company, which proposes to build an interurban line from Frankfort to Delph by way of Rossville, Edna Mills and Pymont, Ind., has asked for a franchise to enter this city. Right of way has been secured and it is announced that cars will be running within two years. The officers are: A. S. Strauss, Chicago, president; W. H. Cohee, vice-president and general manager; Ed M. Cohee, secretary and treasurer. The directors are: A. S. Strauss, W. H. Cohee, Walter B. Cohee, Ed M. Cohee and E. A. Spray.

Mineral Wells, Tex.—A franchise has been granted to Cicero Smith, Ed E. Dismuke and Marcus M. Bright, Mineral Wells, for an electric line in this city, to be known as the Lakewood Park Electric Street Railway Company. A franchise for an electric road was recently granted to another company, which has completed the foundation for its powerhouse and has part of the track material on the ground.

New Castle, Pa.—The New Castle & New Wilmington Railway Company has applied for a franchise for entrance to the city for an electric line which will connect New Castle and New Wilmington. It is stated that most of the right of way has been secured.

New Iberia, La.—The Bayou Teche Railway & Light Company has been granted the additional franchise asked for about a month ago. This provides for the use of certain streets not specified in the original franchise.

Ogden, Utah.—The Ogden Rapid Transit Company has been granted the 50-year extension asked for a few weeks ago.

Olathe, Kan.—The Missouri & Kansas Interurban Railway Company has been granted a franchise to enter the city and lay its tracks in Park street. The Strang gasoline-electric motor cars will be used and as soon as the additional equipment which has been ordered has been received, 30-minute express service between Olathe and Kansas City will be inaugurated. Package freight will also be handled in addition to the passenger traffic.

Portland, Ore.—The franchise applied for by the Mt. Hood Electric Railway Company has been recommended for passage at a special meeting of the council with the following amendments, which have been accepted by Dr. McCorkle, one of the promoters: At the time of acceptance \$500 shall be paid to the city; during the succeeding nine years \$500 annually shall be paid in advance to the city; during the next 10 years \$1,000 and the following five years \$1,500 a year shall be paid; in three years a continuous line shall be built from the eastern limits of the city 40 miles in the direction of Mt. Hood, 10 miles to be built the first year and the remaining 30 miles in three years; a bond of \$50,000 is to be given as a guarantee for carrying out the provisions of the franchise.

Rochester, N. Y.—Franchises for tracks in several of the streets were sold at public auction on January 25 to the Rochester Railway Company. Permission has been granted by the city council for double-tracking several of the single-track lines and for the laying of new track in certain streets.

INCORPORATIONS.

Bowery Bay Railroad.—Incorporated in New York to operate a street railway three miles long from Woodside to Astoria, N. Y. Capital stock, \$100,000. Directors: Thomas Crimmins, New York City; A. S. Williams and William Richardson, Long Island City.

Central Tunnel Company.—W. D. Bryar, E. B. Hartman, Jr., and William E. Walsh have given notice that they will apply on February 19 for a charter for subway lines in Pittsburg practically paralleling the routes asked by the Pittsburg Subways Company.

Cheektowaga Railway.—Incorporated in New York to build and operate a street railway from Cheektowaga to Buffalo, 5 miles. Capital stock, \$75,000. Incorporators, W. H. Finch, C. E. Williams and H. H. Bennett, of Buffalo.

Fremont Belt Connecting Railway.—Incorporated in Ohio to build an electric line from a point on the line of the Toledo Port Clinton & Lakeside Railway through Salem, Rice, Sandusky and Bellville townships, Ottawa county. This will give access to the new state camp grounds and rifle range near Port Clinton.

South Wilmington & Southern Railroad.—Incorporated in Illinois to build an interurban line from South Wilmington, Grundy county, to Wilson, Livingston county. Capital stock, \$25,000; principal office, Chicago. Incorporators: A. L. Sweet, T. A. Lemmon, Walter Farmer, C. A. Sweet and R. H. Gruschow.

Toledo & Indiana Traction Company.—Incorporated in Indiana as a subsidiary company to the Toledo & Indiana Railway, for the purpose of extending its road from the Ohio-Indiana state line to Kendallville, and eventually to Ft. Wayne, Ind. General manager, E. E. Darrow, Toledo, O.

TRACK AND ROADWAY.

Atlantic Northern & Southern Railway.—It is reported that the various towns through which this road is to pass have subscribed \$100,000 for its construction from Atlantic to Elkhorn, Ia. J. H. Simmons, of Atlanta, is president.

Brooklyn Rapid Transit Company.—It is stated that this company is seeking the approval of the New York rapid transit commission for improvements to its elevated system in Brooklyn at an aggregate cost of about \$6,000,000. The plans provide for a third track in Broadway, from the Williamsburg Bridge Plaza to Fulton street; two extra tracks in Fifth avenue, from Flatbush avenue to Thirty-sixth street; two extra tracks in Fulton street, from Franklin avenue, and two extra tracks in Myrtle avenue, from City Hall to Navy street.

Brownsville Masontown & Smithfield Street Railways.—W. J. Sheldon, president, McKeesport, Pa., writes that this company is being organized and is now seeking a charter for an electric railway from Brownsville to Smithfield, Pa., 20 miles, via Gates, Lambert, Masontown, New Geneva and Point Marion. Surveys are in progress from New Geneva to Brownsville, 16 miles, with 6 miles completed. Grading is to begin in February at Masontown. The company will do the first part of the construction work. The power house is to be located at West Masontown. C. A. Smith, superintendent of construction, Masontown, Pa.

Burlington, Ia.—A movement is on foot to build an electric interurban railway between Bonaparte and Burlington, Ia., a distance of about 43 miles. A G. Roberts, of Bonaparte, is interested.

Chicago & Western Indiana Traction Company.—This company, which was organized and incorporated last year by Edward H. Barrows, of Indianapolis, Ind., has been reorganized by the American Engineering Company, of Indianapolis, which will undertake to complete the road. New officers have been elected, but Mr. Barrows is retained as general manager. The road is chartered to connect Chicago and Louisville through Valparaiso, Lafayette, Crawfordsville, Greencastle and Bloomington; but the first division, that between Lafayette and Greencastle, is all that will be built now. This division will be 57 miles long. This road is known as the "Educational Route," as it passes through four college towns. The company will get its power from the Crawfordsville plant of the Indianapolis Crawfordsville & Western Traction Company. It is stated that financial arrangements for building this section of the line are well advanced.

Cincinnati Northern Traction Company.—An official report from C. A. Alderman, chief engineer, Hamilton, O., states that contracts are to be let within 30 days for grading, bridges, tracklaying and ballasting on its new line between Hamilton and Middletown, O., 9 miles. The company already has a line connecting those towns but desires a new one on a private right of way.

Coldwater & Battle Creek Interurban Railway.—It is stated that financial arrangements have been made for building this road between Coldwater and Battle Creek, Mich., and that construction will start in the spring. The right of way has been secured.

Consolidated Railway.—C. W. Blakeslee & Son, of New Haven, Conn., who have the contract for building the road from Stafford Springs to Crystal Lake, Conn., have also been awarded a contract for building the remainder of the line from Crystal Lake to Rockville.

Corsicana & Palestine Interurban Railway.—Chief Engineer McMichael now has a corps of surveyors in the field locating this line between Corsicana and Palestine, Tex., and it is stated that contracts for the grading will be let in about 60 days.

Dunkirk, N. Y.—There is a report that plans are being made for a trolley line from Jamestown to Dunkirk, N. Y., paralleling the Dunkirk Allegheny Valley & Pittsburg Railroad from Falconer to Dunkirk, and passing through Gerry, Sinclairville, Moons, Cassadaga, Lily Dale, Stockton and Fredonia, a distance of about 35 miles. Surveying is now well under way. It is reported that the Chautauqua Traction Company is interested in the line.

Enid Street Railway.—Two carloads of rails have been delivered for the street railway line in Enid, Okla., which is being built by C. H. Bosler, and construction work is progressing rapidly.

Ft. Wayne & Springfield Railway.—Regular service over this road between Springfield and Decatur, Ind., was started on January 24. The running time is 1 hour and 15 minutes. W. H. Fledderjohann, president and general manager, Decatur, Ind.

Illinois Traction Company.—L. E. Fischer, vice-president and general manager, Danville, Ill., writes that it has been decided to build the line from Springfield to Jacksonville, Ill., but that the exact route has not yet been determined.

International Railway (Buffalo, N. Y.)—This company has applied to the city council of Lockport, N. Y., for a permit to build a double track line on East avenue from Market street to the city limits, to connect its lines with those of the Buffalo Lockport & Rochester Electric Railway, which is building from Rochester to Lockport.

Kenansville, N. C.—It is reported that a movement is under

way to build an electric railway from Kenansville to Hallsville and Chinquapin, N. C., about 15 miles, and possibly a line from Kenansville to either Warsaw or Wallace, N. C. S. S. Grady, of Clinton, N. C., is reported to have made estimates.

Lancaster (O.) Traction & Power Company.—We are officially advised that this company, a consolidation of the Lancaster Traction Company and the Fairfield Traction Company, has made no definite arrangements for extending the line to Buckeye Lake and Logan, O., and that probably nothing will be done this year. Henry B. Peters, of Lancaster, is president.

Marengo Midland Railroad.—This company has been organized at Marengo, Ia., to build an electric railway from Marengo to Millersburg, Ia., with a branch from Millersburg to Fairfield, connecting with the proposed line of the Iowa-Missouri Traction & Power Company to Keosauqua, and another to Oskaloosa; also a line from Marengo to Vinton and Cedar Rapids, making a system of about 150 miles. Marengo capitalists are interested.

Niagara St. Catharines & Toronto Railway.—This company has filed plans for an extension from Ft. Erie to Lundy's Lane, Ont., via Bridgeburg, Willoughby and Stamford. E. F. Seixas, general manager, St. Catharines, Ont.

Northern Texas Traction Company.—H. T. Edgar, of Ft. Worth, manager of this company which proposes to build an Interurban line from Ft. Worth to Cleburne, Tex., 23 miles, states that surveys will be started out at once to locate the line and that if no difficulties are met with in securing the right of way construction will begin at once.

Okanogan Electric Railway.—This company, recently organized to build a line from Nighthawk to Brewster, Wash., on the Columbia river, is advertising for construction materials. A franchise has been granted by the county commissioners and it is stated that surveys will be started as soon as the weather is favorable. The road will handle both freight and passengers. Power is to be generated on Sinchekin creek, about midway between Conconully and Loomis. A. M. Dewey, of Spokane, Wash., is one of the promoters.

Omaha & Nebraska Central Railway.—Chief Engineer W. H. Fuller will start in a few days to make a second survey of the line between Omaha and Hastings, Neb. The company will soon apply for an amended franchise permitting more than one line through Hastings.

Prosser (Wash.) Traction Company.—This company will let contracts about May or June for the construction of a line westward from Prosser, 10 miles and another eastward 35 miles. Surveys will be started at once. Frederick Finn, president; F. A. Jerne, chief engineer; Prosser, Wash.

Raleigh & Durham Passenger & Power Company.—This company, of which B. S. Jerman, of Raleigh, N. C., is president, and T. S. Fuller, of Raleigh, is secretary, proposes to build an electric railway from Raleigh to Durham, N. C., 22 miles. At Durham it will be able to connect with Norfolk & Western, Lynchburg branch; Seaboard Air Line branch, two branches of the Southern, the Durham & Southern and the Durham and South Carolina railroads. At Raleigh it will be able to connect with the main line of the Seaboard, the Raleigh & Pamlico Sound, the Raleigh & Cape Fear and a branch of the Southern. Surveys, maps and profiles have been made by John W. Twigg, Jr., engineer, of Augusta, Ga. No date has been set for the opening of bids.

St. Louis Electric Bridge Company.—Bills have been introduced into congress to authorize the construction of a bridge across the Mississippi river at East St. Louis to give the Illinois Traction System, of which the St. Louis Electric Bridge Company is a subsidiary organization, an entrance into St. Louis.

Scranton Railway.—It is reported that this company will construct a viaduct across Muggler street, Scranton, Pa., at a cost of \$75,000. A. S. Kibbe, chief engineer, Philadelphia, Pa.

South Side Elevated Railway (Chicago).—A third track on the main line from Twelfth to Forty-third streets, work on which was begun about two years ago, has been completed. The work was delayed by a strike of structural iron workers. The new track will be used for express trains. The Englewood extension is now in operation as far as Sixty-third and Halsted streets.

Spokane & Big Bend Railway.—W. H. Plummer, president, announces that this company has made a trackage agreement with the Spokane & Inland Empire Railroad, whereby its cars will enter Spokane over the tracks of the latter, which will build a line from Spokane south to Nine Mile bridge. Mr. Plummer also states that grading will begin at once on a line to Davenport, 37 miles, and that the project has been financed by a St. Louis syndicate, which has taken \$2,500,000 of the company's 10-year 5-per cent bonds, certified by the Spokane Trust Company.

Springfield Wilmington & Cincinnati Traction Company.—James B. Cahoon, vice-president of the Eldenbel Construction Company, of New York, announces that the work of constructing the traction line from Springfield to Cincinnati by way of Wilmington, Clarksburg and Norwood, O., will be commenced as soon as the weather permits. Practically all of the right of way has been secured. Mr. Cahoon states that the company has sold \$1,000,000 worth of bonds to English capitalists, and that the material has been purchased. The road will be 72 miles in length, and cars will make the trip in two hours. A branch will be built from the main line at Cedarville to Xenia.

Toledo & Indiana Railway.—We are officially advised that this company proposes to build an extension from Bryan, O., to Ken-

dallville, Ind., 50 miles, through Edgerton and Melbern, O., and Butler, Waterloo and Corunna, Ind. The Toledo & Indiana Traction Company has been incorporated to build the Indiana end of the line. Surveys have been completed and grading is now in progress. The route is an air line paralleling the Lake Shore & Michigan Southern Railway. A substation is under construction at Edgerton. The overhead work will be of the catenary type. The company now has a line in operation between Toledo and Bryan. S. C. Schenk, president; E. E. Darrow, general manager and chief engineer, Toledo, O.

United Cities Traction Company.—President Ira L. Reeves, Ft. Smith, Ark., is quoted as saying that this company will have its road completed between Ft. Smith, Ark., and Ft. Smith, Okla., by July 1. Grading is now in progress and tracklaying is to begin at an early date. Surveys have been made for a line to Muskogee, I. T.

United Railways.—C. E. Loss, president, of Portland, Ore., is quoted as saying that this company has ordered \$130,000 worth of steel rails for the construction of several city lines in Portland and an Interurban line to Hillsboro and Forest Grove, and that work is to begin as soon as the material, some of which is now in transit, arrives.

Versailles, Ky.—It is reported that W. A. Gaines & Co., of Versailles, proprietors of the "Old Crow" distillery, will build an electric railway four miles long from the distillery to Jett Station on the Louisville & Nashville Railroad.

Vicksburg, Miss.—Frank and George Houston, who have been granted a franchise for an electric railway through the Vicksburg National Park by act of congress, are preparing to take up the various details with the secretary of war. When these details have been arranged it is stated that the contract for constructing the line will be awarded and work begin. It is the intention to begin work early in the spring.

Westfield, Mass.—Surveys are being made for an electric railway from Westfield to Canaan, Mass.

Winnipeg, Man.—Sealed bids for the construction of 24 miles of single-track electric railway, from Lac du Bonnet to Point du Bois, Man., will be received until February 25 at the office of the secretary of the board of control, Winnipeg. Plans and specifications may be seen, after February 1, at the power engineer's office. Each bid must be accompanied by a check for \$5,000 as a guarantee.

York County Traction Company.—W. F. Bay Stewart, of York, Pa., has announced that this company will build an electric line from York to Harrisburg, Pa., via Zion's View, Strlestown and Lewisberg. Surveys have been started and it is stated that the farmers along the line are ready to donate the right of way.

POWER HOUSES AND SUBSTATIONS.

Birmingham Railway Light & Power Company.—It is reported that Ford, Bacon & Davis, of New York, the company's engineers, are considering plans with a view to erecting a large power plant in Birmingham, Ala.

Brooklyn Rapid Transit Company.—It is reported that this company will double the size and capacity of the power house at Kent and Division avenues, Brooklyn, N. Y., and that contracts have been awarded. It is stated that the cost of the work will approximate \$5,500,000.

Evansville Electric Railway.—A new 875-horsepower generator has been installed in the powerhouse at Evansville, Ind. This is the first instalment of \$30,000 worth of improvements to the powerhouse. Extensive improvements are being made to the track on various city lines, and when this work is completed the running time of the cars will be reduced. R. R. Smith, of Evansville, is general manager.

Ft. Dodge Des Moines & Southern Electric Railway.—The substation at Kelly is now completed and the machinery is being installed.

Mobile (Ala.) Light & Railroad Company.—This company will increase the generating capacity of its power house at Mobile by the installation of a 1,200-kilowatt General Electric generator and a 550-horsepower Allis-Chalmers engine. At the time of the recent sale of the company's lighting interests ample boiler capacity to care for this new installation was retained.

Pittsfield Electric Street Railway.—This company has recently put in operation its new power plant on Seymour street, Pittsfield, Mass. Two Hamilton-Corliss engines of 1,000 horse-power each, and General Electric generators have been installed, and the generating apparatus in the old power house on Cottage Row is to be moved to the new plant. P. C. Dolan, manager, Pittsfield, Mass.

Philadelphia Rapid Transit Company.—This company has recently installed in its new power house at Delaware avenue and Laurel street, Philadelphia, a new 6,000-kilowatt turbine generator, which will increase the capacity of the company's power plant about 12½ per cent. Two more generators of the same capacity are to be ordered during the present year.

Public Service Corporation of New Jersey.—It is reported that this company is preparing to double the capacity of its power plant at Trenton, N. J., and that the greater part of the equipment has been ordered. Albert H. Stanley, of Newark, N. J., general superintendent.

Personal Mention

Mr. C. M. Thomas, who was formerly auditor of the Muncie & Portland Traction Company, of Portland, Ind., during the construction period, has opened an office at 1431 Union Trust building, Cincinnati, O., as public accountant.

Mr. Frederick Bushnell has resigned as chief engineer of the Rhode Island Company, of Providence, R. I., which position he has held since 1902, to become connected with the Stone & Webster Engineering Corporation, of Boston, Mass., effective on February 1.

Mr. Lewis Cass Ledyard has resigned as one of the members of the New York Board of Rapid Transit Railroad Commissioners, assigning as a reason that the duties of the office demanded more of his time than he could afford. Mr. Ledyard was appointed by Mayor McClellan last spring to succeed Mr. John Claffin.

Mr. George MacLeod, of Versailles, Ky., has resigned as assistant engineer of the Central Kentucky Traction Company to become chief engineer and assistant general manager of the Lexington Interurban Railways, with headquarters at Lexington, Ky., succeeding Mr. William R. Allen, resigned to accept another position at Norfolk, Va.

Mr. C. W. Chase has resigned his position as secretary and treasurer of the Mobile Light & Railroad Company, of Mobile, Ala., effective on January 15, and will engage in other business at Fort Leavenworth, Kan. Mr. Chase will be succeeded as secretary by Mr. Zerah E. Watson, formerly with the United Railways Company, of St. Louis. The office of treasurer will be filled by Mr. C. N. T. White-Spooner, formerly paymaster for the company.

Mr. Edward J. Davis has resigned his position as general passenger and freight agent of the Columbus Delaware & Marion railway company, Columbus, O., effective on February 1. With the retirement of Mr. Davis this office will be abolished and that of soliciting passenger and freight agent created in its place. The latter position will be filled by Mr. L. W. Harrington, of Columbus, who for the past 10 years has been identified with the Hocking Valley Railway Company. Mr. Harrington has, for some time previous to his present appointment, assisted in adjusting claims for the Columbus Delaware & Marion.

Mr. Edward S. Pattee, who was recently appointed comptroller of the Twin City Rapid Transit Company, of Minneapolis, Minn., in addition to his duties as secretary, has been connected with that company for 15 years. He entered service with the Twin City company as accountant in the stores department and later was made chief clerk in the auditing department under J. F. Calderwood, now vice-president of the Brooklyn Rapid Transit Company. When Mr. Calderwood left the Twin City, Mr. Pattee was appointed auditor to fill his place and in January, 1905, was elected secretary of the company with title of secretary and auditor. In January, 1907, Mr. Pattee was appointed comptroller, with the new title of secretary and comptroller, Mr. D. J. Strouse, Mr. Pattee's first assistant, being promoted to the position of auditor.

Mr. John B. McDonald, who on January 23 was elected vice-president of the Interborough Rapid Transit Company, of New York, with general supervision of the construction of new sub-

ways, was the contractor for the original subway system in New York. He was born in Cork, Ireland, in 1844 and came to the United States at the age of 15, receiving his early education in the public schools. His first engineering work was as inspector of masonry on the tunnel under Park avenue. He became the contractor on the Highbridge branch of the Central of New Jersey and subsequently on the Buffalo extension of the Delaware Lackawanna & Western and the Boston & Hoosac Tunnel. Mr. McDonald did some contracting work in the west and took an active part in the construction work on the West Shore road. A company of which he was the moving spirit built the 1½-mile tunnel of the Baltimore & Ohio



John B. McDonald.

through Baltimore. Mr. McDonald also built the Jerome Park reservoir in New York. His latest important work was the construction of the New York subway, which was completed in October, 1904.

Mr. Leslie Carter, who has been president of the South Side Elevated Railroad, of Chicago, since its reorganization in 1897, on January 31 tendered his resignation, giving as a reason that his duties with other companies required more of his time. He

was then elected chairman of the board of directors. Mr. Marcellus Hopkins, who has been general manager of the road for several years, was elected president and general manager to succeed Mr. Carter. Mr. E. C. Nichols, heretofore attorney for the company, was elected vice-president, succeeding Mr. T. J. Lefens. Mr. Hopkins has had a long experience as a steam railroad man, having entered the service of the Chicago & Northwestern Railway in August, 1863. He worked up through various positions in the operating department and in April, 1893, resigned as division superintendent. He was subsequently receiver of the Chicago & South Side Rapid Transit Railroad, now the South Side Elevated Railway, and was later made general manager, which position he has held to date.

Mr. Edward Payson Bryan, who has been elected president of the Interborough Rapid Transit Company, of New York, was born at Windsor, O., on July 2, 1850. Mr. Bryan received his early education at Granville,

G., in the public schools, at the Granville Academy and Dennison University, preparatory department. He was anxious, however, to get into railroad work and stopped his preparatory course at the age of sixteen to learn telegraphy. He entered railroad service at Lebanon, Ky., on the Louisville & Nashville in 1866 and occupied various positions from telegraph operator to agent at Frankfort, Ky., and in August, 1891, was appointed superintendent of terminals of the Louisville & Nashville at Louisville, Ky., holding that position until March, 1892, when he became superintendent of terminals of the same road at St. Louis, Mo. In November, 1895, he severed his connection with the Louisville & Nashville to accept a position as vice-president and general manager of the Terminal Railroad Association of St. Louis. This position he retained until May 1, 1900, when he was asked to accept the position of vice-president of the Interborough Rapid Transit Company and of the Rapid Transit Subway Construction Company, of New York. Upon accepting this position Mr. Bryan worked out the present plan of organization for the operating force and directed the work of the engineering force which had charge of the equipment of the Interborough lines for operation. Mr. Bryan was elected president of the Interborough Rapid Transit Company on January 23, 1907.



Edward P. Bryan.

Obituary.

T. L. Vanderslice, formerly counsel for the Philadelphia Rapid Transit Company, veteran of the civil war and well known as a corporation lawyer, died suddenly in Philadelphia on January 27, from heart disease, aged 65 years. He was born in Chester county, Pa., near Valley Forge, on July 22, 1841, and was educated in the common schools of Chester and Montgomery counties. For several years he was attorney for the Baltimore & Ohio Railroad.

Springfield Troy & Piqua Increases Wages.—The employes of the Springfield Troy & Piqua Railway, of Springfield, O., have been granted an increase in wages from 20 to 22½ cents an hour.

Cincinnati Street Railway.—The Ohio supreme court has decided that whenever the railway desires to do so it has the right to abandon the portion of its line in Winton place which passes over Winton and Gray roads north of Epworth avenue to the north entrance of Spring Grove Cemetery. The company held that it has the right to abandon this line under a clause of its ordinance. The village and the cemetery association brought suit on the ground that this clause was invalid and asked to have the court force the company to renew the former 15 minute daily schedule.

Suit for Damages Against Chicago Elevated Loop.—Alleging that the operation of elevated trains in Fifth avenue has damaged his buildings to the extent of \$125,000, Henry Strong, a real estate owner, has instituted suit in the superior court for that amount against the Union Elevated Railroad Company and the four elevated railroad companies. Mr. Strong's petition avers that his two buildings situated at 165 and 183-185 and 187 Fifth avenue, are valued at \$300,000 and that since the erection of the elevated structure in April, 1896, the buildings, which are used for offices and mercantile purposes, have been greatly damaged by the vibration caused by the rapid running of the heavy trains past his property. It is contended that because the noise occasioned by the passing trains of cars it is difficult to obtain the most desirable tenants. Because of the erection of large iron girders supporting the structure he fears that if a fire attacked his buildings firemen would be hampered in their work, resulting in great loss to him. The steel columns prevent free ingress and egress of the building, it is declared. The buildings are six-story structures and were erected some years before the elevated loop.

Financial News

American Light & Traction Company.—The directors have declared the regular quarterly dividends of 1½ per cent on the preferred stock and 1¼ per cent on the common stock, payable February 1.

Appleyard Traction Companies.—A. C. Thompson, judge of the United States circuit court at Cincinnati, has issued orders for the final payment of a balance of \$386,966 to holders of claims aggregating \$2,000,000.

Aurora Elgin & Chicago Railroad.—Gross earnings for December, 1906, amounted to \$109,547.30, as compared with \$91,307.75 in December, 1905, an increase of \$9,239.55, or 10.1 per cent. For the six months ending December 31 gross earnings were \$700,089.65, an increase of \$67,896.56, or 10.7 per cent over the corresponding period of 1905. The figures, with comparisons, are as follows:

	December, 1906.	December, 1905.	Six mos., 1906.	Six mos., 1905.
Gross receipts	\$109,547.30	\$91,307.75	\$700,089.65	\$632,193.09
Operating expenses	56,913.04	51,126.40	363,600.99	324,792.05
Net earnings	\$43,634.26	\$40,181.35	\$336,288.66	\$307,401.04
Total interest charges and taxes	26,186.10	24,450.04	156,695.13	146,643.21
Surplus	\$17,448.16	\$15,731.31	\$179,593.53	\$160,757.83

Boston Elevated Railway.—Permission to consolidate with the West End Street railway has been asked from the Massachusetts legislature. The Boston Elevated will issue preferred stock in exchange for West End company stock. The West End company has been operated for eight years under a lease by the Boston company.

Chicago & Western Indiana Traction Company.—The company has been reorganized by the American Engineering Company, of Indianapolis, which it is announced will build the road from Lafayette to Greencastle. Chas. N. Wilson has been elected president and Edward H. Barrows, secretary-treasurer, both of Indianapolis.

Chicago South Bend & Northern Indiana Railway.—This company has been incorporated in Indiana with a capital stock of \$7,500,000, of which \$5,000,000 is common stock and \$2,500,000 preferred stock, to absorb the Northern Indiana Railway, including the street railway systems of South Bend, Goshen, Elkhart, Laporte, Michigan City and Mishawaka, and the lines between Goshen and South Bend and from Laporte to Michigan City. It is announced that the company will build from South Bend to Michigan City and Chicago. It is reported that the interests which formed the company are negotiating for the Chicago Lake Shore & South Bend Company, which is under construction in Laporte county and is to be built from South Bend to Chicago, if the plans of the owners are carried out. The officers of the Chicago South Bend & Northern Indiana are: President, Charles A. Dieterich, New York; vice-president, Charles M. Murdock, Lafayette, Ind.; treasurer, Alfred E. Dieterich, New York; secretary and general manager, Samuel T. Murdock, Lafayette, Ind. The incorporators include Randall Morgan, Philadelphia, and Hugh J. McGowan, Indianapolis, of the Morgan-McGowan syndicate; J. Levering Jones of the Ft. Wayne & Wabash Valley Traction Company, and the Lexington (Ky.) Traction Company; Thomas E. Kratz, of the Evansville (Ind.) traction properties; Joseph Mayer, of the Buffalo & Lake Erie Traction Company, and a number of Indiana associates. The new company has given a trust deed to the Central Trust Company of New York City to secure an issue of \$5,000,000 first mortgage 5 per cent thirty-year bonds. Of the proceeds \$2,150,000 will retire outstanding bonds of the Indiana Railway Company, the La Porte & Michigan City Traction Company and the Northern Indiana Railway Company.

Covington & Southwestern Railroad.—William G. Ruhl, president, has filed official notice with the secretary of state of Indiana of an increase in the capital stock from \$75,000 to \$750,000. The road, it is stated, will be extended to Crawfordsville, Ind.

Forest City Railway.—Additional stock to the amount of \$100,000 to provide for extensions and improvements, has been offered for sale. The authorized issue of capital stock is \$2,000,000 and the balance now offered will bring the total outstanding to \$850,000. The proceeds will be used to finance extensions on the west side principally on Bridge street, Ridge avenue, Gordon avenue and Oak avenue, aggregating four miles of double track.

Grand Rapids (Mich.) Railway.—At the annual meeting Jacob K. Knapp was elected a director to succeed A. G. Hodenpyl of New York. The other directors were re-elected as follows: C. M. Clark, Philadelphia; Lester J. Hodge, John A. Cavade, Jacob K. Knapp, William H. Anderson, Thomas P. Carroll, J. Boyd Pearson, William Judson, Benjamin S. Hanchett all of Grand Rapids.

Hagerstown Railway.—At the annual meeting of stockholders action on the proposition to increase the capital stock from \$200,000 to \$1,000,000 was deferred.

Illinois Traction Company.—December gross earnings amounted to \$32,164.90, an increase over December, 1905, of \$5,984.61 or 24.2 per cent. Net earnings were \$133,385.46, an increase of \$12,267.50 or 11 per cent. For the year 1906 the gross earnings amounted to \$302,174.71, an increase of 24.8 per cent while net

earnings were \$1,361,952.33, an increase of 19.9 per cent. The figures with comparisons are as follows:

	December, 1906.	December, 1905.	Year 1906.	Year 1905.
Gross earnings	\$302,164.90	\$243,180.29	\$3,013,107.74	\$2,414,105.60
Net earnings	133,385.46	120,117.67	1,361,952.33	1,134,968.29

Interborough Rapid Transit Company.—The special franchise tax on the Manhattan Railway for years 1900 and 1905, inclusive, amounting to \$3,170,141.71 has been paid to the city comptroller of New York. There is still pending some litigation regarding the tax on franchises and the Manhattan company filed a formal protest to protect its rights. The payment, however, disposes finally of the claim of the city against the property and special franchises of the company.

Interstate Railways Company.—John A. Rigg, the president, announces that the Philadelphia Bristol & Trenton Street Railway Company has been purchased. The Interstate Railways Company owns practically the entire stock of the United Power & Transportation Company. It is announced that a line will be built over the Delaware river at Morrisville to connect the Philadelphia Bristol & Trenton with the Trenton (N. J.) Street Railway Company, which is controlled by the same interests.

Kansas City Railway & Light Company.—Gross earnings for December amounted to \$499,631 as compared with \$447,798 in December, 1905, an increase of \$51,833 or 11.5 per cent. Operating expenses were \$244,102 against \$211,183, an increase of \$32,919 or 15.5 per cent. After the payment of taxes and interest, the surplus amounted to \$107,637, an increase of \$9,460 or 9.6 per cent. Gross earnings for the seven months ended December 31 amounted to \$3,372,621, an increase of \$328,583 or 10.7 per cent. Operating expenses were \$1,658,722, as compared with \$1,474,580, increase of \$184,142 or 12.4 per cent. The final surplus after the payment of taxes and interest was \$696,282, a gain of \$85,722 or 14 per cent over the corresponding period of the previous year.

Lebanon-Thorntown Traction Company.—The stockholders have elected the following officers and directors: President, J. W. Dempsey, Maistee, Mich.; vice-president, Robert P. Woods, Indianapolis; secretary-treasurer, Frank M. Reed, Indianapolis; directors, J. W. Dempsey, Robert P. Woods, F. M. Reed, Mrs. A. S. Atkinson and Mrs. B. D. Woods.

Lexington & Interurban Railway.—The annual meeting was held on January 22 at Camden, N. J., and the following directors were elected: Louis Des Cognets, Joseph M. Skain, J. R. Morton, R. C. Stoll, D. F. Frazee, W. J. Loughridge, Desha Breckinridge, J. C. Noel, George H. B. Martin, J. Levering Jones, Frederick T. Chandler, Percy M. Chandler, Richard Y. Cook, Bayard Henry, H. J. Delaney, John Blair McFee and Samuel T. Burdick.

Lima Electric Railway & Light Company.—Sult has been started by the city solicitor to set aside a franchise giving permission to the company to operate on Bellefontaine avenue.

Lowell & Fitchburg Street Railway.—Permission has been granted by the Massachusetts railroad commissioners to issue \$75,000 additional capital stock to be used in taking up floating debt and for additions and improvements.

Memphis Street Railway.—George M. Clark, John Brand and R. P. Halleck, who own 175 shares, have asked for a receiver and an injunction to restrain the proposed merger with the American Cities Railway & Light Company, a holding company chartered under New Jersey laws.

Menominee & Marinette Light & Traction Company.—At the annual meeting on January 14, the following officers were elected: President, Augustus Spies; vice-president, S. M. Stephenson; secretary and manager, Edward Daniel, all of Menominee, Mich.; treasurer, Harry J. Brown, Marinette, Wis. The directors are: Augustus Spies, S. M. Stephenson, R. F. Goodman, G. A. Bleach, W. S. Carpenter, R. C. Merryman, Harry J. Brown and Frank A. Spies.

Metropolitan West Side Elevated Railway.—A quarterly dividend of ¾ of 1 per cent has been declared on the preferred stock payable on March 20. No dividends have been paid since February 28, 1903. In the interval earnings have been devoted to improvement of the property.

Milwaukee Electric Railway & Light Company.—The annual meeting has been adjourned from January 21 to February 1. The annual report for 1906 filed with the city comptroller of Milwaukee shows gross earnings for the year from the railway department of \$2,973,443.17. The report of the Milwaukee Light Heat & Traction Company shows gross earnings of \$605,583.97.

New London & East Lyme Street Railway.—Application will be made to the Connecticut legislature for authority to extend from New Britain to the Connecticut River, to increase the authorized capital stock to \$600,000 and to extend feed wires beneath the Connecticut river to a connection with the Shore Line Electric Railway.

Newtown Electric Street Railway.—The property has been sold under foreclosure to A. J. Speece, of Philadelphia.

Norfolk & Portsmouth Traction Company.—It is reported that this company will purchase the Bay Shore Terminal Company which has been in the hands of receivers for over three years.

Philadelphia Rapid Transit Company.—The Street Car Service Committee of the Trades League has raised objection to the plan submitted by the Retail Merchants' Association for settlement of the traction problem and will submit a plan of its own. The

Rapid Transit Company favored an adoption of the merchants' plan, but it was thought best to take no definite action until the Trades League was heard from. The municipal authorities may formulate still another plan.

Ottawa (Ont.) Electric Railway.—Gross earnings for the year 1906 compare with previous reports as follows:

	1906	1905	1904	1903
Gross receipts	\$525,746.50	\$449,633.97	\$384,939.54	\$348,888.78
Total expenses (including mileage payments and bond interest)	345,062.23	305,757.57	275,840.98	254,346.96
Net profit	180,684.26	143,876.40	109,098.66	94,541.82
Passengers carried	11,408,422	9,891,311	8,717,205	7,911,718
Percentage of operating expenses to receipts	57 8-10	59 4-10	62	61 8-10

T. Ahearn, the president, says in his report: "The tracks on Sussex street and Gladstone avenue will be re-laid with heavy rails this year.

"A number of closed and open cars were added to the company's equipment, and additional cars have been ordered to meet the demands of increasing traffic.

"The popularity of the company's park at Britannia-on-the-Bay was further demonstrated during the whole year. It is intended to pave the promenade of the main pier with asphalt or bitulithic, and to extend its outer end a distance of 150 feet."

Portsmouth Street Railroad & Light Company.—At the recent annual meeting the following officers were re-elected: President, Levi D. York; vice-president and general manager, Raymond D. York; secretary and treasurer, H. H. Higgins, all of Portsmouth, O.

Rochester Syracuse & Eastern Railroad.—Permission has been given by the State Railroad Commission to issue \$3,000,000 first mortgage 5 per cent bonds to pay for an extension to Syracuse and for other purposes. These bonds are part of an authorized issue of \$7,500,000, of which \$2,000,000 have been issued previously.

Stark Electric Railroad.—The officers and directors were re-elected at the annual meeting of stockholders, as follows: President, C. R. Morley, vice-president, David Morison; secretary, E. S. Cook; treasurer, E. Wiebenson; directors, the officers and Frank Strauss, William Grief and R. A. Brown.

Toledo & Western Railroad.—The company has taken over the Adrian (Mich.) Street Railway and will it is announced, improve the property.

Toledo Port Clinton & Lakeside Electric Railway.—The following directors have been elected: A. A. Klauser, Theodore Schmidt, H. R. Klauser, G. W. Luckey, E. A. Powers, L. E. Flory, William Miller.

United Railways Company of St. Louis.—For the year 1906 gross earnings amounted to \$9,113,622, a gain of \$683,307 over the previous year, or 8.1 per cent. Operating expenses increased \$209,124, leaving an increase in net earnings for the year of \$474,183. The figures for December and for the year 1906, are as follows:

	December, 1906.	Year 1906.
Gross earnings	\$780,823	\$9,113,622
Operating expenses	397,198	4,623,990
Net earnings	\$383,625	\$4,489,632
Taxes	27,351	487,741
Surplus	\$356,274	\$4,001,891
Other income	1,692	32,726
Total income	\$357,966	\$4,034,618
Fixed charges	198,026	2,377,477
Balance	\$159,940	\$1,657,141
Depreciation	39,041	455,681
Balance for dividends	\$120,898	\$1,201,460
Preferred dividends	54,097	649,160
Surplus	\$66,801	\$552,300

The stockholders re-elected at the annual meeting the following directors: John I. Beggs, James Campbell, Murray Carleton, Robert McCulloch, C. H. Huttig, H. S. Priest, W. V. N. Powelson, Festus J. Wade, St. Louis; George R. Sheldon, C. W. Wetmore and C. D. Smithers, New York.

Washington, D. C., Railway & Electric Company.—At the annual meeting in Washington on January 19 the following officers were re-elected: Allen L. McDermott, president; George H. Harries, vice-president; H. F. Ham, treasurer and assistant secretary, and Frederick J. Whitehead, secretary and assistant treasurer. The directors, who were all re-elected, are: Allan L. McDermott, George W. Young, George H. Harries, George Truesdell, R. T. W. Duke, Jr., John T. Dawson, and James B. Lackey.

Western Ohio Railway.—Gross earnings for the six months ended on November 30 were \$219,461.88, and operating expenses were \$115,117.87, leaving net earnings of \$104,344.01. The percentage of operating expenses to gross earnings was 52.4.

Wilkesbarre & Wyoming Valley Traction Company.—At the recent annual meeting, President John A. Rigg, of Philadelphia, and the other officers and directors were re-elected.

Winnipeg Electric Street Railway.—The following directors were re-elected at the annual meeting: Sir William Van Horne, William McKenzie, William Whyte, D. D. Mann, A. M. Nanton, D. B. Hanna, G. Morton Morse, R. J. Mackenzie and Hugh Sutherland.

Manufactures and Supplies

ROLLING STOCK.

Butler Passenger Railway, Butler, Pa., has placed an order for one single-truck car.

Coal Belt Electric Railway, Marion, Ill., has ordered three large cars from the St. Louis Car Company.

Jacksonville Electric Company, Jacksonville, Fla., has ordered eight double-truck cars from the J. G. Brill Company.

Toledo & Western Railway, Toledo, O., has ordered 2 double-truck interurban cars from the Niles Car & Manufacturing Company.

Omaha & Council Bluffs Street Railway, Omaha, Neb., will place an order shortly for 35 heavy double-truck cars for delivery about September 1.

Pennsylvania is reported to have ordered 21 passenger coaches for use on its West Jersey & Seashore line. The cars will be driven by 200-horsepower motors.

Brooklyn Rapid Transit Company, Brooklyn, N. Y., has prepared specifications for 100 elevated cars in addition to the 100 surface cars mentioned in our issue of January 12.

Forest City Railway, Cleveland, O., has announced through A. E. Du Pont, president, that it will at once order 50 new cars for city service, a special feature of which will be a large rear platform.

Northern Electric Company, Chico, Cal., has ordered from the Niles Car & Manufacturing Company, 10 interurban cars 56 feet in length; from the St. Louis Car Company, 4 interurban cars 56 feet long and from the Cincinnati Car Company 3 combination interurban cars 56 feet in length.

Spokane & Inland Empire System, Spokane, Wash., will soon place orders for 12 Brill type passenger coaches and 50 flat cars. An order has been placed with the Seattle Car & Manufacturing Company for 250 box cars 40 feet in length and of 80,000 pounds capacity for delivery prior to July 31, 1907.

SHOPS AND BUILDINGS.

Richmond & Chesapeake Bay Railway.—This company has let a contract to W. A. Chesterman for the construction of a terminal station, 67 by 146 feet, at Broad and Laurel streets, Richmond, Va., to be completed by May 22. The station is to be of light brick, with stone base and metal cornices. Noland & Baskerville are the architects. C. P. E. Burgwyn, chief engineer, Richmond, Va.

Tacoma Railway & Power Company.—This company is erecting five passenger stations along its American Lake line, between South Tacoma and the lake. The stations will be 16 by 20 feet, of the bungalow type.

TRADE NOTES.

John Davis Company, of Chicago, has just shipped three 26-inch and two 22-inch "Hochfeldt Eclipse" relief valves to one of the Utah Copper Company's plants of the American Smelters Securities Company, at Salt Lake City, Utah.

Vulcan Iron Works Company, Toledo, O., has received an order from the Washington Baltimore & Annapolis Electric Railroad for a large steam shovel and from the Wisconsin Central for a 60-ton steam shovel for work at Prentiss Junction, Wis.

John B. Watson, Philadelphia, has taken larger offices and moved from 515 to 531 Drexel building. Mr. Watson is well known in the contractors' equipment line, making a specialty of second hand steam shovels, locomotives, cars and relaying rails.

Westinghouse Electric & Manufacturing Company, Pittsburg, has had plans prepared for a warehouse to be built at the north-east corner of Morgan and Thirty-sixth streets, Chicago. It will be a 4-story structure, 80 by 100 feet, of fireproof steel construction, concrete foundation with concrete and brick exterior, steam heat and to cost \$75,000.

Otto Raymond Barnett, 1515 Monadnock Block, Chicago, will succeed the firm of Raymond & Barnett which was dissolved on January 11 on account of the death of James Henry Raymond. Mr. Barnett will make a specialty of the law of patents, trade marks, corporations and copyrights, being assisted by Parker H. Truman, formerly with the firm of Parker & Carter.

H. Walton Heegstra, for some time past advertising manager of the Western Electric Company, has severed his connection with that company. Mr. Heegstra's experience with all branches of advertising covers a period of eight years, most of which time was spent in the east. His broad experience will doubtless enable him to form a connection of mutual advantage.

O. M. Edwards Company, of Syracuse, N. Y., maker of the Edwards Window fixtures, shade rollers, sash balances and extension platforms, has outgrown its own quarters and has moved into a new building erected for its sole use. The new structure is built on what is known as the Salt Lands, which has been a government reservation and is practically in the heart of the city. It is close to all of the railway lines entering the town. The plant

has 150,000 square feet of floor space and is one of the most complete in the country, devoted to the making of railway supplies, the products requiring as widely varying departments as those of sewing room and a brass foundry. All the buildings and fittings are of the latest design, being thoroughly fireproof and fitted with the most modern machinery.

Lord Electric Company, 904 Fuller Building, New York City, installed about 18 months ago several hundred soldered bonds on the track of the International Railway Company, of Buffalo. A number of these bonds were recently subjected to test by H. L. Mack, superintendent of line of the International Railway Company, and were found to be in perfect condition.

American Car & Foundry Company has had plans prepared by Baxter & O'Dell, 1024 Hammond building, Detroit, Mich., for a millwright shop to be erected at the corner of Ferry avenue and Russell street, Detroit. This will be a 3-story and basement building, 40 by 80 feet, of brick construction, with Bedford limestone trimmings, composition roof and electric lighting. Bids will be received by Baxter & O'Dell.

Fairbanks, Morse & Co., Chicago, manufacturers of gas, gasoline and electric engines, hand cars, etc., have purchased property at Ninth and Harney streets, Omaha, Neb., upon which they propose to erect a warehouse. It will be a 6-story building, 66 by 132 feet, of concrete construction and is estimated to cost \$80,000. W. F. Norman, 1102 Farnam street, Omaha, who is the manager of the Omaha office of this company, will have charge of the work.

F. P. Harrison Electric & Manufacturing Company, of New York, has just sent a large shipment of Deltabeston armature and field coils to the Yorkshire Tramways Company, Liversedge, England, and another shipment to the Australian Natal Government, Sidney, Australia. The company has also received a large order for Deltabeston armature and field coils, amounting to more than \$6,000, from the Pacific Electric Railway Company, Los Angeles, Cal.

Advance Equipment Company, Incorporated, West End Trust building, Philadelphia, makes a specialty of furnishing contractors plant, both new and second hand and is in position to furnish materials promptly. The company handles the Monarch Road Roller Company's products. This road roller passes the specifications and requirements of the state engineers and the highway department officials of many states. It also represents in the east the Municipal Engineering & Contracting Company, manufacturers of the Chicago Improved cube concrete mixer.

ADVERTISING LITERATURE.

Crandall Packing Company, Palmyra, N. Y.—A complete catalogue and price list of the improved steam, ammonia and hydraulic packings manufactured by this company is presented in an 80-page publication.

Abrasive Material Company, Philadelphia, Pa.—A substantial catalogue has been issued by this company for use during 1907. It presents information about the grinding wheels made by the company together with many useful tables for the machinist and drawings of various types of special wheels made by this company for industrial concerns.

Ball Engine Company, Erie, Pa.—A small pamphlet issued by this company calls attention to the fact that this is the twenty-fifth year of its existence and describes a number of the engines manufactured by it. One of these engines is a Corliss with patented valve motion with low clearances, by means of which economy is obtained and a high rotative speed is permitted.

Crescent Machine Company, 42 Main St., Leetonia, O.—The latest catalogue of this company presents a full list with an adequate description of its various wood-working machines. One of the types, a 32-inch band saw, has recently been redesigned and a number of new features added. The machine is made particularly for general planing mill use and the company states that it has proven satisfactory in general service.

Hayes Track Appliance Company, Geneva, N. Y.—This company manufactures lifting derails, a distinctive pattern of a device which is essential for the protection of the grade crossings of one railroad by another and as a safeguard in other instances. The company has recently made a number of improvements in the models of its device and an eight-page illustrated pamphlet tells what the improvements are and why they improve.

Wallace-Coates Engineering Company, Inc., 355 Dearborn street, Chicago.—A well-printed and neatly-arranged pamphlet of this company outlines its organization and scope of work. The executive committee includes Harold F. Wallace, formerly chief engineer of the Illinois Central Railroad and third vice-president J. G. White & Co., New York; Frank R. Coates, formerly chief engineer Chicago Great Western Railway and vice-president Thomas Phee Company, general contractors; John Findley Wallace, president Electric Properties Company, New York, formerly general manager Illinois Central Railroad and chief engineer Panama Canal; Pliny B. Smith, attorney-at-law, and Theodore W. Snow, president Otto Gas Engine Company. This company makes examinations, reports and supervises investments for banks and trust companies; makes examinations and reports on proposed and existing lines and terminals for steam and electrical railway companies; makes examinations and reports for construction companies and on public service utilities for municipalities. Another phase of the company's work is analytical examination of expenses for steam railroads, electric railways and construction companies.

ADDITIONAL EQUIPMENT FOR THE WEST JERSEY & SEASHORE.

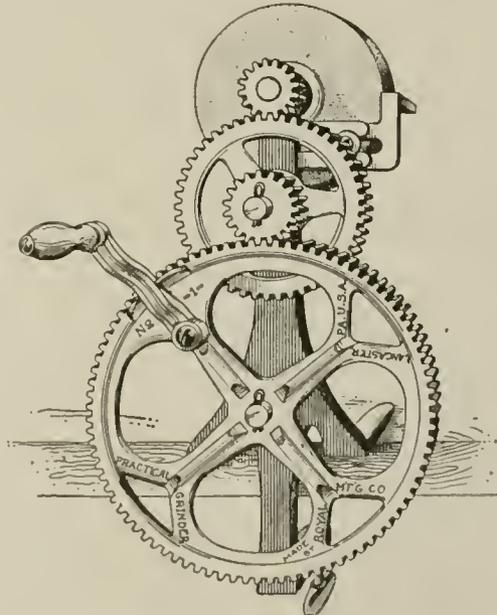
Because of the increased traffic on the Camden-Atlantic City electric line, it has become necessary to add to the present rolling stock some 21 cars. Both the new cars and the generating apparatus necessary to care for the extra load, are similar to the present equipment. Each of the cars will be driven by a GE-69 (200-hp.) double motor equipment and will be fitted with the Sprague-General Electric Type-M control.

At the Westville power house a fourth 2,000-kw., 6,600-volt, 25-cycle, three-phase, Curtis steam turbo-generator will be installed. Additional boiler capacity with the necessary condenser and feed pumps, switchboards, etc., will also form a part of the new equipment, as well as a 75-kw., 125-volt, horizontal Curtis steam turbo-generator for excitation purposes. Three extra 700-kw., air-blast transformers will step up the generator voltage to 33,000 volts for transmission.

Six 1,000-kw. rotary converters will be distributed in the substations. The accompanying air-blast transformers for these machines have a capacity of 370 kw. each, three being installed with each rotary. The Pennsylvania Railroad has ordered all the additional apparatus, as outlined, from the General Electric Company, which also furnished and installed the initial equipment.

A PRACTICAL GRINDER.

The compact and durable grinding machine illustrated herewith is designed for a great variety of uses and in various sizes according to the nature of the work to be done. Its portability makes it of value as a time saver where tools and drills requiring constant sharpening are in use. The grinding wheel is of aluminum, manufactured by the Norton Grinding Company. The frame is of cast-iron, designed for strength, and the spindles are of



Practical Tool Grinder.

cold rolled steel. Each wheel can be removed and easily replaced in case of breakage. A speed of 300 revolutions per minute can be obtained, insuring rapid cutting, and it is said that its work is ten times as rapid as that of a grindstone.

The manufacturer, the Royal Manufacturing Company, Lancaster, Pa., states that the machine has been found especially useful in electric railway shop and maintenance of way work, and one superintendent states that the grinders paid for themselves in two weeks. The same type of machine is arranged for foot-power by the attachment of a treadle and mounting a fly-wheel on the grinding-disc shaft.

THE USE OF DOSSERT JOINTS.

Dossert & Co., of New York City, were exhibitors at the recent electrical trades exposition in Chicago. This company manufactures solderless connectors for making all manner of electrical joints between cables and soldered wires. Mr. E. A. Dossert acted as representative and exhibited, besides the well-known forms, new connectors for making T and L-joints such as would be necessary when turning sharp corners with large cables. It is stated that the Chicago City Railway Company has adopted the Dossert connector for all its new work and that it is now using two-way, three-way and cable taps of various sizes, as well as this company's mechanical joints up to 1,000,000 circular mils in capacity. It is also stated that the Metropolitan West Side Elevated Railway has found it advisable to use three-way and four-way connectors in wiring its new cars.

Some of the other products of this company for which orders have recently been placed are as follows: A neat type of pot-

head connector by the use of which high-tension cables emerging from a pot-head may so be joined to the inside wiring that they are easily disconnected; combination fuse-box plugs, of which more than 125,000 are in use by the Brooklyn Edison Company; special double cable-taps used with jumpers for the Bridgeport Electric Traction Company; special bonding connectors used by the New York Central & Hudson River Railroad, and a type of insulated motor-lead connector, which has found general favor, is used in large numbers by the Philadelphia Rapid Transit Company. This list of products will serve to show how the Dossert type of joint may be used for all classes of work, from connecting ground wires with iron pipe to splicing 1,000,000-circular mil cables.

The Western Electric Company at its Hawthorne plant recently made a comparative test to learn the relative merits of a 1,000,000-circular mil two-way Dossert solderless connection and the common form of soldered copper sleeve. As regards time, the mechanical connection was made in 20 minutes while the joint with a copper sleeve required four hours for making. A test for conductivity showed the mechanical connection to have a loss of .05 per cent compared with a loss of .30 per cent for the soldered joint. The mechanical joint also saved more than two feet of cable, the cost of which was said to equal that of the joint itself. As a result of these tests the Western Electric Company has adopted this type of connection for use on its various products.

SOME EXHIBITS AT THE CHICAGO ELECTRICAL SHOW.

In previous issues of the Electric Railway Review mention has been made of the very interesting collection of exhibits recently shown at the Coliseum in Chicago. Among the exhibits that were of special interest to electric railway interests and which as yet have not been mentioned in these columns were the following:

The American Steel & Wire Company had a very attractive display, including many of its large number of products which are in general use in the electric railway field, such as pin-driven and other types of rail bonds, copper and steel wire, cables and many of the smaller products such as springs, etc.

The Albert & J. M. Anderson Manufacturing Company included in its display sample-boards exhibiting this company's standard overhead fittings. In its booth was shown the Anderson third-rail bracket for supporting the underrunning type of third rail. With this type of bracket the head of the rail is rigidly held by a malleable-iron support, insulation being provided by using the well-known "Aetna" material.

A number of typical designs of clay conduits suitable for single and multiple-duct work were exhibited by the American Sewer Pipe Company. These products are designed and finished in such a way as to adapt them for heavy cable-work.

The following well-known supplies for general wiring and electrical use were exhibited by the Central Electric Company: Okonite wire, Columbia incandescent lamps, Deltabeston magnet wire, D & W fuses, cut-outs, subway and transformer boxes, Edison batteries and fan-motor outfits, Knowles high-tension insulators, Okonite and Mason tapes and various styles of arc and incandescent lamps with reflectors.

The Chicago Pneumatic Tool Company, Chicago, displayed an interesting line of portable electric tools in operation at its exhibit at the Chicago electrical show, consisting of Duntley portable electric drills, grinders and hoists. The drills, which have been on the market for several years, are made in sizes having drilling capacities from three-eighths of an inch to three inches and are made for alternating as well as direct current. A Duntley electric hoist of 1,000 pounds capacity was also shown in operation. This hoist was of the worm-gear type with double-hoisting drums, self-locking and the motor was provided with a dynamic brake. This hoist is made in sizes ranging from 250 to 2,000 pounds capacity.

The products of the Crane Company as exhibited included two large valves designed for remote control. One of these valves was of the gate type, motor-operated, and built of this company's "ferrosteel." The other valve was a 24-inch hydraulically operated gate-valve, provided with an electrical device controlling the admission of water into the operating cylinder. The exhibit also included many of the standard types of smaller valves for use in steam boiler plants.

The Joseph Dixon Crucible Company showed its various types of graphite paints and lubricants, special crucibles for melting brass and a line of Dixon graphite motor-brushes.

The Electrical Appliance Company of Chicago made an attractive exhibit of the many specialties for which it is agent. Among these products are Packard lamps and transformers, Sangamo meters, Stombaugh guy anchors, Paranite wire and complete types of telephone equipment.

The Electric Service Supplies Company exhibited the Automotoneer, which is a controller regulator so constructed that a motorman is prevented from turning on the full current in one sweep of the controller handle. The Automotoneer makes it necessary for him to pause at each point of the controller, so that he cannot start the car suddenly. To the railway operator it means a saving in current. This company's other well-known supplies were also exhibited in an attractive way.

The Electric Storage Battery Company exhibited its well-known types of chloride accumulators of various capacities, from 2½ to 4,800-ampere hours. This larger type of cell has been adopted by the New York Central Railroad Company in the storage-battery stations operating in connection with its rotary-converter substations supplying current for its electrified lines.

The Gould Storage Battery Company had in its exhibit a 49-

plate cell with a capacity of 5,760-ampere hours, the plates of this cell being held in the lead-lined tank furnished with a lead-glass cover. Other types of cells were exhibited as suitable for the following classes of service: Regulating battery, ignition battery, train-lighting sets and signal batteries. The exhibit also included an excellent display of photographs showing working installations of this company's products.

The General Electric Company made an especially fine display of its well-known types of incandescent lamps, including the late high-efficiency products. Many household electrical attachments, suitable for sale by light and power companies, were shown in actual use. These included kitchen, bathroom and bedroom devices.

Mr. J. Allen Haines had space at the Coliseum and represented the following companies whose products he handles: American Electric Heater Company, Bishop Guttapercha Company, Clifton Manufacturing Company, Dayton Electrical Manufacturing Company, the Electric Cable Company, Schwarze Electric Company, Stanley & Patterson and the Wire & Telephone Company of America.

A 100-line express-type magneto switchboard with connecting telephones and a central-energy private branch-exchange switchboard with common-battery telephones were exhibited by the Kellogg Switchboard & Supply Company. This exhibit also included an eight-party harmonic selective system showing the latest improvements for party lines.

The National Carbon Company exhibited various types of its products, including arc-light carbon, motor and dynamo brushes and dry-battery parts.

The Lima jack box, as exhibited by W. N. Matthews & Brother, affords an efficient means of connection to the regular telephone line. Its use is as follows: The boxes are installed on poles every quarter or half mile throughout the line of the railway and each box is connected to the regular telephone wires. Each train crew is equipped with a portable telephone and a Lima jack box plug. When a train gets to a siding where it is instructed to ask for orders the conductor takes his portable telephone and pushes his plug into the jack box and gets instantaneous connection with the dispatcher. The Lima jack box and plug have been in constant use on a number of interurban electric roads in Ohio and Indiana for the past two years.

The National Battery Company had on exhibit various types of accumulator cells for general service such as telephone, fire-alarm and automobile work.

The Ohio Brass Company exhibited overhead electric railway supplies, such as trolley hangers, bars, etc., and also had on exhibition a line of rail bonds. This company also showed a section of the New York Central's third rail supported by the type of the third-rail insulator which was furnished by the company for their recent installation and which this company is now furnishing for additional work.

The H. A. Peterson Manufacturing Company, Harvey, Ill., exhibited electrical conduits known as "Harveyduct" and designed to protect lighting and power wires for all classes of interior work.

The Simplex Electric Heating Company had a working exhibit of electric heating and cooking appliances which it manufactures, together with its well-known line of car heaters.

The United Indurated Fibre Company had a very complete line of its products suitable for protecting the various types of third rails and for use in conduit, cable-ways and transformers.

The Universal Electric Storage Battery Company exhibited a house-lighting plant suitable for a private residence, the Crocker-Wheeler generator of this plant being belted to a Fairbanks-Morse gasoline engine.

The Wagner Electric Manufacturing Company had on exhibit a single-phase elevator motor. This type of machine will open up possibilities in the line of power supply for systems not equipped to sell direct current. The Wagner exhibit also included transformers, transformer parts, a single-phase variable-speed motor and single-phase vertical type motors suitable for driving vertical pumps.

In the Westinghouse exhibit there were to be seen twenty odd machines of widely varying types, driven by motors. Some one of many uses demonstrated by the motor-driven household utensils in operation in the exhibit included washing, ironing and sewing machines and a sanitary cleaning and scrubbing outfit. Among the machines of interest to manufacturers were a lathic, saw sharpener, ventilating fan, printing press, drill and blacksmith blower.

American Trolley Wheel Company, Charleston, W. Va., has been incorporated with a capital stock of \$10,000 to manufacture and sell trolley wheels. The incorporators are: B. G. Young, C. W. Pickering, Adam B. Littlepage, D. H. Pritchett and John Hall.

Smith Improved Lock Nut Company, Rockford, Ill., has increased its capital stock from \$30,000 to \$60,000 to take care of the construction and installation of the track bolt department. This company has heretofore confined itself to the manufacture of the Smith improved nut only, but the demand for this nut seems to make it advisable to manufacture bolts for it. A new brick building is being erected in which track bolts and machine bolts equipped with the ordinary hexagon and square nuts will be manufactured. The company intends to devote particular attention to the steam and electric roads in the central west. This is the third addition to the manufacturing plant since the company was organized about 18 months ago. The Railway Specialty & Supply Company, Great Northern building, Chicago, is the sole agent in this country, Canada and Mexico.

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The Chicago traction situation is nearer settlement than it has been for ten years. By a vote of 56 to 13 the city council passed the Chicago City Railway Company and the Chicago Railways Company ordinances early on the morning of February 5. As earlier announced the Chicago Railways Company is the corporate name of the new company which will be formed to take over the Union Traction lines. Mayor Dunne probably will exercise his right of veto at the council meeting on February 11, but the supporters of the ordinances showed in the vote this week a sufficient majority to pass the measures over the veto. The ordinances contain a provision that unless they are approved by the voters on April 2 they shall not become operative. Mayor Dunne contends that the ordinances have been so drawn that they will be effective in their present shape without the approval of the voters.

Though most of the larger companies have long realized the advantages derived from having one or more wrecking cars at some centrally located point or points, ready for immediate service, many of the shorter lines have neglected this highly important part of the equipment. The reason for this is doubtless because accidents on the smaller roads are comparatively few in number and therefore the cost and maintenance of a special wrecking car is not warranted. A point which is overlooked, however, is the fact that an old car with the body removed and fitted up with pieces of rail, jacks, chain-blocks, replacers and the regular tools necessary for the clearing of wrecks and the repair of tracks, will give all the service required and can also be used for the transportation of material and on construction work when not needed for wrecking purposes. Such a car would serve all the requirements of a small road and save considerable delay and reduce the cost of clearing wreckage. For city use where a block is likely to be caused by any obstruction to the track wrecking cars are of less value, since the car can

not always be run to the place of the accident, and in this case a wagon properly fitted out is of more service.

There is little advantage in paying for the most economical types of engines and specifying the most expensive boiler designs, installing the most approved systems of economizers, automatic stokers, and high-pressure gravity drip apparatus with condensation returns to the boilers, if the consumption of coal is allowed to become excessive by the escape of steam or hot water from the plant through leaky boiler tubes and feed piping, loosely-jointed pipes and stop valves, or loosely-worn valves and pistons in the cylinders of engines and pumping machinery. Where the steam is highly superheated, it is even more difficult to keep valves tight, and much is yet to be learned about the best metals for the high and low-temperature service required in valves for use on superheated lines. It sometimes happens that the leakage of a steam trap will go on undetected for weeks if regular inspections of the piping systems are not in vogue, with a resulting fuel waste which entirely offsets the supposed economy of an expensively designed plant. It is more or less a thankless task to hunt down leaks and repair them. In most cases it would be highly profitable if a thorough examination were made every fortnight or possibly once a month for leakage. Visible waste of steam is easy to detect, of course, but the loss through defective traps and remote auxiliary piping can best be tested out by noting the fall of water in the boiler water columns when the turbines and engines, pumps and heaters are cut off from operation and full steam pressure maintained in the boilers. Radiation and connection losses must be made up by a steady coal consumption, reduced though it may be, so that actual steam leakage cannot be determined by its influence on the coal pile without going to great trouble; but the simple expedient of noting the fall of the water column—which should remain stationary if there is

no leakage—is so easily applied that there is little excuse for its neglect in practice.

A STANDARD FREQUENCY FOR ALTERNATING-CURRENT TRACTION.

Probably the most interesting and important part of the paper by Messrs. L. B. Stillwell and H. S. Putnam on "The Substitution of the Electric Motor for the Steam Locomotive" (Electric Railway Review, February 2, page 150, and this issue 192), related to the question of standardizing the frequency of the current cycle. It is easy to see that it is as yet premature and useless to make laborious calculations of the comparative cost of operating the railroads of the entire United States by steam locomotives and electric motors and that it is sufficient to obtain data for particular conditions where electrification appears to be desirable and for which such estimates are requested. The adoption of a standard current for heavy electric traction is a more hopeful and profitable subject for discussion by electrical engineers, and this we regard as the most valuable result of the recent paper on these subjects.

It appeared to be taken for granted by the authors of the paper and by the principal speakers in the discussion that single-phase alternating-current motors generally will be used on electric locomotives for operating heavy through trains. Such electrification will be a gradual extension of the more immediate work for terminals, tunnels and mountain grades until it includes complete divisions of main line. The system which ultimately will be used for main-line traction should therefore be used for the preliminary work at terminals and a decision to standardize the single-phase current for all heavy traction would effect a greater economy for the owners of steam railroads than can now be realized. The disposition of the electrical engineers at the recent meeting to recommend such a system came much nearer to a general agreement than ever before, and the principal part of the discussion related to the question as to whether a frequency of 25 or of 15 cycles per second should be generally adopted.

While practice with the alternating current in this country has accepted 25 cycles to a large extent, the lower frequency is used successfully for locomotives by two of the largest electrical manufacturing companies in Europe, the Ganz Company in Australia and the Oerlekon Company in Switzerland. In this country the large manufacturers have done sufficient experimental work with motors operated by 15-cycle-current to enable them to speak definitely in its favor. The argument that the higher frequency of 25 cycles is now fairly well established, and that drawings, patterns and conveniences for manufacture are now prepared for building apparatus suitable for that frequency should have little weight in view of the larger work on heavy electric traction using electric locomotives for freight and passenger service which is now in sight and for which it is acknowledged 15-cycle current is better adapted.

The principal reasons for a change to the lower frequency relate to dimensions, weight, efficiency, power factor and commutation in a motor, and the advantages of 15 cycles in this respect have been shown not only by theoretical considerations, but by demonstration in actual practice. The weight and dimensions of motors operating at 15 cycles, as compared with 25-cycle apparatus, can be reduced so that it would often be possible to use two motors where four would be required with the higher frequency. This would effect a saving not only in the weight and cost of motors, but it would also simplify the wiring and auxiliary apparatus.

For high-speed passenger locomotives, which should be gearless, motors designed for 15-cycle current will develop with equal efficiency the greater pull at the drawbar for a given weight per axle. This advantage amounts to 25 or 30 per cent. The reason for not going below 15 cycles is that

at this frequency the fields are practically saturated and any lower one would limit the output; besides, the disadvantages of lower speed of turbo-generators and weight of transformers then become important.

An electric locomotive with single-phase series motors designed for 15 cycles can be operated at slightly reduced capacity with current at 25 cycles, and by adding a 15-cycle transformer an equipment designed for 25 cycles can be adapted for operation on either 25 or 15 cycles. This would make available for use where necessary or desirable, were the lower frequency to be made standard, generators producing current at 25 cycles and car and locomotive equipments designed for the higher frequency. A reduction in the number of motors with 15-cycle current cannot be made where it is necessary to operate the same motor with alternating current and direct current, as this practice requires four motors in one group in order to obtain the benefits of series-parallel control. Such conditions should not be numerous and the result of standardizing the single-phase motor for heavy traction would tend to prevent an increase in that kind of equipment.

The principal objections urged against the 15-cycle current relate to increase cost of generating apparatus and transformers and to the unsuitability of this frequency for lighting cars, but it was shown that the reduction in cost of car and locomotive equipment would more than offset the increased cost of generators and transformers, and that satisfactory lighting with 15 cycles can be obtained by the use of low-voltage lamps having heavy filaments.

In the light of past experience with the slow-moving standardization problems and with another great change requiring conditions favorable to interchange of traffic, it is fortunate that there is little question as to the kind of current which should generally be used for electric traction and that it appears to be possible to arrive at an early agreement on a standard for it.

THE INCREASING SIZE OF BOILERS.

Perhaps the most salient feature of power plant development in the past decade is the constantly increasing capacity of engine and generator units. These gains in size now seem to have reached at least a temporary standstill, for it is a grave question how far it is wise to tie up the capacity of a plant in a very limited number of units. There does not appear much evidence from actual daily operating records that the mammoth turbo-alternator of 10,000 kilowatts capacity for an hour or so is more economical than the machines of 5,000-kilowatt normal output, and there is certainly little question as to which installation is the more flexible from the operating standpoint.

Whatever the future may hold in store for prime movers in the way of ultimate sizes—and it is not at all unlikely that the more general electrification of steam roads will demand even huger machines than those of the present day—it is certain that for a long time to come there will be a demand for larger boiler units than the manufacturers are as yet supplying. For some reason, possibly the difficulty of stoking large grates or the inconvenience of branching out too far from accepted standards of shell size, the modern steam boiler has been slow to respond to the demand for greater concentration of power, but within the last three years the widespread use of the steam turbine has brought about a very perceptible increase in boiler heating surface. A gain of 50 or 60 per cent has been made in several cases over the original 4,000 or 5,000 square feet of heating surface which, until very recently, marked a boiler as one of unusually high capacity. We certainly are not far from the day when a boiler of 10,000 square feet of surface will be regarded as a standard specification, and if engines and turbines of 7,500 to 10,000 horsepower continue to be installed

in large new plants it is a question if the boilermaker will stop at 10,000 square feet.

Hand firing is, of course, increasingly difficult as the size of grates goes up, but few designers of such large plants as these would fail to urge the use of mechanical stokers. The advantages of large boiler units are so great that they are certain to be demanded more and more. Grates can be divided into sections, two or more to the same boiler, so that the loss of heat and fuel through banking fires will be much reduced. With the load curve common in railway plants the use of sectionalized fires is almost sure to be a step toward lower cost of power, for as the sharp peaks of the rush hours come on it is a simple task to fire up another furnace and enjoy thereby a more rapid acceleration in the generation of steam than is possible in working up the vitality of a half-dead fire which has been banked for hours. Radiation losses should be less in proportion to the increase in heating surface; the floor space also should be noticeably decreased—one of the most important points of all—and the general economy of the boiler room bettered. The boilermaker and the manufacturer of mechanical stokers will have to put their energies together to cut down the present gap between prime mover and boiler bulk for the same capacity of plant, but unless we are mistaken there is going to be some good work done along this line in the next few years.

ASSEMBLING NEW CARS.

The widespread adoption of heavier standards of rolling stock on electric railways in the last few years has strained the facilities of many repair shops to their utmost. Recently built shops for important city and interurban systems reflect this evolution of cars and motive power in the equipment of every department. More powerful tools, better hoisting facilities, the extension of the direct motor-drive for machine tools, the use of high-speed steel in the rougher operations, a better working organization and improved store-room facilities, are significant results of the advent of larger and more valuable equipment in the operating department. Master mechanics are working hard to cut down production costs in terms of output in railway shops no less than in industrial plants, and the work of repairs has been thoroughly taken in hand. In the assembly of heavy rolling stock, however, much remains to be done in the direction of reducing the time and expense of the work; for the opportunity to apply far-sighted methods in the erection of new and improved cars is thus far a relatively new proposition to the electric railway shop manager.

If it were feasible from the dual standpoint of factory cost and convenience of transportation few roads would attempt the burdensome task of equipping new cars in their own shops and thereby running the risk of blocking the necessary repairs upon their regular service equipment. But the modern high-powered car contains parts made by several manufacturers; the body, trucks, motors and control, airbrake apparatus, heaters and other apparatus are in no case yet made in a single factory, but must be assembled at the most convenient point for all concerned, which is the purchaser's shop. Even if it were possible to go into the open market and buy new cars complete and ready for service on the "hand-me-down" principle, the question of shipment over the railroads would present grave difficulties. Some of the later electric car bodies have had to be shipped by rail under special permits and with extraordinary care on account of their dimensions exceeding by an inch or two the steam railroad company's standard requirements and it is hard to see how complete cars could be shipped by rail except as parts of regular freight trains—a course which few electric railway managers are as yet ready to approve. It seems to be a settled thing that a certain amount of assembling must be done at the purchaser's own shops, and if the work is han-

dled right there is no question that the erection can be performed at not much more than half the expense which would be entailed by having it done at the original manufacturing plants. A further advantage accrues from the opportunity of the shop force to familiarize itself with any new features in design and construction, so that repairs can be more quickly made after the equipment is put on the road in commercial service.

Economy in assembly can only be attained by the practice of carefully planning for the new work, setting apart certain men for the tasks of erection alone, and organizing the labor and material alone or else separately from the usual shop routine. The number and value of the cars purchased and the relative complication of their equipment should dictate the extent of the organization necessary to handle the assembly promptly and at the lowest reasonable cost. The purchase of 40 or 50 cars, costing complete upwards of \$500,000, if handsomely finished according to modern ideas and fitted with fireproof bodies, motors, trucks, brakes and control suitable for multiple-unit operation at speeds of from 40 to 70 miles per hour, justifies setting apart or fitting up a separate or subshop with a foreman and stock room of its own, to say nothing of the special individual and machine tools and labor-saving kinks which the peculiar circumstances of such large purchases demand.

The importance of the separate stock-room is not easy to exaggerate in large jobs like the foregoing. If the thousand and one odd pieces of equipment which go to make up each complete car are stored in the regular shop stock-room, the chances are ten to one that they will be unavailable when wanted, or at least misplaced, on account of the temptation to use them as repair parts for old equipment. The most scrupulous care ought to be observed in checking up each piece as it arrives, including the date, by reference to an equipment sheet on which the exact number of parts needed by each car is stated in red ink, or in some other striking manner. Single pieces like the contactors in the multiple-unit control system, which are shipped in individual boxes, need not always be unpacked until wanted, but experience has shown the importance of sharp checking. A separate tool-room with facilities for grinding drills, reamers and other cutting devices is certainly worth considering when a large assembly job is projected.

In the labor organization it has been found most essential to separate the different kinds of work upon the car so as to avoid interference in cramped spaces, and to carry the same job through all cars in rotation, making each workman as far as possible a specialist, as in wiring master controllers in cabs, fitting up the car-lighting circuits, connecting motor-men's brake valves, installing reversers, contactors, etc. In this way the progress of the work will be delayed by fewer cases of waiting for other men to finish specific tasks, and the usual loss of 15 or 20 minutes per man in changing jobs will be greatly decreased. In the drilling of holes for wiring conduits and airbrake system pipes, the small 110-volt electric drill of about $\frac{1}{4}$ horsepower recently has made a good name for itself, it having been found on a large car assembly job that small pneumatic drills are not as readily repaired. On some of the later cars no less than 750 holes, varying from small sizes up to about $1\frac{1}{4}$ inches diameter, are necessary, allowing for the pipe conduit, airbrake and angle-iron equipment; and the economy of the portable drill in such a case is too obvious to dwell upon. In this connection the use of special wooden templates has been found invaluable, for they can quickly and cheaply be constructed for any part of the car and applied in either fixed or folding form to vestibule pockets, floors, or any other barrier which has to be traversed by wiring and fixtures.

The use of labor-saving devices is, of course, just as important in an erection job as in regular maintenance. Special clamps and blocking are convenient; portable lamps with

reflectors to keep the rays out of the worker's eyes are a necessity; pneumatic jacks, hydraulic and small electric hoists are worth many times their cost to the company, and in the assembly of cars equipped with pipe conduit wiring, a pneumatic pipe-bender of two or three tons capacity for sharp and difficult curves and a hand-bender of the lever type for easy, long swings are indispensable.

OPERATIONS OF THE SOUTH SIDE ELEVATED ROAD.

That the operation of the South Side Elevated Railroad of Chicago was hampered materially by the construction work in progress is shown plainly by the annual report for the year 1906. It is shown with equal clearness that high prices of labor and materials affected the results. These factors, together with increased competition, caused by improvements in the surface lines, were responsible for the outcome of the year's business, which, as compared with the previous year, was in brief: an increase of 4.4 per cent in gross earnings from all sources, an increase of 14.6 per cent in operating expenses and a loss of 11.9 per cent in net earnings.

Between 1899 and 1905 the cost of conducting transportation on this road fluctuated only 2 per cent. It was kept between 25.4 and 27.4 per cent of gross passenger earnings. These two figures were reached in 1902 and 1901 respectively. Last year there was a striking change; from a percentage of 26.5 in 1905, the cost of this item ran up to 31 per cent in 1906. This is the highest figure shown since the road was fully equipped for operation by electricity. It was exceeded in 1897, when steam locomotives were used entirely, and in 1898, when the change to electricity was made. The cost of conducting transportation in 1906 was 4.5 per cent higher on passenger receipts than the same expense in 1905. In explaining to the stockholders the causes of the decline in net earnings the retiring president, Mr. Leslie Carter, said that the principal single item of added expense was an increase in the cost of coal of \$26,753. This sum is equivalent to 1.5 per cent of gross passenger receipts. The remaining difference of 3 per cent between the two years represents higher cost of other materials, higher wages and the in-

condition of the company and its application of income to betterment and to conducting transportation accounts:

Year	Per Cent of Increase in Gross, all Sources, Over Previous Year	Maintenance of Way and Structures Per Mile of Structure	Conducting Transportation - Per Cent of Gross Passenger Earnings	Maintenance of Equipment - Per Cent of Gross Passenger Earnings
1906	4.4	\$9,110	31	8.3
1905	8.7	8,431	26.5	8.5
1904	6.2	7,587	27.2	8.4
1903	13.1	7,514	25.9	8.1
1902	8.9	6,710	25.4	7.4
1901	5.8	8,703	27.4	7.9
1900	9.9	5,238	26.6	8.5
1899	19.6	5,929	26.2	7
1898	42	3,692	39.5	5.7
†1897		2,656	56.9	6.6

*Decrease.
†11 months only.

Some explanation of the changes shown by these figures is needed. The gain of 13.1 per cent in gross earnings in 1903 as compared with 1902 is excessive. It was due to a strike which interrupted travel on the surface lines. The decrease in 1904 reflects the return to normal business. The expenditures for maintenance of way and structures are figured per mile of elevated structure. This expense for 1906 probably covers some small portion of the new extensions, but no allowance was made for the increased mileage in the computation. The original mileage comprised 8.56 miles of elevated structure. Until April 20, 1898, the road was operated entirely by steam, but after July 27 of that year electricity was substituted. The company has had the advantage of connection with the Union loop since October, 1897.

During the current year the operations of the property will be somewhat complicated, but unless there is unexpected delay revenue will be received from all the new extensions at the close of the year. The company will have to meet, for the greater part of the twelve months, the additional expense of operating parts of incomplete lines. With the new lines the company will approximately double its mileage, and its subsequent operations will be on a much larger scale than heretofore.

EARNINGS OF STONE & WEBSTER COMPANIES IN 1906.

The year book of Stone & Webster has just been issued, showing the earnings and expenses for the year 1906 of the

Earnings and Expenses of the Stone & Webster Companies for the Year 1906.

	Gross Earnings.	Operating Expenses.	Net Earnings.	Interest Charges.	Balance.	Dividends.
Blue Hill Street Railway Co., The, Canton, Mass.	\$ 89,041.34	\$ 67,670.80	\$ 21,370.54	\$21,217.99	\$ 152.55	
Brockton & Plymouth Street Railway Company	111,775.03	70,894.28	40,880.75	21,854.74	19,026.01	
*Cape Breton Electric Company, Ltd.	258,316.80	154,472.28	103,844.52	43,160.97	60,783.55	\$ 7,020.00
Columbus (Ga.) Electric Company	291,244.01	156,074.21	135,169.80	89,996.08	45,173.72	7,500.00
Dallas Electric Corporation	1,023,135.91	699,143.20	323,992.71	185,646.06	138,346.65	100,000.00
Edison Electric Illuminating Company of Brockton	166,799.23	111,410.50	55,388.73	8,584.04	46,804.69	12,500.00
El Paso Electric Company	391,655.96	276,403.00	115,252.96	47,215.64	68,037.32	15,000.00
Fall River Gas Works Company	363,021.25	215,818.77	147,202.48	6,774.51	140,427.97	63,500.00
Galveston Electric Company	315,135.35	191,479.86	123,655.49	50,000.00	73,655.49	21,000.00
Houghton County Electric Light Company	236,108.60	116,387.46	119,721.14	26,250.00	93,471.14	63,000.00
Houghton County Street Railway Company, The	229,244.76	146,255.32	82,989.44	46,976.59	36,012.85	12,000.00
Houston Electric Company	591,351.37	379,746.14	211,605.23	93,319.38	118,285.85	52,500.00
Jacksonville (Fla.) Electric Company	326,468.29	201,838.48	124,629.81	40,703.59	83,926.22	60,000.00
Lowell Electric Light Corporation, The	277,914.63	172,490.27	105,424.36	10,049.91	95,374.45	52,000.00
Minneapolis General Electric Company, The	805,632.46	442,003.36	363,629.10	107,183.33	256,445.77	120,000.00
Northern Texas Electric Company	854,135.52	547,151.22	306,984.30	118,631.67	188,352.63	74,078.00
Paducah Traction & Light Company	227,278.52	149,981.19	77,297.33	63,705.20	13,592.13	5,000.00
Ponce (Porto Rico) Electric Company	107,326.95	59,719.20	47,607.75	29,782.68	17,825.07	
Puget Sound Electric Railway	663,206.02	350,629.99	312,576.03	209,436.53	103,139.50	30,000.00
Proportion of earnings of Tacoma Ry. & Power Co.					69,388.43	
Savannah Electric Company	611,215.19	379,046.25	232,168.94	134,460.69	97,708.25	60,000.00
Seattle Electric Company, The	3,101,385.77	1,963,086.19	1,138,299.58	326,935.87	811,363.71	300,000.00
Tacoma Railway & Power Company	797,432.79	576,182.63	221,250.16	144,203.27	77,046.89	
Tampa Electric Company	469,222.08	279,957.96	189,264.12	1,423.16	187,840.96	130,000.00
Terre Haute Traction & Light Company	823,162.54	468,872.86	354,289.68	160,211.45	194,078.23	
Whitcomb County Railway & Light Company	279,469.45	185,181.91	94,287.54	48,236.22	46,051.32	11,700.00

*Includes one-half of Sydney & Glace Bay Railway Company, Ltd., earnings.

creased difficulty of operating the line during a period of construction.

The present company is now about 10 years old. It was formed on behalf of the first-mortgage and extension bondholders to take the property from a receiver. The management has been aggressive in developing business. The growth of traffic is revealed by the fact that the number of passengers daily increased from 36,727 in 1896 to 94,313 in 1906, a gain of 156 per cent.

The following table shows some of the changes in the

companies managed by this organization. Descriptions of the principal features affecting the companies, their capitalization, dates of dividend disbursements, and maps of the districts served are given.

The table presented herewith shows that the Seattle Electric Company earned, gross, \$3,101,385.77, or about three times as much as the next largest company, the Dallas Electric Corporation, which reports \$1,023,135.91. The smallest gross earnings—\$89,041.34—are shown by the Blue Hill Street Railway Company of Canton, Mass.

BOOK TABLE.

The Treatment of Storage Batteries. By R. W. Vicarey. London, January, 1907. Published by The Electric Accumulator, 15 Queen Street, Cheapside, London, E. C. 58+xl pages; 34 illustrations in the text, 4 tables; 8 by 11 inches. Paper, 2s. 6d. net.

The author of this treatise has no doubt filled a long felt want for a book suitable for those in charge of storage batteries. It is written for operators who know little or nothing about the construction, use or management of batteries, and who desire information on these subjects, written in simple and concise language. While all theoretical discussions are carefully avoided, the practical information and advice contained in this book is excellent. The subject of care and management is treated in a most thorough and intelligent manner, and is worthy of the careful perusal of all those having charge of any size of batteries.

The book takes up the treatment of the subject by discussing the proper location for the battery, selection of the battery and the importance of proper erection. It then gives methods for testing the polarity of the charging dynamo, making the initial charge and of making a discharge test. The succeeding chapters consider ordinary charging, electrolytes, methods of connecting the cells, manipulation of the regulating switch, inspection of cells, gradual sulphating, indicators of irregularities of the plates or electrolyte and circumstances which should never be permitted to exist. Simple remedies which may be applied are then given, including reversals, replacing old cells with new ones, methods of changing the electrolyte if it contains impurities, methods of charging, temperature of the electrolyte, how to determine whether positive or negative plate is at fault, overcharging, growing and buckling, scaling and shedding of active material, rests of cells, varying rates of discharge, local action and keeping the specific gravity of the electrolyte properly adjusted.

At the end of the book is given a glossary of all the technical and trade names and expressions used in connection with storage batteries. This will be much appreciated by those not thoroughly familiar with the subject.

Switchboards.—By William Baxter, Jr. Published by Derry-Collard Company, New York, 1906. Cloth, 188 pp., 5½ by 7¾ inches. Price, \$1.50 net, postage paid.

In any generating plant the switchboard is the operating center, upon the condition of which depends the continuity of service as afforded by the machinery controlled and regulated with the apparatus mounted on this board. It would seem, therefore, that switchboard design should offer problems worthy of much careful study. We are pleased to note that the author of this new work on the subject has treated the switchboard not only as a piece of mechanical apparatus, but as a delicate electrical device which should be capable of displaying the comparative values of the currents which it controls and serve as a distribution center controlling the output of the electrical machinery. In this book the author first outlines the earlier and more crude forms of switchboards. Some of the subjects treated progressively with the development of switchboard construction are as follows: Instruments needed, connections of shunt and compound windings, connections of distributing circuits, three-wire circuits, parallel operation, arrangement of instruments and switches. Following this first section of the book the author discusses the arrangement of boards in actual service, using diagrams of these boards to illustrate details of design which should be considered. The next section of the book is devoted to the construction of switchboards. It outlines the mechanical part of switchboard work, such as the choice and arrangement of conductors, method of supporting and the arrangement of panels, etc. In this section are also considered the electrical and mechanical details of arc-lighting switchboards, alternating-current switchboards for single and polyphase currents, synchronizers, ground detectors, high-tension switchboards and oil-break

switches. In one chapter the author discusses switches of all kinds, varying from simple key switches to power-operated, oil-break, high-voltage switches. Circuit-breakers are discussed and enlarged diagrams shown of the essential parts of the more common types of breakers as used in railway and lighting work. The last chapter in the book outlines the essential principles of the more satisfactory types of lightning arresters and illustrates some apparatus now in actual use.

As this book is devoid of any purely theoretical discussions, and as the subjects are introduced in the order of their development, using many clear illustrations, it should prove to be useful for those who have to do with either the design or the operation of switchboards for controlling the output of electrical machinery.

Electrical Engineering—An Elementary Text Book. By E. Rosenberg. Translated from the German by W. W. Haldane Gee, B. S., and Carl Kinzbrunner. Revised and brought down to date by Edward B. Raymond, B. S., General Superintendent Schenectady Works of the General Electric Company. Published by John Wiley & Sons, 45 East Nineteenth Street, New York, 1907. Cloth, 347 pages, 6 by 9 inches, with 333 illustrations. Price, \$2.00 net.

The object of the author in writing this book is identical with that of the series of lectures upon which it is based—to present the elements and principles of electrical engineering in such clear and simple language that they can easily be understood by those who are interested, or working in any of the electrical industries. Having this object in view, all mathematics has been omitted; a thorough knowledge of arithmetic being all that is required to follow the arguments in any part of the work. Throughout the entire book, analogies are drawn with well-known facts to enable the reader to understand the different electrical phenomena. The simple relations are stated as formulae, after they have been explained and illustrated by practical examples. This, no doubt, facilitates memorizing those which should be remembered. Some points of particular note are the illustrations and the unusual amount of space which has been devoted to measuring instruments, controllers, switchboard apparatus, accumulators, lighting and especially the chapters on alternating currents.

The section on alternating currents begins with a discussion of the development of the required knowledge of the properties of angles. This is followed by some experiments with alternating currents. The results of these experiments are then used to explain the transformer and the details of its construction. This is followed by a short discussion of vector diagrams and alternating-current calculations, and the application of these calculations and the experiments to the operation of alternating-current meters. Types of alternating-current generators, windings and details of construction are next treated, as well as the effect of inductance and capacity upon the regulation of the generator and the effect which these have on the line losses. The succeeding chapter deals with the operations of generators in parallel and describes the methods and instruments used for synchronizing the machines. Synchronous motors and rotary converters are treated in separate chapters, quite extensively considering that all higher mathematics is omitted.

The final portion of the book begins with the development of the rotating field, and from it, the polyphase motor and generator. Faults with alternating-current motors and the remedies to be applied are then discussed, and followed with a short description of high tension transmission lines and apparatus.

The book is well written, printed on good paper and the illustrations are excellent.

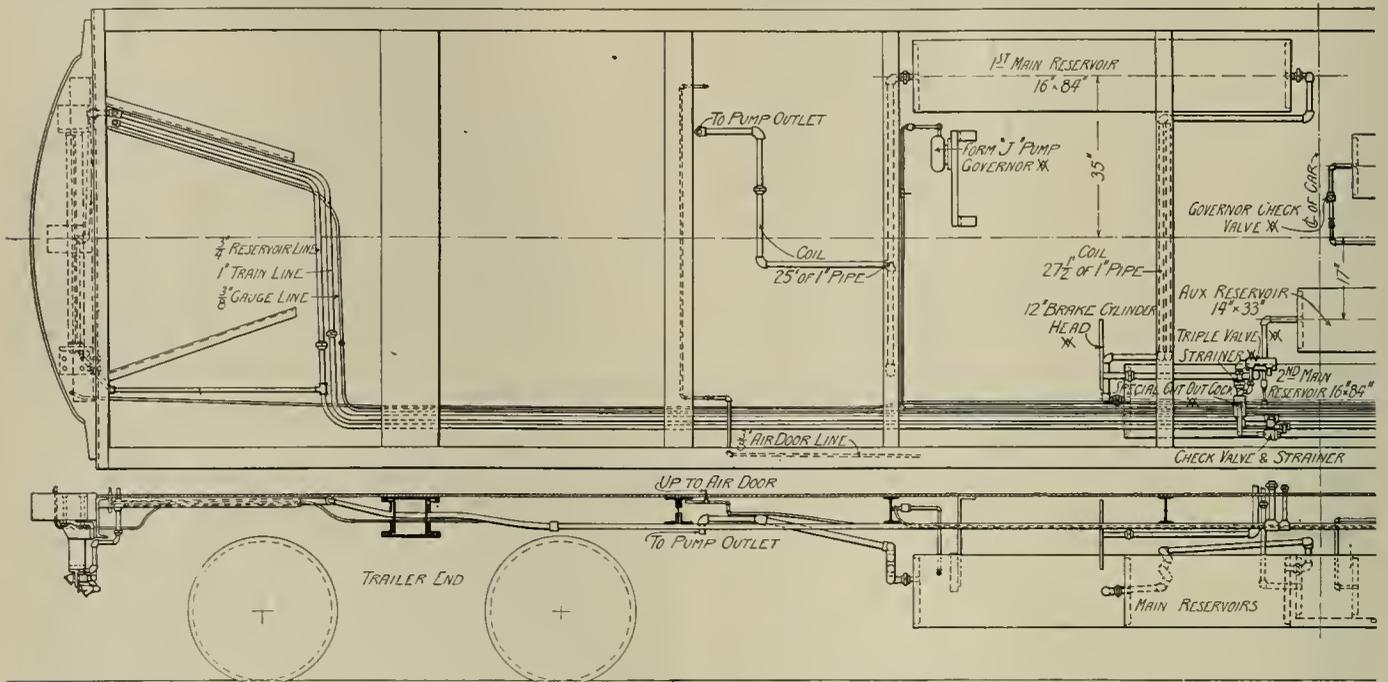
The average daily traffic on the Chicago & Oak Park Elevated Railroad for the month of January, 1907, was 46,919 passengers. This is an increase of 1.59 per cent over the same month for the year 1906.

NEW MOTOR CARS FOR THE METROPOLITAN WEST SIDE ELEVATED RAILWAY.

After numerous orders, placed from time to time with various car builders, the Metropolitan West Side Elevated Railway Company has evolved a type of motor car particu-

motors and control apparatus by the Westinghouse Electric & Manufacturing Company.

The length of the cars on the Metropolitan is restricted by the curves of the Union loop, special trackwork in some places having only 90-foot radii. The new cars, therefore, are not made longer than previous equipments.



Plan of New Motor Cars for the Metropolitan West Side Elevated Railway.

larly adapted to its service and traffic conditions. In this car the desirable features of previous equipments have been retained, while unnecessary or objectionable details have been omitted. In the installation of the electrical and air-brake equipment the effort has been to simplify construction and to make the arrangement convenient for repairs. In the construction of the body the lines of the car are simple and clean-cut, being almost severe in plainness and lack of

The length of the car body on the center line over end-plates is 47 feet 7 3/4 inches; the distance between center of trucks is 33 feet 7 inches. The extreme width of the car over side sills is 8 feet 6 inches. The height of the car from top of rail to top of upper deck roof is 12 feet 10 inches and the height of the car floor above top of rail (light) is 3 feet 10 inches. The cars seat 48 passengers.

In the construction of the underframe there are no center



Metropolitan Motor Cars—Side View.

ornamentation, the only striping being a line on the letter-board and a 3/4-inch band just above the side sill of the steel subframe.

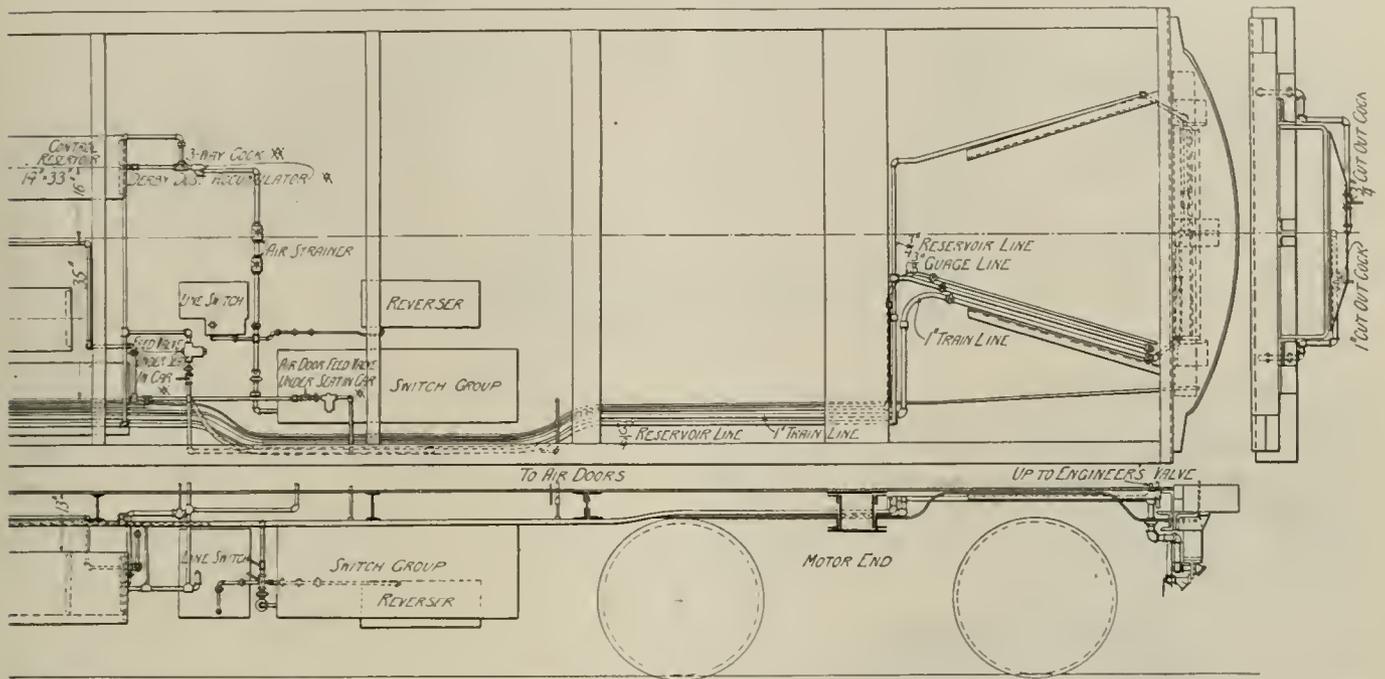
The car bodies were built by the Pullman company, the trucks by the Baldwin Locomotive Works and the electric

sills, and this assists materially in simplifying the arrangement of the auxiliary equipment under the car. The side sills are 9-inch I-beams, weighing 21 pounds per foot and running the full length of the car. These are reinforced by 1 1/4-inch truss rods with 1 3/8-inch turn buckles. The end sills are

9-inch channels, weighing 25 pounds per foot. These extend to the outer edge of the side sills. The body holster is a box-beam built up of plates and angles; it is 12½ inches wide and 9 inches deep. The beams which support the floor extend across between the side sills. They are 6-inch I-beams weighing 12¼ pounds per foot, with the exception of those

non-conductor of heat or cold and keeps the floor comfortable, and also assists in making it fireproof.

The clearance required for motors made it necessary to offset the drawbar, and in order to make a stiff and strong construction a new design has been made, which is shown in detail. It is 5 feet 11½ inches long, 14¾ inches wide over



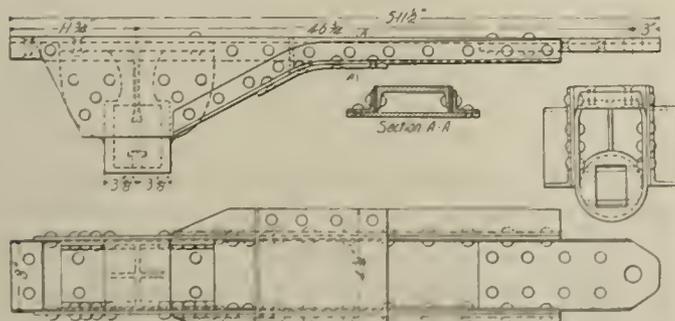
showing the Disposition of the Apparatus on the Under Side of the Car.

nearest the bolster, which are 6-inch plate girders with 3-inch angle-iron flanges.

The floor between the body bolster and the end sill at the vestibule is stiffened by two 3-inch angle-irons placed diagonally, as shown in the drawing. The buffer timber is built up of two pieces, each 3 by 14 inches, of clear white oak, well seasoned. The front is armored by a 5/12 by ½-inch plate and is supported by three steel bracket castings riveted to the end sill. The entire floor frame is covered with steel plate 3/16-inch thick, which greatly stiffens the car against twisting in the severe service due to the sharp reverse curves on the elevated system. It also protects the entire wooden

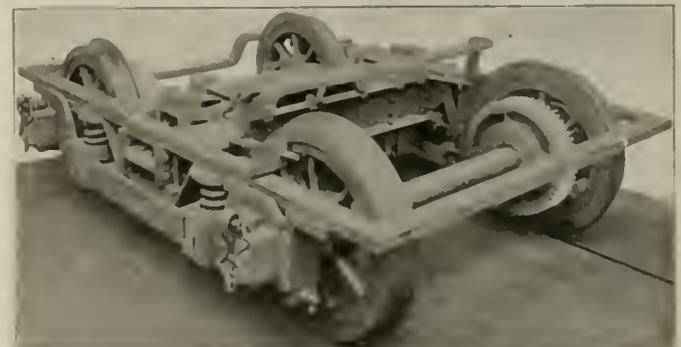
angles and consists mainly of an 8-inch channel, which is reinforced at the back end where it is secured to the truck center-pin and at the front end by a steel casting, which is arranged to fit the back end of the coupler. The drawbar, which swings to permit rounding of short curves, is supported by a sector bar of sufficient length to permit a full swing of the drawbar on a curve of 90-foot radius.

Special attention is called to the arrangement of the equipment under the car, as all the hangers have been specially designed for mounting the control and airbrake apparatus in such a way as to enable the conduit and pipe con-



Metropolitan Motor Cars—Built-Up Coupler Bar.

portion of the body from the motor circuits and wiring carrying heavy currents. There has been no case of burning of cars from operating circuits since this construction was adopted. On top of this steel plate are riveted 2 by 2½-inch angles, to which are bolted 2 by 2 by 2¼-inch nailing strips, to which, in turn, is secured the usual wooden floor. The 2-inch space between the steel and wooden floor is filled with mineral wool packed so as to have a density equal to 12 pounds per cubic foot. This acts as a deadener of sound; it is a



Metropolitan Motor Cars—Motor Truck.

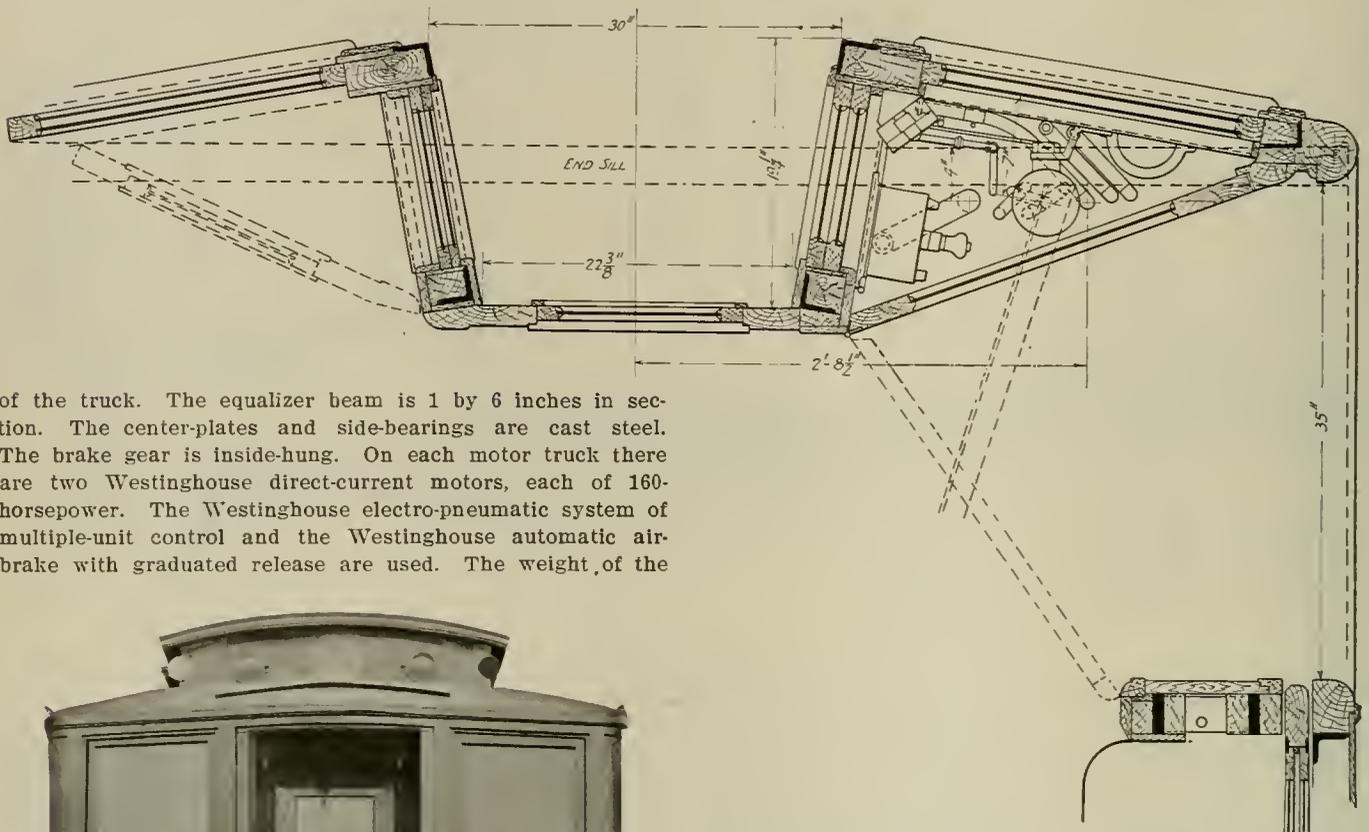
nection to be simply and conveniently arranged. The ordinary practice is to mount apparatus directly on the car bottom and then make connections to fit in any way that they may come.

Trucks.

The motor trucks have a wheel-base of 6 feet 6 inches and 34¼-inch steel-tired wheels with cast centers made by the Standard Steel Works. The weight of each truck is 12,500 pounds. The trailer trucks have a wheel-base of 5 feet

6 inches, with $3\frac{1}{4}$ -inch wheels, and weigh 9,000 pounds each. The truck-frame proper is made of one rectangular forging with wrought pedestals bolted to it. The swinging bolster rests on two sets of triple elliptic springs 33 inches long, supported on a heavy iron seat, which in turn is hung from bars passing over the bolster and resting in the transoms

wide. The corner and door posts are composite, made of whitewood and ash with angle-irons between. At the guard's niche the two outside posts are made of white wood with $2\frac{1}{2}$ by $2\frac{1}{2}$ -inch angle-irons on the outside corners. The two inside posts are made of ash with $2\frac{1}{2}$ by $2\frac{1}{2}$ -inch angle-irons on the corners. These angle-irons are bolted to the



Metropolitan Motor Cars—Plan Showing Arrangement of Doors and Control Apparatus at End of Car.

of the truck. The equalizer beam is 1 by 6 inches in section. The center-plates and side-bearings are cast steel. The brake gear is inside-hung. On each motor truck there are two Westinghouse direct-current motors, each of 160-horsepower. The Westinghouse electro-pneumatic system of multiple-unit control and the Westinghouse automatic air-brake with graduated release are used. The weight, of the

floor and to angle-irons in the roof, which connect the outside posts with the anti-telescoping plate. The usual truss plank is omitted and solid sheeting is used from the floor to the belt rail. There are five composite carlines of $1\frac{1}{2}$ by $\frac{1}{2}$ -inch iron and ash $\frac{7}{8}$ -inch thick. The roof is made of whitewood or poplar $\frac{1}{2}$ inch thick and covered with No. 6 cotton duck. The vestibule and guard's niche are shown by cross-section in detail.

The right corner at each end of the car contains the motorman's brake valve, air gauge, master switch and other small switches. A motorman's cab is formed by a hinged door, which in one position encloses the brake valve and master switch, and at about 90 degrees engages with the arched posts of the car. The front windows of the motorman's cab are glazed with double plate-glass; the inside faces of which are treated with glycerin to prevent them from being frosted. The vestibule door is arranged to swing back about 120 degrees to the end corner, where it can be fastened open and out of the way in summer time.

There is no outside platform for passengers to stand on. The side doors, 35 inches wide, are hung on roller bearings and equipped with devices for operating them by air pressure.

The inside finish of the car is of solid Mexican mahogany slightly stained and rubbed down to a dull surface. The ornaments are simple inlaid lines and only plain moldings necessary for structural purposes are used.

The headlight and marker system is indicated by the illustration of the end view of the car. The upper deck, instead of rounding off at the extreme end of the car, is cut away on a straight line about 18 inches back from the end



Metropolitan Motor Cars—End View.

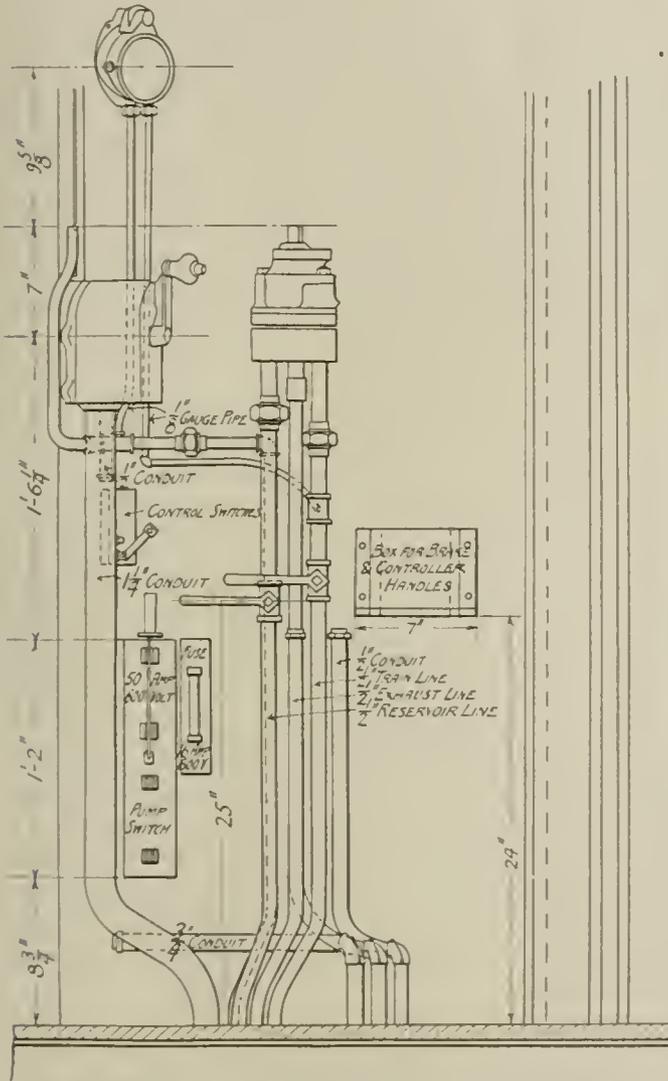
car complete with equipment is 66,000 pounds, and the weight of the car body about 30,000 pounds.

Construction of Car Body.

The construction of the car above the steel underframe includes the wooden side sills of $4\frac{1}{2}$ by $5\frac{3}{8}$ -inch long-leaf yellow pine. The car floor is made of long-leaf yellow pine thoroughly seasoned, $\frac{13}{16}$ -inch thick, and not over $3\frac{1}{2}$ inches

and a vertical plate is fitted into the car framing. This plate contains at the center a glass disc behind which the headlight is placed, and at each side is a 4-inch lens. The lamps for night markers are placed back of these and the same mechanism which operates these also displays the daylight markers. This design does away with the usual outside lanterns and headlights.

The hardware used throughout the car has statuary bronze finish, which retains its original color and is not easily tarnished. The cars are heated by hot water and also arranged for electric heating when desirable. The heating



Metropolitan Motor Cars—Elevation of Control Apparatus.

coils under the car seats are enclosed by perforated steel sheets so as to prevent rubbish from accumulating beneath the seats. Thus the floors are more easily cleaned.

The car throughout is a marked improvement on those previously built, particularly in the smaller details which affect maintenance and repairs. They are attractive in appearance and very comfortable.

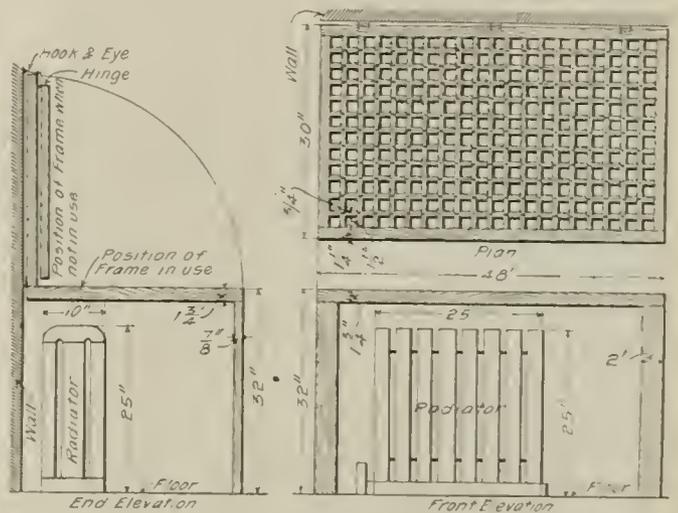
We are indebted to Mr. H. G. Hetzler, president, and Mr. B. H. Glover, superintendent of motive power and way, Metropolitan West Side Elevated, for the drawings, photographs and information for this description.

The Washington Baltimore & Annapolis Railway is now employing a night force on the construction of its line from Washington, D. C., to Baltimore and Annapolis, Md., in the effort to have the road completed and in operation by July 1. A large force of men has been employed, but bad weather has caused many delays.

A CONVENIENT BLUEPRINT FRAME.

Through the courtesy of Mr. George A. Kimball, chief engineer of elevated construction, Boston Elevated Railway Company, we print herewith a drawing of a special frame for drying blueprints which was designed by Mr. H. C. Hardwell for service on the roof of the company's office building. As the main offices of the Boston elevated are located in the heart of the business district, space is at a premium in the blue printing department. A small pent house on the roof is used for photographic and printing purposes, and several thousand negatives of important work on the system, a large movable blueprint frame with table adjustable for varying sun positions, a washing tank, drying racks, developing cupboard and various supplies are compactly stored in this space.

The quick drying of blueprints is often essential in the company's work, particularly with reference to drawings desired by general officers, city authorities, and various commissions. To facilitate the task the white pine latticed frame



A Convenient Blue Print Frame.

shown was designed, to enable prints to be quickly removed from the washing tank and dripping rack, and dried with blotters over a steam radiator. The wet prints on the upper side of the frame and the intense heat of the radiator about 2 1/4 inches beneath the lower side made a specially strong construction necessary to resist the warping and buckling strains due to the difference in temperatures.

The frame is 48 inches long by 30 inches wide. It is composed of strips 3/4 inch wide halved and screwed at all intersections and spaced 1 1/2 inches apart in centers. The recesses cut in each strip are bolted together in a manner so substantial that buckling is impossible. The frame is finished with shellac. The height above the floor is 32 inches when the table is down ready for service. The frame is hinged and equipped with hooks and eyes so that it folds back against the wall when not in use. It was built in the company's shops and the cost was trifling in comparison with the convenience which it affords.

It is stated that the line between Youngstown and East Liverpool, O., which is now under construction by the Youngstown & Southern line extends from Youngstown to Leetonia, railroad will be ready for operation by March 1. The Youngstown & Southern line extends from Youngstown to Leetonia, part of which was formerly operated as a steam road. The Youngstown & Ohio River line extends from Leetonia to East Liverpool. Power will be rented temporarily until the power now under construction at West Point is complete. S. J. Dill, of Youngstown, general manager.

ELECTRIC RAILWAY AFFAIRS IN GREAT BRITAIN.

(FROM OUR LONDON CORRESPONDENT.)

The depositing of private bills for the 1907 session has once more rearranged the complex factors in the London electric power situation. On the one hand, the county council has prepared a most ambitious scheme which, on its engineering side, is more faithfully modelled than even before on that prepared in 1904 by Mr. Merz for the Administrative County Company. It involves the ultimate purchase of all existing undertakings, both company and municipal, in the county of London, and for a wide area outside the county. A new and gigantic power station will be erected at Barking or Erith to supply these undertakings with electricity in bulk, and the complete scheme will demand a capital of little less than 25 millions. As a speculation this power scheme far exceeds in magnitude and risk the tramway scheme to which the council is already committed.

On the other hand the Administrative County Company appears on the scene again with an altered form of proposal. In its report the parliamentary committee mentioned, as alternatives to complete company or county council control, a compromise whereby a company should take the speculative part and the council the non-speculative part of the enterprise; or, secondly, the leasing of the entire undertaking by the county council to a company for the initial period. The new bill promoted by the Administrative company is to enable the company to enter into such arrangements, and, under them, to generate and supply electricity to authorized distributors and to power users. This sort of mongrel enterprise is based on the theory that a certain amount of control by the county council is inevitable in the present state of public opinion, and that, consequently, a purely company scheme has no chance of success with parliament. The London county council, on its side, is keenly sensitive to the trend of public opinion with regard to its business capabilities, and especially with regard to vast increases in its financial liabilities. Rumor declares that even the progressives are favoring a transfer of the speculative risk and of most of the capital burden to a company in a manner suggested by the parliamentary committee. Thus is reached the curious situation that a company, conscious of county council prestige, seeks alliance with it, while the county council itself, conscious of diminishing prestige, is considering a division of liabilities with a friendly company. It is obvious that the solution of this part of the situation depends largely upon the results of the county council elections next March.

* * *

Antagonistic to both these schemes is the bill promoted by all the London electricity supply companies. This is a highly interesting scheme, but it has the misfortune (from the parliamentary point of view) of being quite unprecedented. There are 14 companies, several competing with each other in central districts, and their proposal is to constitute and to incorporate a joint committee in which will be vested the generating stations belonging to all the companies. Powers are sought to distribute electricity over the county of London and a wide area outside. The argument for this scheme is that by linking together the existing stations and arranging for mutual assistance, the electrical needs of London may be met, now and hereafter, with a comparatively small outlay and without the creation of a new body with rights which may injuriously affect the existing undertakings. Each company would continue to distribute electricity to consumers as at present, but the linking up of stations would release a large amount of reserve plant which could be utilized in taking up new power business as well as the supply in bulk to other authorized distributors. The outline of this combined scheme was put before the parliamentary committee last summer, but it did not seem to receive much attention. Probably the feeling was that it had come rather late

in the day; at any rate, no one can doubt that if the companies had, in 1905, fought together instead of separately and had, in 1906, promoted the bill which has now been drafted, their prospects would have been much brighter. As things are, the venture has the appearance of a forlorn hope. It will be opposed as a vicious "combine" and as a contravention of the accepted principle that the highest economy is secured by generation in a single large station for distribution to numerous customers over a large area.

Meanwhile the local authorities concerned with electricity supply are playing a more or less passive part. It is not quite certain how the new moderate councils will act, but there seems to be a decided feeling against the county council ambition to acquire all the municipal electrical undertakings compulsorily. It is impossible for any responsible observer to say how the situation will resolve itself, since the policy of the county council may be reversed next spring; but the best hopes lie in the direction of extended co-operation among the various parties interested. Any further delay would be most serious to the electrical supply industry in London. Already the continued uncertainty is restricting the development of business by postponing the raising and expenditure of new capital. The deadlock has been created more by political than by industrial causes, and is therefore the more intolerable to business men.

* * *

An interesting development of its electric train service has just been inaugurated by the Lancashire & Yorkshire Railway Company in the electrification of its Liverpool Southport & Crossens lines. The adoption of electricity brought with it the necessity for the exercise of a great deal of ingenuity in a variety of matters connected with third-rail guarding, the protection of the public at grade crossings, and so on. That the measures taken have been sufficient seems to be fully proved by the rarity of electric shock accidents or fatalities. When this line was new a number of trespassers and some of the railwaymen were killed through coming in contact with the live rail. It required time for the public to understand the risks they ran in trespassing on the converted track, and for the railway management to make trespassing more difficult and to adopt adequate guarding for the protection of its own employes. There are, of course, a great number of arguments to be produced in favor of single-phase traction with overhead wires for railway working, but the experience on our direct-current lines with the live conductors laid between or at the side of the running rails certainly has not produced that evidence of danger that was expected.

* * *

By the courtesy of Mr. C. B. Byles, the signal engineer of the Lancashire & Yorkshire railway, I am able to put before your readers some particulars of an interesting and new application of electricity for an auxiliary purpose. I refer to the electrical working of the grade crossing gates at Waterloo, near Liverpool. By employing a 2-hp., electric motor (speed 1,500 revolutions per minute) it is possible to accomplish the movement of the gates in about 15 seconds. The motor is so connected that its action may be reversed for respectively opening and closing the gates. A lever, the normal position of which is midway in the frame, is provided to operate the electrical switches, and a forward movement of this lever applies current to operate the motor in one direction, and the reverse movement of the lever applies current for the opposite direction. In addition to the switches worked by this lever, there is a graduated switch worked by hand; this is provided so that the signalman may regulate the speed of the motor as the gates are worked. When the movement of the gates is completed in either direction the current is cut off automatically by means of switches worked off the gate shaft. Mr. Byles anticipates that the average

consumption of current per day will be about two Board of Trade units.

* * *

The Lancashire papers have recently been advancing arguments in favor of electrical instead of steam driving in textile mills. They state that so much saving will be effected in buildings, foundations, gearing, rope, race, etc.—usually amounting to several thousands of pounds sterling—that the first cost of the two systems will closely approximate. By using in the power-house turbines, or the best make of triple expansion high-speed engines, with superheated steam and a high vacuum, the coal consumption can be brought down to a remarkably low figure which can quite easily compete with a high-class steam drive. In two recent instances of the adoption of electrical driving in Lancashire textile mills, increased outputs of 7½ per cent and 12½ per cent have resulted.

* * *

Owing to the withdrawal of the Metropolitan's through services over the East London railway, in consequence of the electrification of the Hammersmith & City line, a deadlock has arisen with regard to passenger traffic on the East London. Formerly both the District and the Metropolitan worked through passenger services over the line. On the electrification of the District that line withdrew its services, as the East London had not been electrified, and now the Metropolitan has been obliged to discontinue its trains for the same reason. This means that all passengers to or from either systems are obliged to change en route. The East London is a line of which the *raison d'être* is only the through traffic passing over it between other railways, and it is now in the unfortunate position of existing as a more or less isolated steam railway, surrounded on all sides by connecting electric lines. The question of electrification has been before the board for some years, and in spite of what has been accomplished by the Metropolitan, the District and the joint District and Tilbury line (the Whitechapel & Bow railway), nothing has been done on the East London. Lord Claud Hamilton, the chairman, has frequently asserted that the development of electric traction for railways was not yet sufficiently advanced for the conversion of the East London to be undertaken, but the real difficulty is evidently to be found in the joint ownership of the line, which seems to have stood in the way of any practical solution. In view of the serious decline in the company's stocks, a situation that directly discourages traffic is not likely to commend itself to the independent shareholders. Possibly the six owning companies may combine to undertake the work of conversion, instead of standing in another's way, as is apparently the case at present.

An Electric Line in Switzerland.

The La Gruyere electric railroad has been recently laid out through a picturesque region of Switzerland not far from Lake Lemman, and has already a large tourist traffic. Several years ago two companies obtained concessions for railroads, one running from Chatel Saint Denis to Paleyieux, and a second from the former point to Bulle and Monthovon. These companies were consolidated, and the electric equipment of the system, which makes a single continuous line, was carried out by the Alloth company, of Bale. The total length of the three sections of the road is 28 miles, and the road uses Vignole rails, weighing 53 pounds per yard, except within some of the towns, where a grooved rail is employed. Motor cars of some length, either separate or coupled together to form a train, are used in this case, and the current is taken by overhead trolley from a suspended wire. A single wood pole, with a long bracket arm reaching clear across the track, supports the wire, and the trolley, mounted on the car roof, is of the arched or bow form.—*Electrical Review*

MOTORMEN'S SCHOOL, DENVER CITY TRAMWAY COMPANY.

BY H. W. SCOTT, INSTRUCTOR OF MOTORMEN.

A schoolroom for motormen has recently been established by the Denver City Tramway Company and fitted with apparatus suitable for teaching applicants for positions the rudiments of car operation.

The accompanying illustration is a view of one end of the schoolroom. At the end of the room, not shown by the photograph, are two platforms, each intended to represent the front end of a two-motor car. They are both equipped with General Electric type-K controllers, a handbrake, connected under the platform to coil springs, which give about the same leverage as the brake of an ordinary car; also gong, sand-plunger, and a fender-trip or trigger attached to the controller reverse-lever. The latter is an ingenious contrivance devised and patented by Mr. D. P. Powell, one of our motormen, and since adopted by this company. By its use a motorman is enabled to reverse a car and drop the fender with one movement of the hand. The controllers on these platforms are not connected to any apparatus, but are sim-



Motormen's Schoolroom—Denver City Tramway Company.

ply placed there to show the student their construction, and to give him instruction in the proper method of turning on the current. After the switch-roll and cut-out switches have been explained to him, he takes his place on the platform, while the instructor stands at the controller shown by the photograph, gives the "go-ahead" signal, and actual practice in starting and stopping a car begins.

After satisfactory progress has been made by the student, his attention is next directed to a chart which shows the method of wiring a car. Here he traces the current as it passes from the trolley wire and follows its path through the machinery and apparatus of the car, until it again finds its way back to the power station through the rails. The principle and use of the tank lightning-arrester are next explained and he is shown how to keep these in working order. Considerable time also is given to the details of the car resistance and its functions.

The instructor's platform, shown in the illustration, is equipped with the same apparatus as that used for the students, except that it is provided with both the incandescent and arc headlights. In addition, however, the controller operates the machinery used for instruction. Instead of motors, two large fans are placed in the circuit and shown in the engravings. Underneath each fan is a box containing incandescent lamps; and when either fan is in circuit the lamps

burn and illuminate the transparent glass front. Through a similar transparency the fans are also shown when running either in series or multiple.

A great deal of the student's attention is directed to the scheme of the controller. The principle of first throwing the motors into series and then into parallel is dwelt upon at some length. The difference in wiring and flow of current when in series and parallel or multiple is demonstrated by carefully prepared illustrations. For this particular lesson we have seen nothing better than the drawing prepared by the Brooklyn Rapid Transit Company, and used in its school for motormen. It shows two waterwheels placed one above another on the same service pipe. This is used as an illustration of the motors when in series. The second drawing shows two service pipes, each feeding one waterwheel, and representing the motors in multiple. To demonstrate to the student the amount of resistance which is used at each point in the transition of the controller handle, we use two circuits of lamps, shown in the illustration under the series-multiple transparency. On the first series-point, they all burn, and are gradually cut out as the last series point is reached. On the first multiple-point all the lamps but four again burn, and the student has an ocular demonstration of the resistance in circuit at each movement of the handle.

At the back and to the left of the instructor's platform we have placed a circuit-breaker, overhead switch, fuse-box and two light-circuits with which the ordinary car is equipped. The uses of these appliances are carefully explained by the instructor, and the student receives many hints and suggestions in the manner of detecting and repairing slight defects that may appear in the car lighting system.

The best methods of avoiding accidents are discussed, and the student is impressed with the necessity for calmness and self-control when danger is imminent. The quick use of the reverse is demonstrated, and the best method of feeding the motors in order to obtain the greatest efficiency from the reversing process, is fully explained. In this connection the use of the sander is taken up. The instructor shows how the track may be sanded to the best advantage and how to avoid flattening the wheels.

Our schoolroom is fitted with a section of overhead line, showing an overhead switch and circuit-breaker; and the instructor takes much pains in explaining to the learner the necessity for turning off the current and reducing the speed of the car when passing under special work. We find that motormen as a class are much more careful to avoid injury to the overhead lines if they are shown in detail just what damage may result by careless handling of the current and fast running.

The student's attention is next directed to the principle of the electric track-switch. On the right of the room we have placed a box containing the circuit-changer, with resistance coil on the outside, and an insulated section of the trolley wire, upon which the trolley must rest when the switch is being operated. The student is made acquainted with the operation of the circuit-changer and shown the fallacy and danger of using more than one or two points on the controller, when moving the switch lever. An explanation of the delicate switch mechanism, we find, has a good effect upon all motormen, whether experienced or not. They are invariably more careful in applying the current after they fully understand its workings.

All of our cars are provided, for emergency, with a "trolley wire pickup." One of these is shown in the engraving, standing against the door of the room, and holding a short section of trolley wire. Should the trolley line break in any district where serious delays may result while waiting for the line crew, the conductor and motorman of the nearest car must proceed at once to get the wire off the ground and tie it to the nearest pole or tree; then protect passersby from injury. The student is shown how he may handle the wire

safely and without delay, and the advantages of the "pickup" are demonstrated to him.

The instructions given in our school are all calculated to impress upon the learner the practical workings of the machinery and apparatus under his charge, and the necessity for strict economy in operating. He is made to understand also that his first thought must be for the safety and comfort of his passengers, and that he must exercise gentlemanly courtesy toward all.

A story which has been going the rounds recently tells of a fond father, who, when meeting one of the professors of the school which his boy attended, remarked: "Professor, I understand that my son has been taking algebra under you." "Yes," rejoined the pedagogue, "he has been exposed to algebra, but I'm not sure yet that he is going to take it." After conducting our novice through a labyrinth of instruction and after having given him the benefit of our experience in methods and practice, we often feel that we have "exposed" him, at one sitting, to a rather good-sized fund of knowledge; and we sometimes wonder whether or not it will "take," and how deeply it will sink in.

We place him on a car, under a competent teacher, to begin actual practice, however; but he is invited and expected to return to the instruction room and go over the same course, if necessary, or to post himself on any special subject where in he is lacking. We are gratified to note the general interest which has been displayed by our trainmen since the inauguration of the school. Many have attended the lecture as often as three or four times.

Chattanooga Railways Improvements.

The Chattanooga Railways Company, a consolidation, effected in May, 1906, of the Chattanooga Electric Railway Company and the Rapid Transit Company, is enlarging its power plant at Ridgedale, building commodious shops and car houses and reconstructing its tracks throughout the city. Since these properties were consolidated the company has purchased power from the Chattanooga Electric Company under a 10-year contract. It has been found advisable, however, as a precautionary measure, to rebuild the company's own power plant at Ridgedale and maintain it as a reserve power station. The plant formerly contained two 300-kilowatt and one 400-kilowatt generators. In the reconstruction work these generating units and two 800-kilowatt machines will be installed and kept in condition for emergency cases.

New shops with a floor area of 125 by 200 feet have been completed and will be soon occupied. The shops are equipped throughout with the latest types of machine tools, each driven by an individual motor. The partitions and side walls of the structure are brick and the floors are concrete.

In addition to the various shops, provision is made in this building for a store-room where all supplies for the railway will be kept. The foundations for a car storage house 200 by 210 feet have been laid and work on the building is being rushed. This building also will contain the general offices of the company. Brick and reinforced concrete construction are to be used in this structure and it will be modern in all its appointments. It will be completed and ready for occupancy by June 1, 1907.

Throughout the city the tracks of this company are being relaid and several extensions to the existing lines will be made during the present year.

The report of the Georgia Railway & Electric Company, of Atlanta, Ga., shows that 32,073,750 paid passengers were carried during the year 1906, an increase of 5,538,450 over 1905. The number of transfers used was 6,194,255, an increase of 1,182,184. The daily average number of passengers carried was 87,873, said to be about two-thirds of the estimated population of Atlanta. The number of cars operated increased from 128 to 143.

NASHVILLE TRANSFER PRACTICE AND RESULTS.

The Nashville Railway & Light Company of Nashville, Tenn., has developed a transfer system that overcomes the common abuses and produces interesting results. A central transfer station has been established in the down-town district of Nashville, from which all cars are started and where all passengers are given bodily transfer privileges. There are five other transfer points in the city but so accustomed have the people become to the use of the central station that less than two per cent of all passengers accepting the transfer privileges, transfer at points other than the main station.

The station, which is illustrated, occupies a lot 100 by 200 feet, between Third and Fourth avenues. At present only one track passes through the building but it is planned to lay another track at an early date so that north and south-bound cars can be separated upon entering the station. All cars pass through the building in one direction. Passengers



Entrance to Transfer Station at Nashville.

desiring to transfer from one line to another are at liberty to do so while inside the building. A charge of five cents is made for admittance to the station unless fare has been paid on an incoming car. The entrances to the station are provided with revolving gates through which no one is permitted to pass without first having deposited a nickel with the gate attendant. Provision is made, by means of an open passageway, for allowing passengers not desiring to use their transfer privilege to pass to the street. By this method, it will be seen, only those who have paid their fares on a car or at the gate are allowed in the station.

After a car upon entering the station discharges the incoming and loads the outgoing passengers an inspector rings up on the register the number of passengers the car contains. He then gives the conductor a coupon ticket that indicates the date, the line and the number of fares rung up. This coupon is turned into the office by the conductor after each round trip as fares collected, and a duplicate coupon is turned in by the inspector at night. All fares collected by the conductor after the car leaves the transfer station are recorded on the register in the usual manner.

This system of transferring passengers has been in successful operation for several months, and up to this time

the officials have not discovered a method whereby it can be "worked." Space inside of the station is leased to candy and fruit venders and the walls of the building are rented for advertising purposes. An annual revenue of \$4,500 is obtained from these sources, which amount figures largely in defraying the cost of maintaining the station.

The Nashville Railway & Light Company operates 100 regular cars on a five-minute schedule on the several lines and during the rush hours the number of cars is increased to 120 or 150 and the headway is reduced to four minutes on many of the lines. For this reason it would be expected that serious congestion should result from the handling of so many cars at one point, but owing to the fact that the station is principally patronized only by those desiring transfers no serious blockade has ever occurred.

This centralization of transfers has, however, its disadvantages, inasmuch as it is necessary in some instances to carry passengers a greater distance than would be necessary were transfers given at the point of intersecting or diverging lines, but it is claimed that the disadvantages are more than overcome by the many advantages obtained from defeating the common abuses of the transfer privilege. On account of the small number of individual transfers used by the conductors the company is able to keep very close records of transfers issued. Each conductor is known by his number and is provided with transfers bearing this number.

By this method of keeping tab on the transfers issued the company can immediately trace to its source any trouble that may arise, and ascertain the facts. When a conductor reports for duty he is given a book of transfers, bearing his number, and his punch, which are kept in individual boxes in the office at the transfer station. Upon leaving his run it is obligatory that he deposit them until he again takes a car. Infraction of this rule is punishable by a three-day lay-off, and repeated infractions by dismissal. In case of a three-day lay-off the conductor is compelled to report at the office at the usual time daily.

Elevated Railroad for Rio de Janeiro.

Consul G. E. Anderson, of Rio de Janeiro, reports that one of the last acts of the retiring administration of Brazil was the granting of a 70-year franchise to Carlos Schmidt and others, of Rio de Janeiro, for the construction of an elevated railroad to serve the city of Rio de Janeiro and its suburbs. This franchise was obtained for an American company. It represents a purely American enterprise and present plans are that all the equipment will be purchased in the United States. The company, according to statements made by its projectors in Rio de Janeiro, was organized a short time ago in the state of South Dakota and was capitalized at \$50,000,000. Charles E. Browne, of New York city, is its president. It is planned to send a staff of engineers and technical experts to Rio de Janeiro to commence the preliminary work. Within four years 13-5 miles must be in operation. Plans call for about 60 miles of right of way, which is to be double-tracked throughout. The third-rail electric system will be used, motive power to be derived from the company's own plant or from one of the two great concerns now preparing to develop water power in the mountains near Rio de Janeiro. It is planned to establish a local and a through service for the benefit of the people living in the suburbs.

The projectors estimate that the first year's business on a full working basis ought to show the carriage of passengers to the extent of many times the population of the city at present. For its privileges the company holding the concession must pay the municipality 50,000 milreis per annum for the first year, 60,000 milreis per annum for the next 30 years, and 70,000 milreis per annum for the following 30 years. At present exchange this would amount to \$16,666, \$20,000 and \$23,333 per annum, respectively.

FEEDER AND RETURN SYSTEMS.

HENRY DOCKER JACKSON, E. E.

In designing the distribution system of an electric railway, it should be noted that there are two methods of procedure; first, with regard to ultimate economy, and second, with regard to first cost only. The first takes into consideration, not only the cost of the feeder system, including rail bonds, but also the cost of repairs to motors, controllers, etc., as well as the loss over the feeder system. The second considers the lowest possible cost of feeders and rail bonds that will allow cars to be operated.

There are many electric roads in operation where the feeder system is so small, and the rails so poorly bonded, that although the cars run at long intervals, the loss over the feeder and return, plus the excessive repairs required on the motors, controllers, etc., would go a long way toward paying a dividend. This could be remedied by the addition of a comparatively small amount of feeder and by rebonding the rails.

In order to understand why these things occur, it is necessary to go back to the days of the early roads. When electric roads were first built, it was seriously suggested that only the overhead feeder was necessary as the current would return through the earth. The first trials showed the mistake. It was then attempted to make use of the rails in a small way by tying them to a supplementary wire laid between them. This worked well for a while, as the cars were light, the speed low and the power required small in amount. As the speeds increased the power also increased, thus for most lines additional grounds or return wires were found necessary. In the meantime it was found that joining the rails in good electrical contact would result in a far better return.

Thus the rail bond was introduced and the return wire, which had been placed overhead, was utilized as a feeder. Each new road was patterned after the old roads, with the result that in many cases the feeder systems were far too small. Therefore until recent times the majority of the roads have had inadequate feeder systems. The rolling stock, motors, controllers and generators increased in size and value of service. The overhead wire and rail joints were neglected; even when new roads were built the old methods of track and feeder work were followed. No calculations were made, but the feeder system of some other road was copied in its entirety. No allowance was made for increased traffic, and it often occurred that even from the first the feeder system was inadequate. It was not uncommon, and for that matter is not unknown to-day, to find that the pressure at the end of a line is down to 200 volts, while the station pressure is 550 volts. Would any transmission engineer consider installing a line where the loss, even for a few hours of the day, was as great as this?

The results of such poor feeder circuits were threefold: First, the line loss was excessive and the power required to operate the cars was far above what it should be. Second, the motors having to operate at such low voltages were slow in accelerating. The cars had to be overworked to make the schedules, and thus the motors were overloaded. It was no uncommon thing for a motorman to throw the controller full-on; the excessive feeder drop would prevent the fuse from blowing, but the motors got far more current than they were designed for and as a result, burned-out fields and armatures were common occurrences. The third result appeared as burned-out controllers and flashing-over of motors, caused by the rise in voltage on the line, either from the sudden throwing off of the controller on the car which had had the flash, or on some other car. The guarding against these conditions is of as much importance as ever and should carefully be considered in designing a feeder system.

It would be quite as good engineering to spend as much

time in the design of the distribution system as is spent in preliminary work on the power house, rolling stock and motors. This practice should result in the line loss being reduced to the smallest amount consistent with the interest on the investment for copper. To obtain the best results in designing our distribution lines, a careful study of the physical and operative features of the road is necessary. The probability of increased traffic should be considered along with the stability of the construction materials.

Having these figures well in mind the size of the rail may be determined, and from this the question of rail resistance. Right at this point many errors have crept into resistance calculations. Most handbooks and many engineers give figures for the conductivity of steel rails as compared with copper as 1 to 6 or 1 to 7. Authoritative tests show that such ratios are too low for even low carbon steel as used for third rails, and that for rails used for traction purposes a ratio of 1 to 10 or 1 to 11 is more correct. A rule-of-thumb method is to assume that each pound of rail per yard is the equivalent of 10,000 circular mils cross section of copper; thus a 70-pound rail is the current carrying equivalent of $70 \times 10,000 = 700,000$ circular mils cross-section of copper. With this assumption and the joints bonded to the full capacity of the rail no allowance need be made for drop at the joints. Nevertheless it will be found advisable to add 15 per cent to the rail resistance as just estimated, when computing the total resistance of the track. This allowance is usually warranted because the rail is seldom bonded to its capacity; for example, the usual bonding for city service is two No. 0000 bonds for a 90-pound rail. The two No. 0000 bonds have a cross-section of 423,200 circular mils, while the rail is the equivalent of 900,000 circular mils.

When a joint is first bonded, its resistance may be as low as that of the same length of rail, this being partially due to the carrying capacity of the plates. Rust, however, soon insulates the plates and then the joint is reduced in capacity to the conductivity of the bonds.

To what capacity the rails should be bonded is determined by the conditions of service and cost of power. The resistance of the bond when first installed should be as low as possible; at least so low that the loss at the joint will not exceed the interest on the cost of the bond.

In addition to the rails, there is often required other return capacity. To what extent this should be added depends on the same factors. If the cost of power lost in the track return circuit will more than pay the interest on the existing amount of copper then more copper should be added to balance the equation. This rule will apply where no danger of electrolysis exists, otherwise the drop over the return circuit must be made low enough to prevent troublesome electrolytical effects.

The type of bond to be used will largely depend on local conditions as well as on the kind of joint used. Cross bonds should be used as seldom as conditions will warrant. Their duty is to prevent open circuits in the return, and to make available at all times the full capacity of both rails. With the rails connected by double bonds at each joint, the value of cross bonds grows less. Too much reliance should not be placed on them because they may be broken by digging in the streets or be stolen from open track work.

There are many excellent methods for making the rail a continuous conductor, the more satisfactory of which afford a conductivity at the joint even greater than that of an equal length of rail. Some of the more acceptable types of bonds may be enumerated briefly:

Soldered bonds are easily and quickly installed, have low resistance, are cheap and, when care has been taken in placing them, they may be considered as permanent. There is also the desirable feature that they may be placed during wet weather. Wherever these bonds have not met expectations the failure has been due to one of three things—not cleaning

the rail surfaces, insufficient heating of the rail or quenching the solder too quickly.

A bond of the steel-terminal type has recently been developed. It is thought that such bonds will make very good joints, but heretofore failure has been met on account of the inability to make a perfect union between the steel terminal and the copper bond, or the copper has been weakened during the process of manufacture.

The various makes of plug-terminal bonds are well known and they have shown that when carefully installed they will give excellent results in service. In placing such bonds care must be taken to thoroughly clean the hole after drilling and the work should be done in clear dry weather.

Other methods of making the rail a continuous conductor are by the use of electrically welded joint-plates, plastic bonding, by the Nichols cast-zinc joint, the cast and thermit welds.

It should be remembered that no matter what type of bond or rail connection is used, special care is warranted in executing on the work.

ELECTRIC RAILWAY TELEPHONE SERVICE.

Dr. C. J. Woodbury, of the American Telephone & Telegraph Company, was the speaker at the meeting of the New England Street Railway Club on January 31, his topic being the "Application of the Telephone to Railway Service." The address was illustrated by lantern slides and portable telephone apparatus for street railway use was shown.

After a brief historical note on the early suggestions for the use of electric signaling on railways and a short discussion of the value of the fixed and portable telephone in modern steam railroad practise, with special reference to the partial displacement of the telegraph and the operation of simultaneous telephony and telegraphy over the same wires, Dr. Woodbury took up the use of the telephone in electric railway service.

The application of the telephone to street railway service increases the economy of both plant and operation, as single-track roads in thinly populated regions can be operated at an efficiency and with a flexibility that would require a double-track line for safe service without the telephone. As a means of instantaneous transmission of all kinds of operating intelligence it is unsurpassed. A case was cited where a collision of two approaching cars on a single-track section was narrowly averted by a watchman telephoning the power house to shut off the trolley circuit.

Portable telephone sets are generally preferred to fixed sets for long mileage and few cars. Dr. Woodbury stated that the experience of the steam railroads had favored the use of the Bell telephones for the reason that the telephone company maintains the plant so that there is a virtual guarantee of its use; the railroad company is not obliged either to train men for this work or to repair the line. The guarantee of the telephone company also insures first-class apparatus, which may not otherwise be forthcoming.

Several forms of portable sets, weighing from 13.5 pounds up, are in use, though the more substantial forms are considered preferable. Jack-boxes on poles must be well insulated and also be rain, snow, insect and "fool-proof." In the latest equipments the jack is carried at the end of the portable circuit from the car, the plug being installed in the jack-box, which resembles a large petticoat insulator. Telephone circuits should be transposed at least every eight poles and the transposition of parallel circuits staggered. Fixed telephone sets in the vestibules of cars are found preferable on roads having a large number of cars and congested traffic, as they may be used more rapidly by merely attaching the flexible wires to a pole than when it is necessary to take a telephone set from a car and hang it upon a pole. Strong instruments, giving loud and clear transmissions, are essential in railway service.

DELAY REPORTS AT MEMPHIS.

An interesting system of issuing delay reports, which illustrates the value of close organization in street railway operation, is in use on the Memphis Street Railway Company's lines at Memphis, Tenn.

This company operates cars on 14 routes, over each of which a division superintendent has complete charge. All cars in making their runs pass the intersection of Main and Madison streets where a car checker records the car number (and train number during the day) and the time each car passes that point. If any car is found to be running behind its schedule it is necessary that a reasonable explanation be made. The crews make such reports to the division superintendent, who reports to the superintendent of transportation, and he to the general superintendent. So thoroughly has the plan of reporting the causes of delays been developed independent of the train dispatching system that it is not uncommon for the delay reports to reach the main office before

Form 20-11-10-10-P.P. Co.

The Memphis Street Railway Company
DAILY REPORT OF SUPERINTENDENT OF TRANSPORTATION

Weather _____ Date _____ 190__

SPECIAL OCCASIONS

LINE	OCCASION	No. Extra Cars	Approximate No. Healed

DIVISION SUPERINTENDENTS OFF DUTY

NAME	REASON	WHO SUBSTITUTING

DELAYS TO SERVICE

LINE	CAR No.	TIME DELAYED		CAUSE
		FROM	TO	

ALL CARS OUT ON TIME, EXCEPT AS FOLLOWS:

LINE	Car No.	Time Dur Out	Time Out	REASON FOR DELAY

NUMBER OF MEN ON LIST

	MOTORMEN	CONDUCTORS	TOTAL	No. On Duty Present
Regular				
Extra				
Total				
Present				

Superintendent's Daily Report, Memphis Street Railway.

the car record blanks have been completed. The delay reports furnish details as to the line, car number, time (both ways), and cause of the delay. The accompanying illustration is a reproduction of a daily report blank used by the superintendent of transportation of this system.

About Railways.

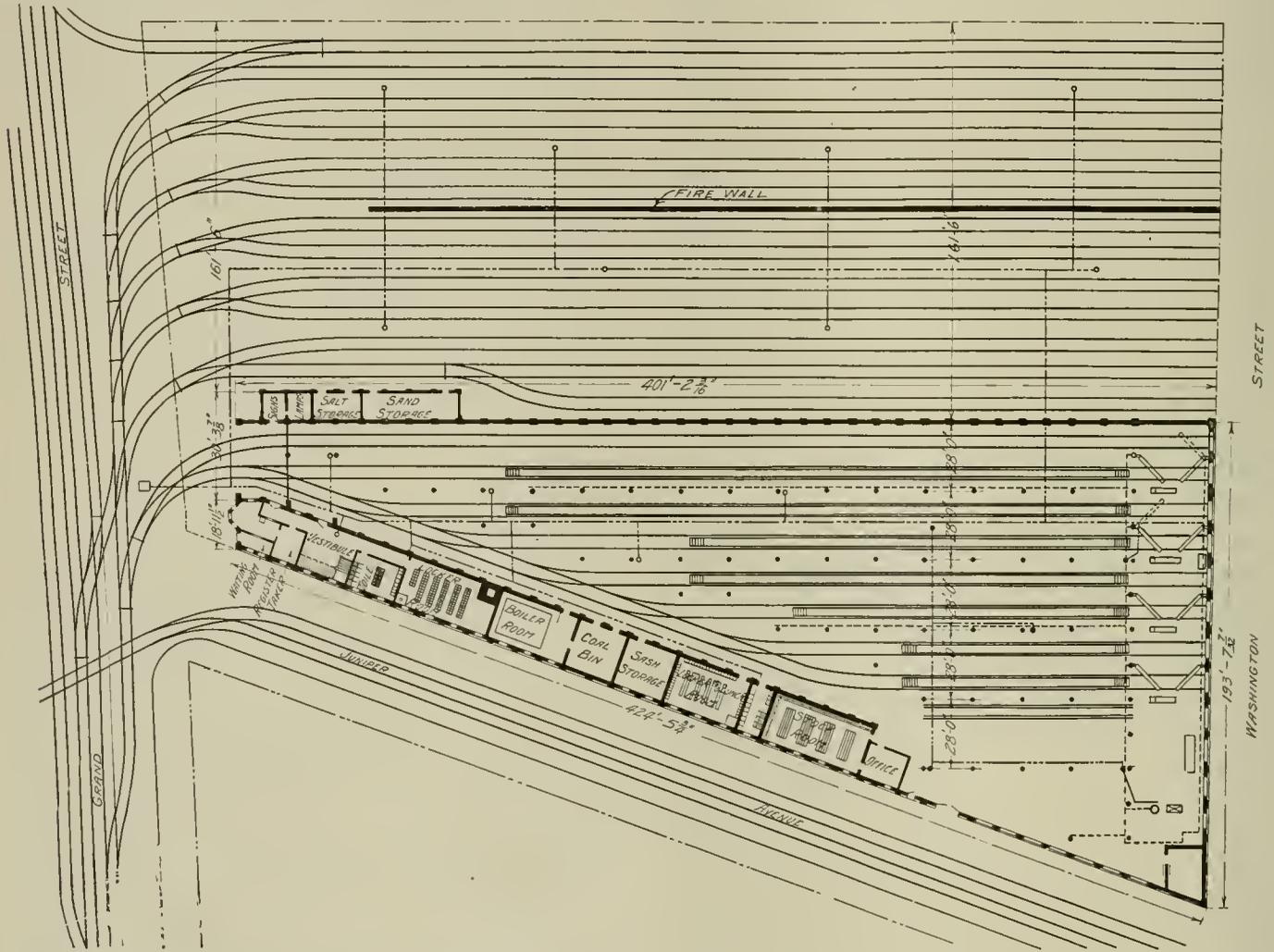
In Great Britain you find both the cheapest and most expensive miles of railway ever constructed. The eight-mile line known as the Wotton tramway, and which was built to the order of the late duke of Buckingham and Chandos, cost only £1,400 a mile. It is of standard gauge and is now used as a light railway.

The most costly piece of railway line in the world is that between the Mansion house and Aldgate, on the Underground, London. It cost nearly £2,000,000. Between Trinity square and King William statue the record rose to no less than 1,000 guineas a yard, about £30 an inch.—London Answers.

MASPETH CAR HOUSE AND SHOPS OF THE BROOKLYN RAPID TRANSIT COMPANY.

The Brooklyn Rapid Transit Company has recently started construction work on a new fireproof surface car barn to accommodate 45 cars, with inspection pits and a small machine shop, and an auxiliary open storage yard with a capacity for 105 cars, in the village of Maspeth, N. Y., to take the place of the now inadequate barns at the corner of Grand street and Juniper avenue, where the cars of the Fresh Pond-Flushing, Flushing avenue, North Beach, Grand street and Metropolitan avenue lines are housed. Maspeth is an important operating point of the company and it has been decided to spend about \$500,000 in the erection of ade-

quate car barn and storage facilities. The structures will be similar in design and equipment to the large new barns and shops of the company at Ninth avenue, which are approaching completion. The ground upon which the car barn will stand is triangular in shape, with a frontage of 50 feet on Grand street, the entrance. The building will extend back to Washington street a distance of 400 feet, with a rear depth on Washington street of 193 feet and a frontage on Juniper avenue, the hypotenuse of the triangle, of 424 feet. The building will consist for the greater part of a single high story, but will be a two-story structure for a distance of 150 feet along Juniper avenue. West of the building will be erected the open car storage yard with 13 tracks served by 6 switches from a Grand street lead track. Through the center of this yard a fire wall will extend and the yards will be surrounded



Brooklyn Rapid Transit Company—Floor Plan of New Office, Shop and Storage Building at Maspeth.

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by a tile fence. A small building within the yard will have compartments for signs, lamps, salt and sand. The entrance to the car barn on Grand street is not of sufficient width to give room for more than two tracks, one having switch connection with the other and forming a straight storage track the entire length of the building. The other is a lead track serving seven tracks equipped with inspection pits. That section of the building formed by the acute angle at the intersection of Juniper avenue and Washington street and a space 35 feet 4 inches wide along the Washington street end is devoted to shop purposes. In this section are gauntlet tracks for wheel storage, over the center of which are suspended from the roof an I-beam trolley runway with chain hoists. The shop will have a forge and several installations

of modern machines will be made, so that light repairs can be made without the necessity of sending cars to the company's car building shops in South Brooklyn. Each lathe or other piece of machinery will receive power individually by direct connected motor, using current from the company's wires. A crane runway extends along the Washington street end and this section is equipped with the usual complement of jib cranes. Reference to the engraving presented herewith will show the attention which has been given the matter of fire protection by direct-connected motor, using current from the company's storage yard. The Grand street frontage of the office portion of the building gives room for the entrance hall and a waiting room for the trainmen. Then come the offices of the dispatchers, the register takers and the day and night depot masters. Back of these are the toilet room and locker room

for the men, boiler room, coal bin, sash storage room, locker and lunch room, stock room and a small office. On the second floor of the barn are offices for the division superintendent and his clerks, and for the men in charge of the mechanical department of this station. A well-lighted and airy lunch room will be equipped on this floor and will be ready for business at all hours. Back of it are club and lounging rooms, with a piano and other forms of amusement, including two standard bowling alleys.

The exterior of the entire structure will be of a fine grade of red pressed brick, while its interior walls are to be constructed of tile and ornamental brick. Floors are to be concrete and ceilings of steel, so that the entire structure will be practically fireproof.

WORK AND WRECKING CAR OF THE CINCINNATI TRACTION COMPANY.

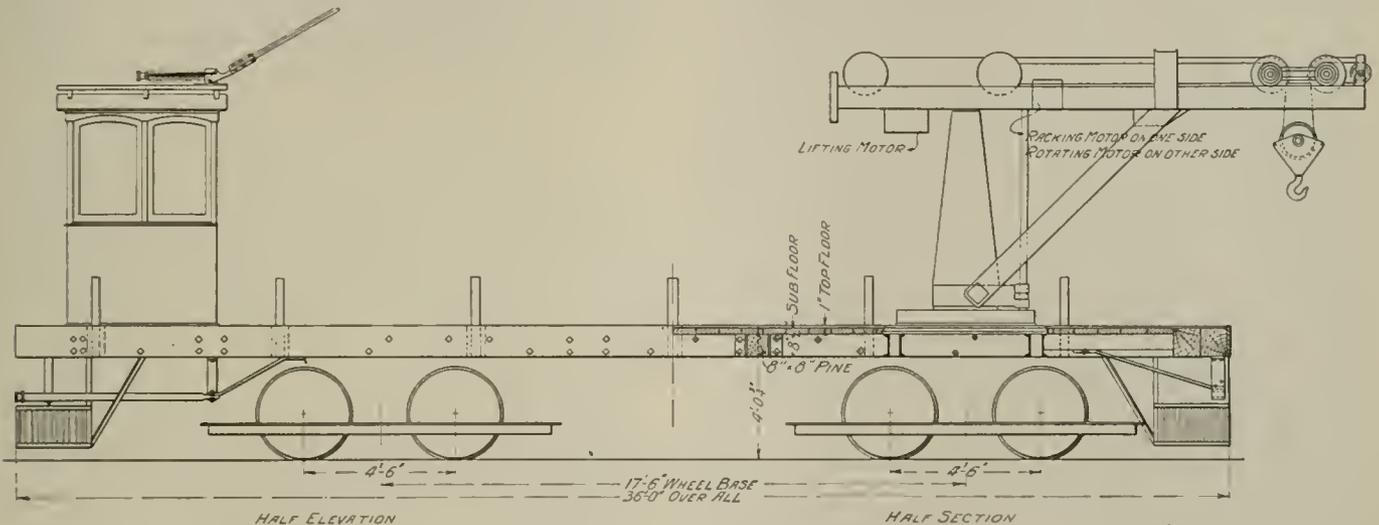
A general utility car of interesting design has recently been put into use on the lines of the Cincinnati Traction Company, at Cincinnati, O. As shown in the accompanying illustration, the car is provided with a swinging boom and

ing, rotating and racking motions respectively. These motors are controlled from the cab, the wires passing through conduits under the floor and up through the post of the crane to the motors, which are located on the boom. The original design of the crane contemplated handling loads of three tons, but some changes have been made in its design so that the equipment is now capable of lifting six tons. The car complete weighs about 50,000 pounds.

THE STRENGTH OF INSULATOR PINS.

Much useful information regarding the comparative strength of wooden insulator pins is furnished in a late report of the Purdue University timber-testing station of the department of agriculture. The report covers the tests made on 53 samples of oak, black locust and rock elm. As stated, though furnishing a fairly reliable indication of the comparative strengths, the number of specimens was not sufficiently large to establish these values as absolute.

The pins were of standard size, 1 1/4 inch by 8 inches. The oak pins were from 1/8 to 1/4 inch shorter than the others, and of slightly smaller diameter at the shoulder. Their



Cincinnati Work and Wrecking Car.

holst mounted over one truck, which makes this equipment available for wrecking purposes. The car is 36 feet long and 8 feet wide. The stringers consist of 8 by 10-inch yellow pine, reinforced on the inside by 8-inch channels and on the outside by 1 by 11-inch steel plates. The other underframing of the car is reinforced by 3/8-inch plates joined to the stringers with 3 1/2 by 3/4-inch angle plates. The floor is laid in two thicknesses, the lower of 2-inch plank laid transversely, and the upper of 1-inch lumber laid lengthwise of the car. The trucks are of the Elliott type with 4-foot 6-inch wheel-base and carrying Westinghouse No. 68 motors. The Cincinnati Traction Company's 33-inch standard steel wheels are used. A motorman's cab located at the front end of the car is 4 by 6 feet in floor area, which allows a 2-foot space on either side of the car floor that may be utilized when carrying steel rails or other supplies of a length equal to or greater than that of the car floor. Thirty-inch sideboards are provided so that the car may be utilized for handling gravel or other loose materials.

The crane, which is probably the most novel feature of the car, is located at the rear end of the platform and is a combination of the rotating, racking and holsting types. It was furnished by the Whiting Foundry Equipment Company, of Harvey, Ill. The derrick has a total height of 8 feet 6 inches above the car floor and the holsting block has a travel of 10 feet from the post to the end of the boom. Motors of 12, 5 and 3 hp. capacity are provided for operating the holst-

lever arm was also about 1/2 inch shorter than in the cases of the other two species.

From the results obtained it appears that the breaking strength of the two shipments of black locust pins was practically the same, and may be taken as 4,000 pounds. Live oak pins came next in order of strength, with a breaking moment of about 3,000 pounds. Rock elm pins were the weakest, having a breaking strength of 2,500 pounds. The oak pins were the heaviest, the locust next, and the elm the lightest. The locust and elm pins failed mostly by splitting from the threads to the shoulder, or by tension at the shoulder. Occasionally the portion of the pin inserted in the block failed by shearing horizontally. The oak pins nearly all failed by tension at the shoulder. An interesting point indicated by the results is that the breaking strength of the pins varied nearly directly as the number of year-rings per radial inch.

The Columbus Railway & Light Company, of Columbus, O., carried over 60,000,000 passengers, including transfers, during the year 1906, an average of 164,250 daily. On straight fares, about 40,000,000 were carried, an average of 110,000 per day. The receipts of the company for the year approximated \$1,540,000. The average fare including transfers was two and six-tenths cents and excluding transfers a fraction less than four cents. Cash fares made up the advance over three and four-sevenths cents, the price of the seven-for-a-quarter tickets.

THE SUBSTITUTION OF THE ELECTRIC MOTOR FOR THE STEAM LOCOMOTIVE.*

(CONTINUED FROM PAGE 160.)

BY LEWIS B. STILLWELL AND HENRY ST. CLAIB PUTNAM.

Comparative Costs of Operation.

The substitution of electric for steam equipment involves a large investment in power plant, and in electric conductors and apparatus for conveying power from the power plant to the moving trains. The distributing system for alternating-current equipment, which is the only class of equipment deserving serious consideration in connection with the general problem which we are discussing, comprises an addition to permanent-way equipment in the form of overhead construction and electrical conductors conveying power from the power house to the trolley or conductor which is carried above the track. For the trolley, a potential of 11,000 volts is suitable and can be adequately insulated. The mechanical support for the trolley comprises, preferably, steel poles with brackets or light steel bridges spanning the track.

The cost of the power plant and distributing system are properly chargeable to capital account.

Our estimates are based upon the assumption that single-phase alternating-current equipment is used; that the trolley potential is 11,000 volts; that each power-house supplies railway line to a distance of 150 miles in each direction, the feeder potential employed being 60,000 volts; that the overhead construction is first class in every respect, and steel bridges and field poles set in concrete being exclusively used for the support of both trolley conductors and feeders.†

As regards equipment of the rolling stock, it is the general practice of our railways to charge against operating expenses all new equipment purchased to replace that which has been worn out in service. In the adoption of electricity, it would seem that this method might be followed in general by our more important railway systems, the substitution of electric equipment beginning naturally upon those parts of the system where the resulting advantages are maximum. In cases where the initial substitution of electricity is on a large scale, as compared with the total rolling-stock equipment of the railroad making the change, it is probable that a part if not all of the cost of electric rolling stock equipment will generally be charged to capital account.

We proceed to compare the cost of electric operation with the cost of operation by steam locomotives, using as our standard of comparison the grand average results in steam operation in the United States for the years 1901-1905, inclusive. These average results are set forth in the following tables compiled from the reports of the Interstate Commerce Commission and printed herewith. Many of the items included in this tabulation vary between wide limits in the practice of different railroads.

Maintenance of Way and Structures.

Under the general heading, "Maintenance of Way and Structures," item No. 1, "repairs of roadway," if changed at all should show some reduction under conditions of electric operation, but obviously no material change is to be expected. We assume therefore that this item, amounting to 10.818 per cent of total operating expenses, will remain unchanged.

The items, "renewals of rails," "renewals of ties," and "repairs and renewals of bridges and culverts," may be conveniently grouped. In the aggregate, these on the average steam operated railroad amount to 6.33 per cent of the total cost of operation. From the best study which we have been able to make of the detailed factors comprised under these three items of the classification, it would seem that under electric operation they should be reduced about one-fourth; in other words, they should approximate 5 per cent of the total operating expenses.

The cost of track-maintenance is increased by reason of the electric bonding of the rails. This bonding, including the cost of special bonds necessary where an automatic track-signal system is used, will cost about \$500 per mile under average conditions. Its cost of inspection and maintenance should not exceed \$50 per mile of single track per annum.

The annual cost of "renewals of rails," "renewals of ties," and "repairs and renewals of bridges and culverts," averages

*Extracts from a paper presented at the 213th meeting of the American Institute of Electrical Engineers, New York, January 25, 1907.

†In assuming the use of the single-phase system we are not condemning other systems. The three-phase system has not received from American engineers in general, that degree of consideration which its possibilities and demonstrated advantages justify. Its use, at least on mountain-grade divisions, can be supported by very strong arguments.

in the United States \$400 per mile of track, which as above stated, is 6.633 per cent of average operating expenses, under steam operation, and for equal trains, as we have estimated, 5 per cent for electric operation. The effect of the cost of track-bonding, therefore, would increase the items under consideration by about one-eighth, which is equivalent to an increase of 0.8 per cent in operating expenses. To avoid possible confusion, we include the cost of "repairs and renewals of track bonding" as a separate item in the column "Estimated Cost of Operation by Electricity."

Under the general conditions which will govern where electricity is substituted for steam in railway operation, there can be no doubt that the substitution will result in a material reduction in the cost of maintenance of rails, ties, bridges, and culverts. In this substitution electric locomotives will be used for freight traffic, while for passenger traffic locomotives will be eliminated ultimately and multiple-unit car equipments employed.

The hammer-blow upon rails is largely and in some cases wholly avoided by the adoption of electricity.

In view of the fact that our railways have been spending large sums of money to increase the stability of the roadbed, to strengthen bridges and culverts, and to maintain rails in position upon the ties, the advantage which the electric locomotive possesses in its higher ratio of tractive effort to weight is important, even in freight traffic at low speed.

Reverting to Table I, item 5, "repairs and renewals of fences, road-crossings, signs and cattle-guards," will not be changed by the adoption of electricity.

Item 6. "Repairs and renewals of buildings and fixtures," includes repairs and renewals of engine houses and shops, also water tanks and coal-handling apparatus. Under electric

TABLE I

Item	Amount 1905	Per cent.					Average Five Years	Estimated Cost of operation by Electricity
		1905	1904	1903	1902	1901		
Maintenance of Way and Structures.....	274,415,279	19.784	19.519	21.185	22.255	22.272	21.003	22.354
1. Repairs of roadway.....	144,161,701	10.393	30.348	11.093	11.331	10.294	10.818	10.818
2. Renewals of rails.....	18,259,022	1.316	1.298	1.386	1.521	1.676	1.439	
3. Renewals of ties.....	36,856,864	2.657	2.519	2.487	2.838	3.140	2.728	5.00
4. Repairs and renewals of bridges and culverts.....	32,166,990	2.319	2.228	2.461	2.593	2.730	2.466	
5. Repairs and renewals of fences, road-crossings, signs and cattle-guards.....	6,179,686	0.446	0.437	0.527	0.625	0.598	0.527	0.527
6. Repairs and renewals of buildings and fixtures.....	29,320,204	2.114	2.147	2.590	2.562	2.417	2.366	1.300
7. Repairs and renewals of docks and wharves.....	2,883,274	0.208	0.209	0.235	0.220	0.283	0.231	0.231
8. Repairs and renewals of telegraph.....	2,374,932	0.171	0.179	0.165	0.173	0.158	0.169	0.169
9. Stationery and printing.....	383,158	0.028	0.029	0.032	0.031	0.029	0.030	0.030
10. Other expenses.....	1,829,448	0.132	0.125	0.209	0.361	0.317	0.229	0.229
Repairs and renewals of track bonding.....								0.800
Repairs and renewals of overhead construction.....								3.250
Maintenance of Equipment.....	288,012,604	20.765	19.967	19.133	19.127	18.629	19.524	12.287
11. Superintendence.....	7,831,965	0.565	0.567	0.559	0.601	0.599	0.578	.578
12. Repairs and renewals of locomotives.....	114,988,428	8.290	7.904	7.408	7.246	6.695	7.509	2.253
13. Repairs and renewals of passenger cars.....	27,342,129	1.971	1.951	2.044	2.157	2.277	2.080	2.080
14. Repairs and renewals of freight cars.....	113,723,239	8.199	7.777	7.442	7.432	7.436	7.657	6.000
15. Repairs and renewals of work cars.....	3,360,390	0.242	0.231	0.242	0.245	0.233	0.238	0.238
16. Repairs and renewals of marine equipment.....	2,650,543	0.191	0.154	0.177	0.215	0.234	0.194	0.194
17. Repairs and renewals of shop-machinery and tools.....	9,186,101	0.663	0.704	0.696	0.643	0.605	0.662	0.500
18. Stationery and printing.....	595,571	0.043	0.042	0.046	0.044	0.043	0.044	0.044
19. Other expenses.....	8,334,240	0.601	0.637	0.519	0.544	0.507	0.562	0.400

NOTE.—It is customary with some railroads using electric equipment to include under the general heading "Maintenance of Equipment," the maintenance of the power plant and electric transmission systems. Both of these, however, are more conveniently treated by including them in the cost of electric power delivered to the overhead trolley system or third rail.

TABLE 1.—Continued

Item	Amount 1905	Per cent.					Average Five Years	Estimated Cost of operation by Electricity
		1905	1904	1903	1902	1901		
Conducting Transportation.....	769,613.017	55.486	56.670	55.893	54.671	54.979	55.540	43.454
20. Superintendence ..	25,007.322	1.803	1.779	1.742	1.711	1.726	1.752	1.752
21. Engine- and round-house men.....	130,437.844	9.404	9.550	9.562	9.401	9.340	9.451	4.710
22. Fuel for locomotives.....	156,429.245	11.278	12.128	11.675	10.776	10.602	11.292	5.553
23. Water supply for locomotives.....	9,147.590	0.660	0.659	0.614	0.623	0.612	0.634	0.000
24. Oil, tallow, and waste for locomotives.....	5,442.970	0.392	0.397	0.389	0.366	0.361	0.381	0.250
25. Other supplies for locomotives.....	3,295.384	0.238	0.248	0.232	0.218	0.216	0.228	0.228
26. Train service.....	90,654.520	6.536	6.735	6.677	6.737	7.011	6.739	6.739
27. Train supplies and expenses.....	21,963.086	1.553	1.581	1.552	1.500	1.471	1.537	1.000
28. Switchmen, flagmen and watchmen.....	60,141.422	4.336	4.386	4.313	3.984	3.848	4.173	4.173
29. Telegraph expenses	24,823.266	1.790	1.788	1.754	1.784	1.785	1.780	2.000
30. Station service.....	69,304.658	6.438	6.605	6.664	6.832	6.947	6.697	6.697
31. Station supplies.....	8,961.573	0.646	0.686	0.667	0.676	0.672	0.669	0.669
32. Switching charges, balance.....	4,201.050	0.303	0.280	0.244	0.272	0.319	0.284	0.284
33. Car per diem and mileage, balance.....	18,835.325	1.358	1.358	1.400	1.480	1.618	1.423	1.423
34. Hire of equipment, balance.....	3,040.641	0.219	0.195	0.214	0.180	0.161	0.194	0.194
35. Loss and damage.....	19,782.692	1.426	1.279	1.094	0.990	0.819	1.112	0.750
36. Injuries to persons	16,034.727	1.156	1.196	1.120	1.048	0.911	1.086	1.000
37. Clearing wrecks.....	3,594.658	0.259	0.275	0.284	0.221	0.189	0.246	0.200
38. Operating marine equipment.....	9,903.479	0.714	0.696	0.745	0.721	0.862	0.748	0.748
39. Advertising.....	5,959.380	0.430	0.418	0.428	0.429	0.428	0.427	0.427
40. Outside agencies.....	19,688.261	1.419	1.411	1.449	1.579	1.615	1.495	1.495
41. Commissions.....	233.987	0.017	0.022	0.044	0.077	0.089	0.050	0.050
42. Stock yards and elevators.....	786.850	0.057	0.060	0.057	0.069	0.075	0.064	0.064
43. Rents of tracks, yards and terminals.....	23,947.881	1.727	1.563	1.544	1.519	1.724	1.615	1.615
44. Rents of building and other property.....	4,814.407	0.347	0.382	0.411	0.440	0.440	0.404	0.404
45. Stationery and printing.....	8,772.789	0.632	0.640	0.642	0.622	0.638	0.634	0.634
46. Other expenses.....	4,408.010	0.318	0.353	0.376	0.416	0.510	0.395	0.395
General Expenses.....	55,022.127	3.965	3.844	3.789	3.947	4.120	3.933	3.933
47. Salaries of general officers.....	11,676.616	0.842	0.841	0.823	0.925	0.984	0.883	0.883
48. Salaries of clerks and attendants.....	18,582.142	1.340	1.313	1.254	1.244	1.262	1.283	1.283
49. General office expenses and supplies.....	3,459.470	0.249	0.230	0.234	0.249	0.257	0.244	0.244
50. Insurance.....	6,835.932	0.496	0.471	0.432	0.412	0.384	0.439	0.439
51. Law expenses.....	7,096.275	0.512	0.513	0.541	0.535	0.549	0.549	0.549
52. Stationery and printing (general expenses).....	2,439.781	0.176	0.170	0.175	0.168	0.161	0.170	0.170
53. Other expenses.....	4,861.911	0.350	0.306	0.3330	0.391	0.447	0.365	0.365
Recapitulation of Expenses.....								
54. Maintenance of way and structures.....	274,415.279	19.784	19.519	21.185	22.255	22.272	21.003	22.354
55. Maintenance of equipment.....	288,012.604	20.765	19.967	19.133	19.127	18.620	10.524	12.287
56. Conducting transportation.....	769,613.017	55.486	56.670	55.893	54.671	54.979	55.540	43.454
57. General expenses.....	55,002.127	3.965	3.844	3.789	3.947	4.120	3.933	3.933
Grand Total.....	1,387,043.0	27.100	100.	100.	100.	100.	100.	82.028

negligible in our consideration of the general problems of comparative expenses of steam and electric service.

Item 9. "Stationery and printing" will not be changed.

Item 10. "Other expenses" we may assume will not be affected.

Maintenance of Way and Structures.

Under the general heading, "Maintenance of Way and Structures," the classified statement of operating expenses of a railroad electrically equipped includes the following items in addition to the foregoing:

a. "Repairs and renewals of track bonding."

This has been referred to in our discussion of Item 2, 3, and 4, and it is included in our tabulated statement as a separate item amounting to 0.8 per cent of operating expenses.

b. "Repairs and renewals of overhead or third-rail construction."

From detailed calculations of the cost of high class overhead construction, where two tracks are to be equipped the cost of overhead construction is approximately \$10,300 per mile. This includes trolley conductors equivalent to No. 0000 wire, B. & S. gauge, insulated for 11,000 volts alternating, and supported by steel cables, carried by substantial steel bridges set in concrete, and spanning the tracks. For single-track work using steel poles and brackets and catenary support, the cost closely approximates \$4,800 a mile.

Of the total line mileage of the United States in 1905, amounting to 216,974 miles, approximately 0.4 are in double track, including yards and sidings for single-track lines, and 0.6 are single-track.

The grand average cost of overhead steel construction of the type considered, therefore, closely approximates \$5,000 per mile of track. In this case, our estimate of the annual cost of "repairs and renewals of overhead construction" cannot rest directly upon actual experience, since practically no overhead construction of this character is in use under the conditions of railway service. We may, however, base conclusions which should be reasonably correct upon consideration of first-class overhead trolley construction such as is used by our best interurban lines. Some light is also thrown upon the subject by extensive experience in the operation of high-potential transmission circuits, and the experience of the Valtellina line is particularly instructive.

Light steel bridges, set in concrete, subject to the comparatively slight strains involved in supporting the light conductors required, should last almost indefinitely if kept properly painted. The absence of smoke and gases from locomotives favors their long life. The cost of these steel bridges and poles is a large part of the overhead construction.

The wear of the trolley wire will depend upon density of traffic, but its original cost is only \$700 a mile, and judging from the experience of ordinary trolley lines and the results obtained on the Valtellina its life should be long.

The steel catenary cables supporting the conductor being well galvanized should last many years without renewals.

Breakage of insulators, such as are now available, will not constitute a large item of expense.

As regards life of steel structures, it is instructive to note the fact that much of the structure of the Manhattan elevated lines still in use is more than 30 years of age, and is apparently unimpaired notwithstanding the heavy and frequent traffic which it has carried and still carries.

It is probable that engineering opinion in regard to the amount which should be allowed for "repairs and renewals of overhead construction" under consideration will not be unanimous, but taking into account all of the factors which appear to affect the problem, it is our judgment that the amount required should not exceed \$150 per mile of track per annum. This is equivalent to \$210 per mile of line per annum, the average ratio of track-mileage to line-mileage being 1.4 to 1.

The increase in operating expenses due to this item is about 3.25 per cent of the average operating expenses per line-mile in the United States for the year 1905 being \$6,451.00.

It is, of course, possible to erect a much cheaper form of construction if wood poles be used. Though the first cost of such construction is low, it involves repairs and renewals constituting a much larger percentage of its cost than in the case of the steel bridge and pole construction set in concrete. The annual effect upon operating expenses with this type of construction as an average figure may be expected to approximate 2.5 per cent.

"Maintenance of Equipment."

Item 11. "Cost of superintendence" will not be changed.

Item 12. "Repairs and renewals of locomotives" amounts to 7.509 per cent of the average operating expenses of our steam railroads.

operation. It is our opinion that this item will be reduced from 2.366 per cent to about 1.3 per cent of the total annual operating expenses.

Item 7. "Repairs and renewals of docks and wharves," obviously will not be affected.

Item 8. "Repairs and renewals of telegraph." It is probable that this item will be somewhat increased in general where electric operation is adopted. The effect upon the operating expenses, however, is so slight as to be practically

As regards "repairs and renewals of electric locomotives," actual experience to date is not sufficient to justify us in fixing a figure for this item which can be regarded as established. There is, however, evidence sufficient to justify an estimate which in the average case should be approximately correct.

Before considering data based upon experience, it is pertinent to remark that a moment's consideration of the constituent details of mechanism, their relative complexity, and their respective functions, leads directly to the conclusion that the repairs and renewals of an electric locomotive should be very small as compared with the same item of expense in the operation of a steam locomotive.

Summarizing data from six examples of electrical operation, we have the following costs per mile:

	Repairs of electric equipment	Tractive effort, 20% adhesion.	of equivalent electric locomotive. Estimated.	
Manhattan Railway	22,000 lb...	0.5c.		
Subway train.....	33,000 lb...	0.7c.		
Wilkensbarre & Hazleton R. R.....	17,000 lb...	0.38c.	(actual)	
Lackawanna & Wyoming Valley R. R.	14,000 lb...	0.84c.	"	
Niagara Buffalo & Lockport R. R....	12,000 lb...	0.79c.	"	
Rete Adriatica-Valtellina line...				} Complete cost of maintenance of locomotives and cars.
Freight locomotives.....		1.6c		
Passenger cars.....				

It may be conceded freely in respect to the foregoing data that they are neither sufficiently comprehensive in scope nor extended in respect to duration of service to justify definite and final conclusions.

Taking into account all of the various considerations which must affect the conclusions in the general case, so far as we have been able to gather them, we are of the opinion that for equal draw-bar pull, the repairs and renewals of electric equipment of locomotives, assuming good design and construction according to present standards of the art, should not exceed 1 cent per locomotive-mile, and will probably approximate 0.9 cent per locomotive-mile.

Taking the higher figure, it is evident that the substitution of electric equipment for all parts of a steam locomotive other than frame, wheels, axles, cab, and other parts which are common both to electric and steam locomotive construction, a very great saving is effected. We have been unable to fix with satisfactory exactness a figure representing the average cost of repairs and renewals of these parts, but it would seem liberal to allow 1.5 cents per locomotive-mile, this being equivalent to an allowance of something over \$400 per annum per locomotive. Taking this figure and adding the estimated cost of repairs and renewals of electric equipment, we have 2.5 cents per locomotive-mile as the estimated total cost of repairs and renewals of electric locomotives, performing the average work now done by steam locomotives.

Item 13. "Repairs and renewals of passenger cars." In cases where electric locomotives are substituted for steam locomotives, there should be some reduction in this item. Painting should be considerably reduced by reason of the elimination of smoke. The life of the upholstery and interior decoration of the car will be increased.

Item 14. "Repairs and renewals of freight cars." This item will be favorably and very materially affected if it should ever prove practicable to operate heavy freight trains by locomotives located at intervals throughout the trains and controlled by the multiple-unit system.

Assuming that the methods of train operation remain the same, the adoption of electricity will still effect a reduction in the cost of Item 14, and for two reasons, viz.:

1. The practical elimination of damage by fire which now frequently is superimposed upon damage caused by collision or derailment.

2. Reducing the wear and tear of wheels and brake equipment in descending long grades, by reason of the opportunity afforded to break the trains by causing the motors to operate as generators.

In the way of an estimate, nothing more definite than a guess based upon consideration of probabilities, and the views of various operating officials, can be advanced; but in the opinion of the writers the general substitution of electricity for steam operation in freight service should reduce this item from 7.657 per cent to something like 6 per cent of operating expenses.

Item 15. "Repairs and renewals of work cars," will not be changed materially.

Item 16. "Repairs and renewals of marine equipment," obviously will not be changed.

Item 17. "Repairs and renewals of shop machinery and tools," will be reduced under electric operation since the repairs of locomotives will be radically decreased as shown and since the tool equipment required for the electrical machinery is materially less expensive and varied.

It would seem reasonable to expect that this item would be reduced from 0.662 per cent to about 0.5 per cent of total operating expenses. Of course a large proportion of the shop machinery and tools are for car repairs.

Item 18. "Stationery and printing," will not be changed.

Item 19. "Other expenses." Other factors comprised are comparatively small and it is evident that the ability to use electricity for light and power purposes in shops, roundhouses and offices produced at a works cost of 0.6 cent and delivered to the point of consumption at a figure which on the average will approximate 0.75 cent will effect a material reduction in this item. We estimate that it will be reduced to about 0.4 cent.

Conducting Transportation.

Item 20. "Superintendence," will not be changed.

Item 21. "Engine and roundhouse men," includes in addition to the engine crew, round-house men whose work, of course, is chiefly in connection with the cleaning and maintenance of the engines. This item averages for the railroads of the United States 9.451 per cent of the operating expenses, of which 91 per cent, or about 8.6 per cent of the operating expenses are for enginemen and for firemen. Of this 8.6 per cent approximately 5.5 per cent is for enginemen and 3.1 per cent for firemen.

It would seem that there can be no question of the reasonableness and safety of entrusting the operation of an electric locomotive to one man, provided the control system is equipped with effective appliances arranged to cut off the power and apply the brakes in case the motorman's hand leaves the handle of the controller.

As regards the wages of the engineman, the Manhattan Railway decided to pay its motormen the same wages which it had paid its enginemen. The great majority of electrically equipped railways operating under conditions similar to the Manhattan, however, pay their motormen wages comparable to the wages of the men who operate street cars rather than to the wages of locomotive enginemen.

It is impossible, of course, to fix with definiteness a figure representing the wages of the motorman in railway service as compared with those of the engineman whom he may succeed, but it seems reasonable to assume that under average conditions the services of thoroughly competent motormen can be obtained at a figure which will represent a reduction of 1 per cent in operating expenses, making this item 4.5 per cent instead of 5.5 per cent.

The expense for roundhousemen, which under steam operation is about 8.5 per cent, will be greatly reduced both by reason of the reduction in the number of locomotives required for a given service and also by reason of the demonstrated less cost of maintenance per locomotive unit. It is entirely liberal to allow for this item one-fourth of its cost in steam operation, the saving here effected being equal to 0.64 per cent of the average operating expenses of steam railroads in the United States.

The estimated cost of the item under consideration, therefore, is 4.71 per cent of total operating expenses.

Cost of Fuel and Current.

Item 22. "Fuel for locomotives." One of the marked economies resulting from the substitution of the electric motor for the steam locomotive in railway operation is in the reduction of the fuel account. The cost of fuel upon the average steam railway in the United States for the five years, 1901 to 1905 inclusive, constituted 11.292 per cent of total operating expenses. The aggregate cost in 1905 was \$156,429,245.

The following figures show comparative fuel consumption upon the Manhattan Railway during the year ending June 30, 1901, when steam locomotives were employed and during the year ending June 30, 1904, when electricity was used. During the period first mentioned one pound of coal produced 2.23 ton-miles, if the weight of the locomotive be included, and 1.5 ton-miles, if the weight of the cars only be considered.

During the latter period (electric traction) one pound of coal burned at the power house produced 3.85 ton-miles, excluding weight of locomotives; therefore, the ratio of ton-mileage per pound of coal in favor of electric operation was 2.57 to 1. Including weight of locomotive it was 1.72 to 1.

The average speed under electric operation was approximately 2 miles an hour greater than that attained by steam.

and if correction be made for this difference the ratio of ton-mileage per pound of coal excluding weight of locomotives is approximately 3 to 1, and including locomotives 2 to 1 in favor of electric traction. It should be noted also that in this case the coal burned at the power house was of lower grade, and therefore less expensive than that used by the locomotives, and it is reasonable to expect that in general electric traction will mean utilization of cheaper fuel.

In the case of the single-phase, 25-cycle motor, assuming the average length of run for freight trains to be 15 miles and for passenger trains 20 miles, we have calculated that of the energy delivered to the locomotive approximately 86 per cent will be effective for traction in the case of the passenger locomotive, which is gearless, and about 84 per cent in the case of the freight locomotive, which uses single-reduction gear. Combining the two, it is safe to say that of the energy supplied at the bus-bars in the power house not less than 75 per cent will be effective for traction in the average locomotive equipped with this apparatus.

The cost of a kilowatt-hour effective for traction, therefore, is 0.8 cent and the cost of a horse-power hour effective for traction about 0.6 cent of which 0.35 cent is for fuel when coal of 14,000 B. t. u. per pound, costs \$3.00 per ton of 2,240 pounds, and 0.25 cent is for other power-house supplies, power-house labor, and maintenance of power-house equipment.

As we have stated, the railroads of the United States in 1905 used coal costing \$156,423,245. Basing our calculations upon the statistical facts and the assumptions noted, we estimate that for the operation of the entire freight and passenger service of the United States as existing in 1905, the aggregate energy required at bus-bars of power houses would approximate 12,500,000,000 kilowatt-hours per annum.

At 0.6 cent per kilowatt-hour the total cost of energy for traction, for the operation of all auxiliaries, and for the supply of light and heat to passenger trains would closely approximate \$76,000,000 per annum. This figure represents a saving of about \$80,000,000 as compared with the coal used by steam locomotives in the year 1905.

Referring to the table, the average cost of this item for 5 years, viz., 11.292 per cent, would be reduced by electric traction to 5.533 per cent.

Item 23. "Water supply for locomotives." This item is eliminated if electricity be substituted for steam.

Item 24. "Oil, tallow, and waste for locomotives." This item should be considerably reduced. We assume that it will be reduced to 0.25 per cent.

Item 25. "Other supplies for locomotives." We make no change in this item.

Item 26. "Train service." This item is not changed.

Item 27. "Train supplies and expenses." This item among many others includes the following which will be changed by the substitution of electric motive power, viz.: "Heating, lighting, cleaning and lubricating cars, including the cost of supplying and pumping gas into cars."

In discussing item 22, we have included in the estimate of electric power required energy sufficient to light all cars three hours out of every twenty-four. We have also included energy sufficient to heat all passenger trains by electricity an average of three months per annum. Both of these are important items. The cost of cleaning the cars should also be reduced by the elimination of smoke and cinders from the locomotives. All things considered, we believe it is fair to assume that under electric operation this item will approximate 1 per cent. of operating expenses.

Item 28. "Switchmen, flagmen, and watchmen" will not be changed.

Item 29. "Telegraph expenses." Telegraph circuits being arranged with reference to the power circuits, or equipped with one or another of the devices which have been suggested as preventives of difficulties resulting from inductive effects of the power circuits, it might be assumed, perhaps with safety, that item 29 would not be changed, but we are inclined to the opinion that there will be a slight increase in the cost of this item even under the best plans heretofore proposed, and we therefore increase it in our estimate by 0.2 per cent.

Item 30. "Station service." Examination of the factors constituting this large item indicates no material change.

Item 31. "Station supplies." For lighting and incidental power service of this kind, equivalent to that with which railroads are now apparently satisfied, the change would undoubtedly mean reduction in cost. We will let it stand as it is, however, and would point out the fact that without increasing the cost of this item, a great improvement in facilities for handling freight at docks and wharves and for lighting passenger stations and yards will result from the substitution of electric power.

Items 32, 33, and 34, viz., "switching charges, balance,"

"car per diem and mileage, balance," and "hire of equipment, balance," will not be changed.

Item 35. "Loss and damage." For reasons which have been referred to in our discussion of the subject "Safety," it is clear that there should be a material reduction in the charges for loss due to destruction of freight, etc.

Another saving will result from the practical elimination by reason of damage of fire, which now not infrequently is caused by sparks from locomotives.

These savings will be offset to some extent by damage due to telegraph, telephone, or other wires coming in contact with the power circuits of the railway, unless reasonable care be exercised in preventing such accidental contact by the adoption of proper precautions when the electric equipment is installed.

In our estimate we have reduced item 35 to 0.75 per cent.

Item 36. "Injuries to persons." "This account includes all charges on account of employes or other persons killed or injured except lawyers' fees and court expenses."

For reasons referred to under the heading "Safety" some reduction in the number of passengers and employes killed and injured in railway accidents may be expected to result from the use of electricity. The risk of fire following collision being materially reduced, we should anticipate a relatively greater reduction in the number of passengers and employes killed in accidents caused by collision or derailment than in the number injured and a reduction in the average severity of non-fatal injuries may also be expected. As regards the expenses included under item 36, we have no data indicating how these are divided other than the fact that the railroads apparently were put to little if any expense on account of about 80 per cent of those persons other than passengers and employes who were killed and injured. While it is probable that a large part of the expenditures were on account of passengers killed and injured, and while any reduction in fatal and serious accidents to passengers therefore would materially affect this item, we have thought it best in the absence of satisfactory data to leave it practically as it stands, our estimate being 1 per cent.

Item 37. "Clearing wrecks." In our opinion this item will be reduced under electric operation for reasons which have been sufficiently indicated in what we have said in regard to item 35. It would seem that 0.2 per cent is a fair estimate of its probable amount.

The following items will not be changed:

Item 38. "Operating Marine Equipment."

Item 39. "Advertising."

Item 40. "Outside agencies."

Item 41. "Commissions."

Item 42. "Stock yards and elevator."

Item 43. "Rents of tracks, yards and terminals."

Item 44. "Rents of buildings and other property."

Item 45. "Stationery and printing."

Item 46. "Other expenses."

General Expenses.

As regards the several items included under the heading "General Expenses," the adoption of electricity will cause no material change.

Our approximate estimate of the expenses chargeable to operation if electricity were in use today for the operation of all the railways in the United States, as discussed in the foregoing pages, is recorded in detail, item for item, in the last column of the tabulated data in Table I; these data with the exception of this column of estimates being the official records of the reports of the Interstate Commerce Commission. When considered in detail, the estimates are naturally subject to criticism more or less destructive, as in respect to many items we have not found opportunities to secure and investigate the great mass of detailed data showing in segregated form the scores of factors which are included in the aggregates appearing as single items in the summarized table of operating expenses; but while recognizing fully the imperfections and incompleteness of the attempted comparative analysis, we believe that the conclusions reached are correct within a reasonable degree of approximation.

Conclusions.

According to our estimate, if all the railways of the United States were today operated by electricity using the single-phase alternating-current system at the potential adopted for the equipment of the New Haven railroad, the energy required for operation being developed by power plants such as are today in extensive use and transmitted at potentials well within limits established in practical service, and if the rolling stock equipment consisted of locomotives and multiple-unit trains fitted with motors and control appa-

ratus no better than the best which now exist, the aggregate cost of operation which in 1905 amounted in round numbers to \$1,400,000,000, would be reduced by about \$250,000,000.

To accomplish this result, power plants delivering about 12,500,000,000 kilowatt-hours per annum would be required. Assuming the radius of transmission from power houses to be 150 miles, the load-factor in railway service should be not less than 0.75, and taking this figure it appears that power plants capable of delivering a maximum output of about 2,800,000 kilowatts will be sufficient to operate the entire railway service of the United States as existing in the year 1905. The average output required is about 10 kilowatts per mile of line and 7 kilowatts per mile of track.

In 1905 the average gross earnings of our railroads per mile of line were \$9,598, and the average operating expenses \$6,409. The foregoing calculations lead to the conclusion that high-class electric equipment now available would reduce this average cost to \$5,265. The difference is \$1,144 per mile of line, against which apparent saving must be charged the annual interest and depreciation of the power plant, the addition to permanent-way equipment, comprising overhead construction and track bonding, the transmission circuits, and the substations with their equipment. Assuming 5 per cent interest on cash cost of these items and allowing 5 per cent for a sinking fund to cover depreciation of power house with its equipment and 2½ per cent for a sinking fund to cover depreciation of the overhead construction and distributing system, the aggregate of fixed charges works out \$837 per mile of line. The saving in operating expenses, therefore, is more than sufficient to take care of the increase of fixed charges. In other words, it appears that the entire railroad system of the United States could be operated today at less cost by the electric motor than by the steam locomotive. That the railroads in general if so equipped would realize a large increase in earning power will be admitted by all who have given the subject intelligent attention.

In charging against electric operation 5 per cent cost of power plant and 2.5 per cent upon overhead construction, transmission circuits, substations, and track bonding, we have departed from methods usually adopted in financing of American railway properties. If no depreciation be charged against the increased capital account represented by the items named, the apparent saving will be materially increased.

While our estimates have led us to the conclusion that, under average existing conditions of railway operation in the United States, improved financial results would be attained by the substitution of the electric motor for the steam locomotive, the immediate and general adoption of the new motive power by our railroad companies is neither possible or desirable. It requires no argument to demonstrate the wisdom of making haste with deliberation in a matter involving interests of such magnitude as those which are tied up with the transportation systems of the United States. Recognizing the magnitude of these interests and having in mind the fact that the art of electric traction as applied upon a large scale to heavy train units is yet young, the point which we desire here to emphasize is the necessity of conservative and carefully considered action upon the part of all members of this Institute who may be called upon to advise in respect to the electrification of railways now operated by steam.

Discussion.

Extracts from that portion of the discussion relating to the second section of the paper are as follows:

Mr. W. S. Murray (N. Y. N. H. & H. R. R.)—During the year and a half that I have been connected with the New Haven road I have been able to make some rather interesting experiments with steam locomotives, of the freight and passenger types. What I have here are very accurate figures on the cost of locomotive repairs for steam locomotives, extending over a period of exactly one year, in which there were 20 passenger engines. I have divided the cost of repairs into two parts, one on the basis of locomotive miles for maintenance, and the other for purely mechanical or shop repairs. It seems that on a freight basis the steam locomotives average 6.68 cents per locomotive mile. I have included in the maintenance the following heads: Cost of oil and waste, flues cleaned, ash pan and grates cleaned, engines wiped, engines turned, engines fired, boilers washed and the cost of sand. Now, on the passenger basis, the cost per locomotive mile total is 5.6 cents as compared with 8 and 10 cents for the freight. Subdividing the passenger locomotives again into maintenance and shop repairs, the first, shop repairs, is 3.88 and maintenance 1.72. I thought with those figures in mind, it would give you an idea of what the saving will be under the electric traction method of train propulsion. I will supplement the figure which Mr. Stillwell has given, if he will permit me to do so, by one received from no less a per-

son than Mr. Potter (General Electric Company), who gave me 1.25 cents for the No. 6,000 General Electric machine, operating, I think, 50,000 miles on the test track, which were very severe conditions.

Mr. O. S. Lyford (Westinghouse, Church, Kerr & Co.)—This paper places squarely before the steam railroads of the whole country the proposition that it is profitable to adopt electric traction instead of steam.

On January 22 the Erie Railroad ran its first electric train into Rochester. This consisted of a motor car equipped with single-phase motors and multiple-unit control for operation from an 11,000-volt trolley wire.

A pantagraph trolley is used making contact with a wire supported with steel catenary construction at a height of 22 feet above the track. The 34-mile line is fed from one substation which in turn receives current at 60,000 volts from a power station 90 miles away. The conditions are in many ways almost identical with the assumptions made by the authors. Power is transmitted about 90 miles at 60,000 volts. One substation supplies 34 miles of track; 11,000 volt catenary trolley construction is used, single phase motor with multiple unity contact.

I may say that the operation of the entire equipment was perfect and fully demonstrated the sufficiency and general practicability of the system. On the return trip the vice-president's private car was hauled as a trailer resulting in a total weight of train 22 per cent heavier than that for which the motors were designed. This was on an icy, slippery rail.

The impression given by the overhead catenary construction is that it is the adequate thing for heavy railroading. An 11,000-volt trolley wire so supported is safe. The 11,000-volt wires on the car are so short and so well guarded that they are not a source of increased danger and all the other wires, housed in the usual way, and operated at only one-half the usual voltage, are unusually safe.

Referring to the tables, it seems to me that more emphasis should be placed on these tables and the deductions reached. Now the advantage to be gained by electric traction resulting from increased facility and increased loads which could be hauled have not been capitalized. Those of us who have had occasion to study different specific problems have found the adoption of electric traction, if a high-voltage trolley is used, will in no case mean an operating cost greater than the cost of steam, and in practically every specific case the saving is considerable. Now, when we come to allow for the advantage gained by increase of service we at once appreciate what can be accomplished, and it seems to me that we as engineers ought not to go into too much discussion of the details, but place emphasis on the one great fact, that almost every specific case that can be presented bears out the conclusion of this paper, which is based on the problem of the United States as a whole, namely, that electric traction can be adopted with great advantage by the railroads.

Mr. C. L. du Muralt (Consulting Engineer, New York)—

I believe the great advantage of the electric locomotives lies principally in the fact that they are able to stand great overloads for great length of time. The curve of the steam locomotive represents practically the maximum output, because the boiler of the steam locomotive cannot for any length of time be forced above its normal rating. It is possible for ten minutes at a time to go 10 or 20 per cent above the rating, but in any case there is a limited overload capacity. An electric locomotive will be able to give for any reasonable length of time, say for one hour, 25 or 50 per cent overload, or for short times 100 per cent or more, because they have the great power house back of them and can practically develop an unlimited power.

Mr. A. C. Armstrong (General Electric Company)—I believe that with the asset we have in the electric locomotive we have reached the day when we can approach big problems in railroading with supreme confidence of winning out over the steam locomotive. It is not a case of types of apparatus, or a question of frequency. Each case has to be considered by itself. In ten years from now we will still be disputing over the question of frequency, alternating-current or direct-current operation.

Mr. William McClellan (Westinghouse, Church, Kerr & Co.)—Having passed through the experience of putting some of these 11,000-volt motors on the car and equipping it, I am very glad tonight that I can endorse and confirm some discussion which I contributed to the New York Railroad Club last year. I believe firmly the solution of the railroad problem is going to be by means of the high-voltage overhead trolley alternating-current, single-phase motor.

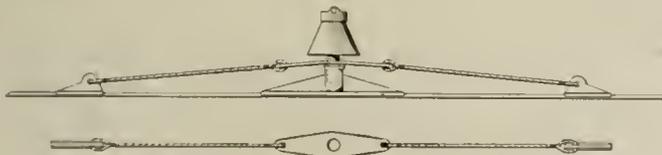
With regard to these figures, I can only say—in regard to figures in general—they should be carefully scrutinized. Westinghouse, Church, Kerr & Co., like others engaged in work of

this kind, wanted some actual figures, and we turned to the same figures Mr. Stillwell turned to, and after careful study of them we concluded that few conclusions of value could be derived from them. Therefore a new scheme was adopted. It was to take several railroads having different kinds of traffic, a division here with large passenger traffic, another division with a good mixture, and another division largely freight traffic, and, if possible, get costs on these, and in this way we could arrive at some general figures which could be relied upon; I am free to say we did have some success and did arrive at some results, but on the whole they were unsatisfactory. Our conclusions were, in regard to maintenance of way, that by including repairs and renewals of track and bonds, repairs and renewals of overhead construction, you will have about the same cost as is shown in the paper.

I do believe that we can standardize certain principal lines on which we can approach this railroad problem and hope to solve it, with electricity. There is no doubt about it. The flexibility of the motor equipment and increase of the road time is a very important item. Take the freight locomotive at the present time, making 3,000 or 3,500 miles a month; 45 per cent of its time it is on the road, about 30 per cent of the time it is in the roundhouse for repairs, and about 25 per cent of the time it is in the yard waiting for orders. These percentages can be greatly changed by the use of the electric locomotive. Another item which I think operates strongly in favor of electricity is the possibility of generating your power cheaply by locating the power plants close to coal mines, which will avoid any haulage of the coal, and also by making use of the large number of small water powers which if properly developed amount to a great asset for the railroad, water powers which would be of no use to the individual, but are of use to the railroad, because its load is distributed over a large territory.

ANCHORING TROLLEY WIRES AT SPANS.

According to the discussion by Mr. M. P. S. Sheardown in a paper read before the Dublin Local Section of the Institution of Electrical Engineers, December 6, 1906, there are four deteriorating actions which take place at these parts



Suggested Attachment to Prevent Breaking of Trolley Wires.

of the trolley wire where it joins the rigid suspensions. These cause most of the breakages:

1. The blow of the trolley wheel against the butt of the ear, part of which comes against the wire.
2. The effect of sparking which occurs at the same place, due to the trolley wheel losing contact with the wire.
3. The molecular change or crystallizing action in the wire, due to what the author has termed the damping-out of vibration in the suspended wire.
4. The bending or hinging action due to the upward pressure of the passing trolley wheels; and possibly a fifth, viz., overheating of the wire when being soldered.

The first of these can be removed by using grooved trolley wire supported by clamps, thus giving a smooth under-running surface for the wheels. This also will in a great measure prevent the wear resulting from the sparking. It is not, however, so easy to prevent the third and fourth causes for broken wires, though they may be reduced slightly by making the cars as short as possible and by the use of flexible suspensions. Neither of these methods will prevent the deadening of vibrations at the points of support and the consequent crystallization, though the effects of the bending action may be much reduced. Both of these effects will also be very much reduced by having the upward tension of the trolley wheel as small as permissible.

A method which has been suggested and reported to have given excellent results is that of anchoring the trolley wire at each support. The anchoring system as proposed consists

of a stamped steel plate with a hole in it through which the threaded portion of the insulator bolt passes. The plate to which the anchor wires are fastened is thus securely held in position at the top of the ear, but the strain of the broken wire comes directly on the bolt. On either side of the ear, as shown in the diagram, a half anchor-ear is attached to the trolley wire and is connected to the anchor-plate by wires which take up the strain and hold up the wire. If it breaks at the ear. It is stated that in one case where these were installed, out of an average of 20 accidents per month three cases only were reported in one year in which the trolley wire fell and interfered with traffic.

The cost of installing these anchors is reported as about \$60 per mile of double track, which, there can be little doubt, would be a good investment.

ADVERTISING FOR RUSH-HOUR TRAFFIC.

The down-town loop over which the elevated railroads of Chicago operate in the business district is badly over-

The Metropolitan West Side Elevated
Railway Co.'s

Fifth Avenue Terminal Station
Just South of Jackson Boulevard

"RUSH HOUR SERVICE"

Trains arrive and depart from this Station at short intervals during Morning and Evening.

<p>MORNING</p> <p style="font-size: x-small;">Trains arrive (all Branches)</p> <p style="font-size: x-small;">(commencing at 6:55 A. M. until 8:35 A. M.)</p> <p style="font-size: x-small;">Daily except SUNDAY</p>	<p>EVENING</p> <p style="font-size: x-small;">Trains depart (all Branches)</p> <p style="font-size: x-small;">(commencing at 6:30 P. M. until 8:35 P. M.)</p> <p style="font-size: x-small;">Daily except SUNDAY</p>
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PLEASE NOTE—If by reason of fire or other cause the Trains of the Metropolitan "L" are not running on the Loop, they will then be dispatched from the Station at Franklin and Van Buren Streets, or from the Fifth Avenue Terminal Station.

Copies of this Circular may be obtained at the General Office, 1001 Royal Insurance Building, 113 Jackson Boulevard.

Rush-Hour Advertising.

crowded; in fact, during the rush hours the trains on each of the tracks are but a few car lengths apart for the entire two miles' distance around the elevated loop structure. To call particular attention to its express service and to the central location of its Fifth Avenue terminal station and thus endeavor to relieve its loop trains of some of their rush-hour traffic, the Metropolitan West Side Elevated Railway has had quite generally circulated through the business districts of Chicago diagrams as shown in the accompanying illustration. It will be noted that the Fifth Avenue terminal station of the Metropolitan elevated is the center of concentric rings which indicate the time necessary to walk from their limits to this station. This terminal station was described and illustrated in the Street Railway Review for March, 1905, page 182.

PIPING AND POWER STATION SYSTEMS—XXVIII.

BY W. L. MORRIS, M. E.

Figure 242-(II-4) shows a water supply which is higher than the ground surrounding the building. It would seem that such a condition would, in itself, suggest that the pipe line must be watertight throughout its entire length. As an illustration, the writer has knowledge of a 30-inch tile pipe line which was carried for a distance of 4,000 feet under a country road. This line had a gradual down grade to the power house, the road at that point being about two feet lower than the water level. It is possible that the engineer who built the line thought that to supply a plant through a pipe of this size and length would cause a drop of more than two

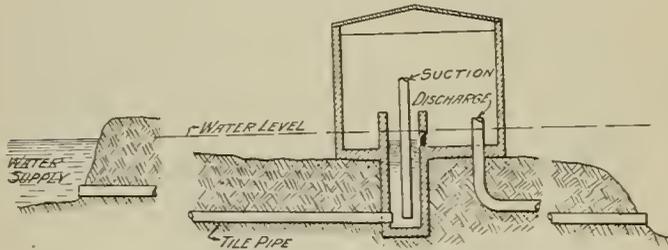


Figure 242-(II-4).

feet; or again he may have considered that cement joints in tile pipe are watertight. Such a pipe line would possibly have been quite satisfactory if it had been for irrigation purposes, as it kept the road in a very wet condition, even when the intake valves, condenser, etc., were carefully manipulated.

Where tile or other leaky pipes are used the manner of filling a trench does not enter into the seepage problem. There is nothing gained in keeping a trench tight if the pipe passing through it has openings permitting seepage. It is important to lay tile pipe so that it is well supported. This precaution should be taken if for no other reason than to prevent open joints that sand may wash into. Where the water pressure outside the pipe is equal to that inside, tile pipe will be found quite as suitable as metal and will cost much less and last longer.

For a situation such as shown in Figure 242 some form of a built-in-the-trench reinforced-concrete water conduit would be found suitable as the pressure inside would be slight and but little reinforcing be required. Such a conduit should be built by one familiar with the methods necessary for insuring watertight work, the chief requisite for such work being continuous progress after the concrete placing has been started, thus avoiding joining the fresh work with that which has set.

Another method of constructing the line shown in Figure 242, though subject somewhat to interruption through breakdown, would be to use a large cistern at the power house and a float which would electrically operate the admission valve, thus maintaining at all times a constant level in the cistern. This would avoid the rise of water to the surface of the ground and at the same time permit the use of tile pipe. The regulation can be accomplished by using a synchronous motor for operating the admission valve and a small alternating-current generator driven by a motor at the cistern. The current supply to the motor may be controlled by the float as shown in Figure 243-(II-5).

Under such conditions the pond-float operates the pair of contacts as shown supported at a. These contact points engage with other contacts when a change of water level occurs and allows current to pass to the direct-current motor operating it in either one direction or the other. The motor driving the generator shown also operates the screw, c. This withdraws the contact points which the float has caused

to engage. The pivot a may so be located to obtain any desired travel of the contacts and thus keep the variation of water level within the specified limits. The arrangement as shown in Figure 243-(II-5) is set for a variation of 4 feet in the cistern level and would have the inlet valve entirely open at low level, half way open at midpoint and entirely closed at the high-water mark. The position of the valve at any point is proportional to the water level in the cistern. This system of control is a modification of the electric damper regulator as used in power houses, except that with the damper regulator, instead of the motor driving the generator, it operates a cable connected to the damper. The contacts in the damper system are operated by the gauge of the regulator.

This method of regulation by the use of motors can be used for open waterways or for cisterns having a great difference in elevation and where the pipes connecting the source of supply with the cistern cannot be filled entirely with water. The control would be much more sensitive if the supply pipe were throughout its entire length below the water level of the pond. Then the amount of water entering the basin would exactly equal that admitted by the valve. If the demand for water suddenly be cut off, that within the pipe would not be emptied into the basin as would be the case if the pipe were not below the level of the pond.

A considerable reserve capacity must be provided if the pipe discharges above the water level of the cistern because it must then be of sufficient size to receive the contents of the pipe that would flow to it after the admission valve were closed. If the pipe were 4,000 feet long, 30 inches in diameter and half-full of water when the admission gate were closed, then 10,000 cubic feet of reserve capacity would be needed. This would represent a rise of 8 feet in the water level if the cistern were 40 feet in diameter. If the pipe were entirely below the water level, a much smaller cistern could be used. Probably the capacity of the condenser pumps would not be such that the water level in the basin could be altered as quickly as the controller could operate the valve.

So many varying conditions are met in different localities that it is impossible to say which is the most suitable material to use for the construction of large waterways. Much depends upon the soil through which the line must be

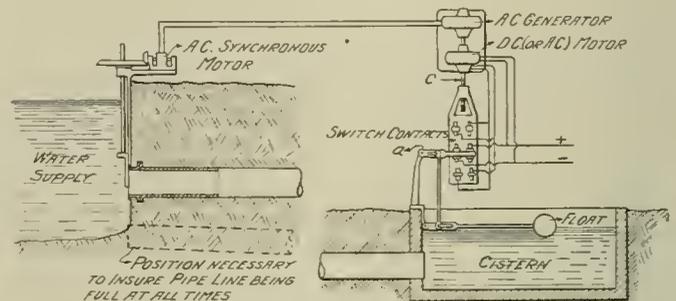


Figure 243-(II-5).

run. If the line is of considerable length,—say 100 or more feet, or of such size that a suction 16 or more inches in diameter is required, then the water should be delivered by gravity. In many cases the soil close to the water's edge is unfit for supporting building foundations. This often necessitates the placing of a power-house some distance from the water. The fact that the soil is unsuitable for building purposes makes it quite as unsuitable for building a trench and placing a waterway through it. If the plant is located alongside of a dock much difficulty may be experienced with old piles, dock timbers, etc., and since it is desirable to carry the pipe line under water the entire distance such conditions would hinder careful construction and necessitate installing a pump of sufficiently large capacity to care for the increased amount of seepage through loose ground.

Figure 244-(11-6) shows an intake constructed of sheet piling. The lower line of plank is driven inside of the upper row. Sheet piling is necessary in soft soil, both to hold back the sides and to confine the water to the desired course. The material between the walls of the trench can be removed while the planks are being driven. Struts and stringers as shown take the thrust of the banks. After the material has been removed between the walls of the trench the lower stringers, a, are placed and the bottom secured to them. Before removing the upper row of sheet piling and filling in the trench the plate, b, should be set approximately correct when driving the piling and planked over as at c.

If placed entirely below the water level, a waterway constructed in this manner will last indefinitely so long as the wood is protected from the atmosphere at all times. The planking can be made double and the waterway made secure against the pressure of the banks and material be prevented from washing through the joints of the plank. To properly carry the tile pipe it would be advisable to use this form of construction as far back from the water as the made ground extends, or at least until firm ground is reached. Tile pipe may be used inside of the sheet piling as far as the water's edge, but where it is necessary to build up a complete enclosure of wood to hold back the banks and seepage water, there is nothing to be gained by placing another conduit inside of the wooden one.

If the intake line is entirely below the water, as would be the case in Figure 244, or as in the case of a pipe line, there should be wells placed at regular intervals, about 150 feet apart along the line of the intake, to facilitate the removal of sand or other deposits which may collect in the pipe. Since they are exposed to varying conditions of moisture, these wells should be of masonry. The bottom of the wells should be at least 3 feet below the bottom of the pipe. This will permit the deposit to collect in the wells along the line, thus acting as small catch-basins. Metal steps should be built in the sides of the wells and the tops should be fitted with iron manhole rings and covers.

There have been intake lines built of $\frac{1}{4}$ -inch steel or iron plate with flanges at the end for bolting the sections together. The most serious objection to this type of construction is its short life and the fact that the sections are built in lengths of about 16 feet—which are difficult to handle in the trenches. Such long sections necessitate extreme care in maintaining a perfectly straight line of trench and a special arrangement of struts, etc., must be provided to permit the lowering of the pipe.

(To be continued.)

The Ohio state railroad commission has let a contract to the Columbus Lithograph Company for the printing of the state railroad maps for 1907. The maps will show all steam and electric roads in operation and in process of construction in the state.

The report of the Connecticut railroad commissioners for the year ending June 30, 1906, shows that the total number of fare passengers carried by electric railways in the state was 121,322,906, an increase of 18,428,746, or 18 per cent, over the previous year. The gross earnings of the electric railways were \$6,349,202.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL.B.

DUTY OF MOTORMAN SEEING DOGS FIGHTING OR OTHERWISE IN DANGER ON TRACKS.

Harper v. St. Paul City Railway Co. (Minn.), 109 N. W. Rep. 227. Oct. 19, 1906.

When dogs are engaged in fighting upon street railway tracks, and are apparently oblivious to an approaching car, the motorman, upon discovering them in a position of peril, the supreme court of Minnesota holds, is required to exercise reasonable care by using proper signals or checking the speed of his car, to avoid their injury. Persons in charge of street cars, the court says, should not be required to slow down merely because dogs may be running in the vicinity of, along, or across the tracks. Under such circumstances, motormen may well assume that dogs will get out of the way. However, under the laws of this state dogs are property, and, whether rightfully or wrongfully upon the tracks, cannot be ignored when discovered in a position of danger. In this instance the dogs were engaged in a fierce fight, and their attention was not likely to be attracted by the noise alone of the approaching car. If the motorman was aware of their situation, then he should have taken reasonable precaution to avoid injury to them. There is no hardship in such a rule, and it has been generally applied, or recognized, in this class of cases.

DUTY TO EXCURSIONISTS CARRIED FREE—WHAT CONSTITUTES A COMMON CARRIER, ITS FRANCHISES AND DUTIES—WHO IS A PASSENGER.

Indianapolis Traction & Terminal Co. v. Lawson (U. S. C. C. A., Ind.), 143 Fed. Rep. 834. Feb. 6, 1906.

It having been agreed or understood that the company would give the delegates to a convention of women a free street-car ride, the United States circuit court of appeals, seventh circuit, says that this implied that it would furnish safe and suitable track, cars and appliances, the necessary power, and to apply that power skilled employees, who should be under the control of the company. The company was charged with the custody and care of human lives in a service voluntarily assumed, and it was of no importance whether it was in the technical relation of common carrier or not.

A public, common carrier of passengers is distinguished from private carriers by the franchises conferred upon it, and the obligations, restrictions, and liabilities with which it is charged, all flowing from considerations of public policy. It must carry all alike, and for a reasonable compensation, furnish reasonable accommodations, must continuously operate its line, and submit to reasonable regulation. It has the franchise of taking tolls, and, if a street railway corporation, the franchise of laying tracks in the streets, of stringing wires and setting poles, and the right of way over all private means of transportation. Owing these public duties, possessing these public franchises, and having the burden of caring for innumerable human lives, it is justly held to the highest degree of care and skill. This burden the company was bearing, and these public franchises it was employing, in carrying these delegates on this free ride.

A passenger is one who undertakes, with the carrier's consent, to travel in the carriage of the latter, otherwise than in its service. It is the existence of a contract of carriage, express or implied, which distinguishes a passenger from an employe, a licensee, an invited person attending on a passenger, and a trespasser.

In view of these characteristics of common carrier and passenger, what was the relation of the parties? At the very least the company was responsible for ordinary diligence, and liable for want of ordinary care. The trial court held, as matter of law, that the company was not a com-

mon carrier as to one of the women, who was hurt by a collision of two of the cars, was liable only for a want of ordinary care, and that the burden of proof to show negligence was on the plaintiff. This was a position sufficiently liberal to the railway company.

AN UNFENCED INTERURBAN ELECTRIC RAILWAY WHEREVER LOCATED IS LIABLE AS A "RAILROAD" FOR DOUBLE DAMAGES FOR LIVE STOCK KILLED.

Riggs v. St. Francois County Railway Co. (Mo. App.), 96 S. W. Rep. 707. June 5, 1906.

An unfenced interurban electric railway carrying passengers, express, mail, and some freight, the St. Louis court of appeals holds, is liable for double damages for killing live stock, under section 1105 of the revised statutes of Missouri of 1899 making railroads liable therefor. It says that it finds that the railroad in question, though incorporated under the provision relating to the organization of street railway companies, is within both the letter and spirit of the statute, and therefore it is manifest that the legislature intended that railroads of this class, when engaged in operating their cars through the country between towns, should fence their tracks as other railroads are required to do under like circumstances. The fact that the railroad ran along the north edge of the public road did not operate to relieve the railroad company from its duty to maintain fences. The county court could grant no authority to the company to operate its road in a manner violative of this positive statute which would operate to relieve it from the duties thereby imposed, and its duty to maintain fences remains the same wherever it is located, and if such a fence in the highway constitutes a public nuisance, or if the railroad itself constitutes a public nuisance, it is immaterial so far as this case is concerned.

DUTY OF PERSON IN CHARGE OF AN AUTOMOBILE OR OTHER VEHICLE AT ELECTRIC RAILWAY CROSSING—CONTRIBUTORY NEGLIGENCE.

Garrett v. People's Railway Co. (Del.), 64 Atl. Rep. 254. Mar. 13, 1906.

A person in charge of an automobile or other vehicle, approaching a railway crossing with which he is familiar, is bound, the superior court of Delaware says, through Boyce, J., charging jury, to avail himself of his knowledge of the locality and the presence of danger, and to exercise that degree of caution which an ordinarily careful and prudent person would exercise under all the conditions. The traveler in his automobile or vehicle should not approach such crossing at a greater speed than is consistent with safety. He should have his team or automobile under control, and be on the lookout for an approaching car, so that he may, the servant of the car being in the exercise of due care, avoid collision with the car; and where he sees, or by the exercise of reasonable care might see, an approaching car, he, as well as the servant of the car, should exercise reasonable care and diligence to avoid injury.

The law governing the use of public streets by automobiles is the same as that governing the use of such streets by carriages or other ordinary vehicles; and their use upon the public streets and the speed at which they may be driven should be consistent with safety.

Again, it is said: If you find that the plaintiff was unfamiliar with the safety appliances, and by reason thereof was unable to use them, or, being familiar with them, he failed to use in a reasonable and prudent manner the brakes of his automobile to prevent a collision with the car, or that he was driving his automobile at a greater rate of speed than one mile in seven minutes through a built-up portion of the city of Wilmington where the houses are and average less than 100 feet apart, or if you find that as he approached the crossing at Orange street he saw, or by looking could have

seen the approaching car in time, by the exercise of reasonable diligence, to slacken the speed of or to stop his automobile before it collided with the car, and he failed to do so, he was guilty of negligence; and if such negligence entered into or contributed to the collision at the time of the injuries complained of, it would defeat his right to recover in this action.

PERMISSION TO CROSS STEAM RAILROAD AS CONSIDERATION FOR CONTRACT ASSUMING RESPONSIBILITY AT CROSSING—RIGHT GIVEN BY CONSTITUTION APPLICABLE TO STREET (ELECTRIC) RAILWAYS—WHEN COMPENSATION MUST BE PAID.

Owensboro City Railroad Co. v. Louisville & Nashville Railroad Co. (Ky.), 94 S. W. Rep. 22. June 7, 1906. "Not to be officially reported."

By contract the electric railway company was granted permission to cross, with its street railroad, the road of the other company at a point south of the city of Owensboro. The contract contained the following provision: "And this permission is given upon the further consideration that the trains of the said Louisville & Nashville Railroad Company shall have precedence over the crossing. Said Owensboro City Railroad Company hereby agrees that all of its cars shall be stopped before passing over the crossing, and its motormen, drivers, and other employes shall see that the track is clear before crossing. And said Owensboro City Railroad Company shall be liable for all damages to people or property by reason of failure of its employes to stop its cars, and see that the track is clear before passing the crossing."

The steam railroad company sued the electric railway company for damages to a locomotive in a collision alleged to have been caused by the electric railway company violating its agreement by running one of its cars over the crossing without first stopping and without its employes first looking to see if the track was clear. But the electric railway company contended, among other things, that the contract was invalid for want of consideration.

In affirming a judgment for the steam railroad company, the court says that it is true that certain cases decide that the provision of section 216 of the state constitution that "all railway, transfer belt lines and railway bridge companies shall allow the tracks of each other to unite, intersect and cross at any point where such union, intersection and crossing is reasonable or feasible," is applicable to street railways as well as steam railroads. The street railway company unquestionably had the right to run its line across the track of the steam railroad company, but the question was did it have the right to do so without making just compensation to the latter for the right of way appropriated through its property? The court thinks not. The cases referred to were where crossings were made on streets and public highways, where the property belonged to the public and not to the railroad. The case here was different; the crossing was not on a street of a town, city, or on a public highway; it was in the country, and crossed the right of way of the steam railroad company. The section of the constitution referred to conferred upon the electric railway company the right to cross the steam railroad company's right of way and track, yet this right could not be exercised in a case like this, without first making compensation to the owner. In the cases referred to the railroads did not own any right of way along the streets or highways; they had been permitted to occupy them by those in control of the highways, and the roads attempting to cross, when given the right by those in control, had the same right in the highways as the roads that were first constructed thereon. In the court's opinion, there was a consideration received by the electric railway company sufficient to uphold this contract, at least to the extent it was sought to be enforced in this action.

News of the Week

Chicago Traction Ordinances Passed.

A few minutes before four o'clock in the morning on February 5 the city council of Chicago, at the end of an all night session, passed the Chicago City Railway and the Chicago Railways Company (Union Traction) ordinances. The vote stood 56 to 13. Mayor Dunne was very much opposed to the passage of the ordinances before the spring election; he is a candidate for re-election. His supporters in the council raised many objections and offered numerous amendments, but they were voted down in almost every instance. The city council has never before had such a meeting. About 50 amendments to each measure were submitted. After the final votes on the complete ordinance had been taken a reconsideration of the votes was asked. These motions were tabled, which has the effect of preventing the retraction of the ordinances.

Although some opposition to the consideration of the ordinances on Monday had been expected, comparatively little, beyond that which came from Mayor Dunne and his personal supporters, developed. The Federation of Labor passed resolutions protesting against action by the council before the spring elections and had a delegation present at the council meeting.

Mayor Dunne is chagrined over his failure to secure a postponement of action, and probably will exercise his veto power at the meeting of the council on February 11. To pass the ordinances over the veto will require a vote of only two-thirds of the aldermen, and the result of Monday's session indicates that the supporters of the measures have a safe majority over the necessary number. The mayor issued a statement in which he said:

"The uncalled for and indecent haste with which these ordinances were rushed through at high pressure in an early morning session of the council, called immediately after a high pressure session of the committee on local transportation, at which a large number of amendments were offered without being printed, and at which a most important agreement purporting to settle the General Electric Railway obstacle was for the first time presented, will not, in my judgment, tend to assure the people that the ordinances fully safeguard the public interests in the matter of provision for the municipalization of the street railway systems. Legislation jammed through in this hurried and precipitous manner is not likely to be regarded with confidence by the public at large."

Walter L. Fisher has resigned as special traction counsel to Mayor Dunne because the mayor's plan to postpone action on the ordinances did not have his approval. The city council committee on local transportation immediately engaged Mr. Fisher to act as its adviser on traction matters.

The referendum amendment which was incorporated in the ordinances provides that they shall not be effective unless a majority of voters approve them at the election on April 2. Mayor Dunne contends that this clause is so worded that the measures will be operative even without this approval.

The board of election commissioners received on February 5 from nine voters, acting for themselves and as the political committee of the United Societies for Local Self Government, a formal protest against the emergency referendum petition. They claim that the "alleged emergency referendum petition is illegal and invalid and contrary to the statute" which provides for the submission of public policy questions to voters. The reasons on which their objections are based are: That it contains three propositions on the same petition; that it is not signed by 25 per cent of the registered voters of the city; that it contains forged signatures and the names of fictitious persons, and is signed by aliens, non-residents and minors; and that some of the petitions contain certain propositions and others contain different propositions.

The board of election commissioners has taken official cognizance of both of the petitions filed on January 31. The committee on finance of the city council estimates that it would cost from \$10,000 to \$15,000 to investigate the "public policy" lists, and it will report this fact to the city council without recommendation. Isaac N. Powell, the chief clerk of the board of election commissioners, said that the board will decide no questions affecting either referendum until any objections which may be filed are heard. After the objections to the emergency referendum petition have been considered, those who filed the petition will be given a hearing.

The election commissioners take the position that under the law they must place the referendum questions on the "little ballot" unless objections which affect the legality of the petitions are raised and sustained. In this instance they anticipate that in any event the clause providing for a vote on the ordinances will be printed. The public policy petition has 184,000 names or more than double the required number. The other has 107,000 signatures. Under the ordinance as passed by the city council, the board of election commissioners, however, would have no power to submit this referendum at the April election, if by any contingency both petitions should be held invalid.

The petitions which were filed with the election commissioners on January 31 are entitled the "Public Policy Petition" and the "Emergency Referendum Petition." The first provides that there shall be submitted to voters the ordinances substantially in the form of the pending ordinances reported to the city council on January 15 authorizing the Chicago City Railway Company and the Chicago Railways Company, respectively, to construct, maintain and operate street railways and providing for the purchase thereof by the city council or its licensee.

The other petition contains three clauses, the first of which is identical with the wording of the public policy petition. The second clause is entitled "For a municipal railway system, one city, one fare, versus franchises." It reads: "Shall the city council proceed by condemnation under the Mueller law to acquire and equip a complete, modern, unified street railway system, with one fare and universal transfers for the entire city, instead of passing the pending franchise ordinances?" The third clause has no bearing on the traction situation; it refers to a repeal of the Illinois Sunday blue laws of 1845.

One of the principal features included in the settlement of the situation is an agreement with the General Electric Railway Company. It was read to the council and guarantees that the Chicago City Railway Company will take over the rights of the General Electric Railway Company if the ordinance is passed and approved. The agreement provides that John A. Spoor and Thomas E. Mitten for themselves and associates will deposit with the First Trust and Savings Bank certain bonds, stock certificates and promissory notes of the General Electric company. The bank as trustee will secure to the city the power to cancel the General Electric franchise if the City Railway ordinance becomes operative before July 1, 1907. These securities are to be held in trust until the tracks of the General Electric have been removed from the streets and all its rights have been annulled. After that the securities are to be returned to Mr. Spoor and Mr. Mitten. In the event that the ordinance does not become operative before that date, the securities are to be returned to the two men. Another amendment alters the two ordinances so that they apply to any changes in the city limits in the future.

The Chicago Real Estate Board has appointed a committee to urge and work for the approval of the ordinances at the election.

The ordinances provide for the expenditure on improvements of \$40,000,000 within three years. Twenty-three through routes without change of cars between the three sections of the city will be established. The traction companies may be required to furnish \$5,000,000 for a downtown municipal subway. The municipality will have the right to take over the systems on six months' notice by reimbursing the companies for the value of \$50,000,000 agreed upon, plus the money to be expended for improvements. Fifty-five per cent of the net receipts from operation are to be paid to the city annually.

The directors of the Chicago Railways Company met on Friday and passed a resolution formally accepting the amendment to their ordinance which provides for a referendum.

Cincinnati Traction Officials Indicted.

President W. Kesley Schoepf, Secretary Robert E. Lee and Superintendent Newton Wickersham of the Cincinnati Traction Company have been indicted by the grand jury for "permitting a motor street car to remain without proper protection to the motorman." This action is on account of an accident on December 30, when 2 men were killed and 30 injured. J. H. Schoepf, claim agent, and William E. Blosing, foreman at the car barns, were also indicted for refusing to answer a subpoena of the grand jury, and for failing "to produce in court certain documents and paraphernalia of the traction company," the latter referring to parts of the wrecked car and books of the company which they were ordered to produce in court.

Iowa Street and Interurban Railway Association.

Secretary L. D. Mathes, of Dubuque, Ia., announces that the fourth annual convention of the Iowa Street and Interurban Railway Association will be held at the LaFayette Inn, Clinton, Ia., on April 19 and 20. The program is not yet complete for announcement in detail, but will include the following papers: "The Steam Motor Car—Its Value for Interurban Service," "Freight Handling by Electric Lines," "Amusements—How Should this Feature be Handled by the Operating Companies," "Modern Train Dispatching Methods for Electric Railways" and "Handling the Peak, or Rush Hour Traffic on City and Interurban Lines." Those who have attended former meetings of the association will recall that it is the practice of the association to thoroughly discuss the papers read. Ample exhibition space has been provided for representatives of the supply trade. Inquiries concerning hotel reservations and other matters in connection with the convention should be addressed to Mr. P. P. Crafts, general manager, Iowa & Illinois Railway Company, Clinton, Ia. The officers of the Iowa Street and Interurban Railway Association are as follows: President, F. J. Hanlon, Mason City, Ia.; vice-president, P. P. Crafts, Clinton, Ia.; secretary and treasurer, L. D. Mathes, Dubuque, Ia.

Bill to Tax New Hampshire Street Railways.—A bill has been introduced in the legislature providing for a tax of from one to three per cent, according to certain conditions, upon the gross receipts of all electric railways.

Indiana One-Cent Fare Bill Killed.—The bill introduced in the Indiana legislature by Representative Joyce of Vigo county to compel all the interurban roads in Indiana to make a flat rate of one cent a mile was rejected in the house by a vote of 62 to 27. At the suggestion of Representative Kelley, Mr. Joyce will introduce a new bill making the rate 1½ cents per mile.

Growth of the Railroad Y. M. C. A.—The railroad department of the International Committee of Young Men's Christian Associations, 3 West Twenty-ninth street, New York, has just issued its annual pamphlet called "Progress and Outlook," which shows the growth of the railroad department for the year 1906 and the prospects for the year 1907. The summary for 1906 shows that there are now 230 associations, a gain of 23 over the previous year, with a membership of 81,610, an increase of 10,286, and that the

associations own 162 buildings, an increase of 32, with a valuation of \$3,000,150, \$742,400 more than in 1905. The pamphlet contains several half-tone engravings of some of the association buildings.

Vacuum Cleaning System in Portland.—The Portland (Ore.) Railway Company has recently begun using the vacuum system for cleaning its cars. The apparatus, which consists of a rotary air suction pump, driven by a 5½-horsepower motor, capable of developing a vacuum of 21 to 25 inches, is installed in an old car, and may be taken from one car barn to another. From 30 to 40 cars a day may be cleaned in this way.

To Permit Cities to Acquire Street Railway Property.—It is stated that a bill similar to the Mueller law now in force in Illinois to permit cities to acquire street railway and other corporation property by issuing certificates secured by the property itself instead of bonding the other property in the city, will be introduced into the Minnesota legislature soon. The measure was recommended by the governor in his message.

Attack Against Overhead Trolley System in San Francisco.—It is reported that Ernest H. Wakeman, an attorney of San Francisco, will bring an action in the United States circuit court at San Francisco against the United Railroads Company, in order to have the overhead trolley system declared a nuisance, on the ground that it is a menace to human life. It is also declared that the franchise which permits the overhead wire is invalid.

North Alabama Traction Company to Build Amusement Park.—The North Alabama Traction Company of New Decatur, Ala., is planning the construction of an amusement park and though nothing definite has been done toward the selection of amusement devices Mr. W. R. Hall, general manager, anticipates having the park ready for business in the early summer. The company operates about 11 miles of city lines, serving a population of upwards of 16,000.

Half Fare for Passengers Without Seats.—A bill introduced into the Oregon legislature requiring street railway companies to issue a rebate ticket worth half the amount of the fare paid was defeated on January 30 because of a technicality, although it is stated that there was a strong sentiment in favor of it. According to the provisions of the bill the companies were not allowed to refuse transportation to passengers after the seats had all been occupied, unless another car was following not more than five minutes behind.

Additional Amusements for Olcott Beach Park.—A large tract of land adjoining the park of the International Railway Company at Olcott Beach has been leased to the Charles Amusement Company of Buffalo, N. Y. It is announced that Charles W. McMahon is president and Charles G. Stevens secretary and treasurer of the new company. It is the intention to install various devices for the diversion of pleasure seekers, from the figure eight and circle swing to the Ferris wheel, and the ground will be broken for the foundations as soon as the weather will permit.

Bill to Make Interurban Railways Common Carriers.—A bill has been introduced into the Texas legislature to regulate the powers and duties of electric interurban railways. An interurban electric railway is defined as one which operates wholly by electricity between two or more incorporated cities or towns in the state, and such railways are authorized to carry freight and express as well as passengers, as common carriers. They shall report to and be regulated by the Texas railway commission, except as regards rates, which shall be under the control of the legislature.

New York Franchise Taxes.—The total franchise tax levied against the street railway companies operating throughout Greater New York from the first levy of 1900 up to and including 1905 is officially reported at \$16,964,258. Cancellations by order of court amount to \$2,081,898, and partial payments have been made aggregating \$5,765,746, leaving a balance still outstanding of \$9,116,613. Interest to February 1 at 7 per cent on this sum, which is allowed by law, is \$2,366,275, making a total of \$11,482,888 which is claimed by the city. The Metropolitan Street Railway Company is charged with \$3,732,143 of this sum and the Brooklyn Rapid Transit Company with \$2,222,622.

Automobile Railway in Indiana.—Thomas J. Honan, of Jackson county, has introduced a bill into the Indiana legislature which gives the right of condemnation and other privileges accorded to steam and electric railroads to companies desiring to operate automobiles over a private right of way. The bill is said to be in the interest of Z. T. Sweeney, of Columbus, and others, who propose to operate an automobile line between Seymour and Brownstown over a concrete roadbed, with a high rail of concrete on each side to confine the wheels. One of the promoters has stated that they will run cars carrying from 30 to 50 people, and that the cost of construction will be about half that for an electric line.

Cleveland Traction Situation.—No announcement has yet been made as the result of the conferences between President Andrews of the Cleveland Electric Company and President Dupont of the Municipal company to determine the value of the old company's property. Both companies have large forces at work making appraisals independently. On Monday, February 4, Mr. Dupont and Mr. Davis reported to the city council that until the value of the physical property of the Central avenue-Quincy street route had been determined it would be impossible for them to determine the amount due the city from the company for the use of those streets since the expiration of the franchises. The Municipal Traction Company has adopted a novel plan for advertising and extending its three-cent fare system, by accepting the Cleveland

Electric 3½-cent tickets for transportation on its own cars without any arrangement with the Cleveland company for redeeming them. These tickets are then sold again to the conductors for further use at three cents each.

Indicating Signs for Express Trains in New York Subway.—The Interborough Rapid Transit Company, which operates the New York subway system, has adopted at Wall, Fulton and Grand Central stations a system of designating express trains that considerably relieves the confusion on these platforms. At every half car length along the platforms a small sign is suspended by wire from above and these indicate alternately the Broadway and the West Farms express. The trains are stopped so that the entrance doors are always opposite the proper sign.

New Headquarters for American Street and Interurban Railway Association.—Secretary B. V. Swenson announces that the headquarters of the American Street and Interurban Railway Association will be moved on Tuesday, February 12, from 60 Wall street to the Engineering Societies building, 29 West Thirty-ninth street, New York. This change in address is made in accordance with the plans of the executive committee, as announced at the Columbus convention. The association will have more commodious offices than heretofore and it is believed that the plan of having the headquarters of all the national engineering and allied societies in one building will work out most advantageously to the general interests and welfare of these associations.

The Electric Journal Topical Index.—The new topical index for the first three volumes of "The Electric Journal," published by The Electric Club, of Pittsburg, Pa., has just been issued. This paper has adopted the plan of issuing annually an index covering all of the preceding volumes, so that it is not necessary to look through a number of volumes to find a desired article, but any article in any volume, along with all articles on the same subject, may be quickly located. This seems especially useful in connection with a technical publication in which the contents are valuable for reference, as it is the experience of almost every engineer who has had occasion to refer to a technical periodical, that it is a very tedious task to find information from back numbers along any desired line, when there is a separate index for each volume.

Result of T-Rail Controversy in Columbus.—An official of the Indiana Columbus & Eastern Traction Company is authority for the statement that this company will probably make no permanent improvements in Columbus, O., in the way of either a passenger or freight station until the T-rail controversy is settled in a manner satisfactory to it. The company plans to put on heavier passenger cars with deep flanges that will admit of high rates of speed and these plans, he said, are effectually blocked by the position the city authorities have taken in demanding the laying of grooved rails in the city. The general offices of the passenger, freight and claim departments have taken leased quarters in the new First National Bank building and arrangements are being made to increase facilities for handling freight at the old interurban station.

Valuation of Milwaukee Electric Railways.—The physical valuation of the properties of the Milwaukee Electric Railway & Light Company, including both city and interurban mileage, is now being determined for the Wisconsin State Board of Assessment and the Railroad Commission of Wisconsin. The valuation staff has been drawn in part from the staff hitherto engaged in the valuation of steam roads in Wisconsin and in part from The Arnold Company of Chicago, which recently had charge of the valuation of the street railway properties of Chicago. Prof. W. D. Pence, M. Am. Soc. C. E., engineer for the two state commissions, has charge of the valuation and with him are associated Bion J. Arnold, M. Inst. C. E., president of The Arnold Company, consulting engineer; C. M. Larson, chief roadway inspector; Prof. John G. D. Mack, M. Am. Soc. M. E., chief mechanical inspector; and George Weston, chief electrical inspector.

Electrolysis Controversy in St. Paul.—It is announced that an agreement may be reached between the St. Paul water board and the St. Paul City Railway Company regarding the electrolysis of the water pipes. The railway company has taken exception to the report of the water board's expert, Prof. D. C. Jackson, on the ground that the additional improvements he suggests would cost \$100,000. Prof. Jackson states in his report that although the returns have been much improved, material damage will be caused to the water mains unless the returns are considerably increased. The railway company has asked the board to arrange a meeting between their engineers and Prof. Jackson to discuss a compromise plan. In case of failure on the part of the railway company to comply with any reasonable demands, the board will again institute the \$500,000 damage proceedings which were brought against the railway company to cover the damage caused to the piping system.

May Use Wooden Cars in Bridge Loop Subway.—The plan and scope committee of the New York rapid transit commission at a meeting on February 5 decided to allow the Brooklyn Rapid Transit Company to use rolling stock that need not be fireproof in the proposed new subway loop to connect the Williamsburg and Manhattan bridges. President Winter of the Brooklyn Rapid Transit appeared before the committee and said that he was not prepared to give assurances in behalf of his company that it would change its rolling stock to fireproof cars to be assured of use of the subway loop. Mr. Winter explained that his company was constantly getting rid of its inferior cars and replacing them with modern steel and wood cars of a substantial type. After a thorough discussion it was decided to report a resolution to the full board on

Thursday, February 7, allowing the Brooklyn Rapid Transit Company to use rolling stock in the subway loop such as it is using on its elevated lines, provided that the cars shall be at least as good as the most modern cars recently purchased by the company.

Report on Electrification of Erie Railroad.—It is announced that the commission appointed over a year ago to investigate the subject of the electrification of the Erie's suburban lines in New Jersey, will make its report to the board of directors in a few days. The committee is composed of Vice-President J. M. Graham, L. B. Stillwell and B. J. Arnold. The New Jersey suburban territory now being considered in this connection includes the New Jersey & New York division for 33 miles; the Northern Railroad of New Jersey, 29 miles, to Nyack; the Greenwood Lake division, including the Morristown branch, 33 miles on the main branch, 14 miles on the Morristown branch, and 4 miles on the Orange branch. The main line is to be electrified as far as Tuxedo, 39 miles; the Newark branch, from Jersey City to Paterson, 19 miles, and the New York Susquehanna & Western for 39 miles. Westinghouse, Church, Kerr & Co. are now engaged in electrifying the main line of the Erie from Rochester to Avon, N. Y., and the branch from Avon to Mt. Morris, 34 miles in all. A trial trip was made recently between Rochester and Avon, 19 miles, and the line is expected to be in regular operation some time this month. Single-phase alternating current is used at a pressure of 11,000 volts. Power is received from Niagara Falls.

Bill to Promote Electric Railway Building.—The building of trolley lines in Minnesota is likely to receive a new impetus, if a bill introduced into the lower house of the legislature by N. F. Hugo of Duluth becomes a law. The bill is intended to facilitate the building of electric railways in country districts by offering the privilege of freight transportation, and its provisions include the general regulation of lines running from cities and towns into surrounding country territory. According to the bill any electric railway company already organized or hereafter to be organized is empowered to construct, operate and maintain lines in territory outside of the corporate limits of cities and towns, and along country roads or through private property, and to carry both passengers and freight for compensation, to condemn property for that purpose, and, furthermore, with the consent of city or town authorities, to connect its lines with central stations in cities or towns for the receipt of passenger freight. While the bill is general in its scope, it was framed especially to cover a need at Duluth. Several of the residents of the country districts outside of the city have offered to the Duluth Street Railway company to build a line such as they want if the company will maintain and operate it. The company is unwilling to agree to the plan unless it can have the privilege of carrying freight, which is now contrary to law.

Settling Claims Against Street Railway Corporations in New York.—The New York City Railway Company last week tendered Comptroller Metz \$150,000 in part payment of the city's claim of \$403,790 on account of deferred car license fees, with the understanding that the payment is not to prejudice the company's allegation that the city's claim is excessive. The case has been in the courts for some time and several administrations have tried to collect the fees. The contention of the company is that the city is trying to collect for both summer and winter cars, and that this is essentially unjust, as about half the company's cars are housed at varying seasons. The company is unwilling to pay more than for the number of cars actually in use the year round. Mr. Rives, former corporation counsel, contended that the law bound the company to pay on every car for which a license was issued.—Attorneys representing the company have also called upon Corporation Counsel Ellison to discuss arrangements for a settlement of the city's claims for repaving between the company's tracks. The claims cover a period of about ten years and amount to \$1,512,000. When Mr. Rives was corporation counsel he brought suit to recover the amount and a referee was appointed but never gave a decision. The company contends that since the introduction of electricity as motive power it should not be obliged to pay for repaving and that the case is not the same as in the days of horse-cars, when the horses wore out the pavement.

American Association Committee for 1907.—Since the issue of the Electric Railway Review of February 2, the membership of two additional committees for the work of the 1907 convention of the American Street and Interurban Railway Association has been completed as follows:

Standard Code of Rules.

E. G. Connette, chairman, general manager Worcester Consolidated Railway Company, Worcester, Mass.

E. C. Faber, general manager Aurora Elgin & Chicago Electric Railroad, Wheaton, Ill.

E. J. Lyon, superintendent Schenectady Railway Company, Schenectady, N. Y.

F. J. Stout, general manager Lake Shore Electric Railway Company, Cleveland, O.

J. N. Shaughnessy, general manager Fonda Johnstown & Glensville Railroad Company, Glensville, N. Y.

Standardization.

H. C. Page, chairman, general manager Springfield Street Railway Company, Springfield, Mass.

T. W. Wilson, general manager International Railway Company, Buffalo, N. Y.

John Murphy, general superintendent Pittsburg Railways Company, Pittsburg, Pa.

H. A. Nicholl, general manager Indiana Union Traction Company, Anderson, Ind.

H. Wallerstedt, electrical engineer, Ford, Bacon & Davis, New York city.

Construction News

INCORPORATIONS.

Black River Electric Power Lighting & Railway Company.—Incorporated in New Hampshire to build a lighting and power plant and to build an electric railway from Claremont, N. H., to Ludlow, Vt. Capital stock \$1,000,000. Incorporators: John B. Reynolds, New York, president; J. E. Jones, Boston, treasurer; Fred C. Davis, of Springfield, Mass., superintendent.

Dallas Interurban Electric Railway.—Incorporated in Texas to build and operate an electric line from Dallas to other points in Texas under a franchise granted to J. Mercer Carter and associates last September. It is stated that plans for the local and interurban service already have been prepared by the American Engineering Company and that construction is to begin within six months from date of the franchise. It is also agreed that there shall be 20 miles of interurban railway entering the city within one year from the beginning of construction. Capital stock, \$2,400,000, of which \$1,800,000 is common and \$600,000 preferred stock. Bonds are to be issued on a basis of \$30,000 for each mile of railway. Incorporators: D. D. Waggoner, president; J. J. Willingham, first vice-president; J. Mercer Carter, second vice-president; Charles T. Alexander, third vice-president; Sidney A. Stermons, secretary; M. H. Wolfe, treasurer; W. H. Clark and W. T. Henry, attorneys; Alexander Sanger, E. M. Kahn, C. C. Slaughter, Robert Ralston, Edward Titche, R. C. Buckner, O. H. Lang, J. B. Nabors and D. Sonnentheil, all of Dallas.

Enid City Railway.—Incorporated in Oklahoma to build a street railway in Enid. Capital stock, \$500,000. Incorporators: John Hall, Albert E. Manuel and Charles Bosler, of Dayton, O.; Carl Kruse and W. H. Hills, of Enid.

Greenville & Greenwood Railway.—Incorporated in South Carolina to build from Greenville to Greenwood. Capital stock \$100,000. Incorporators: H. H. Prince, president; S. A. Anderson, of Marietta, Ga., vice-president; F. C. Owens, Atlanta, Ga., treasurer, and T. J. Connors, secretary.

Hornell Bath & Lake Keuka Railway.—Incorporated in New York to build an electric railway 46 miles long from Hornell, Steuben county, to Jerusalem, Yates county. Capital stock, \$1,000,000. Incorporators: F. W. Hastings, W. R. Campbell and W. H. Phillips, of Bath, N. Y.

Ithaca & Seneca Falls Electric Railway.—Incorporated in New York on February 4 to operate an electric road 50½ miles long from Ithaca to Seneca Falls, with branches from Willard to Ovid and from Trumansburg to Mecklenburg. The capital stock is \$1,000,000 and directors named are J. N. Hammond and T. J. Cleary of Seneca Falls and Jacob Rothschild of Ithaca.

La Crosse & Winona Traction Company.—Incorporated in Minnesota to build and operate an electric line from La Crosse, Wis., to Winona, Minn. This is a subsidiary company of the La Crosse Water Power Company, which is developing water power from the Black River at Hatfield, Wis. Capital stock, \$50,000. Incorporators: C. M. Morse, president; C. P. Crandall, vice-president; F. H. Sampson, secretary, and C. M. Green, treasurer, all of Winona. E. Boynton of La Crosse, is one of the directors.

Manitou & Crystal Park Railway.—Incorporated in Colorado to build an electric line from Manitou to Crystal Park. It is stated that the company is planning a scenic railway on a large scale with a line from Crystal Lake through the mountains to Cheyenne canon. It is announced that the road from Manitou to Crystal Park will be completed and in operation by next summer. Capital stock, \$1,300,000. Incorporators, J. K. Vanatta and C. W. Dolph, Colorado Springs, and E. A. Sawyer, engineer.

Manitou & Interurban Railway.—Incorporated in Colorado to build an interurban line from Manitou to points in Colorado. Capital stock, \$300,000. Incorporators, J. K. Vanatta, C. W. Dolph and E. A. Sawyer, Colorado Springs.

Minster Lorain & Southern Railway.—Incorporated in Ohio to build an electric railway from Minster, Auglaize county, to Versailles, Darke county, 18 miles. Capital stock, \$10,000. Incorporators: J. H. Goeke, William Schulenberg, F. M. Horn, R. J. Defenbrock and P. B. Henderson. Headquarters, Wapakoneta, O.

Mississippi Valley Electric Railway.—Incorporated in Illinois with a capital stock of \$2,500. Incorporators: Howard T. Wilcomin, Arthur W. V. Eastburn and Charles W. Lucas.

People's Railway.—Incorporated in Pennsylvania to build 2 miles of electric railway in the borough of Ellwood City, Lawrence county, Pa. Capital stock, \$12,000. Incorporators, James Campbell and Frank Sheridan, Ingram; Gomer L. Jenkins, Pittsburg; Frank S. Christy, Crafton, Pa.

Prosser Traction Company.—Incorporated in Washington to build a line westward from Prosser 10 miles and one eastward 35 miles. Capital stock, \$150,000. Incorporators, Frederick Finn, president, F. A. Jenne chief engineer; J. W. Callicotte, G. A. Todd and George E. Boomer, Prosser, Wash.

Redlands & Yucaipe Electric Railroad.—Incorporated in California to build an electric line from Redlands to Oak Glen in the Yucaipe valley, 18 miles; also to manufacture gas, electricity and ice. The road will traverse the principal streets of Redlands and from the city limits will run to Oak Glen in the mountains. It is stated that the company intends to develop the country around

Oak Glen and eventually make of it a large summer resort. Capital stock, \$1,000,000, of which \$15,000 has been subscribed. Incorporators: C. S. Chesnut, G. H. Dunn, O. D. Miller and A. A. Moore.

Wawasee Ligonier Topeka & Lagrange Railway.—Incorporated in Indiana to build an interurban line from Lagrange to Wawasee, Ind., through Kimmell, Cromwell, Topeka and Ligonier, Ind., with headquarters at Ligonier. The company will also furnish light and power for commercial purposes along its route. Capital stock, \$50,000. Incorporators: F. H. Green, Frank P. Bothwell and F. E. Weir, Ligonier; Sumner Dowell, I. J. Vaughn and J. N. Babcock, Topeka, and A. J. Hostetter, B. B. Johnston and F. J. Dunten, Lagrange, Ind.

Wilmington & Wittingham Traction Company.—Incorporated in Massachusetts with a capital stock of \$50,000 to build an electric line from the Massachusetts state line at Halifax, Vt., north through Halifax, Wittingham and Wilmington. It is stated that this project is the outgrowth of the purchase of the controlling interest in the Shelburne Falls & Colerain Street Railway Company by a syndicate in which Martin A. Brown, of Wilmington, is interested. It is said the plan is to extend the present line to the railroad station at Shelburne Falls and later north to Wilmington.

FRANCHISES.

Albia, Ia.—A franchise has been given the Albia Electric Light & Power Company for a street railway in this city. It is stated that the owners of the Albia system also control the building and operating of the interurban line from Oskaloosa to Buxton which is believed to indicate that it will be extended to Albia. It is announced that work will be started on the line in the spring.

Cherryvale, Kan.—The Union Traction Company has accepted the franchise recently granted by the council. This provides that \$1,000 shall be deposited by the company as a guarantee that the road will be built according to the terms of the franchise, one of which is that it shall be finished within 16 months after acceptance. The company has also asked for a franchise in Parsons.

Demopolis, Ala.—A franchise has been granted to F. M. Abbott for the Demopolis & Linden Railroad, which proposes to build a street railway in Demopolis and a line to Linden, Ala.

Green River, Utah.—A franchise has been granted to Merritt & Cook for an electric line from the city to the dam on Green river, 7 miles long, with the privilege of furnishing power for lighting the city.

Hammond, Ind.—The Gary Hammond & Eastern Interurban Railway has applied for a 50-year franchise to operate over certain streets of Hammond. William Walmsley, formerly of the South Chicago Street Railway Company, made the application.

Joliet, Ill.—The city council has reconsidered the ordinance recently passed granting the Chicago & Joliet Electric Railway Company a 20-year franchise for laying tracks on Western avenue and has amended it to read "until 1920" instead, so as to make it co-existent with other grants. It is stated that the company intends to ask for the privilege to lay a double track on Chicago street as far as Fifth avenue and on Fifth avenue to Sherman street; also from Chicago street east on Jefferson to Eastern avenue and south to Second avenue.

Marion, Ind.—The Grant, Miami, Cass & Western Traction Company will ask for a franchise at the next meeting of the county commissioners. The line will run from Marion to Logansport and will touch 12 towns along the route. It is said that a 5-cent fare between stations will be charged, with \$1 for the round trip between Marion and Logansport.

Marlin, Tex.—The Buckeye Transit Company has made application for a 50-year franchise for an electric line in this city. This is the company which is to build an interurban line from Marlin to Temple by way of Mooresville and Waco. Work is to be begun within two years from the date of the franchise.

Owatonna, Minn.—The Twin City Rochester & Dubuque Electric Railway, which proposes to build an electric line from Minneapolis and St. Paul to Dubuque, Minn., has applied for a franchise.

Peru, Ind.—The Marion & Logansport Interurban Company has made application for a franchise through Jackson, Harrison, Clay and Pipe Creek townships. It is said that the company already has secured right of way paralleling the Pennsylvania road and that grading will be begun within a few months. The line will pass through Sweetzer, Mier, Converse, Amboy, McGrawsville, Loree, Bunker Hill, Onward, Anoka, Ind., with terminals at Marion and Logansport.

San Angelo, Tex.—Col. J. H. Ransom, Boulder, Colo., has asked for a franchise to build a street railway. He agrees to build one mile the first year, three the second and four the third. He also asks that the property be forever exempt from taxation, agreeing to pay, after the fifth year, $\frac{1}{4}$ of 1 per cent of the gross earnings of the system to the city.

Sandusky, O.—The Sandusky Fremont & Southern Railway has been granted a 25-year franchise across Depot and Norwalk streets in Castalia. The company has agreed to pay for a 24-inch cement tile under the bed of the stream for drainage purposes. It is stated that the crossing with the Pennsylvania road will be accomplished by either an under or overhead grade-crossing part of the expense of which will be borne by the latter company.

Tecumseh, Mich.—A franchise has been granted to the Adrian

Ann Arbor & Detroit Electric Railway, which proposes to build an electric railway connecting the towns named in the title.

TRACK AND ROADWAY.

Addison & Woodhull Electric Railroad.—A meeting has been called to discuss plans and secure stock subscriptions for the construction of this road, which is proposed to connect Addison and Woodhull, N. Y., via Jasper.

Amarillo Street Railway.—This company is letting contracts and making preparations to begin work on the street railway line in Amarillo, Tex. By the terms of the franchise work must be started by April 11 and at least three miles must be in operation by November 11. H. A. Nobles, Amarillo, president.

Boston, Mass.—The Massachusetts railroad commissioners recently held a hearing to consider granting a certificate of necessity to two companies which propose to build electric railways between Boston & Providence. One is the Boston & Providence Interurban Electric Railroad, backed by the Stone & Webster Engineering Corporation and the Gaston-Shaw interests, of Boston, which expects to build a high-speed interurban line on a private right of way. The other is the Boston & New York Electric Railroad, in which A. B. Leach and O. B. Clancy and others, of Boston, are interested. This company intends to build its road through the streets of the towns and cities or on the highways rather than on a private right of way. The hearing was postponed until February 11, at which time both companies are to give further details as to the routes.

Central California Traction Company.—One of the officials of this company has announced that it is expected to have the line between Stockton and Lodi in operation by April 1. The rails and ties are on the ground, and the contractor for the grading and trestle work is making preparations to begin work as soon as the weather permits. E. P. Hilborn, general manager, Stockton, Cal.

Central Interurban Traction Company.—Charles A. Gutke, president, 1113 Chemical building, St. Louis, writes that it is expected to begin grading on June 1, on 24 street railway lines in St. Louis, to connect with the Hillsboro Kimmswick & Southern Railway, which will build from the city limits to the Flat River.

Chicago South Bend & Northern Indiana Railway.—Samuel T. Murdock, of Lafayette, Ind., general manager of this company, which has been incorporated to take over the Northern Indiana Railway and build extensions, is quoted as saying that work is to begin at once on a line from South Bend to Michigan City, Ind., 28 miles, with construction material already obtained by the Northern Indiana. Mr. Murdock states that this line should be completed by January 1, 1908, and that another extension, from Michigan City to Chicago, about 35 miles, will be completed in about two years.

Cleveland Alliance & Mahoning Valley Railway.—It is reported that James W. Holcomb, of Cleveland, the promoter of this road to connect Cleveland with Ravenna, Alliance and Warren, O., has effected an agreement with the Everett-Moore interests in the Northern Ohio Traction & Light Company whereby they will join in the construction of the road, making use of the Northern Ohio tracks for part of the distance. It is also stated that a new company will be organized at once to build the first section of the road, from Ravenna to Warren, electrifying the road between Ravenna and Newton Falls which has been leased from the Baltimore & Ohio.

Columbus Marion & Bucyrus Railroad.—George Whysall, general manager, Marion, O., writes that this company which is building an extension of the Columbus Delaware & Marion Railway from Marion to Bucyrus, O., is now clearing the right of way in order to be ready to begin grading as soon as the weather is suitable. Some of the grading has been done and in the spring the work will be rushed to completion, in the endeavor to have the road in operation by June 1.

Dillonvale & Ohio River Traction Company.—At a recent meeting of the directors it was decided to begin work this month on the road from Rayland to Dillonvale, O., $6\frac{1}{2}$ miles. Most of the right of way has been obtained. T. J. Stringer has the contract.

Eastern Iowa Traction Company.—This company is making surveys for an electric railway between Dubuque and Davenport, Ia., and the complete plans include further extensions south through Burlington, Keokuk and Hannibal to St. Louis and north to Minneapolis and St. Paul. Mrs. Alice M. Butler, of Davenport, is one of the promoters.

Frankfort Delphi & Northern Traction Company.—W. H. Cohee, vice-president and general manager, Frankfort, Ind., writes that this company proposes to build an electric railway from Frankfort, Ind., to Chicago, via Delphi, Monticello, Monon and Hammond, connecting at Frankfort with the Indianapolis & Northwestern Traction Company. The section of the road under consideration for immediate construction is that from Frankfort to Delphi, Ind., 27 miles, via Rossville, Endner Mills and Plymouth. A right of way 50 feet wide has been secured except in towns. At Pymont, on the Wild Cat river, it is expected to build a dam and develop a water power capable of generating 1,500 horsepower. A. S. Straus, 233 Franklin street, Chicago, president; James R. Brown, Frankfort, Ind., chief engineer.

Houston Electric Company.—This company has begun the work of reconstruction of several of its lines in Houston, Tex. The track of the San Felipe line is being relaid and a portion of the

Heights Boulevard line has been relaid. David Daly, manager, Houston, Tex.

Illinois Traction Company.—The track is now laid on the Bloomington-Peoria line from Bloomington to East Peoria, although all of the poles and wires have not yet been put up. Cars were operated over the Champaign-Decatur line from Champaign to Seymour on Saturday, February 2.

Indiana Columbus & Eastern Traction Company.—Superintendent A. F. Schoepf, of the Columbus and Springfield division, has been authorized to commence work on the construction of the London cutoff early in the spring. This will shorten the main line between Columbus and Springfield about seven miles, and as the London stop will also be eliminated it will shorten the running time of the Columbus-Springfield limited cars almost 30 minutes. The cutoff extends from Lafayette to Summerford in Madison county, O., a distance of five miles. The present line extends south, from Lafayette on the east and Summerford on the west, in order to take in London, the county seat of Madison county, and the distance by that route is 12 miles. Vice-President Norman McD. Crawford, General Manager J. L. Adams and Superintendent Schoepf walked over the cutoff right of way last week and decided upon various details of the construction. This will be an expensive piece of work, as several heavy fills will be necessary and three steel bridges will have to be built. The longest of the bridges will be 153 feet, crossing Deer creek. The other bridges will be about 40 feet each. Each will have concrete piers.—The company is now doing the preparatory work on the line between Lima and Defiance, O., in order to be able to rush the construction in the spring. The Columbus & Lake Michigan steam road, which covers a part of the distance, is to be electrified. The company has purchased 15,000 ties and is distributing them along the right of way.

Knoxville Railway & Light Company.—The work of double-tracking the Main street line in Knoxville, Tenn., from Prince street to Temple avenue, has just been completed. As soon as the weather will permit the company will begin double tracking the Broadway line from Fifth avenue to First Creek.

Leroy & Southwestern Railroad.—A. H. Shelby, of Wapello, Ill., president, writes that contracts are to be let for construction and equipment of this line from Leroy to Waynesville, Ill., 23 miles, via Southdowns, Solomon, Wapella and Scott. It is proposed to operate the line with some form of gasoline-electric motor cars, of a sufficient power capacity to haul trains of 15 or 20 freight cars, as the line will be built principally for freight. Two passenger cars, a combination baggage and mail car, and about 50 freight cars will be required. The company is now considering a proposition to finance, construct and equip the line, but is willing to entertain separate proposals, for financing, and construction and equipment.

Lynchburg Traction & Light Company.—It is stated that this company is considering plans for an extension of this line from Lynchburg, Va., to a connection with the Tidewater Railway at Clayton's Ford bridge, 22 miles.

Mesaba Traction Company.—The Duluth Surveying Company is making surveys for this line, which is to connect Blwabik and Hibbing and other towns on the Mesaba range, Minnesota. F. B. Meyers, of Blwabik, is president.

Milwaukee & Fox River Valley Railway.—The final survey for this company's proposed line from Fond du Lac to Chilton, Wis., has been started. The preliminary surveys were made some time ago and it is stated that the right of way has been secured. J. M. Saemann, of Sheboygan, Wis., president.

Northern Texas Traction Company.—M. M. Phinney, of Dallas, Tex., general manager, states that the preliminary work on the proposed lines in Texas is progressing rapidly. The lines are: from Galveston to Houston; from Dallas to Ennis, via Waxahatche, and from Ft. Worth to Cleburne.

Omaha & Council Bluffs Street Railway.—The directors decided last week to begin construction in the spring on three city lines in Omaha, on Twenty-fourth street, on Fortleth street, and on L street.

Pacific Traction Company.—Work has been resumed on the grading of this company's line from Tacoma to American Lake, Wash. It is estimated that about 19,000 cubic yards of excavation will be required. B. J. Weeks, of Tacoma, general manager.

Plainfield & Sterling Railway.—H. H. Gallup and others have applied to the Connecticut legislature for a charter for this company. They propose to build an electric railway from Moosup to Sterling, Conn.

Putnam & Westchester Traction Company.—This company, which proposes to build an electric railway from Peekskill to Oregon, N. Y., 4 miles, has been granted a certificate of necessity by the New York Railroad Commission. J. S. Ladd, of Peekskill, N. Y., is president.

Red Lion & Alrville Traction Company.—This company has been organized and will be financed by A. K. Frey, Samuel Fulton, Hugh Ross and others, of York county, Pa., to build an electric railway from Yoe to Delta, in York county, via Alrville. Power will be received from a plant at McCall's Ferry.

Richmond & Chesapeake Bay Railway.—We are officially advised that the road from Richmond to Ashland, Va., is nearing completion and that a preliminary survey has been made for an extension from Ashland to Tappahannock, Va., 42 miles. F. J. Gould, president, New York, J. H. M. Lure, chief engineer, Richmond, Va.

Rome, Ga.—The Merchants' and Manufacturers' Association, of this city is considering a proposition made by Ben Watts and others to build an electric railway nearly 50 miles long in a circuit including Rome, Cedartown, Cave Springs, Lindale, Etna and other towns.

Salem, O.—It is reported that Pittsburg capitalists, represented by S. L. Tone of the Pittsburg Railways Company, are planning to build an electric interurban line from Alliance to Salem and Youngstown, O., and that City Engineer B. M. French, of Salem, has been engaged to make the survey.

Seashore Municipal Railroad.—H. D. Bristol, secretary, of Oceanside, N. Y., writes that this company, recently incorporated to build from Hempstead to Long Beach, L. I., has made all its surveys and secured all the necessary franchises for its line and is ready to let contracts. Paul K. Ames, of Rockville Center, L. I., president; Henry Olmstead, Jr., of Freeport, L. I., chief engineer.

Shore Line Electric Railway.—It is stated that this company will make application to the Connecticut legislature for permission to build an extension about six miles long from Essex to Chester through Deep River. A. William Sperry, secretary and treasurer.

Spokane & Inland Railway.—It is stated that by April 1 this road will be so far completed that trains may be run from Spokane to Garfield, Wash. The line is now in operation as far as Rosalia. Between Garfield and Palouse the track is being laid to close up the few remaining gaps. Grading is in progress between Palouse, Wash., and Moscow, Idaho. A. M. Lupfer, chief engineer, Spokane.

Texas Traction Company.—The contract for the culvert work on this line from Dallas to Sherman, Tex., has been let to the Atlas Metal Works, of Sherman. Two grading crews are now at work and another is soon to be added, between Dallas and McKinney. J. F. Strickland, Dallas, president.

Troy Rensselaer & Pittsfield Street Railway.—A corps of engineers is making preliminary surveys for an electric railway between Troy and Pittsfield, N. Y.

Vincennes Washington & Eastern Traction Company.—It is reported that financial arrangements have been completed for building this line from Vincennes to Loogootee, Ind., passing through Washington, about 40 miles, and that construction will begin in about two or three months, or as soon as the right of way is secured. The power house and shops are to be located at Washington. W. H. Schott, of Chicago, is president.

Watertown, N. Y.—It is reported that Watertown citizens are about to organize a company to build an electric railway from Watertown to Oswego, N. Y., and that arrangements have been made with Anson R. Flower, a New York banker, to finance the project.

POWER HOUSES AND SUBSTATIONS.

Brooklyn Rapid Transit Company.—A new substation will be erected at Flatbush avenue and Malborn street, at a cost of \$40,000. Three new substations are also under construction at Dean and Grand streets, East New York, and Corona.

Chicago South Bend & Northern Indiana Railway.—It is stated that the first work of this company, incorporated a few days ago to take over the Northern Indiana Railway and to build to South Bend, Michigan City and Chicago, will be to construct a large power house at South Bend. S. T. Murdock, Lafayette, Ind., general manager.

Huntsville (Ala.) Railway Light & Power Company.—This company is considering the adoption of natural gas for fuel in its power plant. The company has recently brought in two high-pressure gas wells on its property located a short distance from Huntsville and is now sinking several other holes with prospects of obtaining equally as valuable wells. A pipe line is being laid to the city with a view to furnishing gas for illuminating and heating purposes. If the supply proves as extensive as the tests indicate the use of coal as fuel at the power plant will be abandoned and gas will be used under the boilers for the generation of steam.

Nashville & Chattanooga Electric Railway.—Charles H. Fisk, of Detroit, Mich., one of the promoters, states that work is to begin at a very early date on the power plant which is to be built at the Great Falls on the Cunev Fork river. The company proposes to build an electric railway from Nashville to Chattanooga, Tenn.

Norfolk & Portsmouth Traction Company.—This new power house at Brambleton, Va., will not be entirely completed until some time this summer, although the three engines to be installed are to be in operation by March 15, according to a statement by General Manager E. C. Hathaway, of Norfolk. The new plant will supply power for lighting and other purposes for the Jamestown Exposition as well as for the railway, and will have a capacity of about 15,000 horsepower.

Sheffield Company.—This company is enlarging its power plant by the installation of a 1,250-kilowatt Westinghouse-Parsons turbine and a 300-horsepower Wickes vertical boiler. The former generating units of this plant consisted of a 325-kilowatt direct-current generator, a 250-kilowatt alternating-current generator and a 200-kilowatt rotary converter. In addition to supplying current for the operation of the railway between Tusculum, Sheffield and Florence, Ala., the plant furnishes current for lighting and power purposes in the three cities named. The plant is located on the banks of the Tennessee river at Sheffield, Ala.

Personal Mention

Mr. D. A. Swan has resigned as cashier of the Utah Light & Railway Company and will open an office in Salt Lake City as public accountant and auditor.

Mr. B. Brown on February 3 assumed the duties of assistant superintendent of transportation of the West Penn Railways, with headquarters at Connellsville, Pa.

Mr. Arthur C. Murray has resigned as purchasing agent of the Indiana Union Traction Company of Anderson, Ind., to become assistant general manager of the Illinois Traction Company, with headquarters at Springfield, Ill.

Mr. Thomas F. Delaney has been appointed foreman of the East New York elevated shops of the Brooklyn Rapid Transit Company, succeeding Mr. Ferris A. Overfield, resigned to engage in the general machinery business.

Mr. George S. Gannett has been appointed treasurer of the Utah Light & Railway Company, succeeding Mr. L. S. Hills, resigned. Mr. Gannett will also assume the duties of cashier, this office having been abolished with the resignation of Mr. D. A. Swan.

Mr. William Schwertfager has been appointed superintendent of the Dunkirk lines of the Buffalo & Lake Erie Traction Company, succeeding Mr. W. N. Mariman, resigned. Mr. Schwertfager has been superintendent of the Dunkirk & Fredonia Railroad, at Fredonia, N. Y.

Mr. John B. McDonald, of whom a biographical sketch and portrait appeared in last week's issue of the Review, was elected vice-president of the Interborough-Metropolitan Company, instead of the Interborough Rapid Transit Company, as stated. The Interborough-Metropolitan controls the Interborough Rapid Transit Company and the Metropolitan Street Railway Company.

Major E. S. Winters has been appointed general agent for the Atlanta Macon & Griffin and the Macon Americus & Albany Electric Railway companies, with headquarters at Macon, Ga. Major Winters was identified with the street railway systems of Macon from 1887 to 1903, when he became connected with the Montgomery (Ala.) Traction Company, later serving as receiver for the company until the final consolidation of the Montgomery lines. His present appointment will take effect at once.

Mr. C. L. Wilcoxon, general superintendent of the Western Ohio Railway Company, with headquarters at Wapakoneta, O., has resigned to accept a similar position with the Pittsburg & Butler Street Railway Company, with headquarters at Butler, Pa. Mr. Wilcoxon has been connected with the Western Ohio for about six years and has held his present position for about a year, having succeeded his father, Mr. C. N. Wilcoxon, now general manager of the Cleveland & Southwestern Traction Company.

Mr. E. C. Folsom has resigned his position with the Atlantic City & Suburban Traction Company, of Pleasantville, N. J., and the Walkill Transit Company, of Atlantic City, N. J., to become general manager of the Saginaw-Bay City Railway & Light Company with headquarters at Saginaw, Mich. In addition to his street railway duties he will also have charge of the electric light and power plants of both cities. Mr. Folsom was formerly general manager of the Ft. Wayne & Wabash Valley Traction Company.

Chicago-New York Electric Air Line Railroad.

President J. D. Price, of the Co-operative Construction Company, on February 2 drove the first spike at La Porte, Ind., and work is said to be in progress on a spur 3 miles long from La Porte to the main line. The driving of the first spike was attended by elaborate ceremonies. A shipment of rails and other materials has arrived and it is stated that a contract for two bridges has been let to the Modern Steel Construction Company, of Waukegan, Ill. The promoters claim that work will now proceed rapidly on the line between Chicago to Goshen, the first section of the widely advertised ten-hour ten-dollar air line from Chicago to New York.

Open Cut Method for Pennsylvania Tunnels.

Eugene A. Philbin, of the United Engineering & Contracting Company and the Pennsylvania Railroad, on January 31 asked permission of the New York rapid transit commission to excavate the tunnels under Thirty-second and Thirty-third streets between Madison and Seventh avenues, by the method of open cuts instead of tunneling by pneumatic shields. He said the contractor had discovered that the streets at the points stated were underlaid with quicksand and subterranean streams, making it impossible to bore the tunnels by the shield method, and making it necessary to cut the ground from the top. He said that it was desired to cut to a depth of 60 feet and that the entire width of the street from curb to curb would be required. The work would require about ten months to complete but that the streets would be covered over except between 11 p. m. and 7 a. m. Mr. Philbin presented affidavits from several prominent engineers to the effect that to continue with the present methods of excavation would seriously endanger the foundations of the buildings. The application was referred to Chief Engineer Rice, of the commission, for a report.

Financial News

Alton Granite City & St. Louis Traction Company.—The Edwardsville Alton & St. Louis Railroad has been acquired.

Ashtabula (O.) Rapid Transit Company.—It is reported that a controlling interest in the Pennsylvania & Ohio Railway, capitalists representing the Pennsylvania & Ohio Railway.

Bangor (Me.) Railway & Electric Company.—The capital stock will be increased from \$1,250,000 to \$1,500,000.

Brooklyn Rapid Transit.—At the annual meeting on January 25 the stockholders re-elected as directors for three years J. E. Jenkins, D. H. Valentine, H. C. Du Val and Eugene N. Foss.

Buffalo & Lake Erie Traction Company.—It is reported that the Erie Rapid Transit Street Railway Company and the Hamburg Railway will be absorbed.

Capital Traction Company.—The total passenger receipts in the District of Columbia and the Maryland division in 1906 were \$1,704,221.82. The receipts and disbursements are reported as follows: Receipts—from passengers, District of Columbia, \$1,680,184.78; from passengers, Maryland division, \$24,037.04; total, \$1,704,221.82. Freight, \$1,338; mail, \$2,903.28; rent of land and buildings, \$7,927.26; advertising, \$9,000; miscellaneous income, \$4.29; income from securities owned by insurance reserve, \$4,280; sale of tickets, \$1,659.18; bills payable, \$405,000; balance January 1, 1906, \$32,670.31. Total receipts, \$2,169,004.14. Disbursements—Maintenance of way and structures—Track and roadway, \$26,019.75; electric lines, \$7,840.72; buildings and fixtures, \$1,978.79; total, \$35,839.06. Maintenance of equipment—Steam plant, \$11,873.68; electric plant, \$1,980.80; cars, \$49,486.89; electric equipment of cars, \$25,661.05; horse and vehicle equipment, \$114.25; miscellaneous equipment, \$402.23; miscellaneous shop equipment, \$3,821.41; total, \$93,340.31. Transportation—Operation of power plants, \$90,501.60. Operation of cars—Superintendents of transportation, \$15,310.68; wages, conductors and motormen, \$305,263.49; freight and mail employees, \$1,186.35; other car service employees, \$15,846.92; car house employees, \$17,311.13; car and motor supplies, \$2,564.61; miscellaneous transportation expenses, \$13,948.27; cleaning and sanding of tracks, \$2,332.98; removing snow and ice, \$504.26; total, \$372,268.69. General expenses, \$122,571.74; taxes, \$76,343.89; special police, \$10,449; interest, \$43,200; construction and equipment, \$66,234.20; miscellaneous reserve, \$4,227.50; dividends, \$720,000; extension account, \$497,618.79; total, \$2,132,594.58; balance December 31, 1906, \$36,409.56; grand total, \$2,169,004.14. The report shows that during the year 39,649,442 revenue passengers were carried, and 14,498,560 transfer passengers, a total of 54,148,002 passengers.

Chicago & Oak Park Elevated Railroad.—The annual report of the Chicago & Oak Park Elevated Railroad for the year ended June 30 last, which has just been made public, shows a small increase in both gross and net earnings. The income account compares as follows:

	1906.	1905.	Increase.
Passenger earnings	\$863,637	\$821,196	\$42,441
Other earnings	23,146	18,302	4,844
Total earnings	\$886,783	\$839,498	\$47,285
Expenses	505,538	505,930	*392
Net income	\$381,245	\$333,568	\$47,677
Other income	3,771	3,446	325
Total income	\$385,016	\$337,014	\$48,002
Interest, rents, etc.....	477,795	447,862	29,933
Deficit	\$ 92,779	\$110,848	*18,069

The balance sheet of the company indicates a small increase in assets for the year, while the profit and loss deficit increased from \$165,565 to \$258,343. The capital stock of the company is \$10,000,000, the funded debt \$6,000,000, and debenture notes issued, \$350,000.

The balance sheet of the holding company, which is the Chicago & Oak Park Elevated Railway Company, compares as follows:

	1906.	1905.
Assets—		
Stocks and income bonds	\$7,682,555	\$7,670,948
Notes receivable	1,608,500	1,488,600
Cash on hand	1,239	814
Total	\$9,292,294	\$9,160,362
Liabilities—		
Capital stock—preferred	\$3,044,800	\$3,039,000
Common	5,656,100	5,645,800
Total	\$8,700,900	\$8,684,800
Capital stock scrip—preferred.....	12,966	14,405
Common	4,257	12,557
Notes payable	574,171	448,600
Total	\$9,292,294	\$9,160,362

*Decrease.

Consolidated Railway.—Judge Rugg, of the Massachusetts supreme court, after hearing arguments, has taken under consideration the action started by Attorney General Malone against the Worcester & Webster and the Webster & Dudley Street Railway companies to dissolve the corporations. The attorney general seeks to defeat the merger and the control by a foreign corporation. The Worcester & Webster company is leased to the Webster & Dudley company, which is said to be controlled by the New York New Haven & Hartford Railroad.

Detroit Jackson & Chicago Railway.—This company, which was recently incorporated by officials of the Detroit United Railway, has acquired the property and franchises of the Detroit Ypsilanti Ann Arbor & Jackson Railway. F. W. Brooks, assistant general manager of the Detroit United Railway, has been elected president to succeed J. D. Hawks.

Detroit United Railway.—Arrangements have been made for the sale of \$2,000,000 three-year 5 per cent notes to Kean, Van Cortlandt & Co. The notes will be secured by a deposit of bonds.

Evansville & Southern Indiana Traction Company.—A mortgage has been given to secure an issue of \$4,000,000 5 per cent, 30-year bonds. The proceeds of the issue will provide for outstanding debts and will redeem the bonds of the Evansville Electric Railway and the Evansville & Princeton Traction Company.

Forest City Railway (Cleveland).—The gross receipts in November, December and January were \$17,271.95. Operating expenses were \$13,333.54.

Geneva Phelps & Newark Railroad.—The New York Railroad Commission has granted this company permission to issue a first mortgage for \$700,000. The road was recently granted a certificate of necessity to build an electric road from Geneva, Ontario county, through Phelps to Newark, Wayne county, 15 miles.

Georgia Railway & Electric Company.—Gross receipts from passengers, freight, electric power and light and steam heating in 1906 were \$3,321,816.04.

Illinois Traction Company.—This company has purchased from Clark Brothers, of Philadelphia, the Mississippi river terminal line of the East St. Louis & Suburban Railway in Venice, Ill. This line gives the Illinois Traction System an outlet to the river and to its proposed bridge across the river which will give it an entrance to St. Louis.

Lake Shore Electric Railway.—It is reported that negotiations are in progress for the purchase of the Sandusky Norwalk & Mansfield Electric Railway.

Lowell & Fitchburg Street Railway.—This company has been authorized by the Massachusetts railroad commissioners to issue \$75,000 additional bonds. This makes the total bond issue of the company \$275,000 and the total stock issue \$275,000. The road was constructed and equipped by A. L. Register & Co., of Philadelphia, and consists of 18 miles of high-class interurban railway. It connects the Lowell system at Lowell, Mass., with the Fitchburg system at Ayer, Mass. In addition there is a branch of about 5 miles from West Chelmsford to Westford, Mass.

Manhattan Railway.—Attorney General Jackson of New York State has been notified that the company will pay its franchise tax for 1906 at once, if it is allowed a reduction of 11 per cent from the assessed valuation of the property, which was \$62,700,000.

Mansfield & Worcester Interurban Railroad.—The authorized capital stock has been increased from \$30,000 to \$2,000,000. It has also been decided to issue \$1,000,000 5 per cent bonds. Philadelphia people who have been interested in the company have disposed of their stock and new directors have been elected as follows: Samuel Kinsey, of Pittsburg; David Collier and M. M. Van Nest, of Wooster; John L. Barr, Charles Brumfield and B. L. Chase, of Mansfield; D. Graven, of Loudonville, and R. H. Critchfield, of Shreve. The directors elected the following officers: Samuel Kinsey, president; David Collier, vice-president; John L. Barr, secretary, and B. L. Chase, treasurer.

Manufacturers' Railroad (New Haven, Conn.).—This company has been acquired by the New York New Haven & Hartford Railroad.

Memphis Street Railway.—Isaac Newman, of Isaac Newman & Sons, in referring to the suit brought by a stockholder applying for the appointment of a receiver, has made the following statement: "We have anticipated for several months legal objections on the part of a few minority stockholders of the Memphis Street Railway Company to the plan of the American Cities Railway & Light Company, by which the latter acquired approximately 90 per cent of the stocks of the Memphis, Birmingham, Knoxville, Little Rock and Houston properties. When the plan of the American Cities Railway & Light Company was announced in June, 1906, objection was made by these minority stockholders in the Memphis Street Railway Company on the ground that the Memphis property was a much better one than the others and for this reason they were unwilling to deposit their Memphis stock under the plan. These minority stockholders, holding probably less than 10 per cent of the common stock of the Memphis Street Railway Company, have not deposited their stock, but the plan of the American Cities Railway & Light Company has in no way disturbed the legal existence of the Memphis Street Railway Company, so that the rights of the stockholders therein have not been interfered with."

Montreal Street Railway.—Gross earnings for December, 1906, were \$266,953, an increase of \$30,008. Operating expenses increased \$23,575, leaving an increase in net earnings of \$6,432. The figures for December and for the last three months of 1906 are as follows:

	December, 1906	Three mo., 1906
Gross earnings	\$266,953	\$812,036
Operating expenses	185,671	516,433
Net	\$81,382	\$295,603
Charges	39,122	119,008
Surplus	\$42,260	\$176,595

Pennsylvania Street Railways.—The annual report of Isaac B. Brown, superintendent of the state bureau of railways, shows that the capitalization of 238 street railway corporations in the fiscal year ended June 30, 1906, was \$183,653,441. Total receipts from operation were \$41,039,186. There were 3,325.33 miles of track and 8,484 cars in service. The total number of passengers carried was 949,647,802. Cost of road and equipment stood at \$140,916,635.

Philadelphia Company (Pittsburg).—The gross earnings from operations in the year 1906 were \$18,223,537.65. Expenses and taxes were \$11,107,967.60, leaving net earnings from operations of \$7,115,570.15. Miscellaneous income was \$277,672.40, making, with net income from operating, \$7,393,242.55. Fixed charges were \$4,378,209.34, leaving a balance of \$3,015,033.21.

Philadelphia Rapid Transit Company.—The Trades League takes the stand that the plan offered by the merchants' association does not provide for immediate improvement of service. In the plan which is being framed by the Trades League the provisions governing the reduction of fares and the surrender of franchises will be revised. Mayor Weaver has issued a long statement criticizing the Merchants' plan. He has not submitted a plan himself.

St. Louis & Suburban Railway.—The board of directors will be reduced by the United Railways Company, which is now in control, from 15 to 5 members.

South Side Elevated Railroad.—Gross earnings for the year 1906 amounted to \$1,788,975, as compared with \$1,713,348 in the previous year, an increase of \$75,627 or 4.4 per cent. The extra cost of operating, due largely to high prices of labor and materials, brought total expenses to \$1,207,268, as compared with \$1,052,963, an increase of \$154,305 or 14.6 per cent. Net earnings were \$581,707, a loss of \$78,678 from the previous year. The final surplus, after paying bond interest and dividends, was \$138,779, as compared with \$217,470, a loss of \$78,691. Operating expenses amounted to 67½ per cent of earnings, as compared with 61½ per cent in the previous year. Leslie Carter, the president, was elected chairman of the board of directors and Marcellus Hopkins, general manager, was elected a director and president and general manager. E. C. Nichola was made vice-president, succeeding T. J. Lefens.

The statement compares as follows:

	1906	1905	1904
Earnings—			
Passenger	\$ 1,721,213	\$ 1,647,988	\$ 1,523,421
Other earnings	63,590	62,662	49,898
Miscellaneous	4,170	2,698	1,510
Total earnings	1,788,975	1,713,348	1,574,829
Expenses—			
Maintenance way	77,984	72,175	64,947
Maintenance equipment	144,317	141,078	129,035
Transportation	534,945	437,934	415,478
General	191,658	165,519	153,411
Loop rental	253,363	236,256	207,106
Total expenses	1,207,268	1,052,963	969,977
Net	581,707	660,385	604,854
Interest on bonds	33,750	33,750	33,750
Dividends	409,177	409,165	409,149
Surplus	138,779	217,470	161,966
Passengers carried	34,424,260	32,959,752	30,468,424
Daily average	94,313	90,301	83,247
% cent increase	4.35	8.47	*6.78
Per cent operating expenses	67.5	61.5	61.6
*Decrease.			

The balance sheet compares as follows:

	1906	1905	1904
Assets—			
Property	\$12,235,803	\$12,255,944	\$12,312,338
Extensions, etc.	6,367,591	3,989,900	1,313,943
Treasury stock	92,400	92,400	92,400
Supplies	126,314	137,879	45,086
Dues from companies	11,489	15,906	7,979
Due from agents	5,855	9,242	5,183
Other assets	67,027	23,444	14,500
Cash—general	142,396	154,059	176,085
Cash, construction	83,135	949,250	81,578
Totals	19,135,013	17,628,023	14,785,091
Liabilities—			
Stock	\$10,323,800	\$10,323,800	\$10,323,800
Funded debt	7,110,000	5,610,000	3,110,000
Payables	255,049	336,839	161,377
Depreciation	50,000	50,000	50,000
Surplus	1,396,163	1,307,384	1,139,914
Totals	19,135,013	17,628,023	14,785,091

Springfield Wilmington & Cincinnati Railroad.—The authorized capital stock has been increased from \$3,000,000 to \$4,000,000.

Toledo Railways & Light Company.—It is reported that this company will acquire the Toledo & Western Railway.

United Power & Transportation Company (Philadelphia).—The annual report for 1906 compares as follows:

	1906	1905	1904
Income from securities and loans	\$824,021	\$809,720	\$708,612
Expenses, taxes, etc.	364,020	364,085	364,055
Surplus	\$460,001	\$445,635	\$344,557
Previous surplus	267,088	267,078	266,155
Surplus applicable to dividends	\$727,089	\$712,713	\$610,642

United Railways & Electric Company.—The tax paid to the city of Baltimore in 1906 for the maintenance of parks was \$410,208. Gross earnings for the year were \$6,589,847, of which the city line earned \$4,558,985.

Washington Alexandria & Mt. Vernon Railway.—Gross earnings for December, 1906, show a loss of \$2,069.14, or 10 per cent from the December, 1905, figures. They compare as follows:

	December, 1906	December, 1905
Gross earnings	\$18,459.77	\$20,628.91
Operating expenses	11,197.44	11,879.68
Net earnings	7,262.33	8,649.33

Manufactures and Supplies

ROLLING STOCK.

Philadelphia Rapid Transit Company is figuring on 60 new passenger cars.

Sioux City Traction Company, Sioux City, Ia., will build 6 new cars in its own shops.

Forest City Railway, Cleveland, O., has ordered 50 cars from the St. Louis Car Company.

Chicago Union Traction Company has ordered 4 additional cars from the St. Louis Car Company.

San Francisco Vallejo & Napa Valley, Napa, Cal., has ordered 8 new cars from the Niles Car & Manufacturing Company.

Washington Baltimore & Annapolis Electric Railway, Washington, D. C., it is rumored, will be in the market shortly for 25 large interurban cars.

Warsaw Street Railway, Warsaw, Wis., has purchased through the Knox Engineering Company, Chicago, 3 cars for city service to be built by the Cincinnati Car Company.

Northern Ohio Traction & Light Company, Akron, O. will build 4 cars in its own shops. Delivery will soon be commenced on the 20 cars ordered some time ago from the Kuhlman Car Company.

Chattanooga Railways Company, Chattanooga, Tenn., has received 10 of an order of 15 new 40-foot semi-convertible cars from the Kuhlman Car Company. These cars are to be mounted on Brill trucks and are to be equipped with National airbrakes and Westinghouse 101 motors, four to each car. The first car of the shipment was put into service last week.

Oakland Traction Company, Oakland, Cal., as mentioned in our issue of January 19, has ordered the building of 40 double-truck cars of the California type in its Oakland shops. They will have a seating capacity of 42 to 44 persons, length over all of 45 to 48 feet, width over all 8 feet 6 inches, wooden body, underframe of steel and wood and will be equipped with airbrakes.

Citizens Railway, Lincoln, Neb., was reported in the Electric Railway Review of January 26 as having ordered 3 full-convertible cars. This order was placed with the American Car Company, and the cars are for May delivery. They will have a seating capacity of 30 persons, will weigh 17,000 pounds, will have a wheel base of 8 feet, length of car body 20 feet, length over vestibule 30 feet 6 inches, length over all 30 feet 6 inches.

East St. Louis & Suburban, as noted in the Electric Railway Review of January 26, has placed an order with the Inter-State Car Company for 200 all-wood gondola cars of 80,000 pounds capacity, and has an option on 300 additional gondola cars, for delivery in September, 1907. The details are as follows:

Weight	31,000 lbs.	Brakebeams	Dexter
Length, inside.....	35 ft. 7 in.	Brakes	Westinghouse
Over all	40 ft.	Couplers	Climax
Width, inside.....	9 ft. 4 in.	Draft rigging	Miner
Height, inside.....	3 ft. 6 1/4 in.	Journal bearings	Spiral

Special Equipment.

Bolsters, body and truck....	Journal boxes.....	Symington
.....American Steel Foundries	Springs....	Railway Steel Spring

Detroit United Railway, Detroit, Mich., as reported in the Electric Railway Review of January 26, has placed an order with the Cincinnati Car Company for 50 double-truck cars and 10 interurban cars for delivery from May 15 to June 15, 1907. The specifications call for the following details:

50 Double Truck Cars.

Seating capacity.....	41 persons	Width inside.....	7 ft. 6 1/4 in.
Weight	37,300 lb.	Over all.....	8 ft. 3 1/2 in.
Wheel base.....	4 ft. 6 in.	Height, inside.....	8 ft. 2 1/4 in.
Length of body.....	29 ft.	Sill to trolley base..	9 ft. 5 in.
Over vestibule.....	5 ft.	Track to trolley base..	.....
Over all.....	41 ft. 4 in.	.....	12 ft. 1 1/4 in.

10 Interurban Cars.

Seating capacity.....	45 persons	Height, inside.....	8 ft. 8 1/4 in.
Wheel base.....	6 ft.	Sill to trolley base..	9 ft. 11 in.
Length of body.....	30 ft. 2 in.	Track to trolley base..	.....
Over vestibule.....	4 ft. 6 in.	.....	12 ft. 5 1/4 in.
Over all.....	46 ft. 4 in.	Body and underframe....	Wood
Width, inside.....	7 ft. 4 1/2 in.		
Over all.....	8 ft. 6 in.		

Special Equipment.

Air brakes.....	Storage	10 interurban.....	Hot air
Bolsters, body.....	Truss type	Motors, number and type...	.....
Control system.....	Unit	.....4 Westinghouse No. 93A	
Couplers	Co.'s standard	Safety tread.....	Universal
Curtain fixtures.....	Keller eccentric	Sanders	Co.'s standard
Curtain material.....	Cotton duck	Seats—	
Destination signs.....	Co.'s standard	50 double truck.....	Plush
Fenders.....	Co.'s standard drop	10 interurban.....	Rattan
Gears	Split	Trucks—	
Hand brakes.....	Peacock	50 double truck.....	Baldwin
Headlights.....	Dayton Mfg. Co.	10 interurban.....	.....
Interior finish.....	Quarter sawed oak	.....Co.'s standard No. 0-50	
Heating system—		Ventilators	
50 double truck.....		.....Single deck sash operator	
.....Peter Smith hot water		Vestibule	Detroit

SHOPS AND BUILDINGS.

Boston Elevated Railway.—An old car barn, on Dunster street, Cambridge, Mass., which has been used by the company as a blacksmith and carpenter shop and which contained the division offices, was destroyed by fire on January 30.

Brooklyn Rapid Transit Company.—The new quarters for the line department, which are to be erected at President street, Nosstrand avenue and Carroll street, will cost in the neighborhood of \$300,000. In a general way the plans will call for new office buildings for the line and track departments, new stock buildings for the purchasing department, new machine and wheelwright shop, painting shop, carpenter shops, and new facilities for the lighting department. The company has asked for bids for the erection of all the new stations on the Brighton Beach elevated line, from Beverly road to Sheepshead Bay. There will be in all stations at Dean street, Beverly road, Avenue C, Foster avenue (express stop), Manhattan Terrace, Greenfield, Kings Highway (express stop), Avenue U, Neck road and Sheepshead Bay (express stop).—A contract has been let to Pierson & Goodrich for the construction of an incinerating plant at Third avenue and Third street, Brooklyn.

Columbus Delaware & Marion Railway.—This company is building a new freight station at Marion, O., containing platforms on each side of the track, connected by a roof, so that cars may be loaded and unloaded from either side and under cover.

Nashville Railway & Light Company.—The work of removing the buildings on Third and Fourth avenues and Cedar street has been started to make room for the new transfer station of the Nashville Railway & Light Company. Though definite plans have not been formulated, it is known that the station will be a one-story brick structure located between the tracks. The distance between the inside rails of the tracks will be 28 feet. The cars from the east and north will use the north track, and those from the south and west will use the south track. It is expected that the work of building the station and laying the track will be completed in six months.

North Alabama Traction Company.—This company has recently occupied its new car barns at New Decatur, Ala. The main building is 90 by 140 feet in floor area and the shops, which are triangular in shape, are 140 feet long and 50 feet wide at the front end of the structure. Offices and waiting rooms are provided in the building. The barn is of brick construction and is one story high.

Pittsburg & Butler Street Railway.—This company has recently let a contract for its repair shops near Butler, Pa. Contracts for equipment are expected to be let shortly. Hudson F. Layton, of Pittsburg, chief engineer.

Toledo Urbana & Interurban Railway.—This company has purchased property on St. Clair street, Toledo, O., for the purpose of erecting a large freight station.

TRADE NOTES.

Lidgerwood Manufacturing Company, has removed its Chicago offices from 1510 Old Colony building to 1917 Fisher building.

V. C. Gilpin, 120 Liberty street, New York, announces that he has been appointed eastern sales agent for the Sterling Electric Company for its flexible steel conduit and armored conductor.

Robert W. Hunt & Co., Chicago, have been appointed consulting engineers to the receivers of the Union Traction Company, Chicago, and placed in direct charge of the lowering of the car tunnels under the Chicago river.

Crocker-Wheeler Company, Ampere, N. J., at the officers' and branch managers' convention held from January 23 to 26, announced that the company had done more business during 1906 than any previous year since its organization.

Consolidated Car Heating Company, 42 Broadway, New York, has moved its purchasing department to the New York office and has appointed Mr. Claude C. Nuckols purchasing agent. Mr. T. M. May, heretofore in the employ of the National Electric Company, has been appointed a representative of the sales department.

Cook's Railway Appliance Company, Kalamazoo, Mich., on December 26, 1905, changed its corporate name to Cook's Standard Tool Company, the ownerships and management remaining the same. This change was thought advisable on account of the name "Standard" by which its appliances have so long been known to the trade.

Thos. P. Conard & Co., Harrison building, Philadelphia, issue from time to time a list of second-hand boilers, engines, locomotives, steam shovels, machine tools, etc., on hand. The company have been specialists in this line for many years. A lot of different make hoisting engines are described in a leaflet just issued which will be mailed upon request.

Wesco Supply Company, St. Louis, Mo., has purchased the plant of the Davis Electric Manufacturing Company, of Springfield, Mass., including all machinery, which it is moving to St. Louis, where it will continue the manufacture of the Davis switches and other specialties. This company has also leased a 5-story building at the corner of Eighth street and Clark avenue, which has been equipped with the latest and most modern machinery for the manufacture of knife switches, cut-out cabinets, panel boards, switchboards and other specialties. With these added facilities in full operation the company will have one of the most

complete and modern plants for the manufacture of electrical specialties in the west.

Niles Car & Manufacturing Company, Niles, O., at its annual meeting elected the following officers: President, F. C. Robbins; vice-president, T. E. Young; secretary and treasurer, Charles Rose. The following were elected directors of the company: F. C. Robbins, J. A. Hanna, I. H. Young, T. E. Thomas, A. G. McCorkle, G. D. Kirkham, W. H. Smiley, A. G. Webb and B. F. Pew.

John F. Allen & Co., 370-372 Gerard avenue, New York, manufacturers of the "Allen" portable pneumatic riveting machine, have received an order from the American Car & Foundry Company for four additional riveters, two of which are for the Jeffersonville, Ind., plant and two for the St. Charles, Mo., plant. The American Car & Foundry Company now has 125 of these machines in use in its different plants.

Niles-Bement-Pond Company has declared a regular quarterly dividend of 1 1/2 per cent on the preferred stock, payable on February 15, and a semi-annual dividend of 3 per cent on the common stock, payable in two instalments on March 20 and June 20. James P. McKinney was elected a director to succeed William S. McKinney and George T. Reiss to succeed Gordon Shillite. Other former directors were re-elected.

Hunkins-Willis Lime & Cement Company, St. Louis, Mo.—One of this company's products is the Bonanza roofing tile, a reinforced concrete tile 52 by 26 inches, which is said to be wind, weather and fireproof and not to be affected by gases, steam or fumes. This tile varies entirely in design from terra cotta clay, slate or other forms of roofing and may be laid directly on steel purlins without any woodwork in the roof construction.

Eck Dynamo & Motor Works, Belleville, N. J., has been re-organized and a new company formed to take over the business heretofore operated by C. A. Eck. The name of the company will remain the same and the manufacture of the Eck dynamos and motors and fan-motor apparatus will be continued. The officers of the new organization are: President and treasurer, William J. Wallace; vice-president, Walter G. Clark; secretary, Charles H. Dilg.

Dodge & Day, engineers, Drexel building, Philadelphia, announce that John E. Zimmermann, formerly secretary of the American Pulley Company, of Philadelphia, has become a partner in their firm, effective January 1. This firm is building the shops of the Jones & Lamson Machine Company, at Springfield, Vt.; also is engineering and constructing a new building for the Bridgeport Brass Company. The steel for both of these buildings has been ordered and construction commenced.

Chicago Pneumatic Tool Company, Chicago, for the year ending December 31, 1906, shows the percentage earned on the outstanding stock to be 11.23 per cent as compared with 9.16 per cent in 1905. The statement of profits, together with the balance sheet, is as follows:

Profits.		
Profits	1,001,550.04	
Less depreciation of buildings, machinery, etc.....	128,981.46	
Less written off for developing new tools.....	21,999.97	
Balance.....	\$ 851,468.61	
Less bond interest and sinking fund.....	165,000.00	
Balance.....	\$ 686,468.61	
Less dividends 4 per cent.....	244,351.32	
Balance.....	\$ 442,117.29	
Surplus Account.		
Surplus as at December 31, 1905	\$ 536,292.15	
Less—Appropriations on account of building of plant at Fraserburgh, Scotland, and to provide additional working capital for foreign subsidiary companies	100,000.00	
	\$ 436,292.15	
Add—Surplus for 1906	442,117.29	
Total surplus	\$ 878,409.44	
Assets.		
Real estate, buildings, machinery, etc.....	\$ 6,442,988.46	
Capital stock of other companies, investments, etc.....	1,319,117.41	
Treasury bonds	200,000.00	
Treasury stock	37,000.00	
Cash in bank, on hand and accounts and bills receivable, less reserve	1,189,659.95	
Inventories	1,050,569.49	
Sinking fund	296,600.00	
Total.....	\$10,526,335.31	
Liabilities.		
Capital stock issued.....	\$ 6,145,800.00	
Bonds	2,500,000.00	
Interest and dividends	119,116.83	
Accounts payable	330,936.68	
Bills payable	247,499.91	
Sinking fund	296,600.00	
Reserve for taxes etc.....	7,972.42	
Surplus	878,409.44	
Total.....	\$10,526,335.31	

Green Fuel Economizer Company, Mattawann, N. Y., has awarded to the Berlin Construction Company of Berlin, Conn., the contract for an extension to its fan shop which, when completed, will enable them to more than double their present output. A shop has also been erected exclusively for manufacturing the new patent Green steam and hot-water heating coil. The large amount of business enjoyed by this company in these lines

and in the manufacture of fuel economizers has compelled them to acquire for building purposes several acres of land adjacent to its present property.

Chicago Engineering & Construction Company, Great Northern building, Chicago, announces the retirement of Hervey B. Hicks and George A. Yulle as managing directors, Mr. Yulle continuing as manager of the office of the company at Monroe, La. The new officers of the company are William G. Luce, president; Percy A. Wells, vice-president, and Harry L. Wells, secretary and treasurer. The general offices of this company were moved on February 1 to 1014 Menadnock block, Chicago.

Henry Clark Sergeant, whose name as a part of the Ingersoll-Sergeant Drill Company has long been known wherever compressed or rock drills are used, died of paralysis at his home at Westfield, N. J., on January 30, at the age of 72 years. He was born at Rochester, N. Y., in 1835 but his earlier years were spent in Ohio. He had always shown an inventive faculty and a number of his inventions when put into systematic operation did much to expedite and facilitate some of the most difficult of engineering problems, the appreciation of which can only be realized by the results obtained. His inventions are many and various, the most pronounced of which cover details in the construction and operation of air compressors, rock drills and mining and excavating machinery. After the consolidation of the Ingersoll-Sergeant Drill Company and the Rand Drill Company in 1905 he retired from active participation in business but still retained his financial interests.

ADVERTISING LITERATURE.

Lumen Bearing Company, Buffalo, New Jersey.—The second of this company's series of monthly art calendars for 1907 is entitled "An Upland Road," reproduced from the original painting of that name by Paul Dougherty.

S. F. Bowser & Co., Inc., Fort Wayne, Indiana.—A pamphlet which has just been issued by this company shows the possibilities in the way of lubricating oil storage which permits neatness, convenience and accuracy in measuring.

R. Woodman Manufacturing & Supply Company, Boston, Mass.—A pocket catalogue giving details, descriptions and prices of an extensive line of punches manufactured by this company has been received. In addition to punches, the company also makes baggage and other brass checks and all kinds of badges and buttons.

Crocker-Wheeler Company, Ampere, New Jersey.—Bulletin No. 74 describes engine type alternating current generators. The various elements including housing, rotor, coils, etc., are described and general information given regarding generators of this type. A number of views are shown of plants where the Crocker-Wheeler alternators are installed.

Goldschmidt Thermit Company, 43 Exchange Place, New York, N. Y.—Thermit is now so well known for welding purposes that it is hardly necessary to enumerate the different classes of welding to which it is particularly applicable. An attractive little pamphlet gives details of a welding outfit and the welding compound and indicates by engravings from photographs, the possibilities of Thermit.

The Locke Insulator Mfg. Company, Victor, New York.—One of the handsomest catalogues which has been received for some time is that which has been issued by this company listing an extensive line of insulators for electric power transmission purposes. The various types of insulators are shown by fine engravings from photographs and the tables giving dimensions are conveniently arranged.

New Era Manufacturing Company, Kalamazoo, Michigan.—A new booklet has just been issued by this company entitled "Valuable Information for Superintendents and Foundry Foremen." It should be of interest to superintendents and foremen in all lines of foundry work as it gives a number of valuable hints designed to aid in the production of good castings together with formulas for the composition of metal for use in many different classes of castings.

Buda Foundry & Manufacturing Company, Chicago.—Bulletin No. 105 illustrates and explains Buda lining-up jacks, which are a recent manufacture of this company placed upon the market within the past month. The jack, which, as its name indicates, is for lining-up purposes, combining elevating and transferring features operated by a single interchange of the lever. It is designed to decrease the necessity of employing a large number of men for lining track.

C. Druckille, 132 Reade Street, New York, N. Y.—"Railroad Sandcraft" is the title of a 24-page booklet describing the injector sand blast apparatus manufactured for cleaning steel cars, locomotive work, steel bridges and other structural work. The sand blast is now such an essential piece of apparatus for use in preparing steel cars and steel structures for repainting as well as in preparing the steel for its original coating that it is believed this publication will prove of general interest.

Ingersoll-Rand Company, 11 Broadway, New York, N. Y.—Catalogue H 36, which has just been received, is a handsomely printed and illustrated publication of 64 pages, describing a single line of air compressors, known as "Type 11," out of the great variety built by the company. The compressors are duplex steam-driven, automatic machines mounted upon a single base and entirely contained. A large number of combinations of steam and air cylinders are provided for in sizes ranging from below 10 to above 200 horsepower. The catalogue furnishes a description of the

various machines and a discussion of their functional relations and their adaptation to special and exacting conditions together with lists of general dimensions, capacities and other details.

Charles F. Johnson, Citizens' Building, Cleveland, Ohio.—Mr. Johnson, who is a dealer in second-hand electrical, steam and contractors' equipment, issues a list from time to time of equipment which he has on hand. Recent lists show an extensive line of cars, motors, snow sweepers and plows on hand for electric railways.

Power & Mining Machinery Company of Cudahy (suburb of Milwaukee), Wis., in conjunction with the Snow Steam Pump Works of Buffalo, N. Y., has opened a new sales office at 719 White building, Buffalo, where will be handled the several types of gas generating apparatus, such as the Loomis-Pettibone system, suction and pressure gas plants, built by the Power & Mining Machinery Company, and the Snow gas engines, built by the Snow Steam Pump Works. Mr. Seward Babbitt, the sales manager of the first-named concern, will make his headquarters at the Buffalo office, on account of the facility for conducting business from that point.

Wendell & MacDuffie, 26 Cortlandt St., New York, N. Y.—A new catalogue issued by this company is a 24-page booklet known as No. 16, which describes fully the asbestos and cement fire-proof materials manufactured by them. The line includes reinforced asbestos corrugated sheathing, a strong and durable composition of asbestos and cement compressed under a high pressure and reinforced with $\frac{3}{8}$ -inch woven wire mesh, asbestos building lumber, designed for use in construction work in electrical plants of all kinds for insulations, door panels, telephone switchboards, etc., and Century asbestos shingles are features of the company's line of manufactures.

Rostand Manufacturing Company, Milford, Conn., manufacturer of the McCarthy hat and baggage rack, states that its business is growing and the railroads are coming more and more to recognize the advantage of a rack well constructed and able to stand heavy usage by passengers. A number of roads have placed orders for these racks for their new equipment and in many cases are replacing as fast as the cars are sent to the repair shop the old racks with the McCarthy rack. F. A. Barbey, 185 Summer street, Boston, and George H. Bryant, 1055 Old Colony building, Chicago, represent the Rostand Manufacturing Company in their respective territories.

The Concrete Review.—The Association of American Portland Cement Manufacturers announces the publication of the Concrete Review, Volume 1, Number 1 of which appeared on February 1. The publication is to be semi-monthly and is to meet the growing demand for the most reliable information regarding the proper use of Portland cement and serve as an easily accessible guide to the best articles appearing in the various technical publications. Original articles will be published together with extracts from articles which appear in other publications. The Concrete Review will be sent upon request addressed to the assistant secretary of the Association of American Portland Cement Manufacturers, Land Title building, Philadelphia.

NEW DIRECT-CURRENT MOTORS FOR INDIVIDUAL MACHINE DRIVING.

Illustrations are herewith presented showing a new line of direct-current motors manufactured by the Allis-Chalmers Company which are designated as "type K." Several interesting features are embodied in this new design. The cylindrical field magnet yoke is of open hearth steel and machined on each end to receive the housings that carry the bearings. The housings are held in place by through bolts and, on four-pole machines, can be rotated 90 degrees or 180 degrees to allow side-wall or ceiling mounting; bi-polar machines can be arranged for floor or ceiling mounting. The yoke is machined on the inside cylindrical surface and the poles are fastened to it by countersunk fillister-head cap screws. The pole cores are of open hearth steel and are circular in cross section; these cores are machined on one end to fit the inner surface of the cylindrical yoke and on the other to receive the pole shoes. The latter are built up of annealed steel punchings riveted together and fastened to the poles by flat head machine screws. The pole face has been carefully shaped to give suitable distribution of the field flux, thus securing good commutation and preventing humming due to the armature teeth. Except for the smaller sizes, the field coils are wound on metal spools, and are covered with sufficient insulation coated with varnish to protect them from external injury or moisture.

The armature cores are built up of sheet steel punchings insulated from each other to reduce the core loss and consequent heating. The laminations are keyed to the shaft, and in building up the core they are separated at intervals so as to form radial ventilating ducts. The punchings are firmly clamped between cast iron end heads, which also serve as supports for the ends of the armature coils. In punching the armature laminations, openings are made in the discs, so that when the latter are assembled, ventilating passages are formed parallel to the shaft and connecting with the radial ducts. There is thus a free passage for the circulation of air through the core, and all parts of the core and windings are thoroughly ventilated.

The armature coils are form wound and interchangeable; they are heavily insulated with stay binding and the whole armature is thoroughly impregnated with insulating varnish after it has been completely wound.

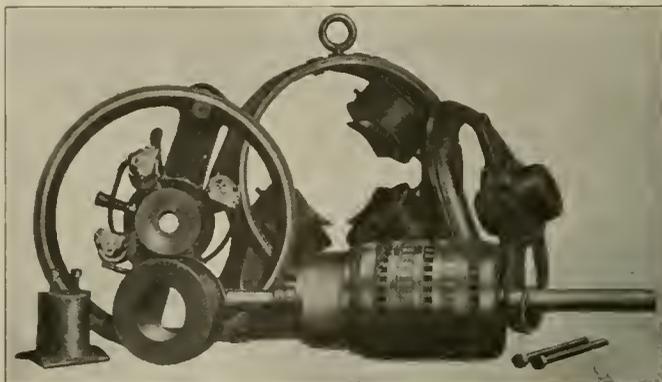
The commutator is of large diameter and ample wearing depth, having bars of hard-drawn copper insulated from each other and from the shell by the best quality of mica; the mica between bars is so selected that the wear is uniform. The clamping

rings hold the bars firmly and the whole construction is such as to secure a perfectly cylindrical surface free from high or low bars.

In all except the smaller sizes, the commutator sleeve is hollow to permit the passage of air through to the armature.

The bearings are of ample size and lubricated by oil rings. The shaft projection for the pulley is turned smaller than the journals, so that the journal can be turned down, when worn, without reducing its diameter below that of the projection.

The brush holders are of the same general design as used



Allis-Chalmers Type-K Motor Dismantled.

on all the standard direct current machines. The brush studs are fastened to a rocker arm mounted on the bearing housing; this allows the brushes to be set at the best running position, but, after being once properly set, they require no adjustment under any change in load within the range of the motor. Graphite brushes are used, connected to the holders by flexible copper shunts.

The frame of the standard Type K motor is open at the ends to permit a free circulation of air through the machine. It can, however, be converted into a semi-enclosed or a totally enclosed motor by the addition of suitable metal covers which are readily fitted to the end housings. For the semi-enclosed type the covers are perforated.

These motors are manufactured in 13 different frame sizes, and for each size there are a number of ratings, the output of a given frame being proportional to the speed.

These motors are suitable for all classes of work where either



Allis-Chalmers Type-K Motor.

a constant or variable speed direct-current motor is required. For general driving of machinery or for variable speed work shunt-wound machines are used. For cases where a large starting torque combined with the constant-speed characteristic of the shunt motor is required, compound-wound motors can be furnished. For crane and hoisting service series-wound motors are supplied.

Type K machines operate exceptionally well as generators which are compound wound, and will deliver any current from zero to their full rated output without sparking and without shifting the brushes.

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Although the city council of Chicago passed the Chicago City railway and the Chicago railways. (Union Traction)

Voters to Pass On Chicago Ordinances.

ordinances over the mayor's veto at its meeting on February 11, the companies have announced that they will not consider the ordinances operative unless they are approved by the voters at the election on April 2. There seems to be little doubt that the ordinances will be approved by a large vote. The Chicago Real Estate Board and the Chicago Commercial Association, two of the leading organizations of the city, have decided to make every effort to secure the approval of the ordinances. Other civic organizations which are also vitally interested in the improvement of the street railway service will take similar action. The veto message of Mayor Dunne raised points which the aldermen considered had been thoroughly thrashed over in the meetings of the local transportation committee before the measures were drafted and for that reason his objections to the passage of the ordinances at this time had no effect.

The report of the first three months' operation of the Municipal Traction Company of Cleveland is interesting.

Municipal Traction Earnings in Cleveland.

Revenue passengers were first carried on November 1. The company earned, during November, \$2,926.50; during December, \$4,811.67, and during January, \$7,703.93; in addition to which it reports a lump sum of \$1,830.75 as earned from "other sources" during the three months. Against the total earnings of \$17,271.85 there was a total operating cost, including rental, of \$16,985.09, or 93.13 per cent, leaving a balance of \$1,186.86. Until January 16 the company was unable to run its cars to the Public Square in the center of the city. It is interesting to observe, therefore, that the earnings from January 16 to January 31, inclusive, aggregated \$5,341.11 and the operating expenses \$3,466.79, not including the rental charge. This operating ratio is so extremely low, when it is remembered that it is in comparison with gross earnings based on

3-cent fares, that it is only too plain that it could be realized only during a period in which repairs and renewals were not part of operating expense. It leaves a balance, for the sixteen days, of net earnings equal to \$1,874.32 or on the basis of about \$45,000 annually. The latter sum would just pay the 6 per cent per annum due on the \$750,000 of par value of the shares of the underlying company to which the Municipal Traction Company is pledged. Apparently, then, the success of the enterprise is conditioned upon a considerable growth in traffic or its ability to get along without charges for repairs or renewals—the latter an obviously impossible requirement.

The rapid development of electric railways is forcing new questions upon the state railroad commissions, and although

Jurisdiction of State Commissions.

In some states the laws have been amended to include the interurban railroads within the jurisdiction of the state commissions, in others they have not been modified to meet the changed conditions. The

South Dakota commission in its annual report says: "A few states have already placed electric roads under the authority of their railroad commissioners in respect to the matter of crossing other roads, but in general there is one law for railways using horse, mule, cable or electric power and designated as street railways, and another for those employing steam power, as in our state. Now that street railways are expanding into interurban roads giving passenger and freight service over extended lines and offering similar service to that of the steam roads, it is found that the laws should be changed to meet the new conditions. A notable example of the extension of electric lines within our state is the comparatively recent transformation of the Chicago Burlington & Quincy line between Deadwood and Lead from a steam railway into an electric line. In case the commission was asked to allow an electric road to cross the tracks of a steam road at grade, the question would at once arise, 'Has the commission any authority to do so?' the law as it now is giving the commission only general supervision over all roads operated

by steam. The law should be so amended as to give the commission general supervision over all railroads or railways operated by steam or electric power, street railways only excepted." Other states are considering the same problem and it is evident that something must be done at once to relieve the inconsistency of the situation. The sooner the electric interurban railroad is recognized by the state legislatures the better it will be for all concerned. Of course there are difficulties to be met, for instance in regard to the distinction between city and interurban lines, but the matter is one that cannot be neglected with impunity and many needless complications will be avoided by facing the problem at once.

Coating the inside of boiler tubes with a thin layer of graphite is a "kink" that has given excellent results in a boiler plant using water containing excessive amounts of scale-forming salts. These deposits have required frequent drilling of the tubes. It was found by experience that much less scale adhered to the tubes coated with graphite and that the scale which did form was far more easily removed from them than from uncoated tubes. The application of graphite might be said to have insulated the steel from deposit and thus rendered the tubes more easily cleaned; and when cleaned their interiors appeared perfectly smooth without the usual patches of scale remaining as is the case after a tube has been bored with a turbine-cleaner. The one application of graphite so adhered to the metal that the interior of the tube had the appearance of a gun barrel, the graphite coat remaining intact after several cleanings. The graphite may be prepared for application to the interior of tubes by mixing it with pure mineral oil in an amount sufficient to form a thick paste, or it may be applied dry.

EXCHANGE OF FREIGHT WITH STEAM RAILWAYS.

In the effort to develop new sources of business, traffic managers of various electric railway companies have tried, sometimes successfully and sometimes without acceptable results, to secure the establishment of joint tariffs and through routes with steam railway companies. Reciprocal arrangements of this kind have been found advantageous in a number of instances.

The Interstate Commerce Commission has been petitioned by the Cedar Rapids & Iowa City Railway & Light Company, of Cedar Rapids, Ia., to establish joint rates on cereals and live stock between points on its line and points on the Chicago & Northwestern Railway Company lines.

The commission held meetings in Cedar Rapids on January 29 and 30, at which the evidence was heard. The Cedar Rapids & Iowa City operates an electric railway between those two cities, a distance of about 28 miles. It is built upon a private right of way 100 feet wide for practically the entire distance. The road is built according to steam railway standards with a 1 per cent grade, and no curves exceed 3 degrees, except one of 4 degrees. The bridges were built to accommodate heavy steam railway traffic. The territory through which the electric line passes is not served by any other railway except at terminal points. The company has exchanged considerable business in carload lots with the different steam railways. Last year it handled 450 cars of live stock.

The steam railways have refused to establish through routes and joint rates and the company was obliged to charge the Iowa distance tariff from the town of shipment to Cedar Rapids. The steam railways then charged their local tariffs from Cedar Rapids to destination. After the enactment of the Hepburn law the company applied to the different railways for routes and rates and, after these were

refused, entered a complaint with the commission. After hearing the evidence the commission adjourned and it is expected that the arguments will be heard within a few weeks.

In its answer to the complaint filed with the commission, the Chicago & Northwestern took the position that the Cedar Rapids & Iowa City is not engaged in interstate commerce and is not subject to the provisions of the interstate commerce law. The Northwestern asserted that the electric railway has no facilities for handling freight and that when freight has been received for shipment from points on the electric road, the Northwestern has been obliged in every instance to furnish the necessary equipment. The electric railway, the Northwestern alleged, has never delivered or offered to deliver cars loaded with live stock, grain or other freight. The Northwestern also maintained that the business which originates on the electric road is not sufficient to warrant the establishment of joint rates.

The business of several electric railways with steam roads is of considerable importance. The St. Louis & Belleville Electric Railway Company of East St. Louis, Ill., hauled and delivered to steam roads last year about 350,000 tons of freight, consisting chiefly of coal, which was carried on a 40-cent rate. This rate is charged by all the steam roads in that district. The amount of tonnage received by the electric company from steam roads was not so large, but it averaged probably 10 carloads a day. The business of the company is entirely in carload lots. No passenger cars are operated. The principal commodities transported which were exchanged with steam roads were coal, lumber, stone, brick, pitch, sand, macadam, mine props, powder and mine rails.

The Omaha Lincoln & Beatrice Railway Company of Lincoln, Neb., limits at present its interchange of freight with steam railways to joint switching of carload lots. Since the traffic arrangements were entered into the business has averaged about 5 cars a month. After the line from Lincoln to Omaha is finished, which it is expected will be this year, the management believes its business with steam roads at the two terminal points will increase. There are 6 miles in operation, over 5½ of which carload lots of freight have been switched.

The experiences enumerated above indicate that the possibilities of developing traffic relations with steam roads are worthy of serious consideration by those officials of electric railways who are responsible for growth in traffic.

TRACK RENTAL AT INTERURBAN TERMINALS.

It is generally acknowledged that the best city entrance for an interurban line is over private right of way. However, financial conditions and the development of many interurban lines as extensions of suburban systems have made it necessary, in most cases, for interurban companies to rent track privileges from local street car companies. It is not believed that there is uniformity in the methods of charging for such privileges.

Probably the most common way of renting city tracks for the use of interurban cars is at a fixed rate per passenger carried. Such rates vary from 2½ to 5 cents per passenger. If the haul is more than one and a half miles it would seem that a charge of 2½ cents per interurban passenger would not yield very much profit to the city company, unless the interurban traffic were very great. On the other hand, if the interurban company furnishes its own cars and trainmen and the distance is less than three miles, a charge of 5 cents per passenger carried would seem to be excessive. The mileage of the tracks rented is a very large factor in the rate to be charged, if the rental is to be on a per capita basis.

In some cities contracts have been made which allow the interurban cars to operate over the city tracks at a fixed

rate per mile run. In one instance a charge of 20 cents per car-mile is made. As a standard method of computing such rentals would be useful in many cases, it is suggested that perhaps the most satisfactory way for two electric railway companies to consider such situations would be to base the charges on the ton-mile as a unit. The weight of city and interurban cars under normal operating conditions could be ascertained, and with a knowledge of the schedule, the number of ton-miles made in a day, a month or a year could be approximated closely without any difficulty. In the smaller cities where single-truck cars are used it probably would be found that the interurban cars would weigh twice as much as those of the city company, so that each trip of an interurban car would count for two trips, or perhaps a fraction more, of a city car. As the question of the weight of passengers or freight carried would include factors of intricate detail it probably should not be considered.

After the proportionate use of any route has been determined according to the ton-miles operated, the cost per mile of the track and overhead construction as used by the interurban cars could be ascertained and interest thereon be allowed at the rate of 5 or 6 per cent. To this should be added the cost of maintenance, including all necessary repairs, removal of snow, sprinkling, etc. A further sum should be added for depreciation and while an exact estimate of this charge might not be possible in the beginning, an amount equal to a fixed rate could be set aside each year and the totals readjusted at definite periods of say five or ten years.

The combined amount of these three items—cost of roadway, maintenance of roadway and depreciation—should be divided by the ton-miles operated over the track included in the estimates and the proportional amounts charged to each company. This will afford a basis for making rates, but to such a unit should be added the cost for power, which could be paid for by the interurban company according to the number of kilowatt-hours used. If the price per kilowatt-hour could not be agreed upon in advance it would be well to determine the cost of power at the switchboard, including the interest, maintenance, depreciation and all power-house expenses, and to this add a fixed percentage as profit for the generating company.

In determining the final amount to be charged per ton-mile as here outlined some allowance should be made to the city company for the expense and labor it has called into play in making available a terminal for the interurban company. This charge might appear as a fixed percentage of the actual cost as determined, or as a lump sum per month which, though small, would yet be a steady income to the city company and one which the interurban company could well afford to pay. If the city company were anxious to promote the construction of interurban lines radiating from its terminals it also could afford to make concessions as to the later cost for the first few years until the interurban road had been placed on a paying basis. Without this charge the city company would derive some benefit from a reduction in its interest charges and any other charges resulting from the increased use of its tracks.

Only city companies that have trackage facilities not occupied to their limits, and therefore an investment which is not earning as much as it might, can afford to allow interurban cars on their lines. The question becomes with them not how much they are really entitled to receive for the use of the tracks, but: we have an investment which is idle part of the time. Any compensation which represents more than the cost of track and roadway maintenance and power is therefore so much clear gain.

The rules governing the operation of foreign cars on city tracks should be simple and it should be obligatory that the interurban company's employes observe the existing rules of the city system. It is thought that in many of the terminal situations where in some cases needless time and

ability have been wasted in arguing over a lump sum to be paid by the interurban company for its yearly rentals, an agreement could satisfactorily be made if the problem were attacked on a unit basis, using the ton-mile as a foundation.

THE INSTRUCTIVE VALUE OF WORKING EXHIBITS.

The increasing power and complexity of cars recently built for rapid-transit service imposes a burden of no little responsibility upon those charged with the instruction of train and car-service men. For several years trainmen, and it is suggested that similar advantages should be given shopmen, have been instructed in their duties by supplementing oral or printed teaching with practical study of actual car equipments. A familiar feature of the latter method is the provision of schoolrooms fitted with controllers, brake-valves and cylinders, train lines, signal lanterns and illustrations of detail parts of the rolling stock. The addition of air-compressor outfits and working control circuits makes possible better teaching than was feasible without the vital stimulus of using power in the concrete. For this reason the modern trainmen's school, when equipped with skeleton cars and complete electrical apparatus, becomes a most efficient factor in preparing men for actual service. Of course, it is a mistake to assume that a new man placed in the car service has little more to learn after his two or three weeks of preliminary instruction. In the exacting routine of platform work new men often need friendly encouragement as the mastery of the equipment with respect to locating troubles on the road comes only with experience.

There appears to be no single part of the car equipment that all new men find especially hard to understand. With some new motormen the fundamental principles of the brake-valve are hard to grasp; with others, the understanding of the contactor, reverser or master-controller wiring may be a stumbling block. Much can be done to aid in the explanation of these points by exhibiting diagrams of circuits clearly drawn on a large scale and by including as a part of the teaching equipment sections of the braking apparatus.

The Boston Elevated Railway Company has gone even farther than to provide dummy cars with actual equipment in its trainmen's school. A special blackboard with sketches of the main motor-circuits, resistances, circuit-breaker, fuse and contactors painted upon it is mounted behind the corresponding groups of equipment on an instruction car. In each circuit on the drawing is inserted an incandescent lamp, which automatically lights whenever the current flows through the corresponding circuit on the dummy train. The change from series to parallel can plainly be seen as well as the flow of current in the reverse circuit.

There is no question that the use of the lamps helps the men materially in understanding the circuit changes and the scheme is a simple one which easily could be adapted for use in less elaborately equipped schools. The great point to be remembered in work of this nature is that electrical conceptions quite probably are foreign to the minds of applicants for train-service positions.

A large wall-drawing of the electro-pneumatic brake system which is used on the later type of cars has been found to be an effective aid to instruction. The valve handles on the drawing are made of celluloid cut to the proper shape and pivoted. All the other movable valves of the instruction equipment as well as the brake piston rod and rotating contacts are constructed of stiff pasteboard, so that the exact function of each part can be seen.

Such refinements may be considered by some as too elaborate, but when we consider the relative importance of high-class trainmen, well acquainted with the cars which they operate, it is easily seen that facilities for careful and thorough instruction are excellent investments.

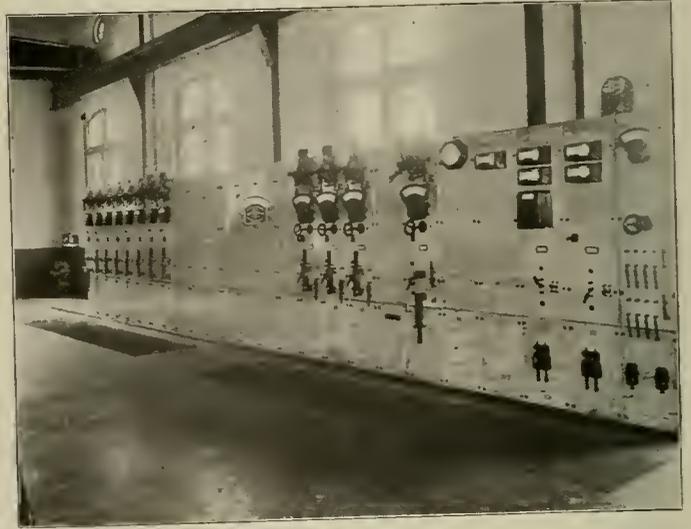
NEW SUBSTATION OF THE INTERNATIONAL RAILWAY COMPANY, BUFFALO, N. Y.

The Seneca and Elk streets substation of the International Railway Company of Buffalo, N. Y., with an ultimate capacity

and switch cells for five 1,000-kilowatt rotaries and a double-feeder booster. It now contains one 1,000-kilowatt and three 400-kilowatt machines, which latter will be replaced by larger units as the service requires. Blank panels are provided in the switchboard, and all conduit is in the floor for a sta-



Seneca Street Substation, Buffalo—Interior View Showing 1,000-Kw. Rotary and Busbar Compartments with Doors Removed.



Seneca Street Substation, Buffalo—Switchboard.

of four 400-kilowatt rotaries, became overloaded during the winter of 1905-1906. It could not conveniently be extended, and, as it was located in a section of the city which is flooded at least once each year by the overflowing of the Buffalo river, it was decided to build a new station and to locate it outside the district subject to flood. The new Seneca and Imson streets substation just completed and described and illustrated herewith, is outside the area that is sub-

tion containing seven 1,000-kilowatt rotaries, a storage battery with its booster set and a two-feeder booster set.

Power Supply.

The southeast section of Buffalo is growing rapidly, and with the mustering into service of the heavy, electrically-heated "5,000-type" cars it is expected that the new substation will soon carry a load that will show not too great a margin of reserve capacity. It is not to be expected, however, that the section which can be economically fed



Seneca Street Substation, Buffalo—Interior View Showing 1,000-Kw. Rotary and Three 400-Kw. Rotaries.

merged at the times of highest water, and is as near the load-center of the southeastern section of the city as was the old station.

Sufficient land was purchased to accommodate an extension of the converter station, a storage battery house, and leave a driveway all around the property. The present station is complete with space, switchboards, bus compartments

from this station will ever produce a load beyond the capacity to which the station can conveniently be increased.

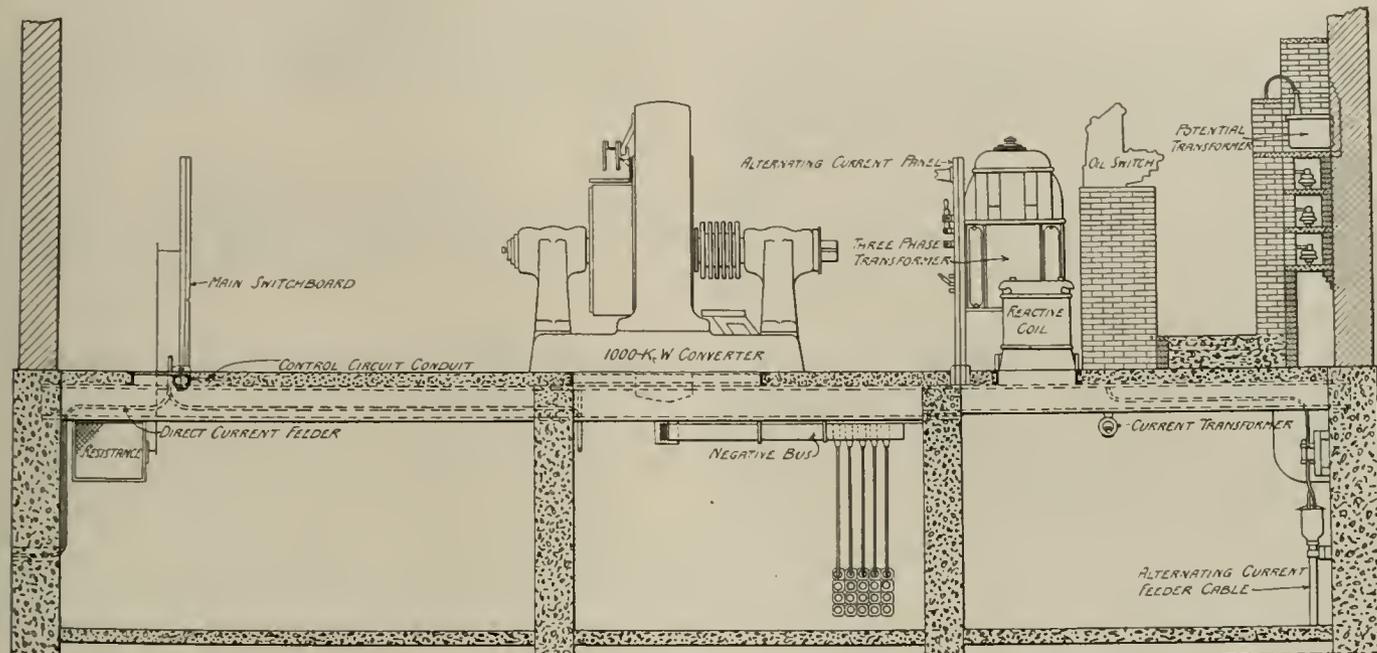
The new substation is supplied with power by means of underground cables of the Cataract Power & Conduit Company, Buffalo, distributor of power from the Niagara Falls Power Company and Canadian Niagara Power Company. The International Railway Company has a steam plant in Buffalo

which supplies alternating-current power in parallel with Niagara Falls power to some of its other substations, but the cables to this particular substation are not connected with the steam plant. An accompanying load chart exhibits a total load curve for the city of Buffalo and also load and voltage curves for the substation described herewith. The

wanda and Lockport have storage batteries. The International Railway Company supplies power to its Canadian division from its own hydro-electric plant situated at Table Rock, Niagara Falls, Ontario.

Building Construction of New Substation.

In excavating for the foundations, a solid, flat stratum

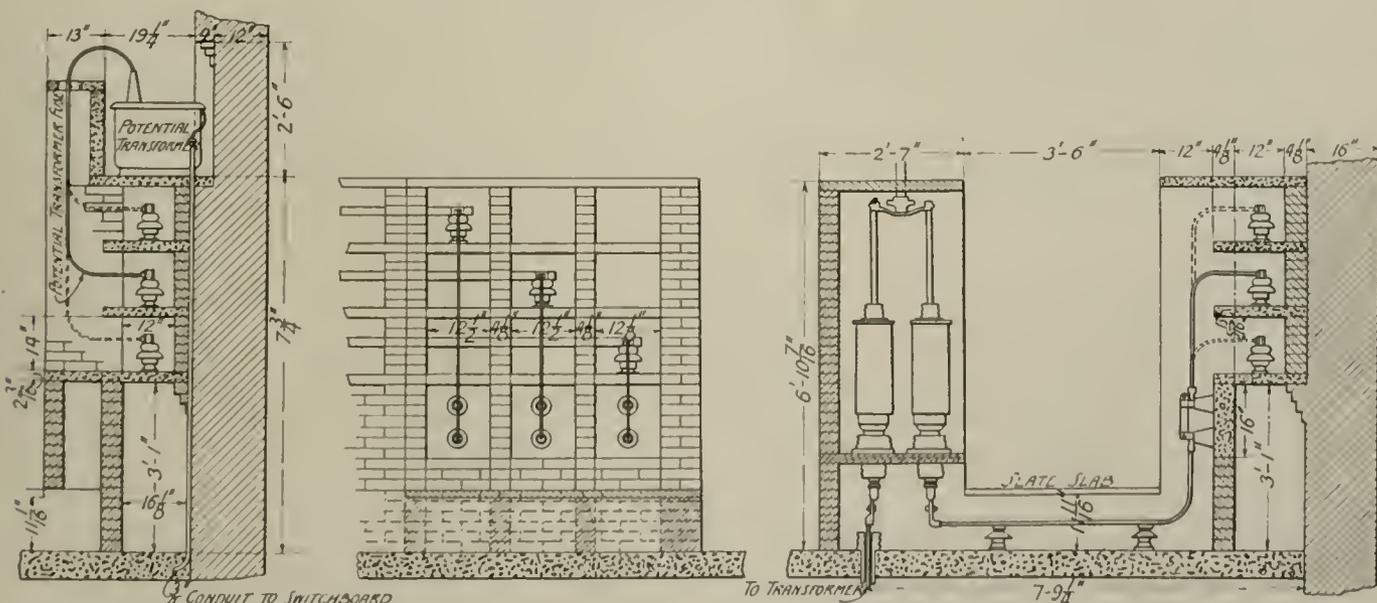


Seneca Street Substation, Buffalo—Cross-Section Showing Arrangement of Apparatus.

largest Buffalo substation is that at Virginia and Washington streets, containing six 1,000-kilowatt rotaries, a motor-generator lighting set and two 1,500-horsepower (one hour rating) storage batteries and boosters. Other city substations are at Walden avenue and the Belt Line, and in the Niagara street steam plant.

The interurban and other divisions of the system out-

of smooth rock was found within a few inches of the depth to which it had been planned to dig. The rock had a slight incline (less than one foot in the length of the building) and it was only necessary to cut out a small channel in this to accommodate sewer pipes for the drainage of the building. On this admirable foundation the walls are carried up to grade with concrete. The superstructure is of red shale



Seneca Street Substation, Buffalo—Busbar Compartments and Method of Making Switch and Potential Transformer Taps.

side of the city of Buffalo are supplied with power from substations located at North Tonawanda, Lockport, Ocott and in Power-house No. 1 of the Niagara Falls Power Company.

All of these stations operate on power from the Niagara Falls Power Company and those at North Tona-

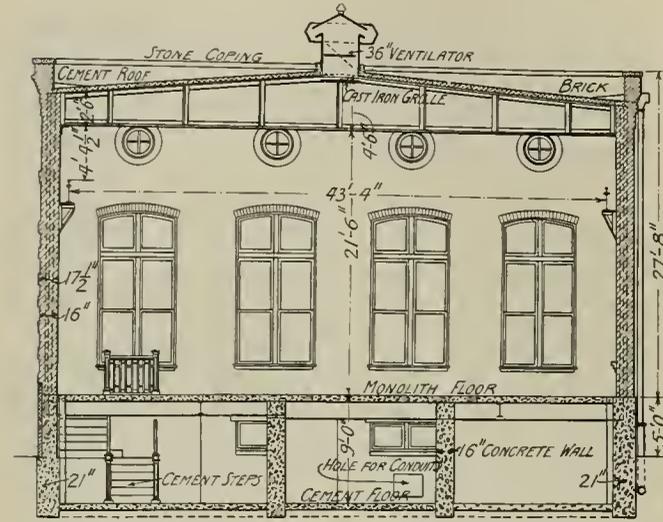
brick with sandstone trimmings, and concrete floors and roof reinforced with expanded metal and half-inch iron rods spaced six inches apart.

Floor Construction.

In preparing the main floor heavy I-beams were arranged so that their tops are at the same level. The various floor

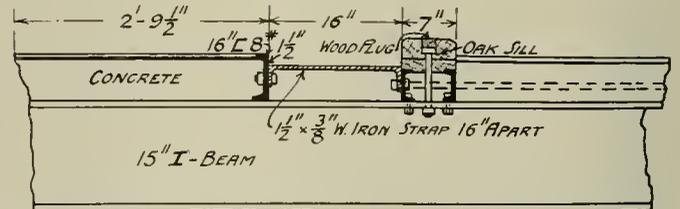
openings were then framed-in with 6-inch channels resting on top of the beams. The floor consists of 5½ inches of concrete finished off with ½ inch of monolith surface. The process of laying the floor was as follows: After placing the wood forms, ½-inch round-iron rods spaced 6 inches

of cheapness in laying, perfect symmetry of short ends and no difficulty about keeping the ducts close to the expanded metal at all points, thus obtaining the maximum possible depth of concrete above the ducts and preventing fractures in the concrete. The flexible conduit comes nearly enough to being water-tight for practical purposes. Where the conduits come horizontally out of the floor they are led through holes of suitable size drilled in the channels and the ends are capped with rigid outlet bushings secured snugly against the channels. Where the ducts pass vertically upward or downward out of the floor a solid steel elbow is at-



Seneca Street Substation, Buffalo—Cross-Section Showing Details of Building Construction.

apart were laid and covered over with expanded metal, the two being wired together firmly. The control-wiring conduit of flexible steel tubing was then put in place and wired to the expanded metal. When the concrete was poured, the rods, expanded metal and conduit were all lifted together so that no portion of the metal was within ½ inch of the

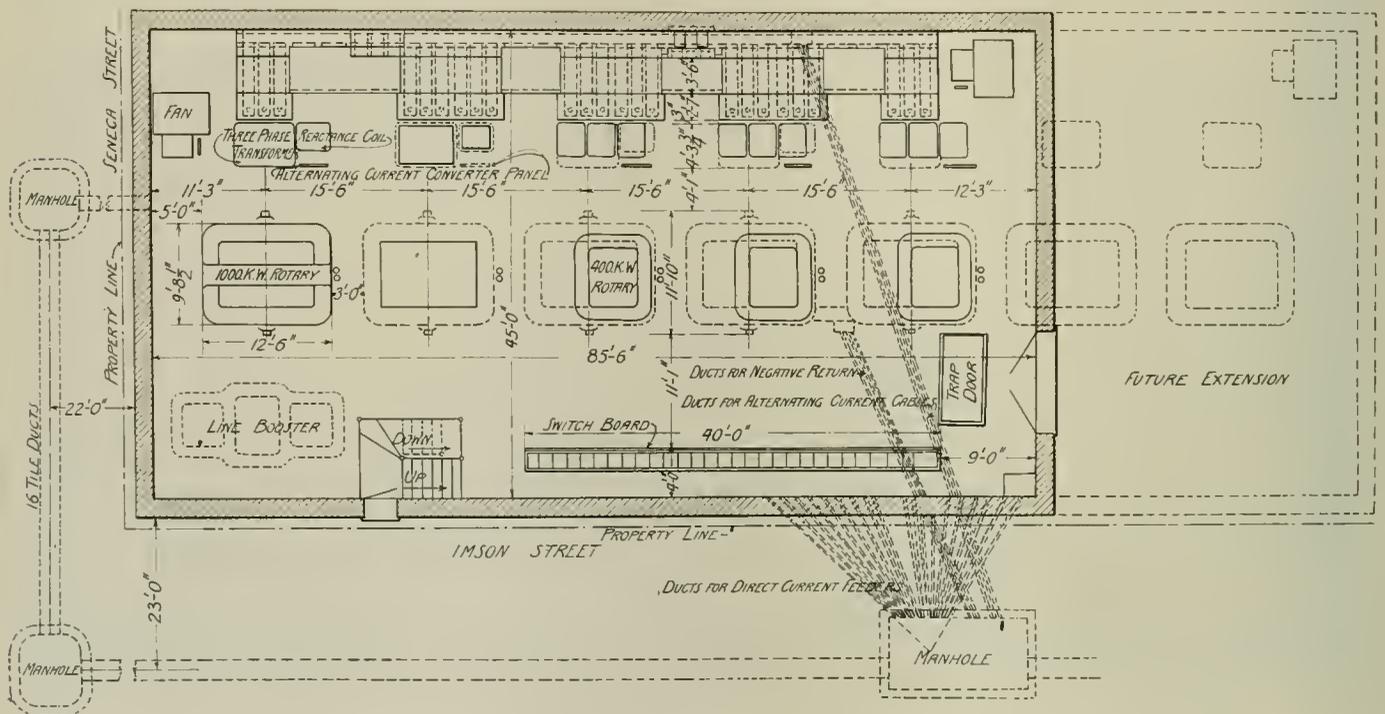


Seneca Street Substation, Buffalo—Details of Switchboard Slot.

tached to the flexible duct, enough of the elbow being embedded in the concrete to render an unyielding outlet fixture.

On account of the proximity to the flooded district it was decided to place the high-tension busbar compartments, disconnecting switches, etc., on the main station floor, instead of in the basement as has been done in many recent installations. This location also has the advantages of avoiding the dust that is always blown into the air chamber by the fans, and it brings the disconnecting switches where the operator does not have to leave the machinery to manipulate them.

The high-tension busbar structure is built up of Kittanning re-pressed buff brick, laid with ¼-inch joints in cement-



Seneca Street Substation, Buffalo—Plan Showing Present and Future Arrangement of Apparatus.

falsework. The result is a strong and most satisfactory floor, smooth on both sides. The monolith has the advantages of not staining with oil, cracking, giving off dust and not being as hard under the feet as concrete. It is also easy to keep clean and can be patched readily.

The use of flexible-steel conduit offers the advantages

tempered mortar. The disconnecting switch slabs and busbar barriers are of concrete. The busbars are supported on iron-capped porcelain insulators of the pole-line type. The insulators are on iron pins set in the horizontal barriers. The hanging barriers for the cable-disconnecting switches in the basement are built up of transite board glued to wooden

frames and painted. The busbar compartments and switch cells are completely covered with doors of transite board.

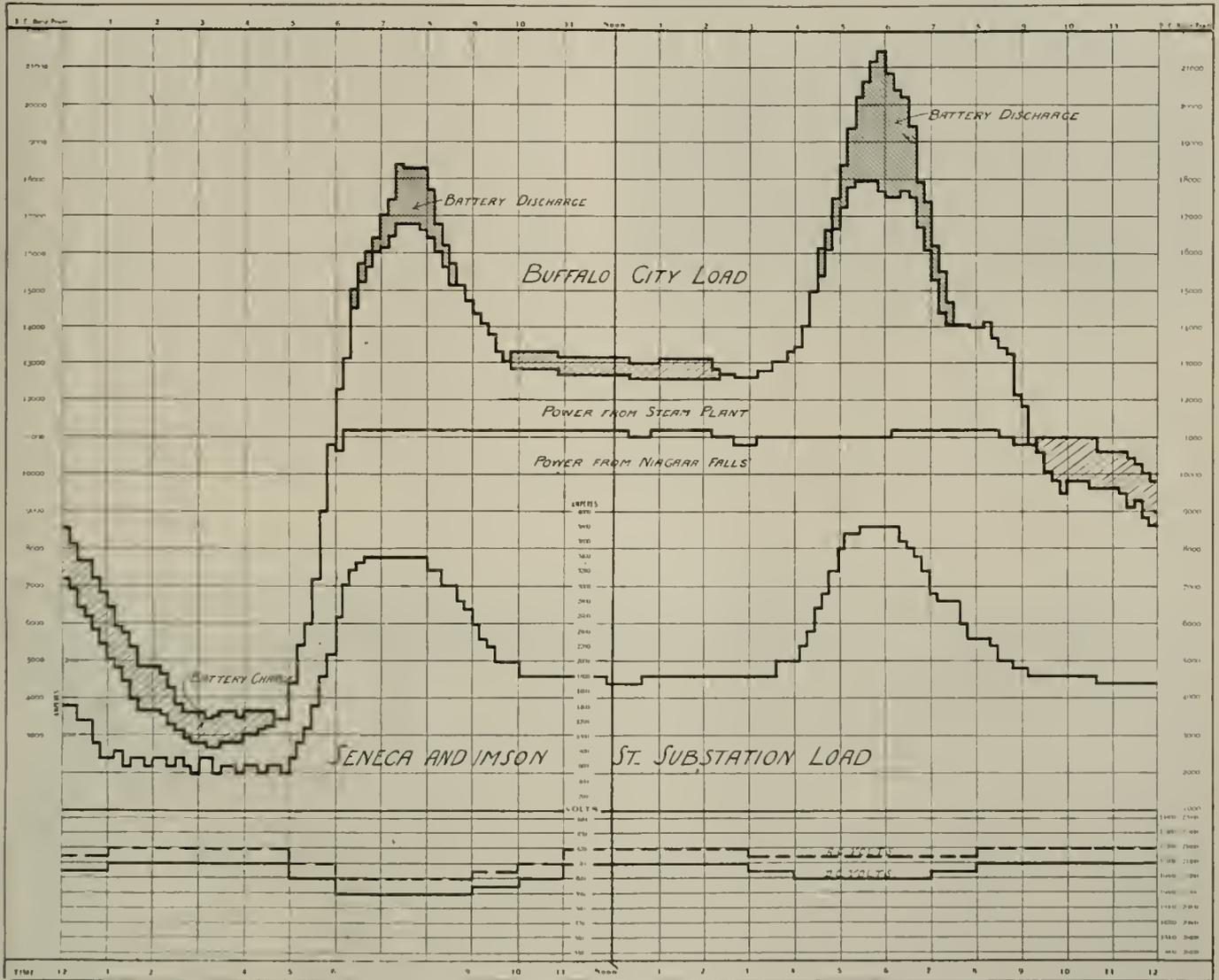
Entrance Details.

The sill of the large entrance door is at the level of the main station floor and a little above the platform height of a wagon, so that apparatus can be conveniently unloaded. To facilitate unloading machinery and bringing it into the station an arrangement is provided by means of which the crane can be used to great advantage. Directly in front of the door, and about fifteen feet from the sill, there is a heavy cast-iron plate secured to the floor framing. This plate has

care of by providing on three sides large windows cut close to the floor and surmounted by transoms, smaller windows near the roof on all four sides, and six 36-inch ventilators in the roof.

Arrangement of Apparatus.

Current enters the 11,000-volt busbars at one side of the building and passes straight across through the successive switches and apparatus to the point where it leaves on the railway feeders at the opposite side of the station. All connections are thus simplified and minimum lengths of cable are required. The direct-current feeders each leave the



International Railway, Buffalo—Power Chart Showing Total City and Combined Seneca and Imson Substation Load-Curves Typical for Winter 1906-1907.

a thick portion which comes flush with the top of the finished floor, and through the thick part there is a vertical hole, or circular eye, three inches in diameter, which passes all the way through the floor. Directly under this eye in the main floor there is a ring-bolt anchored securely in the rock beneath the basement floor. By fastening a chain in the ring-bolt and passing it up through the eye, a snatch-block can be secured at any desired height above the station floor. A cable around the snatch-block with one end attached to the load and the other to the crane-hook can be used to haul the load off the truck and to the station floor, where it can then be picked up by the crane in the usual way. The ring-bolt is set low enough in the basement floor so that it can be covered with a checkered plate flush with the floor.

The ventilation of the whole station has been well taken

building through underground ducts directly in line with the centers of their respective panels. This separates the exposed lengths of cable and gets the feeders into the ducts by the shortest possible route. As shown in the plan view these ducts converge into one large vault under the street.

The apparatus is so placed that there is ample room around each element to perform the usual operations, and the aisles are wide enough so that large, heavy pieces do not have to be raised high with the crane when installing or removing. The fans for cooling the transformers are located close to windows so that outdoor air may be had when necessary.

The 1,000-kilowatt rotary is started on low-voltage taps from the secondary winding of the three-phase transformer,

and the 400-kilowatt rotaries are similarly started but are supplied with power by three single-phase transformers.

Switchboards.

The alternating-current rotary panels contain all the switches to be operated in starting a machine, except the field break-up switch. The overload relay and alternating-current meter are also on this panel, thus simplifying the wiring. These panels are located close to the static trans-

forming out and short-circuiting the secondaries of the current transformers on the dead cables.

The direct-current feeder panels are in the main switchboard and are equipped with potential receptacles connected to the station voltmeter, so that the attendant can determine, if he drops a feeder, whether or not it is alive from another station and what voltage it carries. The circuit-breakers are all wired to sound a gong when they open automatically.

A utility panel is provided in the main switchboard, supporting the ammeter and rheostat controlling the storage battery for operating the oil-switches; also switches and fuses for lighting circuits and the motor-driven air compressor. On the lower section of this panel is a relay which sounds a gong in case any oil-switch opens automatically, and another relay which causes six incandescent lamps on the bottom of the middle roof truss to be instantly illuminated from the oil-switch control battery in a case of a general power interruption which puts out the regular station lights.

Switchboard Details.

The method of leading the wires from the floor ducts to the back of the switchboard panels is rather unusual and is believed to have many advantages over the individual junction boxes, bent tubing in wood sills, etc., that have often been employed. The switchboard panels stand on a wood sill, which in turn rests on two channel-irons on edge with ample space between them for handling and spacing the wires. The conduit projects just through the channels and is capped off flush. Vertical bushings in the wood sills lead the wires from the ducts to the back of the panels. The under side of this opening between the channels can easily be covered with steel plate so as to prevent injury to the wires from below.

The oil-switch control battery is placed in a separate room in the basement. This room is connected by means of



Seneca Street Substation, Buffalo—Exterior View.

formers and rotaries instead of in the main switchboard. The advantages are that the attendant has fewer steps to take in starting a machine, cannot mistake the panel controlling any particular machine in case of trouble and the main switchboard is reduced in length, thereby bringing nearer together the panels with which the attendant is constantly concerned. There are control switches and indi-



International Railway, Buffalo—Virginia Substation with Six 1,000-Kw. Rotaries.

cating bull's eyes for the converter oil-switches on the direct-current rotary panels as well as on the alternating-current panels. These switches on the direct-current panels are only for use in emergency and are arranged so that they will only open the oil-switches.

The incoming power is measured on a single meter, regardless of the number of incoming cables in service. This is accomplished by paralleling the secondaries of the current transformers. Double-throw switches are provided for cut-

a pipe laid in the floor, with the air-chamber under the transformers, and as there are windows in the battery room, the air can be changed at any rate desired. Next to the battery room is the store-room and station-attendants' locker room and opposite these is the toilet room. The whole basement is well ventilated by windows protected on the outside by both screens and bars.

The electrical apparatus was furnished and installed by the General Electric Company, the station arrangement and

design having been worked out by the engineers of the International Railway Company. The equipment and arrangement of the new station are clearly shown in the accompanying engravings from blue-prints and photographs for which, with the above data, we are indebted to G. A. Harvey, electrical engineer International Railway Company.

COMMUNICATION.

A Car Repair Problem.

To the Editors:

The locating of troubles in the electrical equipment of the ordinary street car is not always as simple as might be supposed. The following statement of conditions will illustrate a problem which recently came to my notice. It might be of interest to the shop men who are readers of the Electric Railway Review, and therefore I forward it, trusting that some replies may be received.

The particular car on which the trouble occurred was equipped with four G. E.-80 motors and two K-28 controllers. The electrical equipment was originally placed on the car at the car builder's. When the car was put in service it ran all right for about three months; then it was sent to the repair shop for trouble reported as being in the No. 2 end-controller. On inspection the repair man found a broken pawl spring in the No. 2 controller. This repair was made and the car placed in the hand of the tester, who found that with all four motors the car would run properly from the No. 1 controller both forward and reverse, but on reversing from the No. 2 controller the No. 2 motor would reverse its direction of rotation when the first parallel point was reached. If the No. 1 and No. 3 motors were cut out the car would run forward and reverse properly when operated with the No. 1 controller and would run forward when operated with the No. 2 controller, but when it was attempted to reverse with the No. 2 controller the circuit-breaker would open. Removing the brushes from the No. 4 motor opened the circuit.

SEVENTY-SIX.

INSTRUCTING TRAINMEN AT KNOXVILLE, TENN.

The Knoxville (Tenn.) Railway & Light Company has a novel and satisfactory method of teaching new employes the details of motor construction and car wiring. Each motorman must spend seven days in the repair shops before he is given a regular run. During that time he must apply himself to learning the component parts of motors and on completing this service he able to trace the path of the current from the trolley wheel to the track return. To assist him in this task a large car-wiring diagram is kept for ready reference in a conspicuous place at the shops. In addition to this bulletins are posted which enumerate the component parts of the motors used and furnish descriptions of the course traveled by the current in passing from the trolley wire through the car back to the power house. One of these bulletins is as follows:

"A General Electric motor type—1,000 or 67 consists of, 1 armature, 1 commutator, 1 yoke, 2 brush holders, 2 brushes, 4 pole pieces, 4 fields, 1 gear wheel and 1 pinion.

"A General Electric motor of Type 800 has but 2 fields, and 2 pole pieces, otherwise it is the same as motors of the No. 1000 or 67 types.

Travel of Current.

"The current travels from the trolley wire to the trolley pole, from the trolley pole to the trolley base, from the trolley base to the overhead-switch, from the overhead-switch to the fuse-box, from the fuse-box to the lightning-arrester, from the lightning-arrester to the kicking coil, from the kicking coil to the cable, from the cable to the controller, from the controller to the resistance box, from the resistance box to the motor, from the motor to the rail, from the rail to the power house."

CHICAGO TRACTION ORDINANCES TO BE DECIDED BY VOTERS.

The message of Mayor Dunne vetoing the Chicago City Railway Company and the Chicago Railways Company ordinances was read to the city council of Chicago on February 11, but the aldermen after discussion passed the two measures over the veto. The vote was 57 to 12, or one more in favor of the ordinances than was recorded at the meeting on February 4. The mayor's objections were answered in detail by the aldermen. They pointed out that while the mayor had been in favor of a settlement of the traction problem he was now interposing objections in order to defer action until after the election on April 2. The principal points raised by the mayor and the answers of the aldermen who discussed the message were as follows:

Mayor Dunne.

The ordinances fail to provide practical methods for the acquisition of the systems. At the present time the city is authorized to issue Mueller certificates amounting to \$75,000,000; after deducting commissions these would net \$72,000,000 in cash. The price of the present properties as fixed in the ordinances aggregates \$50,000,000. The cost of rehabilitation will be from \$40,000,000 to \$50,000,000 and may be an unlimited amount, making the total cost to the city at least \$90,000,000 to \$100,000,000. The city will never be in a position to acquire these lines unless supplemental ordinances are passed, authorizing the issue of at least \$100,000,000 certificates. Unless the ordinances limit the cost of rehabilitation at any time to the amount of Mueller certificates authorized to be issued, in my judgment it will be most difficult if not impossible to obtain the passage of such ordinances.

Alderman Foreman.

During the pendency of the negotiations the mayor has known that the price agreed to be paid for the property and the amount shown by the engineers' estimate to be necessary for rehabilitation will exceed the amount of the authorized issue of Mueller certificates and that if the amount required to rehabilitate the properties is expended, it will require another issue of certificates in order to purchase the roads. The price to be paid for the properties is not the price asked by the companies, but is the price placed by the city's own experts, one of whom is the mayor's personal appointee.

If the ordinances become effective and consolidation of the two companies takes place, as is highly probable in view of the statement of John P. Wilson, representing the Chicago City Railway Company, and in view of the fact that the same financial interests dominate and control both companies, the consolidated companies will operate under the ordinance which is more favorable to them. This is the Chicago City Railway ordinance, which, in the event of purchase by the city, requires the payment of all cash, including the total cost of all the properties and rehabilitation. The other ordinance, which in my judgment will not be accepted, requires the payment of all cash except the cost of rehabilitation, which may become a lien subject to which the city may acquire.

We cannot hope with any confidence that a fund will certainly be acquired out of the 55 per cent net receipts which become the property of the city. We view with serious misgivings the assertion of the companies that the net receipts coming to the city will be any substantial part of the gross receipts. You have passed these ordinances without any provision of any character for gross receipts. Not only do the ordinances fail to guarantee to the city an income of any character, but, if the ordinances become effective, approximately \$125,000 which is paid to the city

The one urgent and sovereign need of the city of Chicago is good street railway service, not passable street railway service. The giving of an up-to-date service in this town will not endanger municipal ownership in the slightest degree. If it does, municipal ownership is a pretty sorry thing to be making any claims to our consideration. The installation of the service which is proposed is a matter which rests entirely with the people and if they desire to embark in the ownership and operation of street railways they will have no hesitancy in authorizing the sufficient issue of certificates to consummate it.

The ordinances proceed upon the conditions that the interest return on the investment of the companies shall be limited to 5 per cent of the value of the properties as fixed by the experts plus the new money to be invested in rehabilitation, the latter to be expended under the direct control of the board of supervising engineers and that the city and the companies shall divide the net profits upon the basis of 55 per cent for the city and 45 per cent for the companies. The ordinances provide that two funds, one of 6 per cent and one of 8 per cent, shall be retained, the first for

under existing circumstances will be wiped out.

No licensee company to which the city may give a license may acquire the plants of the present companies unless upon the payment of a 20 per cent bonus above the price the city would have to pay if it acquired the properties for municipal ownership and operation. The reason advanced by the traction companies for insisting upon this premium was that they should be protected against the sand-bagging operations of rival capitalists. The companies absolutely refuse to accept the provision that if a licensee company should offer to the city to accept an ordinance of similar character and give a 4-cent fare, the existing companies should take the money invested in the plant and turn over the properties to a 4-cent fare company.

The city is embarrassed by a provision which permits these companies to charge 10 per cent contractor's profit upon the cost of rehabilitation and at the same time the ordinances permit them to make subcontracts. Under the ordinances the companies are empowered to charge 10 per cent additional on the cost of subcontracts and the profit obtained therefrom.

The agreement between John A. Spoor, Thomas E. Mitten, the City of Chicago and the First Trust and Savings Bank, which purports to remove the obstruction created by the existence of the present General Electric railway ordinance, is not signed by any of the parties.

The amendment providing for the arbitration of disputes between the companies and their employes was voted down.

The ordinances as finally adopted contained some changes from the summary as published in the Electric Railway Review of January 19, 1907. The important changes are as follows:

Referendum.

The ordinances "shall not take effect unless and until a majority of the votes cast upon the following question of public policy at the election to be held in the City of Chicago, on the first Tuesday in April, A. D. 1907, are in the affirmative: 'For the approval of ordinances substantially in the form of the pending ordinances (reported to the City Council of the City of Chicago on January 15, A. D. 1907), authorizing the Chicago Railway Company and the Chicago Railways Company, respectively, to construct, maintain and operate street railways in said city, and providing for the purchase thereof by the said City or its licensee.'

Transfers.

The companies shall exchange transfers with all existing street car lines operating in the city, not heretofore mentioned, under reasonable regulations, and at all points of connection after such time as the franchises of the other lines now operating shall have expired and shall be extended or renewed.

Through Routing.

The purchase or acquisition by the city or its licensee of any street railways shall not affect or impair the obligations regarding transfers and through routes.

the purpose of maintenance, and the second for the purpose of extension and replacement. Whatever remains of these two funds at the termination of the grant goes either to the city or its licensee and never to the companies.

Speculation in Chicago's streets should cease. The city should have no choice as to which profit-making corporation occupies its streets. It must be borne in mind that the demand for 20 per cent bonus is one to protect the companies from other companies which seek to oust them from the streets. They contend, and not without some force, that if the city become a party to such intent, at least they should be compensated for their removal, and that they should not be made the prey of firms of promoters who trade on other people's assets. The suggestion that such a licensee company should give 4-cent fares was met by the companies by the statement that this would be no protection to the companies, but would inure to the benefit of the city. Such a licensee company could not be required to spend any money on subways or underground trolleys, or to make extensions, or to pay the city compensation, or a part of its net profits.

The part of the ordinances relating to contracts, the method of their letting and the percentage of the contractor's profit was one that was properly guarded by Bion J. Arnold, A. B. Du Pont and M. E. Cooley. The price of every article installed by any of the companies must be approved by the board of supervising engineers on which the city has one member, Mr. Arnold.

Alderman Werno.

The contract covering the disposition of the General Electric railway line has been signed and deposited with the comptroller.

The employes have not urged that the ordinances provide for arbitration of disputes between the companies and the employes.

Fares.

The ordinance was amended to include the future limits of the city for one fare.

Chicago Railways Company.

If the property and rights of the Union Traction company are not acquired within 120 days after the passage of the ordinance the company has an additional 90 days in which to secure approval of the plan of reorganization and readjustment. There must be deposited with the Chicago Title & Trust Company as trustee by January 20, 1908, not less than 3,126 shares of stock of the Chicago West Division Railway Company, 1,251 shares of stock of the North Chicago City Railway Company, 29,601 shares of the stock of the North Chicago Street Railroad Company, and 49,946 shares of stock of the West Chicago Street Railroad Company, being a majority in each instance, other than that held by trustees under existing mortgages or trust deeds; also 81,001 shares of the preferred stock of the Chicago Union Traction Company and 133,334 shares of the common, being more than two-thirds of each class. The plan shall not be operative unless the allotment of securities and the other provisions are approved by P. S. Grosscup and John C. Gray. If they fail to agree they shall refer the question in disagreement to a third person to be selected by them. In case they fail to agree on such third person the selection shall be made by George W. Wickersham and Edward B. Burling. The decision of a majority shall then be binding.

General Electric Railway Company.

The representatives of the Chicago City Railway Company agree as a condition of the ordinance to secure to the city of Chicago the power to annul all the rights and franchises of the General Electric Railway Company and to remove its tracks. In accordance with this agreement John A. Spoor and Thomas E. Mitten deposit with the First Trust and Savings Bank as trustee the promissory notes, bonds and certificates of stock of the General Electric Railway. If the ordinance becomes operative these securities shall be held by the trustee until the provisions of the agreement have been carried out. If the ordinance does not take effect on or before July 1, 1907, the securities shall be returned to Mr. Spoor and Mr. Mitten.

The board of election commissioners has heard arguments regarding the legality of the form of the emergency referendum petition, and will probably announce its decision next week. If it is decided that the petition is legal in form, the voters who are attacking it will raise the question that the signatures are not sufficient in number and that some were forged.

In order that there might be no doubt as to its position the Chicago Railways Company, through Henry A. Blair, vice-president, has addressed a letter to Charles Werno, chairman of the local transportation committee of the city council, stating that the company is advised by counsel that the clause providing that the ordinance shall be effective only in the event of a favorable vote at the April election, is legal and valid. "The company," Mr. Blair says, "will not, in any event or under any circumstances, make any claim to the contrary. If the majority of the votes cast shall not be in favor of the ordinance, the company will make no claim that the ordinance is operative and will make no claim to any rights under the ordinance. The company does not desire to undertake the reconstruction of the street railways covered by any ordinance which is disapproved by a majority of the voters of the city who may vote for it. The company is willing to give such other assurances as may be desired by your committee to further protect the city in the matter above referred to." This letter is similar to one that was issued by T. E. Mitten, president of the Chicago City railway, several weeks ago.

Large Power Plant for Inland Empire System.

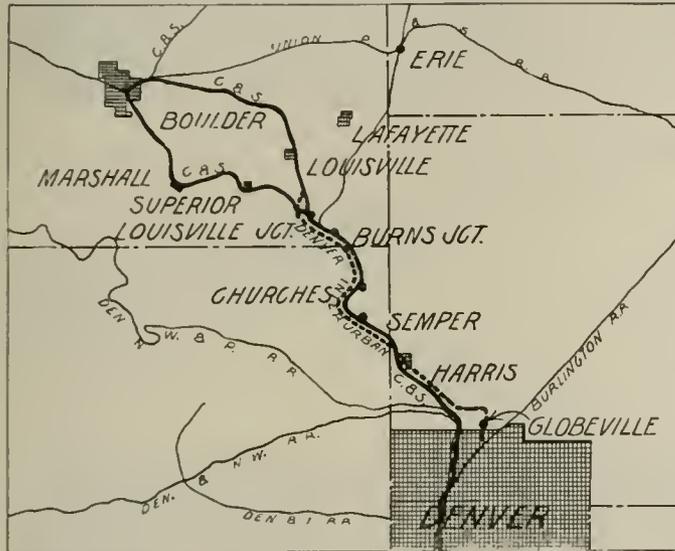
The Spokane & Inland Empire Railroad Company is now engaged on a large water power development at Nine Mile bridge on the Spokane river near Spokane, Wash. The work includes the construction of a masonry dam and power house and the ultimate installation of turbines and generators capable of producing over 20,000 horsepower. The construction is in charge of Mr. F. M. Sylvester, manager for Sanderson & Porter, engineers and contractors, who have the contract for the work.

The new electric railway track laid in Canada in 1906 amounted to 93.32 miles. Of this total 88.42 miles were laid in Toronto, Quebec and British Columbia.

ELECTRIC LINES BETWEEN DENVER AND BOULDER, COLO.

Plans recently have been completed for making possible through electric trains between Denver and Boulder, Colo., a distance of 29.5 miles. United in this work are the Denver City Tramway Company, which will furnish city terminal facilities, the Denver & Interurban Railroad Company, which will build a new line from Globeville just north of Denver to Semper, and the Colorado & Southern Railway Company, which will equip for electric operation its present steam-operated lines between Denver and Boulder, meanwhile building a low-grade freight line to be operated with steam locomotives from Semper to Louisville Junction. It is announced that construction work will begin at once on the Denver & Interurban portion of the undertaking.

The accompanying map shows the location of the smaller towns with respect to Denver and Boulder. It will be noted that at the present time the Colorado & Southern has a steam-operated line comprising a single track from Denver to Louisville Junction, from which point to Boulder there are two operating lines, one by way of Louisville, the



Map Showing New Lines to Be Built and Electrified Between Denver and Boulder, Colo.

other through Marshall. It has been definitely announced that the Denver City tramway will build a new line from Seventeenth street on Arapahoe street to Twenty-Third street, thence along Twenty-Third street and across the Twenty-third street viaduct, which will be rebuilt, thence by private right of way to Washington street and along this street to Globeville at the city limits. From Globeville the Denver & Interurban Company will build a new line to Semper, and from Semper to Louisville Junction the Denver & Interurban cars will operate over the present Colorado & Southern main line, which has a maximum grade of 1.25 per cent. That the trackage facilities may not be limited between Semper and Louisville Junction a new line for the operation of freight trains with steam locomotives will be built with a ruling grade of .8 per cent.

With this new construction there will be afforded two tracks from Denver to Louisville, one to be used by electrically operated cars for passenger traffic and the other for steam-operated freight trains. From Louisville Junction, as has been stated, there are two single-track routes now in operation to Boulder. Advantage will be taken of this so-called "loop" by operating both steam and electric trains from Louisville to Boulder on the northern track and in the opposite direction on the southern track by way of Marshall.

The distance between Denver and Boulder over the new

route will be approximately 30 miles and it is expected to make the run in 52 minutes. The roadbed of the new line will be designed for heavy traffic and the track laid with 80-pound steel rails. The waterways will be crossed with concrete arches. The Denver & Interurban Railroad Company has offices at 809 Cooper building, Denver. Mr. A. D. Parker is president, and Mr. H. W. Cowan chief engineer of this work.

PROPOSED BROOKLYN-MANHATTAN SUBWAY LOOP.

After a long and complicated controversy over the relative merits of a subway and an elevated loop to connect the Manhattan terminals of the Brooklyn, Manhattan and Williamsburg bridges, the Board of Estimate and Apportionment of New York City has approved the plan for a four-track subway loop, and it is now expected that this will be followed by the approval of the appellate division of the supreme court of the state.

Under the rapid transit laws that have been enacted and amended at various times by the legislature of New York for the benefit of New York City, the local authority in the matter of approving routes and granting franchises, which formerly rested with the board of aldermen, is now exercised wholly by the board of estimate and apportionment. The determination of routes and the question of general public policy rest with the board of rapid transit commissioners, which consists of the mayor, comptroller or other chief financial officer, the president of the chamber of commerce of the city and five other persons. The legal course to be followed before new rapid transit facilities are authorized follows: The board of rapid transit commissioners must consider routes and general plans and determine whether the desired rapid transit facilities would be in the public interest; secure the approval of the board of estimate and apportionment; and secure the consent of the owners of the abutting property to the extent of 50 per cent of the assessed value thereof. If the consent of property owners is not obtainable the law provides that the appellate division of the supreme court shall appoint a commission to investigate each proposed route and, upon a favorable report of this commission, the court may authorize the extension. The board must then prepare detailed plans and specifications and advertise for bidders.

The route as designed by the board of estimate and apportionment and shown by the accompanying map begins at the Manhattan end of the Williamsburg bridge and runs through Delancey street and its contemplated extension to Centre street and under Centre street to the Brooklyn bridge terminal at Park Row, with a spur extending under Canal street to the proposed new Manhattan bridge. In Brooklyn the subway extends from the Williamsburg bridge under Broadway to Lafayette avenue and thence under that street back to the extension of the Manhattan bridge approach.

Although the board of rapid transit commissioners has no control over the bridge traffic over the East river, the latter being in the hands of the bridge commission, the former body has taken every step in its power to promote a plan for the early relief of the congested condition of the passenger traffic between Manhattan island and Brooklyn and has anticipated the decision of the appellate division of the supreme court by the preparation of complete plans and specifications for the loop, so that after all legal steps shall have been taken there need be no delay in advertising for bidders and in raising the funds to undertake the work.

The work which will first be undertaken will be the Manhattan portion of the loop connecting the Williamsburg and Brooklyn bridges. The completion of the Brooklyn portion of the loop by means of a line over the Manhattan bridge will await of course the completion of the long delayed work on that structure. Under favorable circumstances the Man-

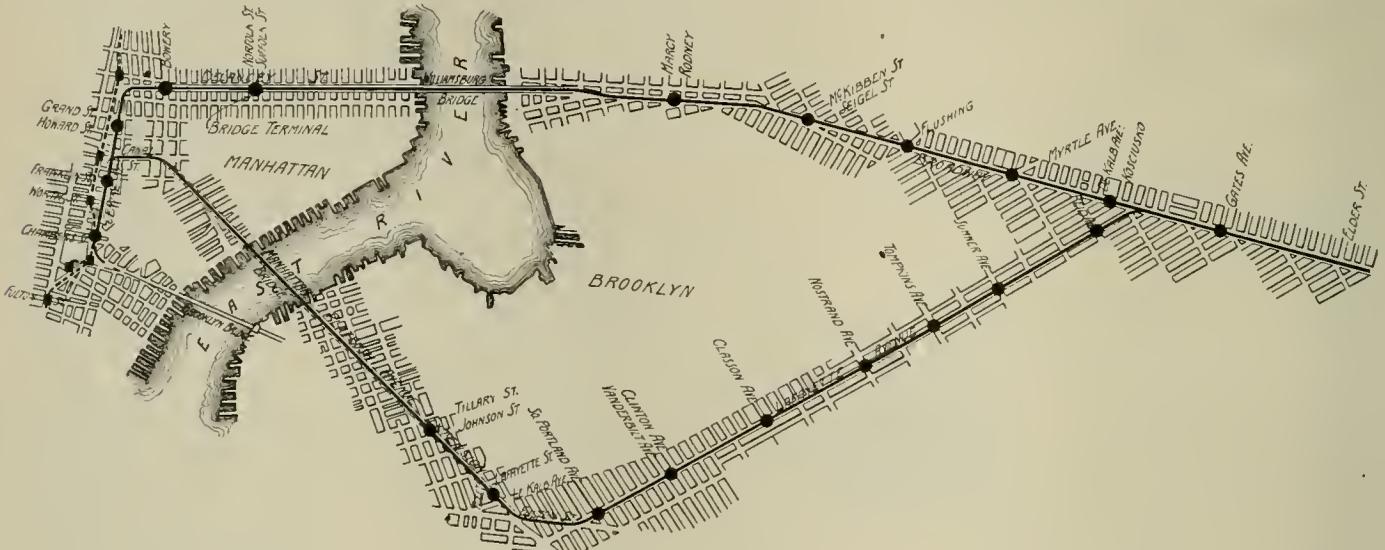
hattan portion of the loop could be in operation within about two and a half years.

The effectiveness of the earliest relief that can be afforded by the construction of the subway loop hinges largely upon the establishment of practicable conditions for the operation of the cars of the Brooklyn Rapid Transit Company around the loop connecting the Williamsburg and Brooklyn bridges.

During the discussion of the relative merits of a subway and elevated loop structure on Manhattan Island this question was an important consideration. The majority of the board of estimate and apportionment favored the subway loop, in order to prevent further disfigurement of the city by an elevated structure, but the Brooklyn Rapid Transit Company contended that from its standpoint a subway loop presented grave operating difficulties, particularly if the board insisted upon the operation of all-steel cars in the subway, and that these difficulties would all be overcome by the building of an elevated structure. It was declared that the section of the city to be traversed is of a character that could not be injured for business purposes by the presence of an elevated structure and that the latter would afford relief in the near future, whereas the subway cannot be built and placed in operation in time to solve the present distress-

Rapid Transit Company is an applicant for the proposed subway loop between the bridges, or at least has signified its willingness to lease and operate it when constructed. This is incorrect. The question of the adaptability of our equipment to such operation, the safety of handling the business under the prescribed conditions, and the possibility of lifting cars up a $5\frac{1}{2}$ -per cent grade at the Park Row end of the Brooklyn bridge without a great expenditure for new types of cars and change of train composition which together with an increased cost of operation would make it impracticable from a financial standpoint—all these will need to have the most careful consideration in the light of further information. The discussion with the committee was on these lines. We are exceedingly desirous of co-operating in any feasible measure, above ground or below, but we cannot do the impossible. I have from the first felt and frankly expressed grave doubt of the feasibility of the Brooklyn Rapid Transit Company operating the subway connection between the bridges on the grades laid down by Mr. Parsons three years ago, which I understand practically control in the present plan, but we will gladly join the committee in the fullest consideration of this or any other proposition, however doubtful the result may now seem to be."

On the Brooklyn side of the Williamsburg bridge no incline will be required, so far as the Brooklyn Rapid Transit cars are concerned, as a cross-over will connect the Williamsburg tracks with the elevated structure of that system in Broadway. There is no question that the proposed loop, if



Route of Proposed Brooklyn-Manhattan Subway Loop.

ing problem of the bridge congestion. The company contended that although enormous sums of money have been expended in improving the company's elevated structures in Brooklyn, the adoption of the heavy steel cars, the use of which in the subway the board of rapid transit commissioners at first proposed to make compulsory, would necessitate a further radical strengthening of the elevated structure in Brooklyn and the expenditure of vast sums for this work and for new cars and auxiliary equipment. As the result of conferences between President E. W. Winter of the Brooklyn Rapid Transit Company and the board of rapid transit commissioners it was decided that the board would not insist upon all-steel cars but that cars similar to the new type of steel-underframe wooden cars, having asbestos floor protection, would be satisfactory. The concession does not relieve the Brooklyn Rapid Transit Company from large expenditures for new equipment and for increased power to operate the loop—expenditures which will be very considerably increased by reason of the $5\frac{1}{2}$ -per cent grades and the very short curves connecting the bridge tracks with the subway. The present position of the Brooklyn Rapid Transit Company in the matter is clearly set forth in the following statement, which has been issued by President Winter:

"Apparently the impression is abroad that the Brooklyn

found practicable, will enable the Brooklyn Rapid Transit Company to operate its cars under a much reduced headway and to care for the bridge traffic with a greater degree of comfort than at present, but it will also involve a complete revision of the company's operating scheme. The ramifications of the company's system will make possible a number of through loop operations and this will involve a freer interchange of cars between the various lines of the system than at present. It will be necessary to work out all the routes on the basis of economical operation. The operation of either elevated or subway loop will add great expense to the Brooklyn Rapid Transit Company. Some 300 new cars will be required and 15,000 kilowatts capacity for additional power, so that the aggregate investment on account of the loop will hardly be less than \$4,500,000, without considering the numerous changes in the elevated structure, which may be necessary in the working out of the new through routes. It is the intention of the Rapid Transit Commission, when the Brooklyn portion of the proposed subway loop is built, that the whole loop will be operated in connection with the present subway system, the Manhattan portion of the loop to the Brooklyn approach of the Williamsburg bridge being used jointly by the subway operating company and the Brooklyn Rapid Transit company.

NEW TYPE OF CAR, UNITED TRACTION COMPANY.

The United Traction Company, Albany, N. Y., has recently placed in service a new type of car which includes several interesting details. The car is of the straight-sided type with vestibuled platforms and a steam-car pattern hood. The principal feature which commends the car to the officials of the traction company is the device for opening and



New Cars for United Traction Company, Albany—Interior View Showing Arrangement of Doors to Form Motorman's Compartment.

closing the doors by the motorman. This mechanism also closes the steps while the car is in motion. It is thought that placing the doors and steps under the control of the motorman will keep the number of accidents to passengers at a minimum. The fact is recognized that nearly all damage suits against street railway companies are caused by injury to passengers while they are getting on or off moving

United Traction Company, who has exercised a general supervision over the construction of the sample car.

The new cars will be run over the Troy division. The general dimensions are as follows: Length of body 28 feet; over platforms 40 feet; over buffers 41 feet 6 inches; width at bottom 8 feet; over drip rails 8 feet 2 inches. The interior finish is cherry; ceilings of bird's eye maple; seats and backs spring cushioned covered with rattan. The glass in the side sash and doors is polished plate, and the deck glass is white-chipped with bevel borders. The car is equipped with a push-button signal bell system, alarm gongs, Consolidated heaters, pantasote curtains, solid polished bronze trimmings and other details. The vestibule platform is on a level with the car floor, the vestibule having a cab for the motorman, who is completely shut off from the platform compartment. A unique feature is the operation of the push-button signal bells, the current being taken from the trolley and the voltage lowered by a diverter. The car is mounted on Brill's No. 27 G. I. trucks, equipped with four G. E. No. 80 motors, and type-M master control.

Suggestion to Prevent Street Crossing Accidents.

A special committee appointed by the Indianapolis Commercial Club to investigate street car accidents has suggested a plan to avoid accidents caused by persons passing from behind one car immediately in front of an approaching car on the opposite track. The plan deemed practical by the committee was the placing of a signal bell on the rear of each car, to be operated by the motorman, when his car is at a standstill and another car is approaching on the opposite track; such signal to be a warning to the pedestrian about to cross from behind a standing car to the track of an approaching car. Robert I. Todd, vice-president and general manager of the Indianapolis Traction & Terminal Company, to whom the plan was presented, said it was impractical, because it depended on a dry battery, the action of which he said was uncertain. Mr. Todd's objections were on the theory



New Cars for United Traction Company, Albany—Exterior View showing Air-Operated doors and steps.

cars. This will be prevented by the new type of car, as a passenger will be unable to get on or off the car until the car comes to a dead stop, when the doors will then be opened by the air mechanism controlled by the motorman.

The trial car operates so satisfactorily that an order for 24 more has been placed with the builders, the J. M. Jones' Sons Company, Watervliet, N. Y. The 24 new cars will be duplicates of the sample car, with some modifications suggested by Edgar S. Fassett, general manager of the

that a bell falling to work at all times might lead the public into danger if depended upon.

The Columbus Railway & Light Company, of Columbus, O., has paid dividends to over 600 of its employees. This is in accordance with a policy adopted several years ago by the company, to pay dividends to its employees at the same rate paid the stockholders, based on the amount of the wages of the employees.

DELLWOOD PARK, CHICAGO & JOLIET ELECTRIC RAILWAY.

The Chicago & Joliet Electric Railway Company, of Joliet, Ill., is now completing in readiness for the summer season what is expected to be one of the finest and most attractive parks owned by interurban railways in the country, both on account of its advantages in the way of natural scenery and from an architectural standpoint. Dellwood Park, as it is called, is located on the main line of the Chicago & Joliet Electric Railway, about four miles north of Joliet and about thirty-five miles southwest of the center of Chicago. The work on the park was begun early in 1906 and it was opened to the public, although in an incomplete state, last season. This year the park is being improved in many ways and new features are being added, including some new buildings. This work is now in progress and is being pushed as rapidly as possible in order to have the park entirely completed by the opening of

Company. From Summit, three miles west of the Forty-eight street terminal, a double-track line extends to Lyons, where connection is made with the cars of the Chicago Union Traction Company connecting with all lines on the west and north sides of Chicago. The distance from Joliet to the Chicago city limits is 30 miles and cars are now operated on an hourly schedule, making the run in 1 hour and 25 minutes. During the summer the headway will be reduced to 30 minutes or possibly 15 minutes and the running time will also be reduced. The run from Joliet to the park is made in 15 minutes and during the park season cars will run every five minutes or oftener if occasion requires. It is expected to attract a large number of visitors to the park from Chicago and to this end it is expected to reduce the round-trip rate to 50 cents. No admission fee to the park will be charged.

The grounds on which the park is located are rectangular in shape, 2,400 feet long by 1,350 feet wide, the long side extending east and west, comprising about 62 acres of land



Dellwood Park—Boathouse and Lower Dam with Passageway Underneath.

the coming season. Although the state of some of the new work is not sufficiently advanced to permit of illustration, the accompanying engravings from photographs, for which we are indebted to the courtesy of Mr. J. R. Blackhall, general manager of the Chicago & Joliet Electric Railway Company, will give an excellent idea of the scope and class of the work and the natural advantages of the location. All of the work is of the most substantial character throughout, and when completed the park will have cost approximately \$250,000.

The Chicago & Joliet Electric Railway Company, which is controlled by the American Railways Company, of Philadelphia, Pa., operates six city lines in Joliet and vicinity and furnishes an entrance to the city over its tracks for the cars of the Joliet Plainfield & Aurora Railroad Company, operating between Aurora and Joliet. The Chicago & Joliet also has a double-track interurban line from Joliet to the city limits of Chicago at Forty-eighth street, whence passengers may continue their journey to the center of the city in the cars of the Archer avenue line of the Chicago City Railway

whose character is admirably suited for park purposes. The ground is mostly hilly and about two-thirds of it is wooded, including 40 varieties of trees, shrubs and plants growing in their natural state. A large number of imported shrubs and plants, as well as native shrubs and trees, have been added during the past season to the already fine collection in the park. A deep ravine extends through the grounds in an easterly and westerly direction, with rock cliffs from 30 to 50 feet high exposed on either side. The difference in elevation between the lowest point in the ravine and the highest point of ground in the park is 82 feet.

The high ground overlooks the valley of the Des Plaines river, with a view to the north and south as far as the eye can reach, taking in the Chicago Drainage Canal and the deep waterway soon to be built from Lake Michigan to a point opposite the park and which is planned to extend to the Gulf of Mexico by way of the Illinois and Mississippi rivers.

Formerly a small stream ran through the ravine, of such insignificant proportions that it was often nearly dry in the

summer. This has been dammed by two reinforced concrete gravity dams to form two lagoons, one with an area of 4.8 acres and the other 3.5 acres, which afford excellent opportunities for boating, bathing and other water sports in the summer and skating in the winter.

Both dams were built by the Ambursen Hydraulic Construction Company, of Boston, Mass. The upper dam is 40



Dellwood Park—Interior of Dancing Pavilion.

feet long by 15 feet high. The lower is 170 feet long by 18 feet high, with an 82-foot spillway. The lower dam, which is illustrated in one of the engravings, is located at one side of the entrance to the grounds and gives a very effective appearance to the first view of the park. This dam is hollow and contains a passageway under the spillway, which is lighted at night.

The walks on both sides of the ravine are connected by means of concrete stairways with promenades extending out over the dam as far as the spillway on each side. At the right of the spillway is a glass cascade 16 feet long by 9 feet high, which is lighted at night by Cooper-Hewitt mercury



Dellwood Park—Band Stand.

lamps. At the other side of the dam is a frame structure 50 by 36 feet, with concrete base, not yet entirely completed, which will be used as a refreshment pavilion and boat-house, and which will be kept open in the winter for the accommodation of skaters.

The ravine is also spanned by two reinforced concrete bridges, which are illustrated, the upper one a single 40-foot elliptical arch, 15 feet above the water, and the other consisting of three 40-foot elliptical arches, 140 feet long, including approaches, and 30 feet above the water. Both bridges were

designed with an eye to beauty and make a very effective appearance.

The finish of the concrete work in the dams and bridges, as well as in other parts of the park, is especially noticeable. Great care has been taken to remove the form-marks and to give a smooth surface. On all plain work the concrete has



Dellwood Park—Three-Span Concrete Bridge.

been rubbed smooth with sandstone. In other places the edges have been rubbed smooth to form a border two or three inches wide and the remainder of the surface has been bush-hammered. In some cases this process has been reversed and the border has been bush-hammered and the rest finished smooth.

A double track branching from the main line of the Chicago & Joliet electric railway enters the park on the north side and forms a loop near the center of the park. This loop contains four tracks where cars may wait in readiness to handle the crowds at the time when most of the park patrons are ready to return home. A concrete plat-



Dellwood Park—View of Scenic Railway.

form 112 feet long by 16 feet wide, covered by a roof supported by a steel frame, is located on this loop. A similar platform is located opposite to the main entrance to the grounds, between the main tracks. A concrete subway leads from the station under the north bound track and the highway into the park, to avoid opportunities for accidents caused by having crowds on the tracks. The entrance to the subway is an inclined plane instead of stairs. There are two outlets from the subway into the park, the most frequented one an incline plane and the other a stairway. From

the subway macadamized walks lead to all parts of the grounds.

All the amusement buildings are located on an avenue 60 feet wide and 650 feet long, starting from the station on the loop. A 50,000-gallon water tank on a steel tower 75 feet high is located in the center of the avenue. A building 50 feet square built around the base forms a refreshment stand. The tower is to be enclosed with metal lath and Portland cement plaster and will be made to represent a lighthouse tower. A 20-foot concrete basin and fountain are located on each side of the tower, each halfway between the tower and the ends of the avenue. Complete water, sewer and gas systems are provided throughout the grounds. An 8-inch water-main extends each way from the tower, supplying all the buildings and fire hydrants located at frequent intervals. The tank will be supplied by an artesian well about 2,000 feet deep that is now being sunk from which water will be pumped into the tank and from there distributed through the system.

The buildings located on the avenue include the scenic railway pavilion, 64 by 33 feet; dancing pavilion, 124 by 74 feet, giving a dance floor 100 by 50 feet and a promenade 12 feet wide on all four sides; the electrical theater, 68 by 36 feet with a seating capacity of 250; a laughing gallery, 36 by 20 feet; and a combination amusement building, 90 by 50 feet, in which will be gathered together the various smaller amusement features, such as the shooting gallery, hall-throwing gallery, penny arcade, cane and knife racks, slot machines, etc. The band stand, and octagonal structure, 25 feet in diameter, with concrete foundations and floor, which will be used for concerts by the Dellwood Park Band, of 30 pieces, is located at one end of the avenue.

Before the opening of the next season a theater, 87 by

the grounds before next season. These will be provided with kitchens and fires for the use of picnic parties.

All of the buildings are of the Spanish mission type of architecture and are substantially built, of frame construction with concrete foundations. The exterior finish is Portland cement plaster and stucco on metal lath. The build-



Dellwood Park—Entrance to Park, Showing Subway.

ings are painted a grayish green. The roofs are covered with red Ludowici interlocking tile.

The scenic railway, which is about 2,000 feet long, starts from the pavilion on the main avenue, winds through the wooded part of the grounds, crosses the ravine over the upper dam, and recrosses over the lower lake, skirting the rock walls of the ravine to a point 200 feet from the starting point,



Dellwood Park—Dancing Pavilion.

146 feet, with a stage 40 by 31 feet and with a seating capacity of 1,200, will be erected on the south side of the avenue opposite to the water tower. A carrousel, a House of Nonsense, and places for one or two other small amusements will also be erected. On the bluff, overlooking the lagoon, a casino, 60 by 100 feet, is to be erected. Here it is proposed to establish a first-class restaurant, where meals of the better quality will be served. Two picnic pavilions, 30 by 65 and 38 by 80 feet, will be erected in different parts of

where the cars are carried up an incline by an endless-chain hoist to the station. The scenery along the railway is all natural.

A tract of 16 acres, at the upper end, including the upper lake, is fenced off from the other part of the grounds and reserved for private picnic parties and for the use of the Joliet Chautauqua Association, which meets for two weeks in July. A steel auditorium building with a seating capacity of 3,500, and equipped with a stage and dressing rooms, is

located in this reservation, for the use of the Chautauqua Association and for concerts, conventions, etc. This auditorium has the shape of a 20-sided polygon, 150 feet in extreme diameter. The umbrella type roof is sustained by steel trusses supported by a center column.

Just north of the Chautauqua grounds is an athletic field



Dellwood Park—Single-Span Concrete Bridge.

containing 5 acres, enclosed by a high board fence. This field is provided with a baseball diamond, a quarter-mile cinder track, a steel frame grandstand seating 1,000 people and bleachers seating 500. Baseball games are held here two or three times a week during the season.

A macadamized driveway for vehicles leads from the highway at the entrance to the park to a court between the

park near the entrance, where the current for the "Magnetite" lamps is converted from alternating to direct current by General Electric mercury arc rectifiers. The substation building is 15 by 20 feet, of buff pressed brick, with concrete floor and a tile roof.

The buildings are all lighted with incandescent lamps, with the exception of the dancing pavilion and the auditorium, which are lighted by four-glower Nernst lamps, and the outside of the buildings, including the water tower, are decorated with incandescent lamps.

An illuminated electric fountain with color-changing effects is located on an island in the lower lake. Another small fountain, with a 15-foot basin, is located in the walk leading from the subway.

A one-and-a-half story frame cottage is now under construction for the use of the head gardener, who will be permanently located in the park.

The entire park is fenced with 72-inch Ellwood woven wire fencing on reinforced concrete posts, with three barbed wires strung above the top in a triangle and fastened to galvanized iron crests cast in the posts. About 1,500 concrete posts were required for the fencing.

The park is being built by the Dellwood Park Company, Incorporated, a subsidiary company of the Chicago & Joliet Electric Railway Company and managed by the same officers.

Improperly Mixed Varnish.

In a recent lecture before the New York Railroad Club Mr. William Marshall presented some interesting facts regarding the history and use of varnish. The explanation of the fact that most cars look dull or "all gone in" in such a short time is found in the common practice of mixing the



Dellwood Park—Steel Auditorium in Chautauqua Grounds.

loop and the athletic field, with an entrance to the Chautauqua grounds.

The grounds are lighted by 80 General Electric "Magnetite" luminous arc lamps, 22 four-glower Nernst lamps, 35 two-glower Nernst lamps and a large number of incandescent lamps. Power for lighting, in the form of three-phase 60-cycle current at 2,300 volts pressure, is supplied from the plant of the Economy Light & Power Company at Joliet. The lighting is all controlled from a substation located in the

color coats with too little linseed oil so that they will dry rapidly. The result of this is that the pigment, which has a large oil-carrying capacity, absorbs the oil from the varnish coat. This consequently loses its life and luster. The claim was made that too little time is allowed for varnishing cars, and the use of too much "dryer" and too little oil to hold the pigment. The remedy suggested was to allow sufficient time for painting and varnishing and to use plenty of oil in the color coats.

SINGLE-PHASE LINES OF THE ILLINOIS TRACTION SYSTEM.*

BY H. C. HOAGLAND, ELECTRICAL AND MECHANICAL ENGINEER.

It is the purpose of this paper to present some of the features of the single-phase railway system now being built by the Illinois Traction System.

A new power house is now being built at Peoria, Ill., to furnish power for this system, as well as the local street railway. The plant consists of eight 400-hp. Stirling water-tube boilers, designed for a working pressure of 200 pounds. These boilers will be fired by Green automatic stokers, and coal will be fed automatically. In the generator room will be installed: Two 2,000-kw., 2,300-volt, Curtis steam turbines, two 750-kw. rotary converters, one 75-kw. turbo-exciter set, and one 70-kw. motor-generator set, together with a switchboard and the other necessary apparatus.

The turbines will generate 25-cycle current at 2,300 volts, which will be stepped up by six 700-kw. Westinghouse, water-cooled transformers, to 33,000 volts. The current will be delivered to the transmission line at this voltage.

Transmission Line.

The first transmission line and two substations are being built on the Peoria Bloomington & Champaign line, to Bloomington. In the substations the pressure will be stepped down from 33,000 to 3,300 volts, which will be used on the trolley. It is the intention to connect the Springfield & Northeastern line from Springfield to Mackinaw, to this line; also the Chicago Bloomington & Decatur line, from Bloomington to Decatur; and balance the three phases of the transmission line by feeding one of these roads from each phase. The transmission line will be connected through an automatic oil switch to busbars in a substation at Decatur. The line from the present Riverton power house will also be connected in the same way, and the two power houses will be operated in multiple. From these busbars, a line will be run to Champaign along the St. Louis Decatur & Champaign Railway and at Champaign the 15,000-volt transmission line—which now furnishes power to the Danville Urbana & Champaign Railway from Champaign to Danville, Georgetown and Ridge Farm—will be connected through three 400-kw. step-down transformers, making the transmission line from Peoria to Georgetown, about 175 miles long.

There will be installed at the Danville power house this summer, a 2,000-kw. generator, direct connected to a pair of 36x60-inch twin engines, which will also feed this transmission line when needed. The substation will be provided with oil-break switches to sectionalize the line and by the use of double-throw disconnecting switches, the transformers can be connected to the live side of the line and the service will not be interrupted while repairs on the transmission line are being made.

Car Equipment.

The Illinois Traction System will soon have in operation 125 miles of track equipped for single-phase operation. The apparatus for which is being furnished by the General Electric Company.

Four-motor, 75-hp., single-phase equipments with multiple-unit train control will be used. The motors will be the GE A-605 compensated type, designed to operate on both high-tension alternating-current and 600-volt direct current.

The armature of the motor has a commutator and is very similar in construction and appearance to the standard direct-current railway motor. It has a series drum winding with three coils per slot and is wound for a maximum of 250 volts. It can be removed from the field frame by removing one of the field heads. The field structure is quite different, however, from that of the direct-current motor, as there are no inwardly projecting poles, and the entire field winding can be removed and readily replaced by a duplicate set of windings, should an accident result in their being damaged. There are two outer steel castings bolted together. These hold the interior field ring rigidly in position to form the magnetic field. This inner portion is built of laminations insulated from one another by japan and securely bolted together by long through bolts. The punchings are shaped so as to form four poles which are slotted for the reception of the compensating field windings.

The field windings are in two sections, the "compensating winding" and the "exciting winding." The function of the latter is to excite the fields, and that of the former to counteract the armature inductance and thus provide a relatively high power factor throughout the range of alternating current operation, and further to improve the commutation

on both alternating and direct-current operation by compensating the armature reaction, thereby reducing the field distortion. The two sets of windings are separate. The field coils are connected in such a manner as to reduce the self induction at high currents, and to permit the motors to be run two in series when operating on standard 600-volt circuits. The compensated windings are connected in series with the armature and field.

Control.

The alternating-current direct-current multiple-unit system of control is similar to the well known type-M control for direct-current operation. To adapt this system for both alternating and direct-current operation, changes are made in the circuit of the contactor coils when the car passes from an alternating to a direct current section, and vice-versa. The motor fields are also connected in series for the direct-current operation and in parallel for alternating current. These changes are made by a special switch called a commutating switch, as the car passes a short dead section separating the alternating and direct-current portions of the trolley line. At the same time, either the resistance or compensator leads are put in circuit for direct or alternating-current operation, respectively.

Direct current operation is exactly similar to that employed on ordinary direct-current equipments. For alternating current operation "potential control" is used; that is, acceleration is obtained by increasing the potential at the motor terminals by connecting compensator taps of successively increasing voltage to the motors in proper sequence, until, when on the last tap, the motors are connected to the full working voltage. The compensator is of the oil-cooled type, suitably designed for suspending underneath the car body and the end castings are provided with stuffing boxes to prevent any leakage of oil where the taps enter.

Protective Devices.

On our cars, both pantagraph and trolley current collectors will be used. For protecting the car equipment against heavy overloads and short circuits that may occur at times, due to unavoidable circumstances, there is placed in the high-tension circuit, between the trolley and the compensator, an oil switch, which is electrically operated and held closed by a small energized coil. This switch is also protected by an expulsion fuse.

For direct current operation, the apparatus is protected by a main direct-current switch. Both the alternating and direct-current circuits are also protected by suitable lightning arresters.

The change from alternating to direct-current operation is accomplished at a dead section in the trolley wire as previously stated. At the instant the car enters this dead section whichever main switch is closed, will open automatically owing to the fact that the circuit energizing its retaining coil is broken. The car can run over this dead section at full speed and all the motorman has to do to obtain the proper connections, is to throw the commutating switch and close the main alternating or direct-current switch, as the case may be, which can be done in the fraction of a minute.

The alternating current passenger cars for the Illinois Traction System are of the standard interurban type, 51 feet 6 inches long over all, having a seating capacity of 58 passengers, and weigh, loaded and completely equipped, about 40 tons. They are geared to a speed of approximately 50 miles per hour on level tangent track. We will also have in operation several electric locomotives, weighing about 60 tons for freight service, which will be equipped with single-phase motors of the same type as described, but of larger capacity.

Cost.

The following table gives an estimated comparative cost per mile of single track road for alternating current and direct current systems, based on the average operating conditions for interurban roads. It is assumed the cars will be 50 to 55 feet over all; equipped with four 75-hp. motors; weighing, loaded and equipped, 40 to 42 tons; geared to a maximum speed of about 45 miles per hour and making a schedule speed of 30 miles per hour with an average of one stop every two miles:

	Distance between substations	Total cost per mile
600-volt DC trolley.....	10 miles	\$24,354
600-volt third rail.....	13 miles	25,908
3300-volt AC trolley.....	17 miles	20,915
6500-volt AC trolley.....	45 miles	20,498

The cost of road bed and track included in the above figures is the same for each system, viz.:—\$13,300. The table has been made on the basis of unit lengths and the figures are only approximate consequently when applied to

*Abstract of paper read before the Illinois Society of Civil Engineers, Peoria, Ill., Jan. 23, 1907.

out the "car report" here shown. On this an exact record of the condition of the car when it left the barn is made, together with the trouble or defect to be repaired. The barn foreman then enters the defects reported on the double car tag which is tied to the controller handle, and left there until repairs have been made and inspected by the foreman.

Form 125 NASHVILLE RAILWAY AND LIGHT CO.		NASHVILLE RAILWAY AND LIGHT CO.	
CAR TAG No. 3581 CAR No. _____		CAR TAG No. 3581 CAR No. _____	
Arrived at Car Barn _____ M. Date _____ 19__	The following repairs were completed _____ M. Date _____ 19__	LINE _____ Time reported _____ M _____ 19__ Nature of trouble reported _____ _____ _____ Reported by _____ Inspected by _____ How reported _____ Telephone _____ Written _____ Verbal _____ Reported by _____	Reported by _____ Inspected by _____ How reported _____ Telephone _____ Written _____ Verbal _____ Reported by _____
Signed _____ Nature of trouble reported by _____ see as follows _____ _____ Car No. _____ is repaired as stated above and ready for service. Signed _____ Barn Foreman		Reported by _____	

Nashville Car Repair Records—Folding Car Tag for Reporting Trouble.

Upon completion of the repairs the workmen fill out the second half of the tag, which is then signed by the foreman, who sends it to the master mechanic with his personal report written on the back of the original car report.

These tags and car reports are filed for future reference and have been found very satisfactory.

FIFTY-TON LOCOMOTIVE, KANSAS CITY & WESTPORT BELT RAILWAY.

The American Locomotive Company, in conjunction with the General Electric Company, has recently completed a 50-

base of 6 feet 6 inches. Each truck is equipped with two General Electric type 55-H direct-current motors. The motors are inside hung, half the weight being carried on the axle and half by nose suspension from the truck frame. The rated maximum tractive effort is 16,400 pounds. When exerting its rated drawbar pull, the motors will use a current of 160 amperes per motor and will operate a train of 320 tons on a 2 per cent grade, at approximately 8 miles per hour. With a current of 215 amperes per motor, the locomotive will exert a maximum instantaneous effort for starting purposes of 25,000 pounds. The same weight of train will be hauled on the level at a speed of 13 miles per hour.

The locomotive is provided with type-M single-unit control, with five steps in series and five in parallel. It is equipped with General Electric combined automatic and straight airbrakes, fed by one centrifugal pump air compressor, with a piston displacement of 50 cubic feet per minute when delivering at a pressure of 90 pounds. It is fitted with one U. S. trolley, suitable for collecting current at a pressure of 500 volts. The frame is of 10-inch channels with cast-iron humpers and floor plates of 3/8-inch steel. The cab is of the steeple type with one motorman's and two auxiliary compartments. Some of the principal dimensions are as follows:

- Length over all.....31 feet 1 inch
- Height over cab11 feet 9 inches
- Width over all9 feet 6 1/2 inches
- Total wheel-base22 feet
- Rigid wheel-base6 feet 6 inches
- Driving wheels36 inches in diameter

Municipal Ownership and Monopoly.

A real result of municipal ownership is afforded by the city of Lansing, Mich. It is the owner of an electric plant furnishing light and power to its citizens. A new corporation having developed a hydro-electric plant adjacent to the city and being in the way of furnishing electric power to the citizens in competition with the municipal plant, it is proposed to enjoin the service of the newcomer and thereby exclude the competition. This is, of course, in the interest of the financial well-being of the municipal plant, but what does



Fifty-Ton Electric Locomotive for the Kansas City & Westport Belt Railway.

ton electric locomotive for the Kansas City & Westport Belt Railway. The locomotive is designed for freight service and is carried on two 4-wheel motor trucks of the equalized type, with a total wheel base of 22 feet, and a rigid wheel

it argue to the consumer? Simply this, that he cannot avail himself of new and modern developments which reduce costs so long as a monopoly is necessary for the municipal plant to make it pay.—Finance.

PIPING AND POWER STATION SYSTEMS—XXIX.

BY W. I. MORRIS, M. E.

If the waterway is of large dimensions and conditions permit, it should be constructed of concrete; this is the best material which can be used and it is probably the cheapest. The shape and method of constructing a concrete pipe will be governed by the condition of the soil through which it is run. If the waterway is cut through shale or rock, vertical sides and a flat bottom will be found the most economical form to construct. Such a conduit is shown in Figure 245-(11-7). There is no object in using rounded sides or bottom where the banks are fully able to support the weight on them without exerting a lateral strain on the walls. If the banks at the points, a-a, are secure and will permit the concrete being rammed hard, the top may be constructed as an arch. But if the banks are weak, there is no object in making the top arched, as it would not have a solid skew-back to resist the thrust. In this case it would be safer and require less material to build a flat top and use metal rods at the lower portion of the top, thus reinforcing the concrete. If the banks are of loose sand, similar to quicksand, then an egg-shaped conduit should be used; in clay, it would be possible to build

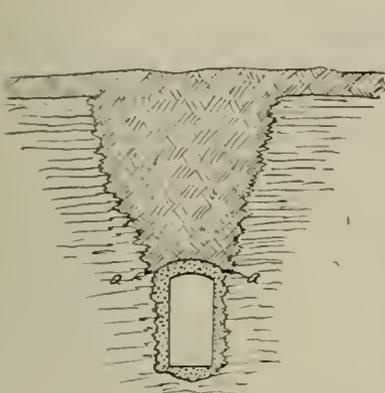


Figure 245-(11-7).

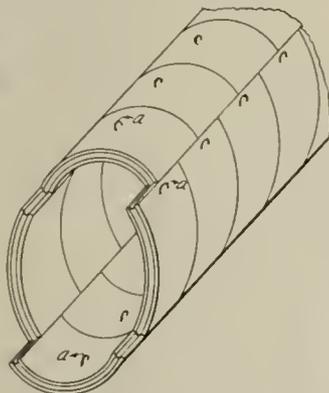


Figure 246-(11-8).

the waterway of hard brick and require very little forming, the bottom being used as a form to lay the brick.

In whatever form the waterway is constructed it should be so graded in regard to low water and have such a height that a man could walk through it when the water is low. For instance, if the bottom of the waterway is 3 feet below low water it should not be less than 5 feet high in the clear, allowing 2 feet above the water for a man to breathe while cleaning the bottom. The wells which run down to the intake should not be over 150 feet apart, as the air in the waterway would become stifling if the distance between the manholes is greater than this. The waterway, as stated, may collect sand, etc., and when the water is high and the conduit is full of water a man could not get in to clean it out. This would not cause trouble as there would be plenty of water available even though there were 2 or 3 feet of sand on the bottom. The trouble would arise only at times when the water level would be low, in which case, however, it could be easily remedied.

Instead of using forms in the trench for building the concrete walls they can be built on the surface of the ground, in a wooden mold, using light wire mesh for reinforcement. This will permit the use of very light concrete walls, possibly 6 inches for a 3 by 5-foot conduit, which could be assembled as shown in Figure 246-(11-8). Two patterns only are required for the molds and all the concrete blocks can be made and be ready for use when the trench is opened. By this method of construction the trench would be open only a short time and many of the difficulties occurring from caving-in would be avoided. Another advantage of this form of

conduit would be that the blocks could be laid in water without injuring the concrete. The loops shown at a should be of heavy wire or rods built into the blocks to facilitate handling them with a crane. Tongue and grooved joints should be used in this construction. The lifting eyes, a, in the bottom slabs may be cut off after they are in place or recessed below the surface. With this construction only a small amount of labor would be required for assembling, as the

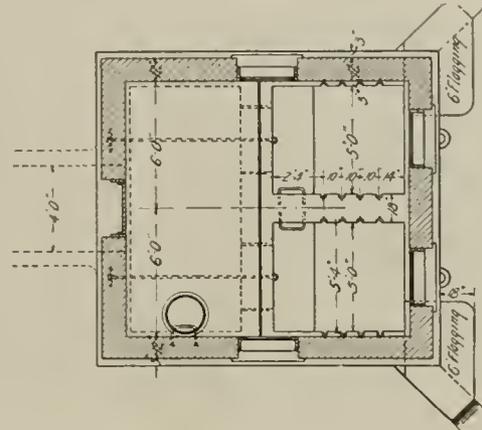


Figure 247-(11-9).

sections could be formed by common laborers. The sections should be put together with cement in the joints and made as tight as tile pipe which would be quite sufficient for this class of work. The weight of these sections,—4 feet by 4 feet by 6 inches, taken at 140 pounds per cubic foot—would be 1,120 pounds, which could easily be handled by a crane.

Whatever the construction of the intake may be it is necessary to guard the mouth so as to prevent the entrance of leaves, sticks, fish, ice, logs, etc. If the water supply is liable to freeze around the intake to such an extent that the supply might be endangered, a line with a regulating valve in it should be run from the condenser discharge so that

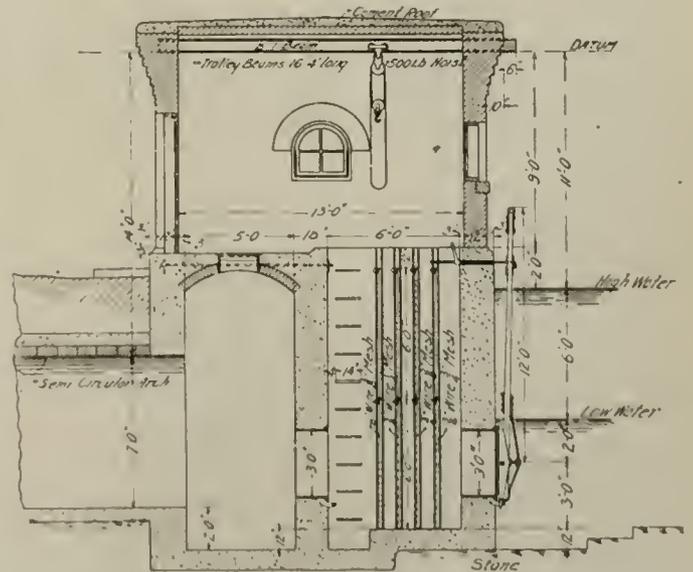


Figure 248-(11-10).

warm water can be delivered at the intake and freezing thus be prevented. The intakes should be fitted with screens of different mesh, arranged so that they can easily be removed for cleaning.

The accompanying figures show a screen house designed by the writer. Figure 247-(11-9) is the plan view showing the double-screen compartment with a 3-foot opening into

and out of each compartment. All four of these openings are arranged for the valve shown in Figure 250-(11-12) which permits shutting off either of the screen compartments without interfering with the operation of the plant. There are two valves for this screen-house. By placing them on the outside of the opening as shown in elevation, Figure 249-(11-11), it is possible to shut off all the openings. The section shown in Figure 248-(11-10) shows one of these

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B., OF THE CHICAGO BAR.

NOT REQUIRED BY ORDINANCE TO STOP CARS BETWEEN TRACKS OF TWO RAILROADS BEFORE CROSSING SAME. *Bartholomaeus v. Milwaukee Electric Railway & Light Co.* (Wis.), 109 N. W. Rep. 143. Oct. 9, 1906.

A city ordinance required that before crossing a railroad crossing an electric car should be stopped at least 20 feet from same and that the conductor should pass in front of the car a sufficient distance to enable him to ascertain whether there was any danger in sight. The supreme court of Wisconsin holds that under this ordinance where an electric railway crossed two steam railroads diagonally, the distance between the main tracks of the two being about 85 feet, the electric railway company was not required to bring its cars to a standstill between the tracks of the two railroads before crossing the last one. It says that an attempt to stop cars in such a situation would increase the danger of collision instead of diminishing it, and render the ordinance unreasonable in its operation.

LIABILITY FOR INJURY CAUSED BY FLASH FROM CONTROLLER. *Gilmore v. Milford & Uxbridge Street Railway Co.* (Mass.), 78 N. E. Rep. 744. Oct. 16, 1906.

The defendant's contention here implied, the supreme judicial court of Massachusetts says, that it was not liable for an injury caused by a flash from the controller which could not be prevented by any means that have yet been devised or any care that could be exercised. The court doubts the correctness of that proposition. It would seem that if the company sees fit to use a force which is so imperfectly understood that no method has yet been devised for preventing a flash from the controller, the company and not the passenger should bear the risks arising from its use. But however that may be, there was testimony here tending to show that what occurred was much more than an ordinary flash from the controller, and it was for the jury to say what the nature of the occurrence was. It was also clearly for the jury to determine what weight was to be given evidence introduced by the defendant tending to show that it exercised proper care and diligence in inspecting the controller

NOT LIABLE FOR SHOOTING OF PASSENGER ON FOURTH OF JULY. *Ormandroyd v. Fitchburg & Leominster Street Railroad Co.* (Mass.), 78 N. E. Rep. 739. Oct. 16, 1906.

A Fourth of July celebrator had a cannon loaded with blank cartridges in his yard, quite a distance from the street, sending out "a jet of flame and a volume of smoke as far as the sidewalk," several feet short of the defendant's car tracks. At about half past five in the afternoon, the plaintiff, a passenger on one of its cars, was injured by being struck by some of the wadding of the cannon. The supreme judicial court of Massachusetts holds that the evidence did not warrant a finding of negligence on the part of the defendant. It says that the defendant had no reason to anticipate any danger to its passengers from such a source. Nor was it bound to stop its car and investigate for the purpose of seeing whether the cannon was properly loaded or pointed. The firing had been going on all day and, in the absence of any indication to the contrary, the defendant had the right to assume that it was not a hostile demonstration against the travelers upon the highway, but was a simple ebullition of patriotic emotion, and as such was harmless. To require a street railway corporation to have a general oversight of the details of such exhibitions along the line of the highway on the anniversary of the Declaration of Independence, and to hold it responsible for the consequences to its passengers of any neglect of the exhibitors, would be unreasonable. Such care would be inconsistent with the proper transaction of the business. It might keep the passengers safe but the cars

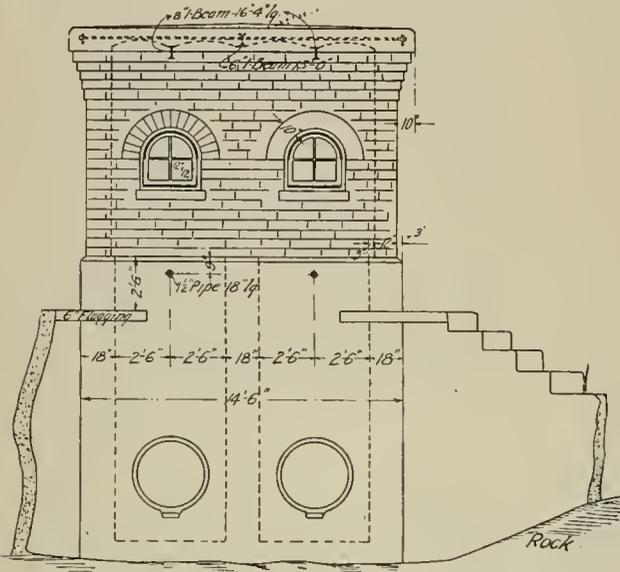


Figure 249-(11-11).

valves in place. The valves, when not in use, are under cover and by keeping them well painted they are always in condition ready for use. The lower end of the long lever has a wrought-iron piece which forms a pivot upon a heavy "scrub-brush handle" cast on the iron casing-ring. The upper end and also the lower portion, just above the valve are each provided with an eye to facilitate raising the valve out of the water; the end of the trolley-beam is extended outside of the building for this purpose.

The valve shown is made of wood of double thickness with well leaded joints and a soft sponge-rubber ring 1-inch square in section fitted around the space at the edge to make a water-tight joint. The screw-rod which extends through the wall and handle-nut are provided to draw the lever up

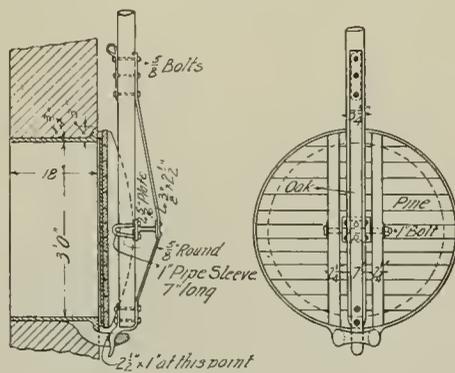


Figure 250-(11-12).

tight against the valve and force the valve against its seat. The adjusting screw is located inside of the building so that it is out of reach of meddlers. The flagging shown in Figures 247 and 249 permits a man to get out of the front of the screen-house and for attaching a small chain hoist to the end of the trolley-beam. An 8-inch I-beam is used; not on account of the weight that it is required to carry is it so great but in order to provide room for trolley wheels of ample size.

(To be continued.)

would practically be at a standstill most of the time and their proper efficiency would be greatly impaired. The case widely differs from those cases where the railway corporation has reason to anticipate danger from a crowd of rioters or other outside parties or causes.

DETERIORATION IN MECHANICAL CONTRIVANCES—PROOF OF INJURY FROM CATCHING HEEL ON METAL PROJECTING FROM STEP OF CAR MAKES PRIMA FACIE CASE.

Rattan v. Central Electric Railway Co. (Mo. App.), 96 S. W. Rep. 735. Oct. 1, 1906.

All mechanical contrivances, the Kansas City court of appeals takes it for granted, as a general rule, are liable to change and deterioration from use. And it thinks it possible that the lead in the metal frame of a "safety tread" fastened to the top of the wooden step of a car had become worn or displaced so as to have left the thin edge of the plate extending above the surface in its worn state; that thus exposed it would become broken, and in that condition have caught and held the heel of the plaintiff's shoe as claimed by her. The point that there was no evidence that the defendant knew, or could have known, of any defect in the step of the car, or had time to remedy the same, the court holds, was not well taken. The plaintiff made out a prima facie case without any direct proof of actionable negligence in that respect. "Res ipsa loquitur" (the matter speaks for itself).

LOCATION OF POLE IN UNDESIGNATED AND UNAUTHORIZED PLACE IS A TRESPASS AND THE OWNER OF THE FEE MAY HAVE RELIEF BY ACTION OF EJECTMENT.

Moore et al. v. Camden & Trenton Railway Co. (N. J.), 64 Atl. Rep. 116. June 18, 1906.

When a trolley company has laid down its railway in the streets of a city, and has obtained by petition from the governing body an ordinance granting such a right and fixing the route of the road and the places where the poles are to be located according to a map accompanying said petition, pursuant to the street railway act of April 21, 1896, the court of errors and appeals of New Jersey holds that it cannot afterwards lawfully place or erect its poles at places in the street different from those so designated. If it locate one of its said poles in the street at a place upon land not thus fixed and designated, and without the authority of the owner of the fee thereof, it becomes a trespasser, and the owner may have relief by an action of ejectment to recover possession of the land thus occupied by the pole, such possession to be afterwards held subject to the public easement.

NOT RESPONSIBLE FOR SAFETY OF STREET OR BOUND TO NOTIFY PASSENGERS OF GUTTER.

Thompson v. Gardner Westminster & Fitchburg Street Railway Co. (Mass.), 78 N. E. Rep. 854. Oct. 17, 1906.

A passenger alighting from a car at about 8 o'clock in the evening of August 16 was injured by stepping into a gutter. The track ran by the side of the road, and between the track and the sidewalk there was a gutter in the form of a ditch 1 foot wide and 1 foot deep, the nearest line of the ditch being 2½ feet from the nearest rail of the track. The supreme judicial court of Massachusetts, in overruling exceptions to a verdict directed in favor of the defendant, says that the place where the car stopped was a part of the highway over which the defendant had no control. "The street is in no sense a passenger station for the safety of which a street railway company is responsible." The plaintiff's contention that it was the duty of the conductor to caution her against stepping into the gutter, and that his failure to do so was negligence, was untenable. Gutters like the one described are not uncommon features of streets in our country towns. They are generally between that part of

the highway which is wrought for public travel and the sidewalk. The plaintiff knew that she was alighting from the car upon the sidewalk side, and the conductor may well have assumed that she was familiar with the existence of gutters and would govern herself accordingly. His failure to warn her was not negligence.

WHETHER PASSENGER WAS THROWN FROM CAR AT CURVE IN OPPOSITION TO CENTRIFUGAL FORCE QUESTION FOR JURY.

Duquis v. Saginaw Valley Traction Co. (Mich.), 109 N. W. Rep. 413. Oct. 29, 1906.

This case is without a parallel in cases of negligence, according to the statement of Mr. Justice Grant, of the supreme court of Michigan, in a concurring opinion, it appearing to be in conflict with the law of centrifugal force. But under the testimony of the plaintiff and his witnesses, if the jury believed them, he was somehow thrown from the car at a curve, although the defendant contended that it was a physical impossibility as claimed, suggesting that the man himself stepped off the car, and it is held that there was a disputed issue of fact which it would have been error to refuse to submit to the jury, unless the court is to substitute its judgment upon questions of fact for that of the jury.

NO ACTIONABLE BREACH OF CONTRACT OR ROUTING ORDINANCE IN ASKING PASSENGER TO CHANGE TO IMMEDIATELY FOLLOWING CAR TO RESTORE SCHEDULE—DIVERSION OF CAR.

Dryden v. St. Louis Traction Co. (Mo. App.), 96 S. W. Rep. 1044. Oct. 16, 1906.

A passenger intending to go to the terminus of the route of the car which he was on was notified on the way by the conductor that the car would not go to the usual terminus, and to take a car following in close proximity. But he refused to change cars, and subsequently sought to recover damages. The evidence on the part of the defendant showed that there had been a delay of 15 minutes, caused by a "jammed switch," resulting in a blockade and disarrangement of the spacing of the cars on the line. The superintendent testified that in order to restore the proper spacing of the cars, and to make up the time lost by the car in question he ordered the conductor to make the loop at a different point from the terminus stated.

That there was no substantial breach of the defendant's contract to carry the plaintiff to his destination, the St. Louis court of appeals says it thinks was clearly shown by the plaintiff's own evidence. He was offered a transfer to another car (at hand) to carry him to his destination, four blocks north of where he was. The mere inconvenience to the plaintiff of getting off one car to take passage on another to be carried immediately to his destination was not an actionable breach of the defendant's contract to carry him.

Nor was he given a right of action by a city ordinance which legalized the company's routing as it existed on a certain date, and which provided that no change of the routing should be thereafter made without the sanction in writing of the mayor, president of council, and supervisor of street railways, and provided, in effect, that a car should not be turned from its established routing, except in cases of unavoidable accident, or when it was about to be turned in according to schedule at a car shed. The ordinance did not attempt to take away from the company its lawful right to make all reasonable rules and regulations for the conducting of its business, nor to specialize all and every circumstance under which a car might be temporarily turned from its regular route. The court thinks that was not only a reasonable diversion, but a necessary one, for the accommodation of the traveling public, and was in no sense a violation of the letter or spirit of the ordinance, and hence afforded the plaintiff no right of action.

News of the Week

Progress of Hudson River Tunnels.

Chief Engineer Charles M. Jacobs, of the Hudson & Manhattan Railroad, which is building the so-called McAdoo tunnels under the Hudson river from Hoboken and Jersey City to Manhattan island, last week gave out some figures showing the progress being made on the work. The two tubes between Hoboken and Morton street are completed under the river, and on the Hoboken side \$34 feet of one approach and 923 feet of the other approach are dug. On the New York side the land tunnel, westbound, has been completed 1,400 feet, almost to a point under Jefferson Market, and the eastbound subway is dug, also through Christopher street, 2,100 feet, to and up Sixth avenue as far as Tenth street.

Of the two downtown tunnels, extending from Cortlandt street, New York, to a point under the Pennsylvania terminal, Jersey City, both are about three-fifths completed under the river, the north or westbound tube having come out 3,120 feet from the Jersey shore, and the south tube having been driven 3,218 feet toward New York.

At Jersey City the two tubes that are to connect the McAdoo terminal under the Pennsylvania station with the Erie and Lackawanna terminals have been dug from the Pennsylvania terminal about half-way up to the Erie terminal; from the Hoboken end of the Christopher-Morton tubes terminal shaft at Fifteenth street about half-way down to the Erie terminal, and from the Fifteenth street shaft up to within two blocks of the Lackawanna terminal. West of the Pennsylvania terminal the four main-line connecting tunnels that go to Newark have been dug to Grove street. Nearly 5,000 feet of the tunnels on the Jersey side are dug. The terminal stations are well under way. The tunnels under the Hudson are to be in operation, it is promised, by September, 1907.

Legislation Affecting Electric Railways.

Oklahoma.—The constitutional convention has adopted a provision prohibiting steam or electric roads from charging more than 2 cents per mile, giving the railway commission power to exempt any road upon satisfactory proof that it cannot earn a reasonable income upon the money actually invested if not permitted to exceed the 2-cent rate.

Pennsylvania.—Four bills have been introduced in the legislature by Senator Campbell. One amends the trolley consolidation act of 1895 by providing that traction companies in country districts may sell or lease property or franchises which are owned, leased, operated or controlled to any other traction or motor power company incorporated in the state. Such companies may also contract with other companies for the operation of lines. The present law was framed to permit the consolidation of the companies in Philadelphia and Pittsburg only. Another bill gives electric companies the right to acquire the franchises of steam railway companies, to carry freight, and to make arrangements for the operation of steam railway cars over electric railway tracks. The bill also gives the president and directors of the street railway companies power to borrow money and to issue bonds without any limitation. The present law provides that money shall not be borrowed in an amount exceeding the capital stock subscribed and bonds shall not exceed double the amount actually paid in of the capital stock subscribed, "the proceeds whereof shall be actually expended in the construction and equipment of the roads." A fourth bill authorizes the companies to construct branches or extensions by resolution of the board of directors instead of by resolution of the stockholders. Proposed branches or extensions need not be within the general scope of the original charter. A bill has also been introduced in the legislature by Representative Robert Dearden of Philadelphia to compel street railway companies to provide each passenger with a seat. It also provides that if all the seats are occupied the companies shall not refuse passage, but must transport any passenger not provided with a seat for half fare. It further provides that a passenger having paid half fare may take a seat when one is vacated.

Mayor Guthrie's Views on Pittsburg Subway.

Mayor Guthrie of Pittsburg, on February 6 addressed the rapid transit commission of the city councils at their invitation on the subject of the proposed ordinance to give the Pittsburg Subways Company a franchise for a system of subways covering the entire city. He said in part:

"To provide a permanent basis for the settlement of terms of joint use by other companies the subway company should be required to keep a separate account of the cost of the construction of its down town system. This account should be audited by the comptroller or an auditor and the amount thus ascertained should be used in determining the amount to be paid for such joint use.

"The length of the franchise should not under any circumstance exceed 50 years, and that term should not be considered unless the public interests are fully safeguarded. Personally, I think 25 to 30 years a long term. We have no right to bind the future city to a system which may cripple its growth and subject the people to a great burden.

"Bonds for the construction of the line not to exceed the actual cost might properly be given as a lien on the franchise until paid, but provision should be made for a sinking fund to extinguish them. The capitalization of the company, either by bonds or stocks, should be limited to the cost of construction and not exceed 25 per cent in addition thereto. No increase of bonds or capital stock should be issued without the consent of the city, and then only if the amount be actually raised in cash and expended

for improvements. Cost and maintenance should be paid out of the earnings.

"The value of the franchise is solely in the power of the holder to tax the public for its use. It is not just to permit the holder to tax the public in order to pay interest and dividends on watered bonds and stocks, and even to withhold proper accommodations in order to reduce operating expenses, so as to leave a larger balance to be applied to such purposes.

"The company should not be permitted to sell or lease its lines or to consolidate with any company without the consent of the city. There should be a provision that transfers at all stations should be made with other lines, either surface or subway. The city must have power to compel the company to furnish adequate accommodations and service.

"All details of construction and operation should be determined before construction is begun. The city should have the right to select at least three consulting engineers to pass upon all plans.

"In order to require the company to bear its fair share of the city's expense it should pay each year an amount equal to the mileage fixed for that year on the cost of construction.

"It should be required to pay into the city treasury each year any balance of its revenue remaining after payment for operating and maintenance; 5 per cent interest on its bonds and 6 per cent on its capital stock.

"The city should have the right to buy the capital stock of the company at par any time after 25 years.

"The company should be required to render annual accounts to the comptroller, and there should be some limitation on the power of the company to absorb its surplus income by excessive salaries."

Western Society of Engineers.—The programme for the regular meeting of the Electrical Section of the Western Society of Engineers on February 15 included a lecture on "Direct-Current Compensators for Balancing Electric Circuits" by H. M. Biebel.

Thefts of Copper Wire on the Illinois Traction System.—Considerable trouble has been caused recently on the electric lines in the southern part of Illinois by thefts of copper wire. On Wednesday night, February 6, 200 feet of heavy trolley wire was stolen from the Illinois Traction Company's line between Bloomington and Peoria.

Louisville Railway Wage Increase.—President T. J. Minary of the Louisville Railway Company announced on February 9 that the directors had decided to increase the wages of all the company's employes who are paid by the hour one cent an hour. This includes trackmen, mechanics, motormen and conductors, whose wages vary between 15 and 21 cents an hour. About 1,500 men are affected by the increase, which will take effect at once.

Special Car for Tacoma Railway & Power Company.—An attractive special car is now being equipped in the Tacoma Railway & Power Company's shops. It will be equipped with cushioned chairs, buffet, tables, and the floor will be carpeted. The fittings throughout will be equal to those of the best modern private cars. It is primarily intended for the use of the officials of the road in inspecting the 200 miles of electric railway lines included in the system, and for the use of distinguished visitors. During the summer when the car is not required for official purposes it will be chartered to trolley parties to American lake and many of the other attractive points of interest on the roads.

Proposed Union Station at Dayton.—According to an assertion attributed to Col. E. C. Spring, manager of the Dayton Covington & Piqua Traction Company, the owners of all the lines entering the city of Dayton, O., have been trying to agree upon a union station to be erected here, but no definite answer has yet been received from the Schoepf roads. He said that some of the companies wanted a union passenger station, but not a station to be used for both freight and passengers by all the roads. The managers of the various companies met with the city council a few days ago and discussed the matter. It is possible that the old city building may be converted into a depot, but as yet nothing definite has been decided upon.

The Concrete Review.—The Association of American Portland Cement Manufacturers announces the publication of the Concrete Review, Volume 1, Number 1, of which appeared on February 1. The publication is to be semi-monthly and is to meet the growing demand for the most reliable information regarding the proper use of Portland cement and serve as an easily accessible guide to the best articles appearing in the various technical publications. Original articles will be published, together with extracts of articles which appear in other publications. The Concrete Review will be sent upon request addressed to the assistant secretary of the Association of American Portland Cement Manufacturers, Land Title building, Philadelphia.

Plan Bureau of Alliance Against Accident Frauds.—A meeting of representatives of steam railroads, traction companies, accident and liability insurance companies, public service and other corporations was held at the Great Northern hotel in Chicago on the evening of February 5 to consider the establishment of a local index bureau of the Alliance Against Accident Fraud. H. C. Wagner of the Employers' Liability Assurance Corporation was elected chairman and L. L. Austin of the Northwestern Elevated Railway secretary. No definite action was taken. Another meeting will be held in a short time. This index bureau receives daily from each local subscriber a report showing the name, age, address, attorney and physician of each individual who has made a claim upon the subscriber's company. The bureau sorts and classifies the reports and whenever a duplication of names of claimants, physicians or attorney is found the claim departments

of the companies affected are brought in touch for the purpose of finding out if the claim is fraudulent or exaggerated. Such bureaus have been established in Boston and New York and are said to be doing effective work at a small cost.

Los Angeles Cars Shipped on Their Own Wheels.—The Pacific Electric Railway Company, Los Angeles, Cal., recently received 52 new standard-gauge cars, which are now being fitted with electrical equipment at the Los Angeles shops. These cars will have multiple-unit control so that during the rush hours they may be operated in trains. It is of especial interest to note that in delivering these cars from the shops in St. Louis they were transported on their own wheels. While this practice is perhaps not unusual in the east where distances are comparatively short, it is worthy of note that experience has shown it to be feasible to deliver for a distance of 2,100 miles on their own wheels three trains, including 52 electric railway cars.

Organization of Shop Foremen.—The shop foremen of Brooklyn, Manhattan, Newark and vicinity met and formed an organization for the exchange of experiences and data on the equipment and repairing of rolling stock. It is hoped by the men that an exchange of ideas will be brought about which will be a great advantage both to the men and to the companies. Officers have been elected as follows: President, Clark Crather of Paterson; first vice-president, Miles Hoyt of Brooklyn; second vice-president, A. Dotschall of Manhattan; third vice-president, R. R. Myers of Flatbush; secretary and treasurer, John R. Case of Newark. An executive committee of seven members has been appointed to draw up a constitution and by-laws. The association will hold monthly meetings.

Cleveland Traction Situation.—The street railway situation in Cleveland still remains in the same condition as for the past month. President Andrews of the Cleveland Electric Railway and President DuPont of the Municipal Traction Company are still engaged in determining a basis on which to calculate the value of the Cleveland Electric property and have given out nothing as a result of their conferences except the statement that satisfactory progress was being made and that probably the negotiations will not be completed until some time next week. The thirty-day truce, during which all hostilities between the two companies were to be suspended, expired on February 10, and by agreement it was extended indefinitely, with a provision that it may be terminated upon 24 hours' notice from either side. Attorneys for both companies have filed in Judge Phillips' court a petition that the injunction case of the old company against the Forest City Railway be suspended until the result of the negotiations is known.

Committee on Municipal Ownership.—The membership of the committee on "Municipal Ownership" of the American Street & Interurban Railway Association for the work of the 1907 convention has been completed and now stands as follows:

C. W. Wyman, chairman, general manager Stone & Webster, Boston, Mass.

John A. Beeler, general manager Denver City Tramway Company, Denver, Colo.

George F. Chapman, general manager United Railroads of San Francisco, Cal.

H. M. Sloan, general manager Calumet Electric Street Railway Company, Chicago, Ill.

J. J. Stanley, general manager Cleveland Electric Company, Cleveland, O.

The names of members of the other committees that have been appointed may be found in the Review for February 2, page 161, and for February 9, page 203.

Electrification of Washington Terminal.—On January 29 the senate committee on the District of Columbia gave a final hearing to the railroad interests which are opposed to the bill applying the smoke law of the district of Columbia to the steam railroads doing business in Washington. Arguments against the bill were presented by representatives of the Pennsylvania and the Baltimore & Ohio. The point was made that the railroads had incurred great expense in providing terminals at Washington, which were far in advance of the needs of the city; that they had established freight yards outside of the city limits in order that the smoke nuisance might be reduced by keeping freight locomotives out of the city so far as possible, and that to force the railroads to assume the additional expense of electrifying the Washington terminal would mean great loss to the public, first by reason of the delay which must ensue before electrical installation would be completed, and secondly because of the terminal charge, estimated at \$5 per car, which would have to be assessed on cars within the district.

Trackage Agreement Between Boston & Worcester and Boston & Albany.—It is reported that a tentative agreement, involving important changes, has been entered into by the officials of the Boston & Worcester Street Railway and the New York Central Railroad. Among the interesting changes promised as the result of it is the reduction of the running time of the Boston & Worcester trolley air line cars between Worcester and Boston from 2 hours and 15 minutes to 1 hour and 30 minutes, and the establishment of the trolley freight business that has been under consideration by the Boston & Worcester officials for months. The agreement is to the effect that the Boston & Worcester road may run from Newton Highlands into Boston over the Boston & Albany circuit branch, and have its Boston terminals at the old Park square station, which the New York Central recently secured on a conditional sale, awaiting legislative sanction. By the carrying out of this agreement, the railroad can electrify its circuit branch, a step that has been under consideration. Another plan that the Boston & Worcester has in mind is the construction of a 3¼-mile boulevard from a point in South Framingham, opposite the South Framingham

muster field to Fayville, at the Southboro and Framingham line, to cost \$300,000.

New York Rapid Transit Affairs.—Chief Engineer Rice of the New York rapid transit commission, who was instructed to investigate the application of the United Engineering & Contracting Company, which is building the Pennsylvania tunnels in Thirty-second and Thirty-third streets, between Fifth and Sixth avenues, to be allowed to excavate by the method of open cuts instead of by boring, presented his report on February 7. Mr. Rice found that the character of the ground required open cut excavation but of less length than stated in the company's application. The commission heard protests from several property owners who declared that the open cut work would injure the foundations of their buildings and take trade away from the merchants. Mr. Philbin, of the contracting company, said that they would be compensated for all damage and the commission postponed the hearing for a week until an agreement on the question of damages could be reached. The commission approved the action of the committee on plans which on February 5 decided that if the Brooklyn Rapid Transit Company operates in the proposed bridge subway loop it shall be allowed to use the best type of cars of its present rolling stock equipment, instead of being required to use steel cars. The commission has ordered a public hearing for February 28 on the form of the proposed contract for the bridge subway loop.

San Francisco Employees Receive Increase of Wages.—It is reported that the board of arbitrators selected last fall to adjust the differences between the United Railroads of San Francisco and its employees, in regard to hours and wages, has decided that the company shall increase the wages of its employees 20 per cent and that the hours of labor shall remain as at present, 10 hours constituting a day's work. The unions directly interested in this decision are the local bodies of the Amalgamated Association of Street and Electric Railway Employees of America, International Brotherhood of Electrical Workers, Stationary Firemen and Street Railroad Construction Workers. The company's refusal to accede to the demands of the unions resulted in a strike which lasted from August 26 to September 5, 1906, almost completely tying up the street-car service of San Francisco, which was terminated on September 5 by an agreement to submit the demands of the men to arbitration by a board consisting of one man chosen by the unions, one by the company, and the third by the other two. A few days later President Calhoun offered increases to the different unions involved, but they rejected the offers in favor of arbitration. The board of arbitrators consisted of William H. Beatty, Major Frank McLaughlin, and Rev. Peter C. Yorke. The increase in wages is to take effect from the date of the end of the strike, September 5.

Plans for a Municipal Subway in St. Louis.—Senator J. J. Prendergast of St. Louis on February 9 introduced into the Missouri legislature a bill to permit the city of St. Louis to build subways. The bill, which was drafted by Mayor Wells and approved after certain amendments by a committee of fifteen representative citizens, provides that any city of 100,000 or more inhabitants may build or acquire subways within their corporate limits to be exclusively owned by the city, for the transportation of passengers, baggage, express and freight; that such cities may operate subways or lease them for a period not exceeding 50 years, and may regulate their use and the construction and operation of cars therein. It is also provided that such cities may issue municipal bonds, at not less than par, payable out of the income from the subway. In connection with this bill an amendment to the state constitution was also introduced, which provides for an increase of the borrowing powers of such cities for the purpose of building or acquiring subways. According to the amendment no indebtedness may be incurred by a city for this purpose unless approved by two-thirds of the voters, and unless provision is made for an annual tax sufficient to pay the interest on such indebtedness and to constitute a sinking fund for the payment of the principal thereof within 30 years. No definite plans for the actual construction of a subway have yet been considered, but it is desired to secure the necessary legislation to make such a step possible as soon as it is deemed necessary or feasible.

Six Fares for a Quarter in Minneapolis.—The Minneapolis city council has decided that the people of Minneapolis are entitled to six street car rides for a quarter. Friday evening, February 8, the council passed an ordinance requiring the Twin City Rapid Transit Company to "sell and provide for the sale of tickets, each good for transportation of one passenger for a continuous passage over the street railway lines of said company in said city at the rate of not less than six tickets for twenty-five cents." The ordinance was drafted by Attorney C. B. Holmes, a member of the council. The street railway is expected to resist the ordinance, when it is given the mayor's signature and made a law, relying on the provisions of an ordinance of 1890, confirming an act of the council permitting the street railway company to operate all its railway lines in the city by electricity. This ordinance provided for a minimum fare of five cents a ride. However, the ordinance which it continued and which names the five cent fare is taken by advocates of the new measure to be a license merely, revocable at the will of the council. It is believed that St. Paul will also take up the crusade for lower fares. A special committee of the city council appointed to confer with the Twin City company's officials in regard to the street-car service on February 11 informed W. J. Held, the general manager, that in the event of Minneapolis getting six fares for twenty-five cents the same concession would be demanded for St. Paul, in spite of the fact that the franchise of the company seems to allow it to charge a straight five-cent fare during the life of the franchise. This announcement was accompanied by a demand for improved service and Mr. Held made several proposals to that end, which will be considered by the council.

Construction News

FRANCHISES.

Albia, Ia.—A franchise has been granted to C. A. Ross, Chicago, C. B. Judd, Pittsburg, A. S. Kimberly, New York, and Calvin Manning, Ottumwa, Ia., to operate a street railway in Albia. The promoters agree to have one mile of line in operation within a year.

Auburn, N. Y.—The Auburn & Ithaca Traction Company has been granted a franchise to enter the city with the provision that within two years from the date on which permission to build is granted by the railroad commissioners the line must be completed. The franchise also provides for the improvement by the company of all streets through which its line passes.

Carbondale, Ill.—The Southern Illinois Transit Company, which proposes to build an interurban line from Carbondale to Murphysboro, Carterville, Herrin, Johnson City and other points, has been granted a franchise to lay tracks over certain of the principal streets of the city. The franchise specifies that actual construction shall begin within three months after acceptance and that within one year thereafter there shall have been completed and in operation a single or double track railway from a point on Main street to one of the following points: Carterville, Herrin or Cambria. A bond of \$5,000 is to be given as a guaranty that \$5,000 shall have been expended on actual construction by the first of next July.

East Liverpool, O.—At a recent meeting of the stockholders of the Ceramic City Light Company, the Wellsville Light & Power Company of this city and the People's Light & Power Company of Chester, W. Va., it was agreed to surrender the charters of the corporations to the secretary of state at Columbus, O. These companies have been in operation many years with the exception of the People's, which was organized to furnish light to the city of Chester and also to East Liverpool, but which never exerted its authority. The business of all three companies was merged into the affairs of the East Liverpool Traction & Light Company, which now controls the traction and light properties in this section of the state.

Grand Rapids, Mich.—The Grand Rapids Electric Company, a new organization, has applied for a franchise for right-of-way through the city from the northwest to the southwest side and from the southwest side to the heart of the city for freight, passenger, mail and express service. It is reported that this is a part of a projected interurban system which is to begin at Alpena and run through West Branch, Gladwin, Mt. Pleasant, Edmore, Greenville, Belding, Rockford, Grand Rapids, Kalamazoo, Battle Creek, Coldwater, Camden and into the state of Ohio. Another part of the project, it is stated, contemplates a road from Grand Haven to Lansing through Grand Rapids. The application has been referred to the committees on streets and ordinances.

Kankakee, Ill.—The Kankakee Electric Street Railway, the North Kankakee Electric Street Railway and the Kankakee & Western Electric Railway have been granted new 20-year franchises. It is stated that the franchises under which the companies were operating were illegal because the consent of the abutting property holders had not been obtained.

Lexington, Ky.—The Central Kentucky Traction Company, represented by Louis des Cognets, president, and Judge J. R. Morton, attorney, has applied for a franchise to construct and operate a traction line connecting Lexington with Nicholasville, Lancaster and Richmond, Ky.

Marysville, Cal.—A franchise has been granted to the Northern Electric Company, Chico, Cal., to build an electric line in certain streets of Marysville. The franchise as originally drafted and applied for last November, was objectionable to the council on account of certain provisions omitted and incorporated. The company has now conceded these points, among which are the elimination of the third-rail clause and the cutting-out of the right of way asked for on Orange street. The company also agrees to place lights at certain points along its line.

Mt. Vernon, O.—The city council has been asked for a franchise to build an electric railway in Mt. Vernon, by two different companies: the Cleveland & Southwestern Traction Company and the Mansfield & Southern Traction Company, the former represented by Roberts & Abbott of Cleveland, and the latter by Frank L. Beam and Dwight E. Sapp, also Judge Maxwell of Mansfield, O. Both companies desire to operate over practically the same streets in Mt. Vernon. The petitions have been referred to the board of public service and the city solicitor.

New Castle, O.—The 50-year franchise recently applied for by the New Castle & New Wilmington Street Railway Company has been granted by the city council with the provision that the road must be completed and cars running within two years from the date of its acceptance.

Spokane, Wash.—The city council in committee of the whole has reported for passage the ordinance granting the Spokane & Inland Empire Railroad a franchise for a subway nearly a mile long connecting its freight and passenger terminals in the city. A map showing the route of this subway and an outline of the company's plans in connection with it was published in the Electric Railway Review for February 2, 1907, page 148. The franchise is perpetual and practically free from restrictions. Work must begin within two years and be completed within five years.

St. Charles, Mo.—St. Louis capitalists, represented by H. H.

Wilmes, are asking for a franchise to operate an electric line over the principal streets of St. Charles. It is stated that the proposed line will connect with the St. Louis St. Charles & Western Electric Railway across the Missouri river, which, it is said, may mean that the United Railways Company of St. Louis is interested.

Waxahachie, Tex.—The Central Texas Traction Company has been granted a six-months extension to its franchise for entering the city with an interurban line. The franchise expired on February 7 and the extension was asked for to allow more time in which to decide on the streets over which it shall run.

Weatherford, Tex.—G. M. Bowie, of Weatherford, representing Chicago capitalists, has been granted a franchise to build an electric line in Weatherford which it is said will be a part of an interurban line connecting Weatherford and Ft. Worth. One mile of track must be completed within one year from the date of the franchise.

Winona, Minn.—The La Crosse & Winona Traction Company has applied for two 50-year franchises, one for furnishing light, heat and power for commercial purposes and the other for a street railway. The first franchise gives the company the right to furnish electricity from a plant to be located in the city and permission to control and maintain all new lines it may acquire in the city as well as the present lines. Rates are quoted in the franchise for light and power and an important section provides that they shall be adjusted every 10 years by three adjusters, one appointed by the council, one by the company and the third by the two already named. The street railway franchise provides that cars shall be in operation from Winona to Galesville within 18 months and to La Crosse within two and a half years, with permission to run tracks into the city and on the present tracks or on new ones to be constructed by the company. The council probably will not act on the measure for some weeks. C. M. Morse, president, Winona, Minn.

RECENT INCORPORATIONS.

Alfarata Electric Street Railway Company.—Incorporated in Pennsylvania to build an electric railway from Alexandria to Tyrone Forge, Pa. Capital stock \$75,000. Incorporators: John Phillips, president; Samuel I. Spyker, secretary, and W. G. Kenaga, treasurer. Headquarters, Altoona, Pa.

Big Valley Street Railway.—Incorporated in Pennsylvania to build an electric line from Mill Creek by way of Airy Dale, Allensville, Belleville and Kishacoquillas Seminary to Reedsville, Pa., 27 miles. Incorporators: R. W. Jacobs, H. E. Steel, F. Blair, I. Isenberg, George C. Wilson and Wallace H. Wilson.

Brownsville Masontown & Smithfield Railway.—Incorporated in Pennsylvania to build and operate an electric line between Brownstown and Smithfield, Pa., 20 miles. Capital stock, \$150,000. Incorporators: W. J. Sheldon, president, McKeesport, Pa.; W. J. Dain and C. V. Kennedy.

Decatur Taylorville & Litchfield Traction Company.—Incorporated to build a railroad from Decatur to Litchfield, Ill. Incorporators, Dudley Taylor, Frederick Job, Thomas B. O'Connell, Alma L. Dorothy and W. W. Taylor.

Franklin & Towamensing Electric Street Railway.—Organized and soon to apply for a charter to build an electric line from Weissport through North Weissport and Phifer's Corner to Harry, to Parryville and thence to Bowmanstown, Hazard, Palmerton and Millport, Pa. Incorporators: A. P. Berlin, John T. Semmel, Dale Craig, H. J. Bretney and T. J. Fretz.

Hagerstown & Northern Railway.—This company has been incorporated to take over the Hagerstown & Northern Railway Company and the Franklin Railroad Company. The Hagerstown & Northern extends from Hagerstown to Reid, and the Franklin line runs from Reid to Shady Grove, Franklin county. Christian W. Lynch of Harrisburg is president.

Juniata Valley Street Railway.—Incorporated in Pennsylvania to build an electric line from Huntingdon to Mt. Union, Pa. Incorporators: R. W. Jacobs, H. E. Steel, F. Blair, I. Isenberg, Wallace Wilson and George C. Wilson.

Lyndhurst & Sherando Railroad.—Incorporated in Virginia to construct a line from Lyndhurst to Mount Troy in Augusta county, 6 miles. Capital stock, \$50,000. Incorporators: J. H. Ralston, president; J. B. Sleman, Jr., secretary and treasurer; H. T. Winfield, F. L. Siddons, James Sharp and Harry Standford, all of Washington, D. C., and H. L. Millner, Morgantown, N. C.

Mattoon, Ill.—The Decatur Sullivan & Mattoon Transit Company has been granted a 50-year franchise to build and operate over certain streets in Mattoon. The franchise was passed as originally drafted by the company with the exception that 28-foot iron poles were substituted for the wooden poles specified.

Rock Island Construction Company.—Incorporated to continue the construction of the Rock Island Southern Railway from Galesburg to Rock Island Ill. Capital stock, \$500,000 with a right to increase to \$2,000,000. Incorporators: G. H. Higbee, president, Burlington, Ia.; E. C. Walsh, vice-president, Clinton, Ia.; C. H. Walsh, treasurer, Burlington; J. W. Walsh, secretary, Davenport; W. B. Young, W. W. McCullough, S. S. Halnan, Monmouth; M. A. Walsh, Clinton; G. W. Gale, Galesburg; Albert Hidden and L. N. Elwards, St. Louis. It is stated that the line connecting Rock Island, Monmouth and Galesburg will be started as soon as the route has been decided upon.

Williamson Traction Company.—Incorporated to construct and operate a street railway in Williamson and Mingo counties, West

Virginia, also in Pike and Martin counties, Kentucky. The capital stock of the company is \$50,000, of which \$500 has been subscribed and \$50 paid. The incorporators are W. J. Williamson, E. J. Wilcox, George W. Brown, H. Williamson and C. H. Jones, all of Williamson, W. Va.

TRACK AND ROADWAY.

Alliance, O.—Surveys are being made for an electric line from Akron, to Alliance and Youngstown, O.

Atlantic Northern & Southern Railway.—H. S. Rattenborg, general manager, Atlantic, Ia., writes that contracts are to be let about March 1 for grading on this line from Manning to Valisca, Ia., 72 miles. Surveys have been made from Atlantic to Manning, 40 miles. The motive power has not yet been determined, but will be either electricity or gasoline motors. J. A. McWaid, of Atlantic, president.

Batavia Medina & Ontario Railway.—It is reported that the Orleans Construction Company, of Buffalo, N. Y., will soon begin the construction of this line from Olcott to Batavia, N. Y.

Beloit Traction Company.—The Rock River Construction Company, which has the contract, has placed orders for all the materials and equipment for the proposed city lines in Beloit, Wis. The American Trust & Savings Bank of Chicago has been made trustee for the bondholders. The Rockford & Interurban Railway of Rockford, Ill., is interested.

Boston Elevated Railway.—This company has taken all of the land necessary for its elevated extension from the North station to the Charles river dam, Boston, Mass., which has been authorized by the Massachusetts railroad commission. Work must begin within six months from the date of the grant of location, December 22, 1906, and be completed within 3½ years.

Boston, Mass.—Representative M. M. Lomasney has introduced a bill into the Massachusetts legislature asking that the Boston Rapid Transit Commission be directed to look up the matter of a subway in the West End, from the Charles river dam to a point near the North station, making connection with the various subways and tunnels at that point. This subway would practically follow the line of the proposed elevated structure of the Boston Elevated Railway.

Buffalo Niagara & Toronto Railway.—Plans have been filed for the construction of this line from Niagara-on-the-Lake, via St. David's, to St. Catharines, Ont.

Charleston & Summerville Electric Railway.—About ten miles of the grading has been completed between Charleston and Summerville, S. C., and two grading crews are now at work, one near each end of the line. D. E. Baxter & Co. of New York have the contract.

Chicago Lake Shore & South Bend Railway.—It is reported that rapid progress is being made on the construction of this road from South Bend, Ind., to Kensington, Ill. The grading has been completed from New Carlisle to South Bend. The strip from New Carlisle to Michigan City will be graded soon, contracts having been let. Grading west of Michigan City is now in progress. Proposals are being received for the grading from Dune Park to Gary, a distance of 12 miles. A contract has been let for the strip from Gary to the Calumet river, a distance of 5 miles, and the remainder of the grading will begin as soon as weather conditions will permit. All the steel necessary for the construction of the road has been ordered.

Consolidated Railway.—It is reported that this company is planning to build a line from Adams, Mass., to the summit of Mt. Greylock. The plan is to build an electric line to the base of the peak and a cog-rail line to the summit. As the summit of Greylock is high above the surrounding country, the building of that portion of the line will be an expensive undertaking. Surveys are being made, and it is understood that a move toward procuring the necessary franchises will be made in the near future.

De Kalb-Sycamore Electric Company.—This company, which now has a line in operation between De Kalb and Sycamore, Ill., has been reorganized and it is stated that the line will be extended from Sycamore to Belvidere. J. H. McMichael of Chicago, president.

Derry & Goffs Falls Street Railway.—The board of railroad commissioners has acted favorably on the petition of this company to build an electric line from Derry to Goffs Falls and it is stated that work will be started as soon as possible to enable the road to be in operation by the middle of the summer.

Ft. Wayne & South Bend Railway.—It is reported that this company, which was incorporated last year to build a road through Syracuse, Milford Nappanee and Wakarusa to Ft. Wayne, Ind., has been financed by a syndicate headed by H. L. Turner, of Chicago, and that a construction company is being formed to do the work.

Ft. Wayne & Springfield Railway.—It is reported that work is to begin early this spring on the continuation of the line from Decatur toward Celina, Ind., via Pleasant Mills, Willshire and Chattanooga. The road has been in operation from Ft. Wayne to Decatur for about two weeks. W. H. Fledderjohann, president, Decatur.

Gainesville Whitesboro & Sherman Railway.—Thomas S. Wayne, chief engineer, Gainesville, Tex., writes that grading will be resumed about March 1, on this line from Gainesville to Sherman, Tex., 29.4 miles, via Callisburg, Whitesboro and Sadler. About six

miles, from Gainesville to Milepost 7, was graded last year and the entire route has been surveyed. M. M. Elkan, of Macon, Ga., has the contract. G. A. Hassinger, New Orleans, La., is president.

Indianapolis & Louisville Traction Company.—The work of setting poles for this line between Jeffersonville and Seymour, Ind., has been started at Seymour and tracklaying is in progress. Several miles of track has been laid at the southern end of the line. The power house and car barns at Scottsburg are well under way and are expected to be completed by April 1. John E. Greeley, Jeffersonville, superintendent of construction.

Joplin & Pittsburg Street Railway.—It is reported that this company has made preliminary surveys and financial arrangements and has secured the necessary franchises for its proposed line from Joplin, Mo., to Pittsburg, Kan. D. H. Holmes, of Kansas City, Mo., president; D. K. Wenrich, Joplin, secretary.

Kalamazoo Gull Lake & Northern Railroad.—It is stated that this company has made the necessary financial arrangements and that construction will begin in the spring on the line from Kalamazoo to Gull Lake, Mich. J. T. Upjohn, of Kalamazoo, president.

Lafayette & Logansport Traction Company.—Chief Engineer H. L. Weber of Ft. Wayne, has announced that 16 miles of track has been laid between Clymers and Rockfield, Ind., on this extension of the Ft. Wayne & Wabash Valley from Lafayette to Logansport. Material has been distributed between Clymers and Logansport.

Los Angeles-Pacific Company.—It is stated that this company will begin work in less than 90 days on the construction of a \$5,000,000 subway in Los Angeles, to be completed in two years. C. H. Ellison, chief engineer, Los Angeles.

Minneapolis Rochester & Dubuque Traction Company.—It is reported that this company has secured the greater part of the right of way for its proposed line from Minneapolis, Minn., to Dubuque, Ia. Secretary William P. Mason, of Minneapolis, has announced that construction work will begin as soon as the weather permits and that beginning May 1 12,000 tons of steel rails a month will be delivered.

Minster Loramie & Southern Railway.—R. B. Anderson of Wapakoneta, O., writes that this company, which was recently incorporated to build an electric line from Minster to Versailles, O., 16 miles, is not yet organized. Grading is to begin some time next fall.

New York, N. Y.—Eridge Commissioner J. W. Stevenson advertised on February 7 for bids for the construction of the elevated railway connection on the Brooklyn plaza of the Williamsburg bridge. The bids will be opened on Thursday, February 21, and the contract must be completed by August 30, 1907. The contractor will be required to begin work within five days of the date of certification of the contract by the comptroller. A bond of \$30,000 is required. This connection has been delayed because there have been no plans for a terminal or connection on the Manhattan side of the bridge. The city has now determined on a subway loop for the connection between the Brooklyn and Williamsburg bridges, and if the Brooklyn Rapid Transit Company gets a contract to run cars in the subway it may run across the Williamsburg bridge from its Brooklyn tracks and into the subway loop.

Ocean Shore Railroad.—John B. Rogers, chief engineer, San Francisco, says that this road will be completed from San Francisco to Santa Cruz, Cal., by October 1. Over 60 per cent of the grading and practically all of the fills and bridges have been completed.

Rice Lake, Wis.—The Rice Lake Milling & Power Company is interested in a project to build an electric railway from Rice Lake to Cameron, Barron and Prairie Farm, Wis.

San Bernardino Valley Traction Company.—A. D. Denham, Jr., president, San Bernardino, Cal., writes that contracts are to be let for grading the line from Colton to Riverside, Cal., 6½ miles. Surveys have been completed and construction is to begin in about three months. O. K. Dunham of San Bernardino is chief engineer.

Scranton Railway.—President J. J. Sullivan of Philadelphia, has announced that the company intends to expend \$720,000 on improvements in Scranton, Pa., beginning this spring. The plans include several important extensions of lines, details of which are not stated, double-tracking of existing lines, improvements to car barns, a larger power house and new cars.

Spokane & Big Bend Railway.—W. H. Plummer, president, Spokane, Wash., states that rapid progress is being made in clearing the right of way for the line from Spokane to Davenport, Wash., 40 miles, and that contracts for the grading are being let. Within three months 1,000 men will be at work on the line and it is expected to have the work completed by January 1, 1908. The right of way has been secured as far as Crystal City and the necessary franchises have been granted. At Seven Mile Bridge, below Spokane, the road will connect with the Spokane & Inland Railway and enter the city over its tracks. To cross the Spokane river at this point a \$20,000 bridge will be erected, plans for which are now being prepared.

Southwest Missouri Electric Railway.—The viaduct between Webb City and Cartersville, Mo., over the tracks of the Missouri Pacific and St. Louis & San Francisco railroads, was opened for traffic on January 31. This viaduct, which was described in the Electric Railway Review for August, 1906, is about ½ mile long and contains three steel bridges. The route over the viaduct

is much more direct than the old route and eliminates seven grade crossings. E. J. Pratt, chief engineer, Webb City, Mo.

Tacoma Railway & Power Company.—Manager W. S. Dimmock of Tacoma has announced that work is to begin at once on the extension of the P street line to the city limits, Tacoma.

Tecumseh-Norman Traction Company.—An official report states that grading is to begin in April on a line from Tecumseh to Norman, Oklahoma, 34 miles, which has been surveyed. W. E. Powell, Tecumseh, president; W. J. Beebe, Shawnee, chief engineer.

Toledo & Indiana Railway.—This company, it is stated, now has a clear right of way for its proposed extension from Bryan, O., to Waterloo, Ind., with the exception of two or three little strips between Bryan and Milburn. The right of way is 66 feet wide, paralleling the Lake Shore & Michigan Southern Railway the entire distance.

United Railways & Electric Company (Baltimore).—Preparations are being made to begin work on the proposed line from Towson to Lutherville, Md., about 2 miles. Surveys have been completed and the necessary property has been acquired.

Utah Light & Railway Company.—It is reported that this company has ordered 80 miles of rails and 150,000 ties to be used in the reconstruction of the Salt Lake City system. Seventy miles of the rails are 65-pound steel and 10 miles are of 85-pound steel, for use in the business portions of the city where traffic is heaviest. Shipments are to begin about March 1, at which time the work will begin. O. A. Honnold, Salt Lake City, Utah, chief engineer.

Warren Company.—H. L. Knickerbocker, chief engineer, Bisbee, Ariz., writes that grading is to begin on February 20 on this five-mile line from Warren to Bisbee, Ariz. Haggitt, Girard & Smith, of Prescott, Ariz., have the contract for grading, bridges and tracklaying. Eighty-pound rails have been specified. The company is still in the market for switches, frogs and other special work. The road will have 100-foot radius curves and a maximum grade of 7 per cent. L. W. Powell of Bisbee is president.

Wrightsville & York Street Railway.—This company, a subsidiary of the York County Traction Company, has filed with the recorder of York county, Pa., notice of its intention to build an electric line from Wrightsville to Columbia, over a double deck which is to be built by the Pennsylvania Railroad on its bridge across the Susquehanna river.

Yakima Intervalley Traction Company.—The report of the engineer who made the surveys has been approved by the directors, and it is announced that construction will begin at once on the line from North Yakima into the Moxee valley and to Zillah, Wash., 24 miles. Another line is to extend to Wide Hollow, west of North Yakima. W. A. Beli of North Yakima is interested.

POWER HOUSES AND SUBSTATIONS.

Alton Granite & St. Louis Traction Company.—Superintendent R. W. Bailey, Alton, Ill., is reported to have announced that this company has appropriated \$40,000 for improvements to its power plant at Alton.

Boston Elevated Railway.—It is reported that arrangements are now about completed for enlarging the power houses so as to supply 12,000 additional horsepower. It is planned to place two new generators in the Lincoln Wharf power house, one in the Charlestown power house and one at the Harvard power house.

Citizens' Electric Street Railway.—It is stated that this company, of Newburyport, Mass., will erect a substation near Salisbury, Mass., in which two 300-kilowatt transformers and the other necessary equipment will be installed.

East Liverpool Traction & Light Company.—The boiler capacity of the power plant at East Liverpool, O., is to be increased by installing two 500-horsepower Stirling boilers. Orders for the new equipment have been placed.

Indiana Columbus & Eastern Traction Company.—It is stated that this company proposes to erect a \$200,000 power house either at Lima or Bellefontaine, O., to supply the line which the company intends to build from Lima to Bellefontaine and from Lima to Defiance. J. L. Adams, general manager, Cincinnati, O.

Little Rock Railway & Electric Company.—This company has placed a contract with the General Electric Company for a 1,500 kilowatt Curtis steam turbine. D. A. Hegarty is general manager.

Sioux City Traction Company.—This company has purchased additional engines and generators which will increase the capacity of its power plant to 10,200 horsepower. The engines are of the Allis-Chalmers cross-compound type. It is stated that another unit of 1,200 kilowatts capacity will be installed during the coming summer. It is intended to use part of this output for supplying power and light throughout the city. E. L. Kirk, general manager, Sioux City, Ia.

Southern Pacific Company.—On February 7, 1907, this company bought the entire block lying west of Fruitvale avenue, Oakland, Cal., for the sum of \$30,000. The property was purchased by the railroad company as a site for the new power house and car barns which the company will erect in connection with the establishment of an electric line to supersede the steam roads which now accommodate the local travel in that city and Alameda. The company proposes to erect one large power plant at this point for the generation of the electric current for the entire new system. This will require an outlay of half a million dollars.

Personal Mention

Mr. E. M. Kenley has been appointed chief engineer of the Yakima Intervalley Traction Company, of North Yakima, Wash.

Mr. H. A. Currie has been appointed assistant electrical engineer of the New York Central & Hudson River Railroad, succeeding Mr. J. D. Keiley, who was appointed electrical engineer last November.

Mr. S. W. Childs, who as construction superintendent has represented J. G. White & Company in the work of electrifying the Ft. Dodge Des Moines & Southern Railway, is now at Davenport, Ia., where he is in charge of reconstructing the properties of the Tri-City Railway Company.

Mr. George H. Dodge, formerly superintendent of the West Chester Kennett & Wilmington Electric Railway Company, has been elected secretary and treasurer of the Coatesville & Kennett Railway Company, which is building a 16-mile road between Coatesville and Kennett Square, Pa.

Mr. T. W. Ryley has been appointed superintendent of the Groton & Stonington Street Railway of Mystic, Conn., succeeding Mr. J. B. Crawford, who was recently appointed superintendent of the Ft. Wayne & Wabash Valley Traction Company. Mr. Ryley has been assistant to Mr. Crawford.

Mr. Charles Kane, assistant superintendent of the Alton Granite & St. Louis Traction Company, at Alton, Ill., has been appointed assistant superintendent of transportation of the East St. Louis & Suburban Railway, at East St. Louis, Ill. Mr. George Bennett, of Venice, Ill., has been appointed to succeed Mr. Kane at Alton.

Mr. J. F. Scott, formerly superintendent of overhead lines for the Chicago & Milwaukee Electric Railroad Company, has been appointed general superintendent of construction for the same company, with headquarters at Highwood, Ill. Mr. Scott has been working on the company's lines since 1900, when, as a contractor, he began building the Libertyville division of the railway. Later he had charge of the reconstruction of the existing lines and more recently assumed charge of the maintenance of the overhead construction.

Mr. Clyde M. Graves, general manager of the Spokane Traction Company, Spokane, Wash., has been appointed general manager of the Coeur d'Alene & Spokane Railway of Coeur d'Alene, Idaho, also, succeeding Mr. R. F. Blackwell, resigned, to take effect some time in March. Mr. Blackwell, who was one of the original incorporators and builders of the Coeur d'Alene line, and has been general manager of the company since its inception three years ago, leaves to devote his entire time to his lumber interests. Mr. Graves is the son of Mr. Jay P. Graves, president of the Spokane & Inland Empire System.

Obituary.

Louis R. Altimus, chief clerk and assistant auditor of the Chicago Union Traction Company, died on February 9 at his home in Chicago, aged 50 years. For many years prior to coming to Chicago he was associated with the Widener-Elkins street railway interests in Philadelphia. In 1888, at the solicitation of the late Charles T. Yerkes, he became identified with the North Chicago Street Railway systems, with which organization he served until his death.

John I. Beggs on Plans for St. Louis Subway.

John I. Beggs, president of the United Railways of St. Louis and the Milwaukee Electric Railway & Light Company, has given out the following statement of his views of the plans for a subway in St. Louis, for which an enabling act has been introduced into the legislature:

"The intention is to make the bonds payable in 30 years. It seems to me that so short a time would be injurious to the plan. The bonds should be made payable in 50 years. As the lease will run for 50 years, there should be no objection to making the bonds payable in the same period. The construction of the subway will cost about \$2,500,000 per mile. I give this as an approximate figure. I do not see how the operating company could meet the capital and sinking fund requirements in 30 years. The investment would be so great that the annual financial requirements would probably exceed the revenue. St. Louis is not New York. In the metropolis, passengers are carried in one direction. St. Louis spreads out in several directions, and it will be only a few years until it reaches out to the Missouri river. The problem of conducting transportation is more complicated here than in New York, and the complete subway system will be relatively more expensive here, as the trunk lines will not run one way, but in several directions."

Increase of Wages in Oakland, Cal.—On account of the increase in its business, and the increased cost of living, the Oakland Traction Consolidated company, of Oakland, Cal., has announced the following new scale of wages for conductors and motormen: One year or less in service, 30 cents per hour; between one and two years in service, 31 cents per hour; between two and three years in service, 32 cents per hour; between three and four years in service, 33 cents per hour; between four and five years in service, 34 cents per hour; between five and six years in service, 35 cents per hour; between six and seven years in service, 36 cents per hour; between seven and eight years in service, 37 cents per hour; between eight and nine years in service, 38 cents per hour; between nine and ten years in service, 39 cents per hour.

Financial News

Bay Shore Terminal Company.—The property has been purchased at receiver's sale for \$765,000 by E. B. Smith & Co. of Philadelphia, who are said to represent the Norfolk & Portsmouth Traction Company.

Brooklyn Rapid Transit Company.—The reports of the four operating lines for the six months ended December 31, 1906, show total gross earnings of \$9,612,105 as compared with \$9,101,374 for the corresponding period of 1905. The surplus after charges was \$1,137,307, a decrease of \$201,707 from the corresponding period of the previous year.

De Kalb-Sycamore Interurban Traction Company.—At the annual meeting of stockholders on February 2 it was voted to increase the capital stock from \$100,000 to \$1,000,000. It was also decided to authorize a bond issue of \$1,000,000. The De Kalb-Sycamore Electric Company will be absorbed. Officers were elected as follows: J. H. McMichael, president; William Jarvis, vice-president, and John McMichael, secretary and treasurer.

Detroit United Railway Company.—At the annual meeting of stockholders on February 5 the president, J. C. Hutchins, submitted a report for the year 1906 which showed that the mileage was increased from January 1, 1906, to December 31, 1906, 78.6 miles. The total on the latter date, including side and yard tracks, was 620 miles. This was divided as follows:

Detroit United Railway	392,998
Rapid Railway System	127,548
Sandwich Windsor & Amherstburg Railway	25.26
Detroit Monroe & Toledo Short Line Railway	74.35

Total 620.156
The company's rolling stock consists of 830 closed passenger cars; 242 open passenger cars; 212 freight and construction cars; 13 line cars; 36 express cars; 6 miscellaneous cars; 2 locomotives; 2,288 motors and 1,766 trucks.

The following shows the business of the Detroit United railway, the Rapid railway system, the Sandwich Windsor & Amherstburg railway for the years ending December 31, 1905 and 1906, and the Detroit Monroe & Toledo Short Line railway from March 1 to December 31, 1906:

	1906	1905
Gross earnings	\$6,063,182.54	\$5,125,563.01
Operating, including taxes	3,718,621.54	3,041,522.90
Net earnings	\$2,344,561.00	\$2,084,040.11
Other income	58,757.73	44,076.40
Gross income	\$2,403,318.73	\$2,128,116.51
Interest on funded and floating debt:		
Detroit United	\$ 988,806.72	\$ 960,372.39
Rapid Railway	135,050.00	135,050.00
Sandwich Windsor & Am.	18,000.00	17,871.25
Detroit Monroe & Toledo.....	250,000.00	.....
	\$1,243,273.38	\$1,113,293.64
Dividend, Detroit United.....	625,000.00	562,500.00
Charged off for Dep.....	250,000.00	.....
Total deductions	\$2,118,273.38	\$1,675,793.64
Surplus income	\$ 285,045.35	\$ 452,322.87

Passenger and mileage statistics for all the lines were as follows:—

Passenger Statistics.

Revenue passengers	113,011,309
Transfer passengers	32,840,259
Employe passengers	4,939,224
Total passengers	150,790,792
Receipts revenue passenger .....	.0507
Receipts per passenger .....	.0380

Mileage Statistics.

Car mileage	25,973,526
Earnings per car mile .....	.2334
Expenses car mile .....	.1432
Net earnings car mile .....	.0902

Great Falls (Mont.) Street Railway.—Gross earnings for the year 1906 are reported at \$54,080.25 as compared with \$48,552.40 in 1905.

Lake Shore Electric Railway.—The company has sold \$550,000 short time notes bearing 6 per cent interest and secured by \$800,000 general mortgage 5 per cent bonds. The proceeds will provide for extensions and improvements.

Merrimac Valley Electric Company.—This company has been organized to hold the stocks of the Citizens' Electric Street Railway Company, of Newburyport, Mass., the Salisbury Land & Improvement Company, the Salisbury Beach Improvement Company, the Haverhill & Amesbury Street Railway Company. James F. Shaw is president of the new company and George A. Butman, treasurer.

Owosso (Mich.) & Corunna Electric Co.—It is reported that the company has received an offer for its property from the promoters of the Lansing Owosso & Saginaw Interurban Company.

St. Joseph Valley Traction Company.—This company, operating from Middlebury to Angola, Ind., has given a mortgage to William P. Knickerbocker of Elkhart, trustee, to secure an issue of \$700,000 bonds. The proceeds, it is reported, will be used to meet the cost of extension to Elkhart or Goshen.

Toronto Railway Company.—Gross earnings in 1906 were \$3,109,739.61, as compared with \$2,747,324 in 1905. Operating expenses were \$1,646,515.27, leaving a balance of \$1,463,224.34. William MacKenzie, the president, in presenting the report said that the city received \$7,000 more of the earnings than the stockholders received in dividends.

Twin City Rapid Transit Company (Minneapolis).—Gross earnings for the year 1906 were \$5,644,988.34, an increase of \$885,725.58, or 18.6 per cent. The figures compare as follows:

	1906.	1905.
Receipts.		
Passenger earnings	\$5,592,079.24	\$4,733,334.80
Miscellaneous	52,909.10	25,927.96
Total earnings	\$5,644,988.34	\$4,759,262.76
Expenses.		
Maintenance of way and structure.....	\$ 195,023.55	\$ 143,491.43
Maintenance of equipment.....	240,229.79	203,762.03
Operation of power plants.....	467,264.33	403,574.33
Car service	1,167,998.71	945,783.96
General expenses	354,340.81	251,585.12
Injuries and damages	152,522.43	122,948.45
Insurance	48,000.00	48,000.00
Total operating	\$2,625,379.62	\$2,119,145.32
Net earnings from operation	\$2,019,608.72	\$2,640,117.44
Interest and taxes	1,137,427.77	1,050,797.35
Surplus	\$1,882,180.95	\$1,589,320.09
Dividends, preferred stock.....	\$ 210,000.00	\$ 210,000.00
Dividends, common stock	952,500.00	881,387.50
Total dividends	\$1,162,500.00	\$1,091,387.50
Surplus from operation.....	719,680.95	497,932.59
Appropriated for renewal funds	482,000.00	240,000.00
Income account, surplus	\$ 237,680.95	\$ 257,932.59

Per cent total operating (including taxes and depreciation) to total earnings... 60.95 58.27
Revenue passengers carried..... 109,194,985 94,666,696
Gross passenger earnings per mile of single track were \$16.-690.78, and per mile of street occupied by track \$30,526.12.

Thomas Lowry, the president, said in his report: "During the boom of 1892, there were started outside of the Minneapolis city limits, two villages for manufacturing purposes, St. Louis Park on the southwest, a distance of 6.1 miles from the city limits, and Robbinsdale on the northwest, a distance of 2.2 miles. Great pressure was brought to bear on our company to make extensions to these suburbs, but instead of doing so, we secured the Minneapolis rights to connect with both villages. We then leased these rights to parties desiring to build, reserving the privilege to purchase whenever we saw fit. We recently concluded that the time had arrived when it would be to our advantage to take them over. Accordingly, we purchased the St. Louis Park line for \$40,000 and the Robbinsdale line for \$30,000. These lines will pay their operating expenses and interest on the investment.

"From the surplus of \$257,932.59 earned in 1905, as shown in the accounts of that year, your directors have appropriated \$100,000 to the renewal fund. During the year 1906 the fund was further increased by the addition of interest on the investments. We estimate the depreciation on the properties of the company for the past year to be \$482,000. During the year there was expended for car replacement and track reconstruction the sum of \$480,783.05. The balance at the credit of the renewal fund now stands at \$590,449.80, of which \$363,500 is invested in bonds."

The following is a statement of extensions and improvements made during the year. They aggregate \$2,648,518.22, and are distributed as follows:

New power	\$1,034,514.22
New shops	201,684.57
Buildings and furnishings	52,754.88
Car equipment	402,815.10
Track and Paving—	
Minneapolis	\$180,274.59
St. Paul—	
Track	\$122,999.32
Selby Tunnel	82,209.37
Suburban	205,208.69
	239,901.94
	625,385.22
New Lines—	
St. Louis park line.....	\$ 40,000
Robbinsdale line	30,000
	70,000.00
Big Island park and boats.....	261,364.23
Total	\$2,648,518.22

Washington Railway & Electric Company.—The report for the year 1906 submitted to congress shows that 41,952,715 passengers were carried. Passenger earnings were \$1,200,786. Receipts from all sources, including income on securities, were \$1,645,396. Operating expenses and fixed charges amounted to \$1,121,776, leaving a balance of \$523,620.

New York Interstate Bridge Commission.—The report of the New York Interstate Bridge Commission to the legislature was made public on February 7. The commission finds that there are two points on Staten island from which a bridge could be built profitably—one from Fort Richmond to Bergen Point, which, with a bridge from Hudson county to Manhattan, would afford all land communication with Staten island, and the other site at the end of the Trans-Staten Island Boulevard at Holland Hook to Elizabethport.

Manufactures and Supplies

ROLLING STOCK.

Atlantic Shore Line, Kennebunkport, Me., is figuring on 15 new cars.

Newell Street Railway, East Liverpool, O., has purchased five additional cars.

Connecticut Valley Street Railway, Greenfield, Mass., will soon purchase 8 new cars.

Worcester Consolidated Street Railway, Worcester, Mass., is figuring on 30 new cars.

Beloit Traction Company, Beloit, Wis., is reported to have placed an order for new cars.

Western Massachusetts Street Railway, Westfield, Mass., is considering the purchase of 8 cars.

Farmington Street Railway, Hartford, Conn., has purchased one car from the Wason Manufacturing Company.

Galesburg & Kewanee Electric Railway, Galesburg, Ill., expects to place orders for three interurban cars for May 1 delivery.

Rockville Broad Brook & East Windsor Street Railway, Hartford, Conn., has placed an order with the Wason Manufacturing Company for 2 cars.

Montreal Street Railway, Montreal, has under construction in its own shops 25 cars of a new type and it is reported will place an order for 20 more for July delivery.

Auburn & Syracuse Electric Railroad, Syracuse, N. Y., has ordered one car for interurban service from the Cincinnati Car Company. It will be 50 feet 6 inches in length over all and be equipped with Baldwin trucks and Westinghouse motor equipments.

Syracuse Lake Shore & Northern Railroad, Syracuse, N. Y., has ordered 7 interurban cars from the Cincinnati Car Company. These cars will have a length over all of 53 feet 6 inches and will be equipped with Westinghouse motor equipments and Baldwin trucks.

Rochester Syracuse & Eastern Railway, Syracuse, N. Y., has placed an order with the G. C. Kuhlman Car Company for two cars for heavy interurban service. They will have a length over all of 53 feet 6 inches, will be equipped with Westinghouse motor equipments and Baldwin trucks and are for delivery next summer.

Ft. Wayne & Wabash Valley Traction Company, Ft. Wayne, Ind., as reported in the Electric Railway Review of January 26, has placed an order for 6 semi-convertible cars for delivery on May 15, 1907. The specifications are as follows:—

- Length of body.....20 ft. 8 in.
- Over vestibule.....30 ft. 1 in.
- Over all.....31 ft. 1 in.
- Width, inside.....8 ft. 5 in.
- Over all.....8 ft. 7 in.
- Height, inside.....8 ft. 2 in.
- Sill to trolley base.....9 ft.
- Track to trolley base.....11 ft. 6 in.
- Body.....Wood
- Underframe.....Wood and steel

- Special Equipment.**
- Brake rigging.....Peacock
 - Couplers.....Builders' double pocket
 - Fenders.....Consolidated
 - Heating system.....Consol. electric
 - Interior finish.....White oak
 - Roofs.....Monitor
 - Seats.....Hale & Kilburn
 - Varnish.....Murphy

Mexico Electric Tramways, Limited, Mexico, Mex., as reported in The Electric Railway Review of January 26, has placed an order with the St. Louis Car Company for 25 closed cars for June and July, 1907, delivery. The details are as follows:

- Seating capacity.....48 persons
- Weight.....4,000 lb.
- Wheel base.....6 ft.
- Length, over all.....43 ft. 8 in.

- Width, over all.....8 ft. 8 in.
- Height, track to trolley base.....12 ft.

- Special Equipment.**
- Air brakes.....Christensen
 - Control system.....General Electric
 - Couplers.....Mexico City standard
 - Destination signs.....Hunter
 - Headlights.....Mosher arc
 - Interior finish.....Mahogany
 - Markers.....Armspear

- Motors, type and number.....G E 87-4
- Seats.....St. Louis—rattan
- Trolley poles and attach.....G E roller bearing
- Trucks.....St. Louis

Milwaukee Electric Railway & Light Company, Milwaukee, Wis., as reported in the Electric Railway Review of January 26, has placed an order with the St. Louis Car Company for 10 closed interurban motor cars of the Milwaukee type for delivery in March. The specifications call for the following details:—

- Seating capacity.....62 persons
- Weight, body.....35,000 lb.
- Total.....85,000 lb.
- Wheel base.....35 ft. 1 in.
- Length, body.....40 ft.
- Over vestibule.....51 ft. 11 in.
- Over all.....53 ft. 5 in.
- Width, inside.....7 ft. 7 3/4 in.
- Over all.....8 ft. 4 in.
- Height, inside.....7 ft. 10 in.
- Sill to trolley base.....8 ft. 4 3/4 in.
- Track to trolley base.....11 ft. 8 3/4 in.
- Body.....Steel
- frame with wood covering
- Underframe.....Steel

- Special Equipment.**
- Bolsters, truck.....Wrought iron
 - Brakeshoes.....Co. standard
 - Center bearings.....Co. standard
 - Curtain material.....Pantasote
 - Dust guards.....Wood
 - Heating system.....Hot water
 - Interior finish.....Quarter oak
 - Journal boxes.....St. Louis
 - Motors.....G. E. No. 605A
 - Roofs.....Monitor
 - Seats.....Hale & Kilburn
 - Side bearings.....St. Louis
 - Trucks.....St. Louis
 - Vestibules.....At both ends

Spokane & Inland Empire, Spokane, Wash., as noted in our issue of February 2, has placed an order with the Seattle Car Manufacturing Company for 250 box cars. These will be 40 feet

in length, will have wooden bodies and are for delivery prior to July 31, 1907. An order has also been placed with the St. Louis Car Company for 15 cars of the St. Louis type, five of which will have Detroit platforms. These are for use by the Spokane Traction Company and will have a seating capacity of 50 persons, will be 29 feet 6 inches over vestibule, 8 feet 6 inches wide over all and will be 12 feet 6 inches high over trolley base. The body will be built of ash, with underframe of steel construction. They will be equipped with National Brake & Electric Company's brakes, Consolidated Car Heating Company's heating system and will have full-ventilated roofs.

SHOPS AND BUILDINGS.

Chicago Union Traction Company.—General Superintendent Robert R. Hertzog has announced that a new car barn will be built on the site of the old barns on North Clark street between Sherman and Dewey places, which were destroyed by fire on January 31.

Indianapolis Columbus & Southern Traction Company.—This company has purchased property in Seymour, Ind., for an interurban station and ticket office.

Oakwood Street Railway (Dayton, O.).—The directors have authorized the extension of the present car house by an addition about 128 by 132 feet. Several alterations will be made and the structure will be fireproofed. H. P. Clegg of Dayton, vice-president and general manager.

TRADE NOTES.

Automatic Electrical Brake Control Company has been incorporated at Frankfort, Ky., with a capital stock of \$200,000.

Buffalo Forge Company has changed the location of its Cleveland office from 311 Citizens building to 618 Citizens building.

General Electric Company, Schenectady, N. Y., will erect a new three-story building at the corner of Calhoun and Clifton streets, Ft. Wayne, Ind., and will equip it with new machinery for making incandescent lamps.

H. B. Stebbins has accepted a position as chief engineer of the Stover Manufacturing Company of Freeport, Ill. Mr. Stebbins has for the past four years been erecting engineer for the Allis-Chalmers Company of Milwaukee.

C. H. Worcester Company, Chicago, dealer in cedar poles and ties, has found it necessary on account of a constantly increasing business to move into larger quarters. The offices are now located in 1708-1712 Tribune building instead of Room 1208.

W. R. Burrows has resigned his position as purchasing agent of the Norfolk & Southern Railway to accept a position as eastern sales agent of the Buda Foundry & Manufacturing Company, with headquarters at the New York office, 26 Cortlandt street.

Augustus Dowdell, eastern railway representative of Valentine & Co., Fisher building, Chicago, died in Philadelphia, Sunday, February 10, of paralysis. He has been connected with the company for over ten years but for the past two years has been in poor health.

David Smith Greer, vice-president and general counsel of the Chicago Railway Equipment Company, Chicago, died on February 9, at Kalamazoo, Mich. He had been suffering for several months from kidney trouble, which finally developed into uraemic poisoning, causing his death.

American Rail Joint Company, Niagara Falls, N. Y., has been incorporated with a capital stock of \$750,000 to manufacture rail joints, rails, angle bars, etc. The incorporators are: Morris Cohn, Jr., Frederick Charmann, Fernum G. Anderson, Arthur Killiaw, Henry Charmann, all of Niagara Falls.

Henry Docker Jackson has removed his office from 4 State street, to room 626, Broad Exchange building, 88 Broad street, Boston, Mass., where he will continue his business as consulting electrical engineer, with special reference to improvement in power plant economy, mill work and power distribution for electric railways and lighting plants.

General Electric Company, Schenectady, N. Y., according to good authority, for the fiscal year ending January 31, 1907, will show earnings to the amount of \$10,800,000, as compared with \$7,319,000 for the fiscal year ending January 31, 1906. It is said that new business is coming in at the rate of \$1,500,000 a week and it is expected that the dividend on the stock of the company will be increased within the next six months.

Allis-Chalmers Company, Milwaukee, Wis., announces that a car load of air brake equipments recently left its West Allis works for shipment. This, its first foreign shipment of airbrakes by the company, marks a new step in its progress. It is stated that 80 per cent of all the electric railways using power brakes of any kind are equipped with Christensen brakes, for which that company now controls the exclusive rights to manufacture.

Standard Asphalt & Rubber Company, with general offices in the First National Bank building, Chicago, is manufacturing on a large scale paving asphalt, asphalt roofing, mineral rubber, insulation, pipe dip and other hydro-carbon products, having a daily capacity of 1,500 barrels. The company claims to have solved with its Sarco pipe dip in connection with electrolysis the problem which confronts all municipalities where there are electric car lines. It is stated that a layer of its insulation one-eighth inch thick will withstand a potential of 12,000 volts. A number of

handsome catalogues have been issued by this company dealing with its hydro-carbon products.

Price Publishing Company, Lima, O., has in course of preparation a new electric railway map of Ohio, Indiana and Michigan, showing all the new lines in operation up to date, with their names, the names of the principal towns, and a table of the population of the towns according to the latest census, arranged alphabetically according to states. The map will be printed on heavy paper with cloth back, 26 by 28 inches, and will be generally similar to the map published by the same company last summer.

Bristol Company, Waterbury, Conn., well known maker of recording instruments, has opened a branch office at 753 Monadnock block, Chicago, in charge of H. P. Dennis, who represents the company in the capacity of western manager. Mr. Dennis is a graduate mechanical engineer and has been connected for several years with the factory at Waterbury. This company makes a specialty of continuous recording instruments including recording thermometers, pressure gauges, recording voltmeters, ammeters and wattmeters.

Griffin Wheel Company, Chicago, is having plans prepared by Harry E. Stevens, Chicago, for a new manufacturing plant at Pullman, Ill. It will consist of a foundry 300 feet square; a machine shop 40 feet high of brick and steel construction; a one-story carpenter shop, 19 by 70 feet; a storé house, five molding sand sheds, five coarse sand sheds and two wood sheds; also several scrap and coal bins and other buildings. All the buildings will have gravel roofs and much new machinery will be needed. It will cost with equipment, about \$1,000,000.

Western Electric Company, Chicago, at the annual meeting of the stockholders held on February 7 made announcement that the sales for the fiscal year ending November 30, 1906, were \$69,245,331 as compared with \$44,145,753.18 in 1905, showing an increase of 56.9 per cent. This increase was due in part to the large expenditures of the Bell telephone companies for new construction. The company has made several additions to its plants, including two to its cable plant at Hawthorne, Ill., the construction at Hawthorne of a switchboard and woodworking factory, now nearing completion, warehouses at Atlanta, Ga., Pittsburg, Pa., and San Francisco, Cal., and additional machinery for the Chicago and New York factories. Early in 1906 the board of directors established a pension fund of \$400,000 for the benefit of superannuated and disabled employes and later in the year \$150,000 was added. In December, 1906, the company had in its employ 26,933 people as compared with 19,704 in December, 1905. The following directors were elected: Charles W. Amory, Adolphus C. Bartlett, Enos M. Barton, Alexander Cochrane, W. Murray Crane, Frederick P. Fish, Henry S. Howe, William R. Patterson, Thomas Sherwin, Harry B. Thayer, Arthur D. Wheeler and Charles Williams, Jr.

Thomas F. Griffin, founder of the Griffin Wheel Company, died on Monday, February 11, at the home of his daughter in Chicago, of pneumonia. His death was preceded by an illness of only 36 hours. Six children survive him, T. A. Griffin, president of the Griffin Wheel Company, Chicago; P. H. Griffin, Buffalo, and four married daughters. Mr. Griffin was born in County Limerick, Ireland, on December 18, 1826, and accordingly was over 80 years of age. Eight years after his birth his family removed to the United States and located at Rochester, N. Y., where Mr. Griffin served his apprenticeship as a molder. In 1848, the firm with which he was connected engaged in the manufacture of wheels under the Washburn patents, which cover the present double plate wheel, now in universal use. In 1873 he removed to Detroit to take charge of the foundry of the Michigan Car Company. He severed his connection with that company shortly afterward and incorporated the Griffin Car Wheel Company. The original plant had a capacity of 18 wheels per day and from this beginning the company's output has grown to 6,000 wheels and plants are located in Boston, Detroit, St. Paul, Kansas City, Denver, Tacoma and Chicago, where there are three.

ADVERTISING LITERATURE.

Ingersoll-Rand Company, 11 Broadway, New York, N. Y.—"Some Economical Applications of Compressed Air in the Cotton Industries" is the title of a pamphlet (Form 410) recently issued by this company.

Locknut It Concern, 515 East Sixty-third St., Chicago.—This concern equips nuts and bolts with a nut-lock and has issued a small pamphlet showing a design of its lock, its method of operation, advantages claimed for it and giving the cost.

Automatic Oil Cup Company, 155 Huron St., Milwaukee, Wis.—This company has published a bulletin describing the Bangs automatic oil cup which is the invention of Mr. E. D. Bangs of Milwaukee. The oil cup is designed to feed oil to journals in exactly the quantity needed. It is simple and compact in mechanical construction, being made entirely of aluminum, brass or iron.

Allis-Chalmers Company, Milwaukee, Wis.—Bulletin No. 1044 deals with the subject of the "H. Ward Leonard System of Multiple Voltage Control for Variable Speed Motors." Complete descriptive matter, together with diagrams and a number of half-tone engravings showing machines driven by Allis-Chalmers motors, operated on the H. Ward Leonard multiple voltage system, are presented. Publication No. 115 is an instruction book entitled "Directions for Erecting Gates Elevators." This is a companion publication to Bulletin No. 1115 which describes the Gates rock and ore breaker. Bulletin No. 1038 describes Allis-Chalmers alternat-

ing current generators and presents a large number of engravings from photographs.

Garvin Machine Company, Spring and Varick Sts., New York, N. Y.—Circulars No. 53 and 54 describe the Garvin Nos. 14 and 15 vertical spindle milling machine and the Garvin No. 2A Universal milling machine, motor driven. Also Garvin Nos. 14 and 15 plain milling machines, motor driven. Engravings of the various types of milling machines are presented together with a general description of them.

National Cellular Steel Company, 27 William street, New York, N. Y.—This company, which is the manufacturer of a new steel fireproof building material for floors, doors, partitions, box cars, etc., of modern fireproof construction has issued an illustrated pamphlet describing its product, which it designates as cellular steel. The western representatives of the company are S. P. Holmes & Co., 250 La Salle St., Chicago.

Arnold Company, 181 La Salle St., Chicago.—A paper entitled "What is an Engineer Constructor" which was presented before the electrical section of the Western Society of Engineers on November 16, 1906, by George A. Damon, managing engineer of the Arnold Company, Chicago, has been reprinted in pamphlet form. An abstract of this paper was presented in the December issue of the Electric Railway Review.

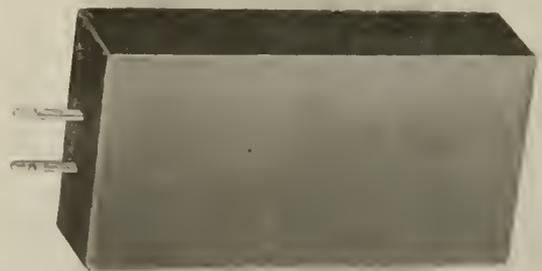
American Blower Company, Detroit, Michigan.—Catalogue No. 206 gives a description of the vertical self-oiling steam engine, designed to fill the demand for a small high speed engine. The catalogue presents engravings from photographs of the various types of engines, together with tables showing sizes, net and gross weights and cost and also a table of horsepowers, and in addition a general description of the points of superiority are briefly indicated and the more important parts of the construction are described in detail. Engravings are also shown of a number of parts.

Buffalo Forge Company, Buffalo, N. Y.—A 4-page pamphlet has just been issued by this company to call attention to the Buffalo air washer. The washer is designed as an adjunct to the Buffalo fan system of heating and ventilating and it is said to remove all dust or smoke from the air entering a ventilating system, to regulate the humidity of the atmosphere in a building and to reduce the temperature in summer over 80 per cent of the initial difference in temperature between the air and the cooling water used. The Buffalo Forge Company also issues a 361-page catalogue of standard size, describing the air washer and humidifier.

CONDENSERS FOR IMPROVING TELEPHONE SERVICE.

Many street railway companies have telephone lines in use for other purposes than dispatching. Some such lines consist of a single metallic circuit on which from 25 to 30 telephones are bridged, the different stations being signaled by means of code rings. It frequently happens that through carelessness the receiver is left off its hook, or after a given station has signaled over the line for a distant station, some one, other than the station desired, "listens in." This puts the secondary of the induction coil and the receiver across the line, forming a shunt which it is impossible to ring past. The receiver offers a resistance of about 70 ohms and the secondary of the induction coil a resistance of about 35 ohms, making the total resistance of the shunt only 105 ohms.

The Kellogg Switchboard & Supply Company, Chicago, to relieve such troubles is promoting the sale of a small ½-micro-farad condenser which may be connected in the secondary circuit of the



Small Condenser for Improving Telephone Service.

telephone in series with the receiver and the secondary of the induction coil. This condenser, known as No. 10, is made of tin-foil and rice paper, like ordinary telephone condensers, and is quite small, its dimensions being 2¾ inches (including terminals) by 1½ by ¾ inches. The manufacturer furnishes this condenser as a part of its telephone sets, or separately. For the latter purpose the Kellogg company furnishes a small brass strap to hold the condenser in the corner of a telephone cabinet.

The condenser acts as follows: The frequency of telephone ringing current as generated by an ordinary hand generator at the usual rate of turning the crank is about 1,000 cycles per min-

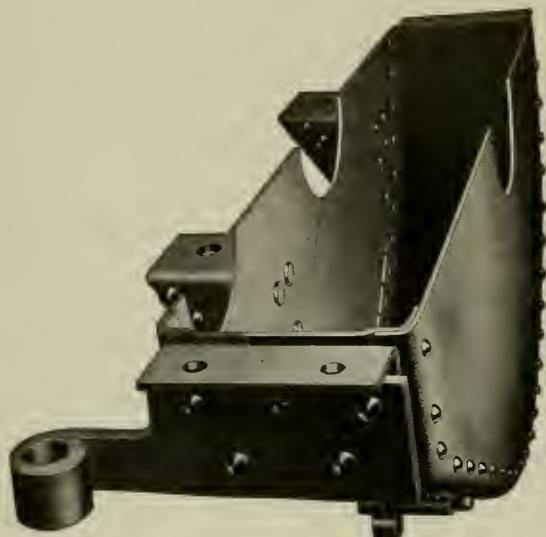
ute. To current of this frequency the condenser offers an impedance of about 10,000 ohms so that when the receiver is down the ringing current is not shunted. On the other hand, the frequency of voice currents is so high that these currents pass through the condenser very readily and the efficiency of the receiving circuit is in no way affected.

LYON SHEET-STEEL GEAR CASES.

The Lyon sheet-steel gear case has proven itself to be a good investment for electric railways. These sheet-steel cases weigh from 75 to 100 pounds less than those of cast iron and therefore reduce the weight on cars from one to four times such amounts, according to the number of motors used. The lightness of this type of case also facilitates the work of handling in repair pits. The criticism has been raised that sheet-steel gear cases were too light, but it is thought that an examination of the accompanying illustration showing the top section of the Lyon sheet-steel gear case will show that the case as a unit is especially strong, being reinforced at points of strain by properly designed brackets.

For some time the demand for these cases has been such that their manufacturer, the Lyon Metallic Manufacturing Company, has been unable to supply the demand of its sales agent, the Electric Service Supplies Company. Recently the manufacturing company's plant has been quadrupled in size and it is now stated that orders for gear cases can be promptly filled.

These sheet-steel gear cases have made such a successful rec-



Lyon Sheet-Steel Gear Case.

ord that the Electric Service Supplies Company offers to send sample cases to those railway companies that desire to have them for 90 days' trial.

THE ANDERSON TIME SWITCH.

The Albert & J. M. Anderson Manufacturing Company, Boston, Mass., has perfected a mechanical time switch that embodies many points of superior merit. Such switches are found to be of much use in many places where it is necessary to open or close electric circuits at definite predetermined hours.

The parts of a first-class time switch are three in number: the switch, the mechanism which opens and closes it; the time-controlling element, which is necessarily a clock of some form.

The Anderson switch mechanism consists of two pivoted arms carrying laminated contacts and arcing contacts after the fashion of approved circuit-breaker construction so that there is no partial or imperfect contact possible. The contact mechanism is housed in a slate enclosure in a separate compartment of the box, and is fireproof. The lower or entering contacts are each separated from the jaws of the switch a distance of over an inch when the switch is open. The circuit is opened horizontally instead of vertically, thereby minimizing the chance of maintaining an arc.

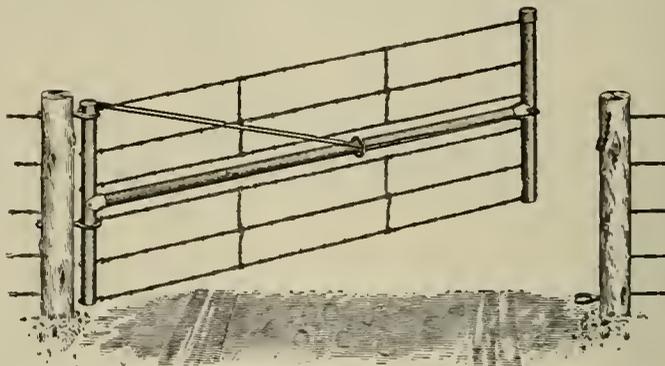
The propelling mechanism consists of a heavy spiral spring, equipped with two trains of gears. One of the spindles of one of these trains is equipped with a crank and connecting rod, the connecting rod being utilized to force the toggle of the switch up or down. A flyer on this train engages with an escapement that permits the crank to make a half revolution at a time. The connecting rod of this crank has a slotted joint with the toggle, so that the parts can have some momentum before they are called upon to do any work, thus rendering the action more certain.

The propelling mechanism is so arranged that it can be set to trip at any hour of the day or night, and by means of an auxiliary dial, graduated to the days of the week, the switch can be set so that it becomes inoperative any day of the week desired.

The apparatus is controlled by a clock of the best manufacture, which can be set and regulated as any ordinary clock, and needs to be wound but once a week. All the parts of the clock and switch are enclosed in a cast iron box, waterproof and dust tight, the door being fitted with a rubber gasket. A Yale lock insures that the switch is out of reach of meddlers.

CLIMAX FARM CROSSING GATES.

The Climax Stock Guard Company, Chicago, Ill., and Canton, O., has recently taken on a line of farm crossing gates which, though embodying the same general principles, are yet made in a variety of forms to adapt them to specific requirements. Some of the styles are illustrated herewith. The gates are not an experiment, but have been used for a number of years on some of

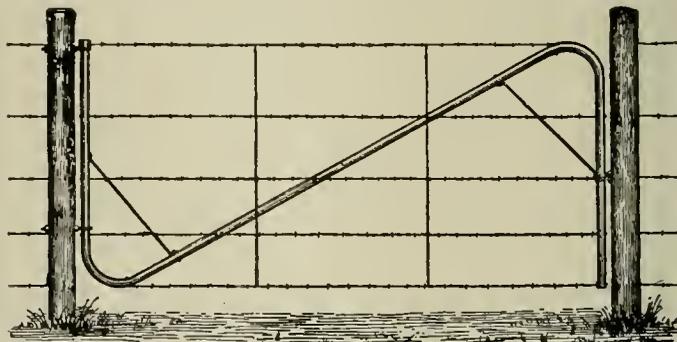


Farm Crossing Gates—Climax No. 1.

the principal railway lines and reports from users have been exceptionally favorable.

The Climax gate, No. 1, is an adjustable swinging gate that can be readily moved up or down at the outer end and at the same time be swung in either direction. The main frame is made of rolled steel tubing which is trussed by means of a cable attached to the inner end of the main frame and by means of a sliding ring to the central tube forming the longitudinal member. The sliding ring connection enables the outer end of the gate to be raised to clear uneven ground or snow and to be easily depressed when the obstruction is cleared. The hinges are made of heavy iron eyebolts encircling the hinge of the main frame.

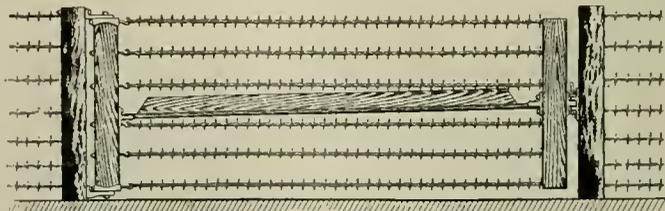
Eureka gate No. 4 has a tubular frame of Z-form with braces



Farm Crossing Gates—Eureka No. 4.

at the angles, and, it is said, will stand a very heavy strain before yielding. There being no lower frame member, there is nothing except the lower wire to catch snow, and the gate therefore serves in winter as well as in summer, and on account of the lightness of the construction the gate is not liable to be affected by the wind. The weight is about 50 pounds and it is stated that gates in service for 20 years have shown no serious deterioration from rust.

The Novelty gate differs from those before described in having a wooden frame composed of three members, the central longitudinal member being hinged to each of the end members. The wires are attached to stretchers at the hinge end for the purpose of tak-



Farm Crossing Gates—Novelty No. 8.

ing up slack and also for adjusting the gate to swing over sloping or uneven ground. The horizontal member is made up of two 2x4-inch pieces spiked together, the edge of one against the side of the other, and all castings are of heavy malleable iron.

All of these gates are made in various sizes and with any desired wiring.

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The directors of the Philadelphia Rapid Transit Company have decided to recommend to stockholders the adoption, after a few changes, of the plan suggested by the Retail Merchants' Association for settlement of the traction problem. In his letter to the merchants' association announcing this decision, the president of the company, Mr. John B. Parsons, suggests, as it is generally conceded that a new contract should be entered into with the city, that some determination be reached as to the advisability of action by the legislature, which will give the city undoubted power to act with freedom as to terms. The plan offered by the Trades League was not seriously considered by the directors because it would involve violations of the contracts and leases between the Philadelphia Rapid Transit Company and the 50 or more underlying companies. A new plan containing the modifications which the company believes should be made in the merchants' plan will be submitted soon. The result of the proposed re-adjustment of relations between the company and the city will be the investment of large amounts of capital for improvement of the service. If a satisfactory arrangement is completed, the company believes that new capital can be secured upon fair terms.

The analysis of operations of the South Side Elevated railroad of Chicago for the last 10 years, which was published in the Electric Railway Review of February 9, 1907, showed an increase in expenditure for maintenance of way and structures per mile of structure from \$2,656 for 11 months of 1897 to \$9,110 for the year 1906. At our request Mr. Marcellus Hopkins, the president and general manager of the road, has sent us the following in explanation of the large increase in this item of expense: "The 1897 report showed only 11 months' operation. The railroad was only four years old, and few repairs were required. The South Side Elevated Railroad Company commenced immediately to re-equip the road with electricity, making an

up-to-date road of it. A great many things were added, in the shape of storage batteries, conductor rails, etc., all of which required attention. In addition, there is quite a charge for repairs to buildings. Many of these buildings are tenement houses which, in buying right-of-way for our various branches, were acquired; and for convenience in book-keeping, these, together with storage batteries, etc., are listed under the head of 'maintenance of way and structure.' In 1897 no rails or ties were required. Since then, as the road grows older, these repairs have to be made. The road in 1897 had just been taken out of the hands of the court. It is assumed that the receiver turned over the property in good repair, consequently the repairs for 1897 were light."

Although the chemist is now recognized as an important member of the engineering staff of a large power station, his importance in a small plant has not been properly recognized. It is generally thought that all that is necessary, in localities where the feed water is poor, is to send away a sample, have it analyzed, and then buy a couple barrels of some good boiler compound. In many plants more money is wasted in experimenting with boiler compounds than would be necessary to pay a competent chemist who could direct the proper use of such chemicals and the treatment of the water. Further, when properly looking after the feedwater in plants, the chemist can watch the circulating water as well, and in many instances the cause of pitted and leaky condenser tubes could be ascertained. Testing the coal—which can then be bought under specifications—is another important part of the chemist's work and one which, in most cases, will pay a high rate of interest on the money invested in an expert. The chemist can very materially assist the head stoker by making frequent flue-gas analyses, and by this means determine when the proper combustion is being maintained. An analysis of the ashes also is of value and serves as a check upon the

stoking. There are many other ways in which the chemist can make himself useful and valuable to a small company. There are always oils and many other supplies and materials which are bought under certain specifications and without the chemist the purchaser, in most cases, does not know what he is getting.

The transfer problem in large cities is one of the most troublesome matters with which street railway managements have to deal. It is doubtful if there is ever a time when agitation on the part of the public for more extended transfer facilities is entirely quiescent. The effect of extended transfer privileges upon traffic is a very uncertain affair. The public generally believes that crowding of cars will be diminished by the creation of new transfer points, whereas it often happens that crowding is increased in such cases. The quality, appearance and general comfort of the cars at transfer points are really powerful factors in the situation, and with some properties there is a growing belief that all the cars running on the same general routes should be of the same general design. Otherwise, for example, the public will overcrowd the larger semi-convertible or through cars, leaving the single-truck locals but partially filled.

A recent case in Boston which was heard by the Massachusetts Railroad Commission well illustrates the public idea that extended transfer privileges are certain to relieve crowding. A number of residents of Arlington petitioned the board that an additional transfer station be established at the North Cambridge car house of the Boston Elevated system. It was claimed by the petitioners that there would be less crowding of cars if this were done, as any Arlington passenger, finding his own cars crowded on the Boston side of the North Cambridge car house, could ride to North Cambridge by other lines, changing at the latter point for his destination and continuing his journey in greater comfort. In remonstrance the company pointed out that there are already three points between the business center of Boston and Arlington where passengers traveling via the Back Bay and Harvard Bridge lines may transfer in the same general direction. It was stated that the establishment of a fourth transfer point would be objectionable for the reason that it would tend to increase the crowding of lines already busy. The company recognized that there was no practicable way of keeping local patrons from taking through cars for short riding, but pointed out that the needs of the larger residential districts are a considerable factor in the provision of the frequent service which is given.

The final solution of any transfer scheme acceptable to an operating company and its patrons must rest upon effecting the greatest good for the greatest number. There is no question about this in the minds of transportation experts. Without passing upon the merits of the preceding case, it is nevertheless instructive to note the recurrence of the old problem of local versus through service, and the difficulty of establishing any system of transfers which will satisfy every resident of a given territory. In cases where large and handsome cars of new design tend to become overcrowded by local passengers, about the only positive remedy seems to be the standardization of all the rolling stock possible in a given section of the system. Generally speaking, the elaborate extension of transfer privileges tends to cut down the speed of transit from the beginning to the end of

the journey, on account of the waits for connections and the time consumed in changing cars; it opens the way toward abnormal concentrations of traffic at undesirable times and places, and establishes new loopholes for abuses which annually cost an operating company a considerable loss of revenue.

THE WOODLAWN ACCIDENT ON THE NEW YORK CENTRAL.

It is to be regretted that the initial operation of such a magnificent work as the electrified New York Central terminals should have been attended by the disastrous accident of February 16. Lessons of great value to this and similar projects will be learned from the investigations of the accident, but these are had at the high price of life and property.

The accident to a local train on the electrically-equipped tracks of the New York Central, which caused the death of 21 persons and injury to 140, happened on a $3\frac{1}{2}$ -degree curve near Woodlawn. The investigations are not yet far enough advanced to define the cause, but the general impression is that the train entering the curve at an excessive speed caused the rails to spread.

The track rail on the $3\frac{1}{2}$ -degree curve was elevated $4\frac{1}{2}$ inches, which is quite sufficient for the safety of ordinary rolling equipment moving at the rate of 60 miles an hour, and if the wreck is to be attributed to insufficient super-elevation of the outer rail, the speed must have been far in excess of 60 miles an hour. It is understood that the scheduled speed of the train in the locality of the wreck was 57 miles an hour. The train was delayed six minutes at Mott Haven and it is probable that from that point on a speed in excess of 60 miles was obtained in order to make up time. With the two powerful electric locomotives it is possible to accelerate such a light train more than twice as fast as the best steam locomotives could do it, and it is quite probable that the train entered the curve at a speed much in excess of the safe limits. It does not appear that any limitation had been made on speed and no means were provided for indicating to the motorman how fast he was running. It was a matter of common experience when the old steam engineers were in training for motormen on these electric locomotives that they were deceived as to speeds, and that they were running very much faster than they had thought.

The engineer of maintenance of way testified at the coroner's inquest that one of the rails on the outside of the curve had been sprung sideways and the spikes sheared off.

The third rail was torn up and bent and some reports say that it entered one of the coaches. It has been assumed that the injury to this rail was caused by a broken collector shoe catching under it, and the initial cause of the accident has been attributed to this by some railway officials. The earlier forms of top contact third-rail shoes were supported by cast iron links of such cross section that in event of derangement of the third rail the links would break and free the shoe from the side-bar rather than permit the shoe itself to break and catch on the rail. It would seem hardly probable that this protective principle of design had been neglected with the underrunning shoes. The effects of expansion and contraction frequently disturb the alignment of the third rail and especially on curves, but it is difficult to see, with the underrunning type, and on a curve, how an injured shoe could have done otherwise than throw the rail away from the wheels.

The New York Central has taken the greatest precaution to see that the new electric locomotives would operate safely on curves and on tests they have been operating at speeds of 85 miles an hour on straight track and 78 miles an hour on 2-degree curves, but it is doubtful whether they were justified in allowing motormen to drive this powerful equipment around curves at unlimited speeds as appears to have been the case with the wrecked train.

The center of gravity of these electric locomotives is

unusually low and they have a long rigid wheel-base. It was found in testing them on sharp curves at high speed that they were rather severe on the track, and it will probably be found that greater precautions must be used in their operation than appear to have governed those hauling the wrecked train. The various commissions which are now investigating the accident will doubtless get at the real cause and it will not be sufficient to say that the accident could have been prevented, but the conclusion must be that some one has blundered.

AMOUNT OF MAINTENANCE AND DEPRECIATION CHARGES.

The investigations made by direction of the receivers of the Chicago Union Traction Company, the particulars concerning which are given elsewhere in this issue, should be found of considerable assistance in determining what constitutes a "reasonable charge for depreciation of plant and equipment." In taking up this subject the company's engineers first made a complete inventory of the property and estimated that to provide for depreciation proper, that is, that reduction in value

and depreciation. On reflection it will be evident that these two plans are in no sense antagonistic, but on the contrary are complementary. In no instance can a percentage of gross income be named which will be that needed to provide for these charges, until the amount required has been determined by an investigation such as was made in this case. However, when the depreciation to be reasonably expected has been estimated, and cost of ordinary maintenance has been shown by experience, there are decided advantages in combining the two charges and expressing the total as a percentage of gross income.

First, this method removes all temptation to bicker over what items should be classed as maintenance and what as renewals, or to favor the repair account at the expense of the depreciation reserve.

Secondly, to compute these charges as a certain proportion of gross income is extremely simple, while the other method of determining depreciation if accurately carried out would involve a vast amount of bookkeeping.

Thirdly, to base these charges on earnings apportionments them according to the ability to pay and also in proportion to

Comparisons Between Chicago Union Traction Company and Glasgow Corporation Tramways.

For Fiscal Years ending August 31.

	Gross Income, Per Cent of	Original Cost, Per Cent of	Per Mile of Track Operated, Dollars	Per Revenue Passenger, Cents	Per Passenger, Cents	Per Car-Mile, Cents	Per Car-Hour, Cents
Maintenance of Track, Railway and Equipment:							
North Chicago, 1904	12.20	7.08	4,099	0.621	0.376	3.22	24.79
" " 1905	9.98	.....	3,429	0.508	0.303	2.75	21.26
" " 1906	10.06	.....	3,748	0.511	0.301	3.01	22.71
West Chicago, 1904	12.26	6.18	3,292	0.622	0.378	3.16	24.27
" " 1905	10.33	.....	2,995	0.523	0.307	2.86	21.87
" " 1906	10.70	.....	3,418	0.541	0.316	3.05	23.32
Depreciation of Plant and Equipment:							
North Chicago, 1904	9.80	5.69	3,295	0.499	0.302	2.58	19.92
" " 1905	12.02	.....	4,132	0.611	0.366	3.32	25.62
" " 1906	11.94	.....	4,448	0.607	0.357	3.57	26.96
West Chicago, 1904	11.74	5.76	3,153	0.596	0.362	3.03	23.25
" " 1905	13.67	.....	3,962	0.693	0.407	3.78	28.92
" " 1906	13.30	.....	4,251	0.673	0.394	3.79	29.00
Total Maintenance and Depreciation:							
North Chicago, 1904	22.00	12.77	7,394	1.120	0.678	5.80	44.71
" " 1905	22.00	.....	7,561	1.119	0.669	6.07	46.88
" " 1906	22.00	.....	8,196	1.118	0.658	6.58	49.67
West Chicago, 1904	24.00	11.94	6,445	1.218	0.740	6.19	47.52
" " 1905	24.00	.....	6,957	1.216	0.714	6.64	50.79
" " 1906	24.00	.....	7,669	1.214	0.710	6.82	52.32
Glasgow Tramways (Year ending May 31, 1906):							
Maintenance, 1906	14.55	* 4.18	3,543	.....	0.279	3.08	21.99
Depreciation, 1906	20.69	* 5.92	4,911	.....	0.398	4.38	31.26
Maintenance and depreciation, 1906	35.24	*10.10	8,364	.....	0.677	7.46	53.25

*Per cent of capital accounts May 31, 1905, with one-half of additions for succeeding year added.

or usefulness which is not compensated for by current maintenance and repairs, there should be charged annually a sum equal to 6.20 per cent of the original cost of the physical property. A subsequent examination into the same matter was made by independent engineers and accountants, Messrs. Stone & Webster of Boston, and their recommendations were approved by the court having jurisdiction of the property, and have been followed by the receivers for over three years. This second estimate placed the annual depreciation at 5.65 per cent of the original cost of the physical property. Reference to the detailed statements shows that over four-fifths of this difference is due to differences in the estimated life of power plant buildings and of cable-driving machinery. Strong arguments can be advanced in favor of the higher depreciation charges recommended by the company's engineers, especially if consideration be given to the fact that improvement in the art may cause apparatus to be superseded before its usefulness is ended by wear, as was actually the case with this company's cable power stations. The important conclusion to be drawn from the close agreement of the two estimates is that the average life of the physical property of an urban street railway under such general conditions as obtain in Chicago is from 16 to 18 years and that six per cent of the original cost is very nearly the proper annual allowance for depreciation.

It had been the intention to base depreciation charges on the original cost, but on the recommendation of Stone & Webster the court decided that it would be better to set aside a fixed proportion of gross income to pay for both maintenance

the wear and tear which under normal conditions may be expected to increase as the earnings increase.

It is believed that the policy of the Glasgow Corporation Tramways committee in providing reserve funds is regarded by American accountants generally as an ideal toward which all street railways should strive, and therefore comparison of the Chicago Union Traction Company's reserves with those for the Glasgow lines should be of especial interest. The income, mileage, passengers, etc., for these properties (last complete fiscal year) are as follows:

	North Chicago.	West Chicago.	Glasgow.
Gross income	\$3,543,176	\$6,624,368	\$3,997,973
Miles of track operated	95.1	207.3	168.5
Revenue passengers	69,716,881	130,863,648	.....
Total passengers	118,533,806	223,912,157	208,059,833
Total car miles	12,107,494	23,231,597	18,886,910
Total car hours	1,569,392	3,035,625	2,646,512
Income per passenger, cents	2.95	2.96	1.92

In the larger table the maintenance and depreciation charges for the two Chicago companies and for the Glasgow lines have been expressed in a number of different units. Referring to that table, it will be remarked that while the Glasgow lines require 35.24 per cent of gross income for maintenance and depreciation as against an average of 23 per cent for the North Chicago and West Chicago, the corresponding figures per mile of track operated, per total passenger, per car-mile, and per car-hour are so close that their agreement is striking. Conditions are so different in the two cities that no conclusions are ventured as to whether any of these units offer a basis for computing depreciation that would have wide application. Were there available similar data for other com-

panies it would be an easy matter to determine whether the close agreement in the figures shown for these two properties is more than a coincidence. But while some companies publish reports in which the expenditures for maintenance and repairs are separated from other operating charges, and a few show reserves for depreciation and renewals, there are very few which make public all the data needed for such a comparison as that here made between Chicago and Glasgow.

In the new ordinances under which, in all probability, the Chicago street railways will be operated, the minima of the sums to be expended or reserved for maintenance and for depreciation have been fixed at 6 and 8 per cent, respectively, of the gross receipts, but it is specified that the companies shall expend all that may be necessary on these accounts. If these minima, which together amount to only 14 per cent as compared with the 23 per cent (on an average) charged on these accounts during the last three years by the Chicago Union Traction Company, are sufficient for the purposes intended it means, (1) that the plant and equipment of the near future will be about 65 per cent more durable than that heretofore used, (2) that the carrying capacity of an equivalent equipment will be this much greater, (3) that by improvements in operation increases in receipts and reductions in expenses for a given traffic can be effected to make up the difference, or (4) that there may be a happy combination of all three.

There may be some question as to whether these minimum percentages specified will be sufficient, but the transportation committee of the Chicago city council, the representatives of the street railway companies and their advisers who framed these ordinances are deserving of the highest commendation for what has been accomplished in establishing depreciation as an operating expense, and providing that the reserves are to be held in cash. The separation of maintenance and repairs from depreciation and renewals will doubtless make a great deal of work for the board of supervising engineers, but thorough discussions on mooted points and decisions by a disinterested board will go far to develop acceptable definitions and standards and mark the line between the two classes of charges. Also, this recognition of sound principles should go far towards educating the public to demand that the accounting of municipal undertakings be put upon a similar basis.

CONSTANT VOLTAGE FOR CAR LIGHTING.

With the many refinements that are being introduced in the latest types of rolling stock it would seem that more attention might profitably be given to improving interior illumination. The last few years have seen the electric headlight advance until now the manufacturers have for distribution types of arc and incandescent headlights that are quite satisfactory for their various classes of service. Since the time when oil lamps were replaced by 16-candlepower incandescent globes five in series between the trolley and the ground, practically no general advancement has been made in the methods of lighting street car interiors. Very recently, however, high-efficiency incandescent lamps have been adopted for some cars. With these improved lamps carefully disposed about the car the lighting is materially improved, from both the passengers' and managers' standpoints.

In a paper on "Car Lighting" read before the Central Electric Railway Association by Mr. R. C. Taylor of the Indiana Union Traction Company (*Electric Railway Review*, January 26, 1907, page 128), the requirements of the lighting situation as regards interurban roads, which requirements are also applicable to street cars, were stated as follows: "The modern interurban car should have its lighting arrangements so designed as to provide sufficient light at all times to give the passengers an opportunity for reading with comfort." In

this statement especial attention should be called to the requirement that light should be supplied "at all times."

It is obvious that with trolley lines the fluctuating voltage is the undesirable factor which must be overcome, if incandescent lamps supplied from the operating circuit are relied upon, before a continuously well-lighted car can be had. With interurban lines operated by third rail still another factor enters to interrupt the continuous illumination of the car. On nearly all these roads the distance between the collector-shoes on one side of a single car is less than the length of the gap between the ends of the third rail at highway crossings. As cars pass such crossings the current supply to the car is broken. At night this prevents the proper illuminating because the lights go out during the short space of time necessary for the front shoe to reach the rail which it is approaching after the rear shoe has left the other rail.

Mr. Taylor suggests that the obvious remedy for any fluctuation in the potential on trolley lines would be had by inserting in the lighting circuit some form of regulator which would maintain a constant potential on the lighting circuit, irrespective of the fluctuations of voltage on the trolley line. Several suggestions for accomplishing this desirable condition have been advanced, but so far as known none of these have met with very conspicuous success. One such plan utilizes as resistance for the arc headlight a number of lighting circuits and the balance of the resistance for the headlight circuit is obtained by feeding the current through a number of specially designed arc lamps illuminating the interior of the car. Still another method for use on trolley lines with fluctuating voltage includes a regulator in the car which, as the potential falls, short-circuits a number of lamps, thus maintaining a constant voltage on those left burning.

It would seem that the general demand for refinements in car lighting should in the near future bring forth improved apparatus or methods of connection. Mr. Taylor suggests that in the event that no satisfactory regulator is produced to supply the demand for better service, the matter of having a constant potential on the lighting circuits is of sufficient importance to warrant the adoption of an independent motor-generator set for car lighting. In the design of a new car this detail could be very nicely cared for by combining the lighting generator as a part of the air motor-compressor unit. The motor of the set could then be designed to maintain a constant speed under a varying voltage and be of such capacity as to run the air-compressor and a generator supplying the lighting circuits. This generator could be mounted on the motor shaft and no additional bearings or frame would be required. By providing an air-operated clutch which would throw the air pump in and out of service to meet the demands for compressed air, the motor and the generator could be connected to run continuously. The generator would maintain a constant potential on the lighting circuits, when driven at a constant speed by the motor which would also drive the air-compressor when necessary.

It will be noted that with such a unit the potential of the motor, lighting and headlight circuits could be unified and the energy at present dissipated through headlight resistance conserved. Mr. Taylor estimated that with interior lamps of the high efficiency type operating under the uniform conditions as just stated, the net saving in energy per year would be 2,815 kilowatt-hours per car. The suggested arrangement, therefore, presents the pleasing prospect of affording an abundant supply of unvarying illumination for headlight, tail-lights and interior lamps; it also affords an estimated saving of about \$100 per year per interurban car. It is thought that the added expense for variation from the present method of lighting and operating the air-compressor would be about \$100 per car. This, then, would balance the financial items and as a result highly improved car lighting would be obtained.

ANNUAL REPORTS.

Chicago City Railway Company.

The annual report of the Chicago City Railway Company, presented at the meeting of stockholders on February 16, showed gross earnings for the year 1906 of \$7,871,126, an increase as compared with 1905 of \$549,046, or 7.5 per cent. Charges for operating expenses, taxes, depreciation and interest on floating debt were \$6,146,304, an increase of \$503,697, or 8.93 per cent. The president, T. E. Mitten, says that the increase in cost of operation was due largely to the increased volume of business, necessitating more cars and labor, to which were added the heavy track repair account and the increased interest charges on borrowed money. The large sums which are being expended for new cars and the construction of power plants and other buildings made it necessary to borrow money. Mr. Mitten made the following statement regarding improvements:

The 200 cars purchased during 1905 having proved satisfactory, 100 additional cars of the same type were purchased and placed in service.

The use of cable lines and horse cars has been discontinued and all lines of the company are now operated electrically. In order to meet the demand for increased power, occasioned by operating the entire system electrically, marked additions have been made to the substation power plants of the company. The buildings have been enlarged in size and additional machinery installed. The rated capacity of the generating plants and substations combined is now approximately 35,000 horsepower, an increase of 10,000 horsepower.

A new paint shop, with a capacity of 150 cars, has been completed at Seventy-seventh street adjacent to the general repair shops. A modern office building for use as divisional headquarters has also been completed at the same location.

Two new car stations of large capacity and modern equipment are in course of erection. Portions of the track on Twenty-sixth street, Thirty-first street, Forty-third street, Forty-seventh street, Fifty-first street, Sixty-third street, Ashland avenue, Halsted street and Centre avenue have been reconstructed.

The eliminating of grade crossings still continues. This is occasioned by the city ordinances compelling railroads in certain sections to elevate their tracks and to cross the tracks of this company by means of overhead bridges. The expense to this company during the year as a result of this track elevation approximated \$100,000; this expenditure will be reflected later in decreased operating expenses, as faster schedules can be maintained, and the abolition of grade crossing accidents will result.

Material improvements in the fire risk at the several power houses and other buildings of the company have been effected, which have considerably lessened the possibility of loss by fire. These changes have also served to decrease materially the rate of insurance for the current year.

The statements of earnings, operation and equipment compare as follows:

Income Account.			
	1906	1905	Increase
Passenger receipts	\$7,773,446	\$7,240,671	\$532,775
Receipts from other sources	97,680	81,409	16,271
Total	\$7,871,126	\$7,322,080	\$549,046
Operating expenses, taxes, depreciation and int. on floating debt	6,146,304	5,642,607	503,697
Net income	\$1,724,822	\$1,679,473	\$ 45,349
Dividends	1,620,000	1,620,000	—
Surplus for the year	\$ 104,822	\$ 59,473	\$ 45,349
	1906	1905	Increase
Earnings on stock, per cent.	9.58	9.33	.25
Expenses, per cent of gross earnings	78.08	77.06	1.02
Passenger receipts per day	\$21,297	\$19,738	\$1,459

Operating Statistics.			
	1906	1905	Per Ct. of Increase
Passengers carried—			
Fare passengers	156,177,363	145,500,483	7.34
Transfer passengers	94,623,106	87,911,785	7.63
Fare and transfer passengers	250,800,469	233,412,268	7.45
Percentage of transfer to fare passengers	60.59	60.42	—
Average fare, all passengers	3.1 cts.	3.1 cts.	—
Miles of Single Track—			
Electric	242.56	184.39	—
Cable	—	34.75	—
Total	242.56	219.14	10.6
			Per Ct. of Increase
Car Equipment—			
Electric, 62.5 per cent of total	1,291	—	42.6
Cable, 37.1 per cent of total	767	—	*
Horse, .4 per cent of total	7	—	*
All	2,065	—	23.

*Cable and horse car equipment on hand are unchanged

President Palmer C. Ricketts of the Rensselaer Polytechnic Institute has announced that Mrs. Russell Sage has given \$1,000,000 to that institution.

MAINTENANCE AND DEPRECIATION CHARGES OF THE CHICAGO UNION TRACTION COMPANY.

On July 1, 1899, the Chicago Union Traction Company leased the properties of the West Chicago Street Railroad Company and the North Chicago Street Railroad Company, the annual rentals being fixed at the equivalent of 6 per cent upon the outstanding stock of the West Chicago and 12 per cent upon the outstanding stock of the North Chicago. As some of the stock of the two lessor companies was owned by the lessee, these rentals involved annual payments (to others than the lessee company itself) as follows:

On account of West Chicago stock	\$ 599,340
On account of North Chicago stock	710,400
Total	\$1,309,740

The Chicago Union Traction Company met its obligations for three years, but on April 22, 1903, it having become apparent that the demand of the city that all rights claimed by the company under the 99-year act be waived as a preliminary to further franchise negotiations would seriously embarrass the company, a petition for a receivership was filed in the United States circuit court and receivers were appointed by Judge Grosscup for the lessee and the two lessor companies.

Shortly after receivers for these properties were appointed negotiations were begun with the object of modifying the terms of the original leases, and what are known as "the amended leases" were agreed upon and approved by the court, the amended leases becoming effective on September 1, 1903. Under the new leases the lessor companies for five years were to receive all of the net profits from the operation of their respective lines up to amounts equal to 4 per cent on the stock of the West Chicago and 8 per cent on the stock of the North Chicago; after five years (that is, with the year beginning September 1, 1908) the lessor companies were to receive all earnings up to 6 and 12 per cent, respectively, on their stocks, and the lessee guaranteed that the rentals paid would be the equivalent of at least 4 and 8 per cent respectively on the West Chicago and North Chicago stocks.

Section 5 of the amended leases provided that:

There shall be deducted from the gross income of the demised property, in order to ascertain the net earnings, the following items:

(f) A reasonable charge for depreciation of the plant and equipment hereby demised.

Prior to the execution of these amended leases the Chicago Union Traction Company and its predecessors had ignored the question of depreciation. Under the new arrangement, however, this subject required attention and it was determined to treat it in the most scientific manner practicable. As the investigation into this matter proved to be vastly more important than had been anticipated by any of the parties in interest, a full account of the methods pursued and the results obtained will be given.

A complete inventory of the property was prepared as a basis for determining the value on September 1, 1903, depreciation being considered. Each item in the inventory was considered separately and the best judgment of the company's engineers taken on its life and value. By reason of the company's records of original cost and date of purchase being incomplete in some particulars, the same method of arriving at the value could not be followed with all classes of plant and equipment.

In appraising track, it was surveyed section by section and estimates made (1) as to the time to elapse before renewal would be necessary and (2) the cost to replace new according to the old specifications, which was taken as the original cost. Comparison of the record of the date of original construction with the estimate as to date of renewal gave the estimated total life in years. Then the annual charge for depreciation necessary and the then value were computed. It will be observed that this method, while it

gives the property the benefit of the appreciation in value that has occurred because of the rise in cost of materials and labor, also imposes a proportionately greater depreciation charge.

In regard to paving, the original cost was a matter of record and the annual depreciation was based upon an estimate of the number of years each class of paving will last.

Cars were assumed to have a life of 20 years, giving an annual depreciation of 5 per cent of the original cost. An estimate of the number of years each car could still be used was made, and that number of twentieths of the original cost taken as the then value.

In fixing depreciation on buildings other than power houses, 2 per cent was assumed because it is the figure used by the Chicago real estate board.

The property surveyed comprised the plant and equipment for the operation of an aggregate of 302.4 miles of track as follows:

Miles of Track.	Electric.	Cable.	Horse.	Total.
North Side	76.5	17.8	.8	95.1
West Side	170.9	29.8	6.6	207.3
Total.....	247.4	47.6	7.4	302.4

Exception to the allowance for depreciation thus determined having been taken by the stockholders of the lessor companies the court retained Stone & Webster of Boston to report upon the subject, and on September 28, 1904, the following report was submitted to Judge Grosscup:

"In accordance with your request, we have investigated the affairs of the Chicago Union Traction Company so far as they bear on the question of the amount of depreciation on the properties of the North Chicago Street Railroad Company and the West Chicago Street Railroad Company for the year ending September 1, 1904.

"We examined the physical property, investigated the methods of accounting and carefully calculated depreciation based upon the replacement cost, present value and probable life of the different items of the property of the respective companies.

"Owing to the short time that was allowed for this work we necessarily assumed that the inventory and other figures submitted by the company were accurate.

"We believe we have included all the property with the exception of the tunnel belonging to the West Chicago Street Railroad Tunnel Company, the depreciation on which has not been included in the figures given below. We understand the federal government has ordered that the tunnels under the Chicago river be lowered at once. In this case the depreciation on the tunnel will be outside of ordinary operation and a matter which we think should be considered by itself. If you decide it necessary to allow a sum for depreciation on the tunnel, we think a figure of \$7,000 per annum, on the basis of its continuance in use, a reasonable one and this, of course, should be added to the figures submitted in this report.

"In response to your request for a basis on which you can figure depreciation for future years, we would say that our figures show that about 22 per cent of the gross earnings of the North Chicago Street Railroad Company and 24 per cent of the gross earnings of the West Chicago Street Railroad Company should have been reserved for maintenance and depreciation for the year ending September 1, 1904, and we think these figures will be reasonably accurate for future years. If these figures are adopted the process of arriving at the depreciation for each year will be simply to deduct from the percentage of gross earnings above described the amounts expended by the respective companies on maintenance accounts for that year, the remainder so obtained to be carried to a depreciation fund for that year.

"It might seem that a yearly depreciation based upon an arbitrary percentage of gross earnings is not as accurate as a figure based upon an arbitrary percentage of the replacement cost of the property. On consideration it will be seen that in basing depreciation on a single figure of percentage of the total replacement cost of the property there are admitted many variable conditions brought about by changes in the different items of property; that is to say, this year a certain piece of track might be laid with 7-inch rail and the depreciation for this year based upon the replacement cost of the track laid with such rail. During the year, if this track should be relaid with 9-inch girder, it would be necessary to calculate annual depreciation on the replacement cost of the new track.

"In addition to such variations it is necessary to take into consideration the methods used in the accounting department in discriminating between improvements, betterments and maintenance and there is great likelihood of different opinions on this matter from year to year.

"Taking all these things into consideration, our opinion is that depreciation arrived at on a basis of an arbitrary percentage of the gross earnings will be as accurate as depreciation arrived at by means of an arbitrary percentage on the replacement cost of the property. Our experience has been that increasing earnings require additional investment in property and that for a term of years depreciation based on gross earnings increases nearly proportionally to the increase in property.

"From all the above we are of the opinion that a fair amount to be set aside for depreciation and maintenance is 22 per cent of the gross earnings of the North Chicago Street Railroad Company and 24 per cent of the gross earnings of the West Chicago Street Railroad Company.

"The difference in percentages for the two railroads may be accounted for by the greater earning capacity per mile of the North Side lines."

The engineers submitting this report accepted the inventory prepared by the company's engineers, and the principal differences as to depreciation charges are comprised in three items:

(1) The life of power house buildings, estimated by the company at 20 years, was increased to 50 years, reducing the annual depreciation charge by nearly \$31,000.

(2) The life of the cable driving machinery, estimated by the company at 15 to 20 years, was increased to 30 years and the life of electrical machinery, estimated by the company at 15 years, was increased to 20 years, these changes causing a reduction in the annual depreciation charge of over \$43,000.

(3) Small variations in the estimated life of a few pieces of track resulted in a reduction of the company's annual depreciation charge of about \$17,000.

In Table I are shown the estimated life of the various classes of property as fixed by the company and by the independent engineers.

Table I—Estimated Life of Plant and Equipment.

Property.	Life in Years—	
	Company.	S. & W.
Track: Electric (average).....	*12.85	13.86
Cable (average)	*14.53	14.68
Horse (average)	*12.29	12.29
Paving: Granite block.....	15	16
Cobble stone	25	25
Cedar block	6	6
Asphalt	10	10
Brick	7.69	7.69
Trolley wire: No. 0.....	7	7
No. 00.....	10	10
Poles, iron	20	20
Power plant machinery: Cable.....	15 to 20	30
Electric.....	20	50
Power plant machinery: Cable.....	17.5	30
Electric.....	15	20
Cars	20	20
Electric car equipment: Edison.....	10	10
Siemens-Halske ...	10	10
G. E. 800.....	12	12
G. E. 57.....	15	15
Buildings other than power houses.....	50	50
Shop machinery	20	20

*The range in the company's estimate was: Electric, 7 to 20; cable, 11 to 19; horse, 11 to 25.

In Table II are shown summaries of the original cost and of the annual depreciation on each class of property.

The few differences between the two estimates are as follows:

Property.	Reduction Made in Company's Estimate.		
	North.	West.	Total.
Tracks	\$ 8,434.89	\$ 8,428.20	\$16,863.09
Power house, buildings.....	10,821.78	19,986.36	30,808.14
Power house, machinery.....	13,701.95	29,370.66	43,072.61
Sundries	630.00	.....	630.00
Total.....	.....	.....	\$91,373.74

The depreciation charges recommended by the company's engineers were 6.20 per cent of the estimated original cost for both North and West Side lines. In percentages of the gross receipts they were 10.69 for the North Side and 12.30 for the West Side.

The reduction of the total depreciation charge by the

\$91,374 shown in the preceding table changed these percentages to the following:

Percentage of—	North.	West.	All Lines.
Original cost	5.59	5.68	5.65
Gross earnings	9.64	11.26	10.67

Having estimated the proper charges for depreciation, Stone & Webster analyzed the maintenance accounts of the company in order to determine what the total charge on account of maintenance and depreciation should be in terms

Table II—Estimate of Original Costs and Depreciation Charges.

Property.	North.		West.		Annual Depreciation (as adopted).	
	Miles.	Original Cost.	Miles.	Original Cost.	North.	West.
Track:						
Electric	76.5	\$ 883,793	170.9	\$1,985,671	\$ 61,067	\$145,902]
Cable	17.8	817,848	29.8	1,375,639	60,005	90,458
Horse .....	.8	8,171	6.6	71,065	667	5,779
Paving:						
Granite	28.9	298,597	65.6	678,132	18,662	42,383
Cobble Stone	25.7	202,151	44.6	350,752	8,086	14,030
Cedar Block	32.2	166,480	86.0	445,309	27,747	74,218
Asphalt	4.6	56,498	2.7	32,441	5,650	3,244
Brick	1.9	17,280	2.2	19,440	2,246	2,527
Trolley wire		16,837		39,985	2,288	5,053
Poles		156,527		322,434	7,826	16,122
Power plant buildings:						
Electric		112,476		124,760	2,250	2,495
Cable		248,250		541,452	4,965	10,829
Power plant machinery:						
Electric		357,749		644,644	17,887	32,232
Cable		447,000		661,000	14,900	22,033
Cars		891,322		1,962,230	44,566	98,111
Electric car equipment		191,495		408,205	15,929	33,419
Tools, machinery		21,068		17,816	963	891
Buildings and improvements		612,825		1,358,820	12,347	27,176
Total		\$5,506,367		\$11,039,795	\$308,053	\$626,905

of gross receipts. The conclusion reached was that there should be expended or reserved for the year ending August 31, 1904, on account of maintenance and depreciation 21.77 per cent (taken as 22 per cent) of the gross earnings of the North Side lines and 23.70 per cent (taken as 24 per cent) of the gross earnings of the West Side lines.

However opinions may differ as to the estimate to place

sense of experience with railway power plants 50 years old, the estimate of 20 years is to be preferred rather than the one of 50 years.

In Table III are shown abstracts of the income and expense accounts of the Chicago Union Traction Company for the fiscal years ending August 31, 1904, 1905 and 1906. In this table is also shown an abstract of the similar accounts of the Chicago Consolidated Traction Company for the same period; this is a matter of interest in this connection as the Union Traction lines have to carry the deficit of the Consolidated.

In Table IV are exhibited the summaries of the depreciation and maintenance charges of the North and West Side lines for the same three fiscal years. It will be observed from Table III that when the balance available for depreciation and rentals has been less than the accepted depreciation charge no deficit was shown. In Table IV the amounts of these deficits on account of what may be called "accrued depreciation" are shown and also the total of these deficits to date of report for each company, and for the two combined. Under the original leases this total deficit of \$910,000 for the three years would have been increased to \$4,839,330, had depreciation been considered and the rentals accrued upon charged.

The percentages of gross receipts recommended in the report quoted, 22 per cent for the North Chicago and 24 per cent for the South Chicago, are to cover (1) maintenance and repairs, and (2) depreciation and renewals. In determining the amount to be charged for "Depreciation" the process is as follows: To "Gross Earnings from Operation" is added "Total Miscellaneous Income." The named proportion of this sum (22 or 24 per cent) is then taken for maintenance and depreciation. The maintenance is found by adding the two items "Maintenance of Way and Structures" and "Maintenance of Equipment" (see Table III). This sum subtracted from the named proportion of total gross income gives the amount to be charged for "Depreciation" reserve.

So much for the past and present policy of the Chicago Union Traction Company and the receivers in giving consideration to depreciation.

The future policy has been prescribed in the new traction ordinances passed by the Chicago city council on Feb-

Table III—Abstract of Income and Expense Accounts, Chicago Union Traction Company and Chicago Consolidated Traction Company.

Year ending August 31.	North Chicago.			West Chicago.			Consolidated Traction.		
	1904.	1905.	1906.	1904.	1905.	1906.	1904.	1905.	1906.
Total car earnings.....	\$3,138,903	\$3,207,913	\$3,479,920	\$5,489,106	\$5,929,115	\$6,539,479	\$1,461,839	\$1,598,939	\$1,826,090
Total miscellaneous earnings.....	35,611	37,600	38,084	34,030	33,901	34,485	6,793	6,859	7,469
Gross earnings from operation.....	\$3,174,514	\$3,245,513	\$3,518,004	\$5,523,136	\$5,963,016	\$6,573,964	\$1,468,632	\$1,605,798	\$1,833,559
General expenses.....	\$ 337,404	\$ 417,741	\$ 417,357	\$ 709,173	\$ 824,486	\$ 940,631	\$ 147,854	\$ 143,919	\$ 160,683
Maintenance, way and structures.....	152,114	134,266	144,566	314,958	297,179	354,517	158,479	68,946	142,917
Maintenance, equipment.....	237,677	191,811	211,888	367,538	323,687	354,009	142,067	91,965	143,837
Transportation.....	1,391,283	1,373,766	1,411,883	2,411,230	2,512,784	2,686,580	774,783	818,471	866,972
Operating expenses.....	\$2,118,478	\$2,117,584	\$2,185,694	\$3,802,899	\$3,958,136	\$4,335,737	\$1,223,183	\$1,123,301	\$1,314,409
Net earnings from operation.....	\$1,056,036	\$1,127,929	\$1,332,310	\$1,720,237	\$2,004,880	\$2,238,227	\$ 245,449	\$ 482,497	\$ 519,150
Total miscellaneous income.....	21,467	22,939	25,172	44,303	45,819	50,404	80,342	82,152	82,881
Gross income less operating expenses	\$1,077,503	\$1,150,868	\$1,357,482	\$1,764,540	\$2,050,699	\$2,288,631	\$ 325,791	\$ 564,649	\$ 602,031
Taxes.....	\$ 173,082	\$ 145,574	\$ 219,912	\$ 173,398	\$ 170,855	\$ 198,619	\$ 42,397	\$ 43,296	\$ 55,489
Interest, rentals, etc.....	573,420	586,340	582,401	1,210,050	1,243,719	1,225,428	673,351	639,837	649,521
Total deductions from income.....	\$ 746,502	\$ 731,914	\$ 802,313	\$1,383,448	\$1,414,574	\$1,424,047	\$ 715,748	\$ 683,133	\$ 705,010
Net income.....	\$ 331,001	\$ 418,954	\$ 555,169	\$ 381,092	\$ 636,125	\$ 864,584	*\$ 389,957	*\$ 118,484	*\$ 102,979
Less proportion deficit, Consolidated Traction.....	141,199	38,164	35,519	248,758	80,320	67,460			
Balance for depreciation and rentals.....	\$ 189,802	\$ 380,790	\$ 519,650	\$ 132,334	\$ 555,805	\$ 797,124			
Reserved for depreciation.....	189,802	380,790	423,045	132,334	555,805	797,124			
Balance applicable to rentals.....			\$ 96,605				*Deficit.		

on the life of cable power house machinery, considered theoretically, the fact that these plants have (since the appraisal) been abandoned after an average service of only 16 years shows that, practically, having in view the hazard of supersession the company's estimate of 15 to 20 years on cable machinery was more nearly correct than the revised estimate of 30 years. In regard to power house buildings, in the ab-

February 4, 1907, and passed over the mayor's veto on February 11, 1907, and which are to be submitted to the voters at the city election to be held on April 2 next. In these provisions for maintenance, repairs, renewals and depreciation are included as follows:

(a) After the expiration of the three-year period of reconstruction and re-equipment during which the so-called "Im-

mediate rehabilitation" of the property is to be carried out, the companies are required:

(1) To maintain the property in first-class condition, by "making from time to time such expenditures thereon for maintenance, repairs and renewals as may be necessary or appropriate to give to the public first-class street railway service in all respects."

(2) To expend for maintenance and repairs during each and every year at least a sum equal to six per cent of the gross receipts for the particular year. If this amount is not thus expended, at the end of the year the unexpended balance is to be deposited with one or more banks or trust companies for the purpose of being used whenever necessary for such maintenance and repairs.

(3) To deposit with one or more depositories, on or before the fifth day of each and every month of each and every year, a sum equal to eight per cent of the gross receipts,

PROPOSED CHICAGO-ST. LOUIS LINE OF THE ILLINOIS TRACTION SYSTEM.

President William B. McKinley of the Illinois Traction Company has announced that plans have been decided upon for the construction at once of the much-talked-of electric railway to connect St. Louis and Chicago. Of this distance, 130 miles, or approximately half, is now in operation, between East St. Louis and Lincoln, Ill.

From Lincoln the line will be extended this summer north to Mackinaw in Tazewell county, intersecting at that point with the line from Bloomington to Peoria, which is now nearly completed. From Mackinaw the line will be extended northeastward through Washington and Eureka, in Woodford county to Minonk, in Woodford county; thence north to Streator and Ottawa. Franchises in both Streator and Ottawa were obtained last summer under the charter of the

Table IV—Depreciation and Maintenance—Chicago Union Traction Company.

Year ending August 31	North Chicago Lines.			West Chicago Lines.		
	1904.	1905.	1906.	1904.	1905.	1906.
Total of "Gross earnings from operation" and "Total miscellaneous income" from Table III.....	\$3,195,981	\$3,268,452	\$3,543,176	\$5,567,439	\$6,008,825	\$6,624,368
Total maintenance and depreciation (22% of above for North and 24% for West)	\$ 703,116	\$ 719,059	\$ 779,499	\$1,336,185	\$1,442,118	\$1,589,848
Total maintenance (from Table III).....	389,791	326,077	356,454	682,496	620,866	708,526
Proper charge for depreciation.....	\$ 313,325	\$ 392,982	\$ 423,045	\$ 653,689	\$ 821,252	\$ 881,322
Balance available for depreciation and rentals (from Table III).....	189,802	350,790	519,650	132,334	555,805	797,124
Balance for rentals.....	*\$ 123,523	*\$ 12,192	\$ 96,605	*\$ 521,355	*\$ 265,447	*\$ 84,198
Excess accrued depreciation over balance for depreciation and rentals to date of report	\$ 123,523	\$ 135,715	\$ 39,110	\$ 521,355	\$ 786,802	\$ 871,000
Excess for both companies to date of report.....	\$ 644,878	\$ 922,517	\$ 910,110			

*Deficit.

which shall constitute "a reserve fund for taking care of renewals and depreciation" for the preceding month. Payments from this fund for the purpose of renewals may be made on the written certificate of the "Board of Supervising Engineers." This board is to determine from time to time what particular items shall be considered as renewals and what as maintenance and repairs.

(b) It is stipulated that the amounts expended or reserved, six per cent of gross earnings for maintenance and repairs, and eight per cent for renewals and depreciation, are minima, and that the companies' obligations to expend all that may be necessary on these accounts are in no wise limited or lessened by reason of these percentages being named.

(c) The amounts expended or reserved for maintenance, repairs, renewals and depreciation shall be considered a part of the operating expenses. In event of the sale of the property to the city or its licensee, the amount of the reserve funds, or due to be deposited therein, shall become the property of the purchaser.

A Wells-Fargo Express Company car recently began operating over the Columbus Delaware & Marion Railway, making two trips daily between Columbus and Marion, where it connects with the Erie Railroad, over which the express company operates. The Wells-Fargo company entered into a contract with the Columbus Delaware & Marion several months ago for this service and the express matter has been handled by the company on its regular freight and combination cars.

The first sleeping cars operated on an electric line in Illinois were operated over the line of the Illinois Traction System the night of February 14, 1907, one car leaving East St. Louis for Decatur, and the other leaving Decatur for East St. Louis. The two cars are duplicates and equipped with 10 sections, 20 berths. There is the usual smoking room for men and a dressing room for women. Instead of curtains the berths are separated by pulling up from the floor a partition built on the plan of the roller top of a desk.

Peoria Streator & Ottawa Railway, both franchises stipulating that the line should be completed between the two towns by October 1, 1908. From Ottawa eastward to Seneca the Illinois Valley Railway, controlled by the same interests as the Illinois Traction Company, is now in operation, thus obviating the necessity of building.

Beyond Seneca the direction of the line has not yet been determined, two alternative routes being presented, one to Yorkville and the other to Joliet. By building the line from Seneca to Yorkville it would be possible to connect with the line of the Aurora Elgin & Chicago Railway, which operates cars hourly into the center of Chicago in 2 hours and 25 minutes running time. A line from Seneca to Joliet could connect with the Chicago & Joliet Electric Railway, whose cars run on an hourly schedule from Joliet to the city limits of Chicago at Forty-Eighth street in 1 hour and 25 minutes running time, connecting with the Archer avenue line of the Chicago City Railway Company.

It is planned to build the sections from Lincoln to Mackinaw, from Streator to Ottawa and from Seneca to either Yorkville or Joliet this summer, and to close up the gap between Streator and Mackinaw during 1908, with a branch from Eureka to Peoria. By that time it is expected that the company's proposed bridge across the Mississippi river at East St. Louis will be completed, giving an entrance to St. Louis. Franchise negotiations for a terminal line into the heart of the city are now pending.

Thus if present plans are carried out it will be possible by the close of 1908 to travel by electric railway between the two great cities of the middle west over a system whose branches cover a large part of the state. The line is now in operation from East St. Louis to Bloomington, with limited trains and sleeping cars as far as Decatur. A line from Champaign to Danville and Ridge Farm has been in operation for several years and construction between Decatur and Champaign is progressing rapidly. Surveys are being made for a line from Springfield to Jacksonville.

NEW POWER STATION OF THE ILLINOIS TRACTION SYSTEM AT PEORIA, ILL.

BY C. S. JOHNSON.

After absorbing the street railway interests at Peoria, Ill., and arranging to extend its interurban railway system into Peoria, the Illinois Traction System found it advisable to increase the generating capacity at Peoria.

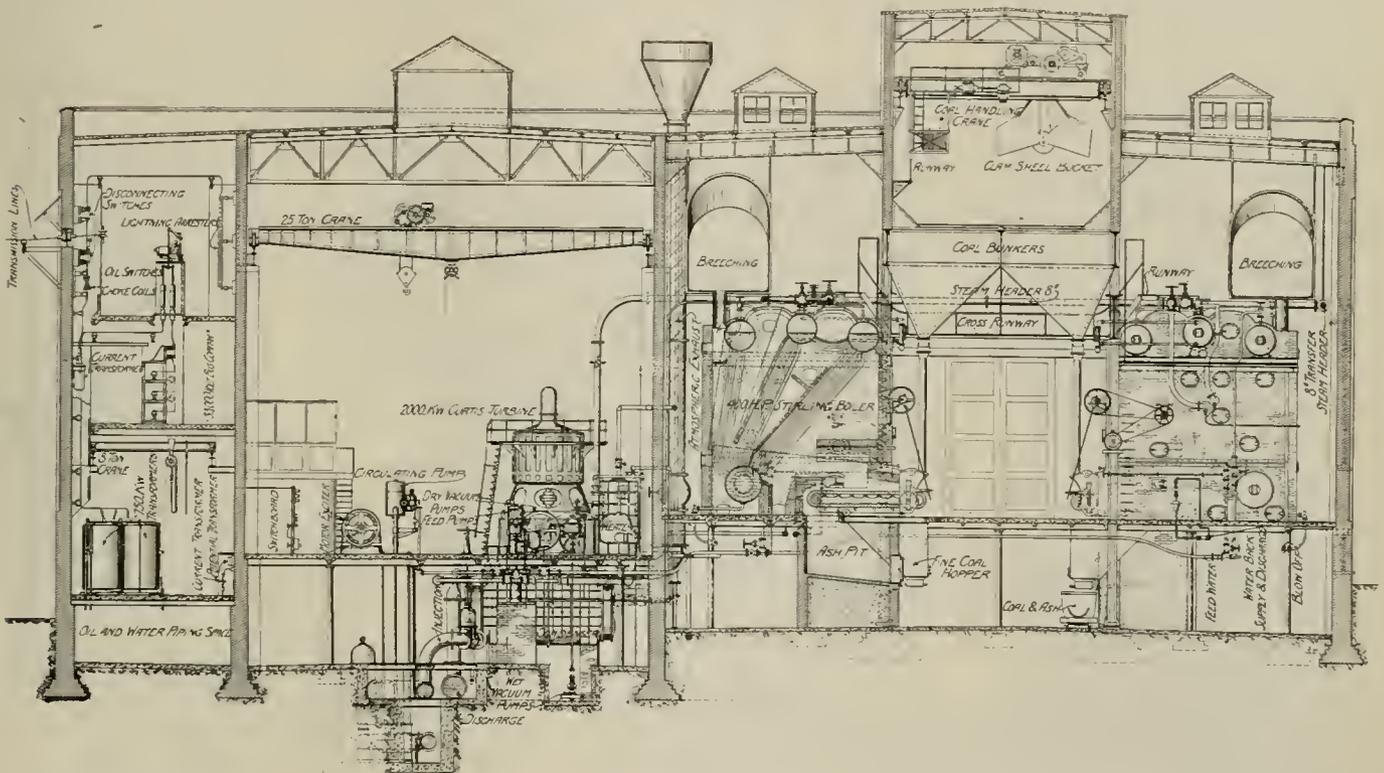
The old generating station contains horizontal fire-tube hand-fired boilers, non-condensing engines and 550-volt direct-current generators; all belt driven excepting one 400-kilowatt generator. The station has a total capacity of about one thousand kilowatts. The new power station as contemplated is to have an ultimate rated capacity of 8,000 kilowatts. Mr. John A. Radford, Chicago, Ill., is consulting engineer in charge of the station design and construction.

The site chosen for the new station is 180 feet by 171 feet 6 inches, and about five hundred feet from the Illinois river.

and to make a complete shut down of the station unnecessary in case of accident to any part the machinery, boilers and piping, in so far as advisable, are arranged according to the "unit plan."

The building is of fireproof construction. Steel is used wherever desirable. All walls except those of the coal and ash pit are brick, laid in cement mortar. All brick used is vitrified paving brick (paving block size). The exterior surfaces and the faces of the walls in the turbine room are laid in red mortar. The floors are steel-beam and concrete-arch construction, the spans and size of beams being carefully selected for the probable loadings in different parts of the station. The roof is reinforced cinder concrete covered with tar paper and gravel. All skylights are $\frac{1}{4}$ inch thick "rough" transparent wire-glass.

All of the high-voltage electrical apparatus and connections are placed in what is practically a separate building, there being only one door leading from the main station into



Peoria Power Station, Illinois Traction System—Vertical Section through Boiler House, Turbine Room and High-Tension Compartments.

It immediately adjoins the approach to the new steel bridge which the Illinois Traction System is building across the Illinois river. The site is at the corner of Walnut and Water streets, near the center of the city and in the same city block with the old power station. When the new plant is in satisfactory operation the old station will be dismantled and the site used for an interurban passenger station.

Arrangement of Building.

In connection with the selection of apparatus and the design of the station the operating engineers' work was given due consideration. All operating apparatus, except the boilers and coal-handling machinery, are controlled from the turbine-room floor and the arrangement is such that ordinarily one engineer on watch may attend to two turbines and the auxiliary machinery, including the condenser equipment, feed pumps, feed-water heater and step-bearing pumps. The excitors are so located that they may be under the care of the switchboard attendant. No apparatus in the turbine room is so located that the engineer's regular duties will require him to leave the turbine-room floor.

In order to facilitate repairs and inspection of apparatus

the high-voltage apparatus section. The busbar compartment room and oil switch room are entered by stairs from the transformer room.

Coal and Ash Handling Facilities.

In providing coal handling facilities advantage was taken of the elevation at which the bridge approach crosses the property, a 300-ton coal pit being placed beneath the bridge approach and the contemplated switch track. The relative location of the tracks and station building may be seen by reference to the accompanying plan.

The Illinois Traction System will haul practically all the coal used, direct from the mines in its own dump-bottom cars which will unload into this coal pit. A traveling bridge crane, carrying a 108-cubic-foot clamshell bucket, built by the Case Manufacturing Company, Columbus, O., and having a capacity of 50 tons of coal per hour, is provided for hoisting and carrying coal to the coal bunkers over the boilers and for handling ashes. The operating speeds of this crane are: Hoist, 80 feet per minute; bridge travel, 400 feet per minute, and trolley travel 150 feet per minute.

The crane is equipped with General Electric 325-volt

direct-current crane motors, a 25-horsepower motor for closing and opening the bucket, a 50-horsepower motor for holding and hoisting the bucket; a 15-horsepower motor for traveling the bridge, and a 5-horsepower motor for traveling the trolley. The choice of voltage will be explained later. The crane is equipped throughout with cut gears and all high-speed gears are enclosed in dust-proof cases. All bearings are large, self-oiling and removable. The load-brake is made extra large in view of the severe service. The crane is controlled from a cage built under the crane-bridge structure.

Interlocking devices are installed so that the crane cannot run over the main track except when the trolley wire is raised out of the way of the bucket and when the blocks on the main track are set.

The "fine coal" which falls unburned, through the chain grates, is caught in two reinforced concrete hoppers built under each grate and beneath the boiler-room floor. These hoppers are provided with cast-iron valves. The sides of the hoppers are so sloped as to dump the coal into coal cars which run in front of the ash pits. The slope of the sides is also chosen so as not to interfere with the ash-pit doors. The ashes are

of the way so as not to interfere with lowering the clamshell bucket into the ash and fine-coal pits.

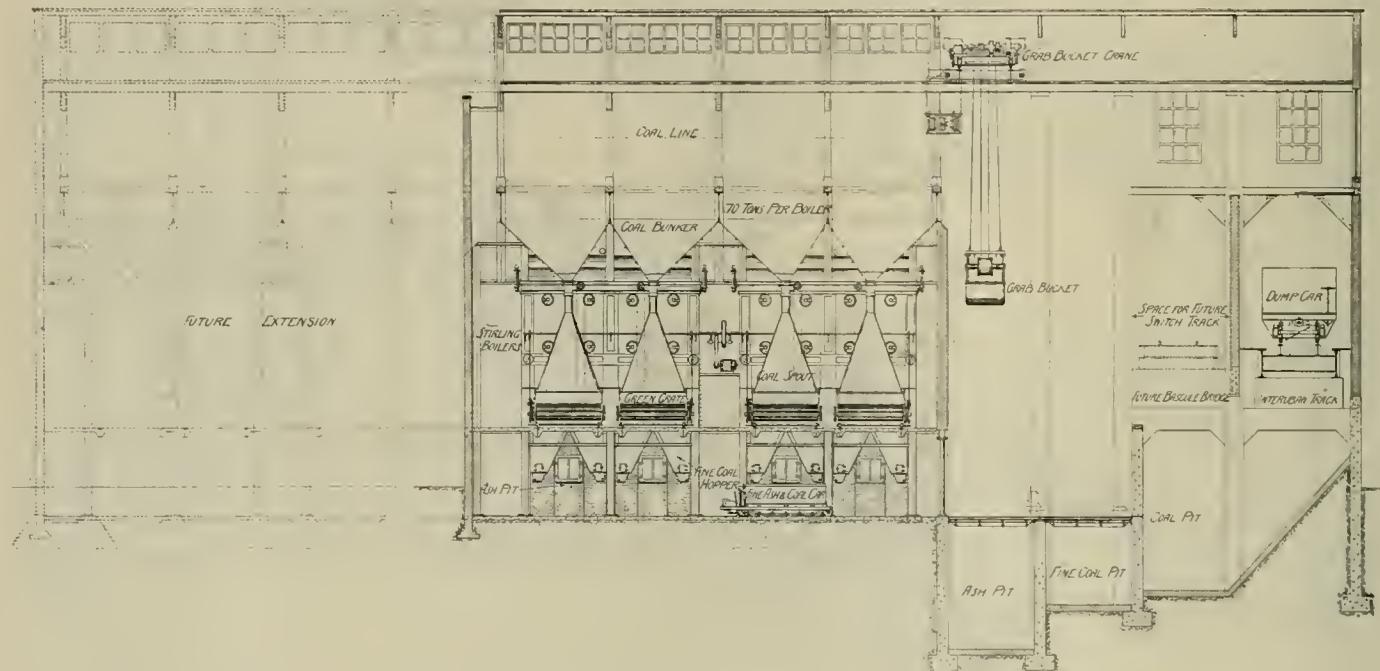
Until such time as the station is extended the coaling will be done from the interurban track shown on the plan, and between 12 p. m. and 5 a. m., when no interurban cars are running.

When the station is extended it is expected that it will be necessary to build the contemplated switch track which will be used only for coaling purposes. This track will pass directly over the 300-ton coal pit on a small bascule bridge which will be opened when coal is being removed from the pit with the clamshell bucket.

Boiler Equipment.

The boiler equipment consists of eight 400-horsepower Stirling water-tube boilers. Four of these boilers, opposite the second turbine, are equipped with Foster superheaters for 100 degrees F. superheat. These superheaters are located in the second flame-pass and thus are not exposed to the gases at the initial temperature.

The boilers and superheaters are designed for 200 pounds working pressure; the actual working pressure is 180 pounds.



Peoria Power Station, Illinois Traction System—Section Through Boiler Firing Space showing Coal-Handling Facilities.

caught in large ash pits built of brick and with walls independent of the boiler settings. The ashes are raked from the ash pits to the fine coal and ash cars.

A 75-ton ash-storage pit is provided into which the cars loaded with ashes are dumped. The ashes are allowed to accumulate in this pit until such time as is most desirable for removing them from the station. The ashes are transferred from the 75-ton ash pit to the interurban coal cars by the grab-bucket crane.

A 35-ton fine-coal storage pit is provided into which the cars loaded with fine coal are dumped. Fine coal is allowed to collect in this pit until such time as is most desirable for transferring it with the grab-bucket crane to the bunkers over the boilers.

One of the illustrations shows the construction of the cars used for handling the fine coal and ashes. These cars were designed especially for this service. A 5-horsepower 125-volt direct-current Westinghouse crane motor with reduction gearing is used to propel the car. Current is fed to the motor by means of two contact shoes sliding on two trolley wires. The trolley wires are surrounded with steel hoods and placed along the sides of the track. The car track over the fine coal and ash pits is hinged and may be thrown out

At first, only four boilers will be equipped with superheaters, so that practical running tests for determining the value of superheated steam may be made. It will be noted that the steam piping is so arranged that turbine No. 2 is supplied with saturated steam while turbine No. 1 is supplied with superheated steam and that each turbine may be operated independently.

The furnaces are equipped with chain grates furnished by the Green Engineering Company, Chicago.

Turbine Units.

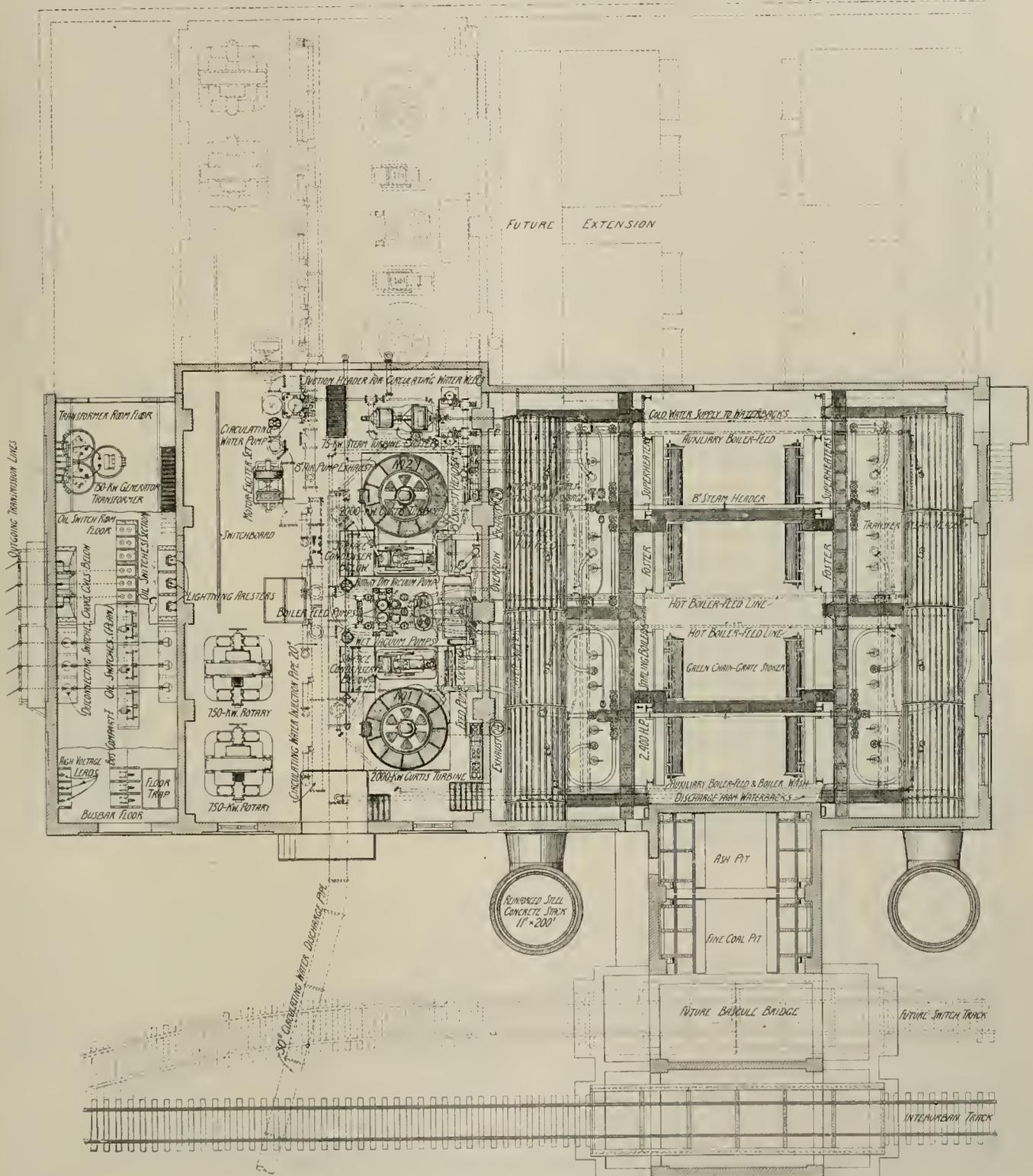
The main generating units are 2,000-kilowatt Curtis turbo-alternators, 25-cycle, 2,300-volt, 3-phase. The turbines are equipped with hydraulically operated governor gears. The step bearings require 800 pounds oil pressure. The turbines were placed with the exhaust bases below the turbine-room floor and the atmospheric exhaust and condenser connections are made in the basement. It will be noticed from the general plan that the first and second turbines are arranged right and left hand and that the same arrangement is contemplated for the third and fourth turbines.

The condensers are located in the basement and are entirely covered over, but there are floor traps so that an entire condenser or any of its parts may be handled by the turbine-

room crane. The condensers, dry-vacuum pump and wet-vacuum pumps were furnished by the Wheeler Condenser & Engineering Company.

The condenser has 8,000 square feet of cooling surface consisting of 1-inch brass tubes 13 feet long. The con-

and air reliefs are provided for the pumps. The pumps are placed in a pit five feet below the bottom of the condensers and the motors are located on the turbine-room floor. The wet-vacuum pumps discharge into the reheating tubes and from them directly into the feed-water heater (not through the reg-



Peoria Power Station, Illinois Traction System—Plan of Station Showing Contemplated Extensions.

densers are arranged with reheaters designed to raise the temperature of the condensed steam to within five degrees of the exhaust temperature.

The wet-vacuum pumps are of the vertical-shaft motor-driven centrifugal type with 125-volt direct-current motors operating at 800 revolutions per minute. Water-sealed glands

ulating valve). The dry-vacuum pumps are placed directly above the condensers on a steel and concrete framework. The air pumps discharge into a dry air pump discharge header and to the atmosphere.

Cooling water for the condensers is obtained from the coarse gravel strata under the station property. Thirteen

wells eight inches in diameter and extending down about 40 feet below the surface of the ground supply the water. These wells are spaced approximately ten feet apart and are all connected to an 18-inch suction header. A vertical direct-acting pump with its water-end placed within 10 feet of the low water line and its steam end on the turbine-room floor, is used for lifting the water from the wells and discharging it into the condensers. This pump has a capacity of 4,300 gallons per minute at 40 single strokes. The size of the pump is 20 by 36 by 24 inches. It was furnished by Dean Brothers Steam Pump Works, Indianapolis, Ind. A motor-driven centrifugal pump will be installed to operate in parallel with and as an auxiliary for this pump.

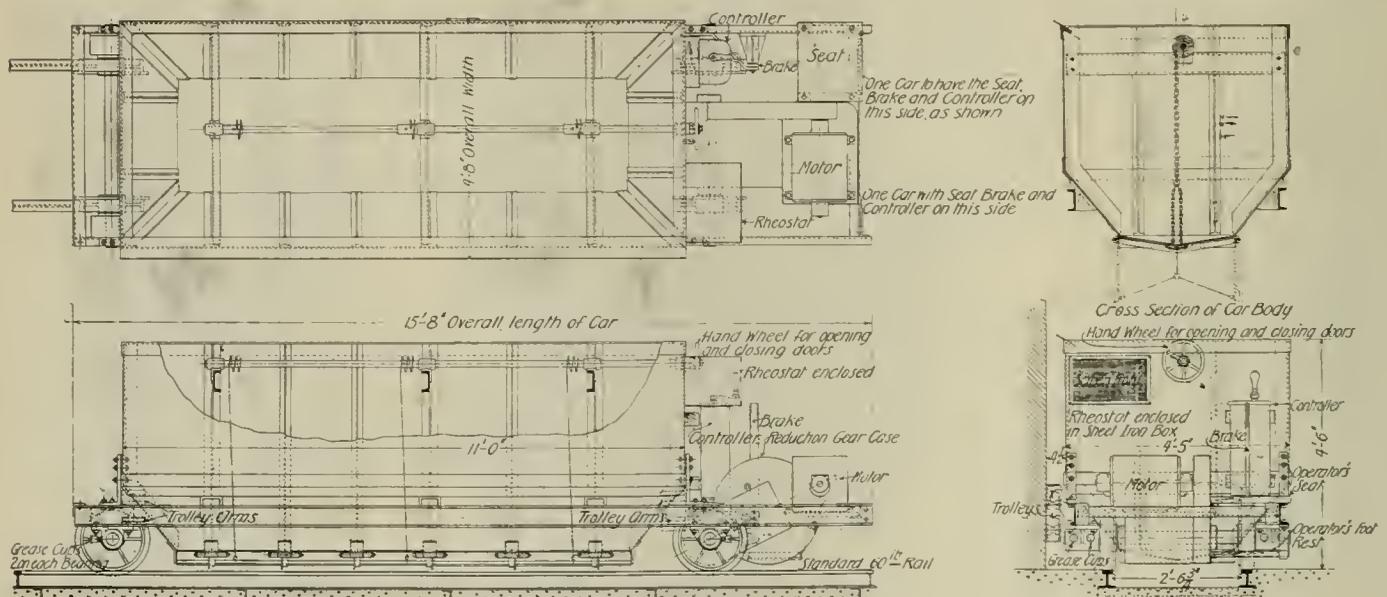
By installing one steam-driven and one motor-driven pump the exhaust steam supply for heating the feed-water may be regulated to balance the demands, by shifting the load on the pumps. The overflow water from the condensers is discharged through a 30-inch cast iron pipe to the river. All circulating-water pipe within the station building, including the suction header, is placed in an open trench and is thus readily accessible for repairs at any time. This trench is covered with an oak floor. The water obtained from these

The open feed-water heater is of 4,000-horsepower capacity furnished by A. Sorge, Jr., Chicago. Two 10 by 16 by 24 inch vertical simplex Dean pumps are installed for house service.

High Pressure Steam Piping.

The arrangement of high-pressure steam piping is similar to the electrical bus connections in some modern electric plants. Each turbine is connected to a small header to which four boilers are also connected. These headers are in turn connected to a transfer header so that all turbines and boilers may be operated interconnected or they may be operated as separate units. This arrangement dispenses with the usual special fittings required for steam headers and keeps the size of the piping at the minimum.

Steam for the feed pumps, dry-vacuum pumps and step-bearing pumps is taken from the same header as the steam for the corresponding turbine. Steam for the turbo-exciter, house pumps and circulating pump is taken from the header for unit No. 2, and when the station is extended will have an alternate connection to the header of unit No. 3. These auxiliaries are common to the entire station, but any or all may be stopped for repairs and the station still kept



Power Station, Illinois Traction System—Plan, Section and Elevation of Coal and Ash Car.

wells it is expected will never be warmer than 54 degrees F., and will be nearly uniform in temperature for the entire year. If water were taken from the river it would be as warm as 80 degrees F. at times. It is thus seen that a great saving in water pumped (over fifty per cent) is effected by obtaining circulating water from the wells. The circulating water piping is arranged with a view to taking part of the water required for the completed station from the river in case the wells are found inadequate.

Feed Pumps.

The feed pumps comprise two 14 by 10 by 24-inch simplex vertical pumps furnished by Dean Brothers Steam Pump Works, Indianapolis. These are mounted "back to back" on a common base-plate. This gives the most compact arrangement and straight-forward suction and discharge connections. The water-ends of the pumps are placed below the turbine-room floor and the steam ends above. They are placed near the center of the turbine room where they may be seen from nearly all locations in the room.

Duplicate sets of feed lines are installed, one set to be used as the hot feed and the other as an auxiliary feed and pressure wash line. The feed lines are arranged on the unit plan corresponding to the steam connections.

in operation. All high-pressure steam and feed-water as well as the blow-off lines consists of extra heavy pipe and fittings. The valves and fittings for the steam piping are semi-steel. The high-pressure piping was installed by M. H. Crane Estate, Cincinnati, O.

For the oiling system of the step bearings, governors and steadying bearings of the turbines the General Electric Company furnished two 12-gallon per minute, 800-pound pressure outside end-packed pumps and a 400-gallon filter, together with the necessary haffles, etc. A 30-gallon accumulator will be installed in connection with the oiling piping.

Electrical Equipment.

All the electrical equipment except the 33,000-volt transformers was furnished by the General Electric Company. The generator pressure is 2,300 volts and the bus pressure 33,000 volts, at which pressure current is transmitted to the substations. The generators are permanently connected to three 750-kilowatt single-phase oil-insulated, water-cooled 2,300-33,000-volt transformers connected delta on both high and low-voltage sides. In the 33,000-volt leads of these transformers are the generator switches.

The local street railway current supply will be taken from two 6-phase, 25-cycle, 650-volt, 750-kilowatt rotary con-

verters provided with reactance coils for voltage regulation. These machines are started from the alternating current side by one-third and two-thirds voltage taps.

Current for the rotary converters is taken from the 33,000-volt bus through an oil switch and stepped down to 400 volts, 6-phase by three single-phase, oil-insulated, water-cooled transformers. The transformers for the generators and the rotary converters were furnished by the Westinghouse Electric & Manufacturing Company.

The motor-driven exciter set consists of a 75-kilowatt, 125-volt generator and a 3-phase, 25-cycle, 2,080-volt, 110-horsepower induction motor. Current for the induction motor of the exciter set is stepped down from 33,000 volts to 2,080 volts. The induction motor is started from half-voltage taps.

All 33,000-volt bus wires, oil-switch leads, transformer and lightning arrester taps are installed in brick or concrete compartments for mechanical and fire protection. The oil switches are the General Electric Company's motor-operated type H-3.

It will be noted from the illustrations that the single-phase transformers are arranged in a "mechanical delta." This arrangement was selected as it makes the electrical connections the most simple and occupies less space than other arrangements.

The switchboard consists of General Electric Company's standard panels and instruments. A Tirrell regulator is provided for voltage regulation.

In selecting current for the coal handling crane, it was considered inadvisable to use as high pressure as the direct-current railway feeders, 650 volts, which would at times be as high as 750 volts. If 125-volt current were used it meant the installation of large exciters, especially for this service. A moderate voltage was obtained by installing a set of balancing coils in connection with the rotary converters to obtain a neutral so that current from one side of the rotary converters may be used for the coal-handling crane service.

Two 3-phase, 33,000-volt transmission lines are provided for carrying current to the various sub-stations. Locations are provided for two additional transmission lines in the first half of the station. Twenty 500,000-circular mil feeders are provided for the local direct-current railway system supply.

The completed station will cover 2.36 square feet of ground surface and will contain 135 cubic feet per kilowatt rated generating capacity. No deductions are made for the 3,000-kilowatt capacity substation equipment which may be installed in the station.

ELECTRIC ARC HEADLIGHTS.

BY P. LINDEMAN.

Undoubtedly many of the derailments and accidents on the high-speed interurban railways are due to faulty or poorly adjusted headlights. Further, much of the wear and tear of the controllers, motors and braking apparatus is directly traceable to the application of the emergency stop and the reversal of motors. This is the result of backing up for passengers missed because the motorman did not have sufficient light to see the signals in time.

In many cases the fault is not with the headlight, but simply because the lamp is not hung on the car in a vertical position. Other reasons, however, also cause the light to be sent in the wrong direction, among which are the faulty adjustment of the carbons and burning away of the position carbons. The effect of the latter causes will be readily understood by recalling the well-known principle of the parabolic reflector, i. e., parallel rays are emitted when the source of light is at the focus. If, however, the source is not at the focus, the rays are no longer concentrated and their direction is changed. If the arc comes too near the bottom the rays are directed upward; if too near the top the

rays will illuminate only a small portion of the track directly in front of the car. The light is further diffused and diminished by the enclosing globe and the deposit of carbon on it.

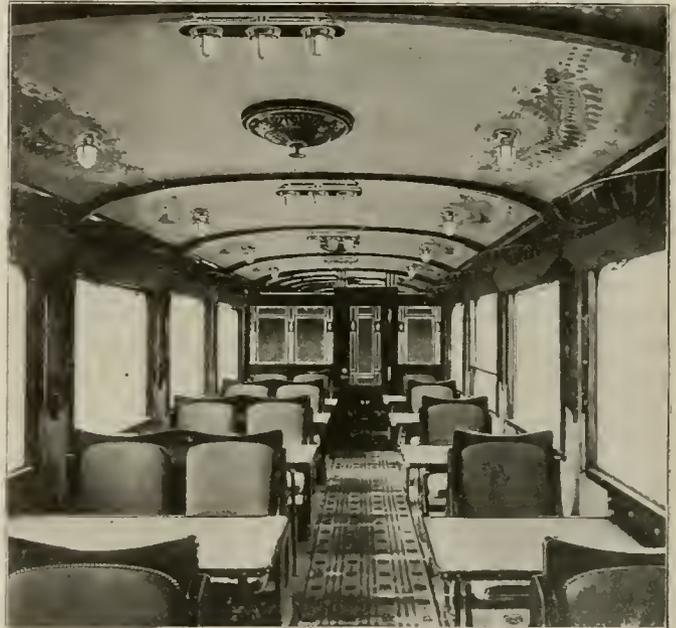
From what has been said it is evident that arc headlights should be fitted with an automatic feed for regulating the size of the arc and its position with respect to the reflector. A more uniform position of the arc will also be assured if the positive carbon is made larger than the negative.

DINING CAR, MONTREUX-BERNESE OBERLAND ELECTRIC RAILWAY.

BY DR. ALFRED GRADENWITZ.

The Montreux-Bernese Oberland Electric Railway is believed to be the first European electric railway to operate a dining car.

The car, which was built by Messrs. Ringhoffer, of Smichow, Austria, is a narrow-gauge car running on two 4-wheel bogies. The frames of the bogies are made of pressed steel and are well braced and connected by substantial transverse girders and suitable angle pieces; they are carried on axle bearings by means of ordinary supporting springs. The



Dining Car for Montreux-Bernese Railway—Interior View.

jack made of flat iron on which the car body rests by means of a ball pivot and rotary friction surfaces is supported on both sides by extensive inverted longitudinal springs arranged outside of the frame plates and the deflections of which are applied externally to the frame.

The substantial underframe is made entirely of steel and is fitted with central buffers. The car body is designed for 30 passengers.

The tables are bolted to frames fastened to the sides of the car, and the chairs are fixed to the floor, the seats being arranged to hinge upwards. The seats and backs are upholstered with white horse hair and gray lamb leather. The chairs and tables are finished in dark-stained polished mahogany, while all visible wooden parts are likewise made of mahogany treated in the same way.

The panels of the side walls are filled in partly with gray gold-decorated lamb leather and partly with metal reliefs. The broad windows have metal frames the apparent weight of which is reduced and which are readily lowered by convenient lifting devices. The ceiling is coated with painted cloth and is divided into several panels containing

electric lamps and two fans. The basket-shaped luggage-carriers are fitted above the windows; the blinds located underneath have vertical guiding rods.

Heating is effected by electric radiators situated below the seats. Close to the dining room are the pantry and kitchen, the latter containing a range. Two ice tanks are provided.

The corridor and entrances are finished partly with Chinese paper and partly with polished mahogany lining.



Dining Car for Montreux-Bernese Railway.

The car has an automatic vacuum brake in addition to a handbrake operated from the platform.

LOW FARE CONTROVERSY IN MINNEAPOLIS.

The Minneapolis Street Railway Company has been granted a temporary injunction restraining the city of Minneapolis from putting into effect the six-for-a-quarter fare ordinance passed by the city council on February 9. The injunction also prohibits the publishing of the ordinance. The city officials are ordered to appear in court on March 2 and show cause why the injunction should not be continued.

An interesting part of the bill of complaint follows:

It is petitioned that the city and its officials be perpetually enjoined, restrained and prohibited from publishing or completing the publication of said ordinance, and also from putting said ordinance into effect, and from instituting or authorizing any suits against the street railway company, conductors or employees, or to compel the company, its conductors or employees to accept less than 5-cent fares or to sell tickets as therein provided at the rate of six for 25 cents, and from making complaint for violation of said ordinance or any part of it, and from bringing any suit for the purpose of vacating the charter or from annulling the existence of the company as a corporation, or for the forfeiture of any of its privileges or franchises, because of the violation of said ordinance, passed on February 9, 1907.

The company alleges that the city in its charter has no power to fix and regulate the rate of fare, except as provided in the original charter granted to the street railway company in 1875, which fixed the rate of fare at 5 cents. The company further declares that an attempt to enforce the ordinance would lead to personal conflict between passengers and conductors.

It is declared further by the company that the ordinance is in violation of the constitution of the United States, and if enforced will take the company's property rights without due process of law.

The federal court was appealed to because the company is organized under New Jersey laws, and is not a Minnesota corporation.

With regard to the situation the company has issued a public statement, in abstract, as follows:

Our franchise contracts with the city of Minneapolis give us the legal right to collect a 5-cent fare. From 1875 to 1889 the Minneapolis Street Railway Company was operating its system by animal power. At that time electricity began to be talked of as a motive power for street railways, and during the year 1889 considerable agitation arose in the city with reference to changing from animal to electric power.

Forced into Costly Experiments.

We urged upon the council the need of further investigation of the use of electric power as applied to street railways before

spending so much money in making the change, and asked that the matter be delayed for a year in order that more thorough tests and development in this new power might be made. The council, however, insisted that the company should begin at once to change its system, and should within two years not only convert all existing lines, but also build numerous additional lines and operate the same by electricity.

The company finally agreed to this, and at once began making the change. The system which we then installed was the best known at that time, and after making the change we operated with some difficulty for a period of about seven years. This first change was a very expensive matter for the company.

In the meantime the development in electrical equipment changed to such an extent that we found the system we had installed so imperfect and inadequate that we found it necessary to rebuild and reconstruct our entire system. This we did without request from the council or public discussion or complaint. Today none of the first equipment and hardly five per cent of the trackage first built is in use. In addition to these changes, we have also built new power houses and stations, and have equipped these, as well as the entire system, with the most approved and modern appliances.

In making these changes and in bringing our system to its present standard, we have expended vast sums of money. All this has been done at a time when labor and material have been steadily advancing. We have endeavored to establish and maintain the highest character of service and equipment, and we believe that in no other city is the service or equipment of a higher order and in no other city a transfer system more liberal.

Comparisons Unfair.

Comparisons have been made on the rate of fare charged here as against that charged in other cities. This is hardly a reasonable comparison, considering the widely different existing conditions. In the item of fuel alone there is a difference of \$1.10 a ton in the freight rate between Minneapolis and Chicago. Buffalo, Cleveland and other lake points have the advantage over us on coal rates of not less than \$1.50 a ton. Climatic conditions in Minneapolis are such as do not prevail in most cities throughout the country, and it is necessary for us to make extensive provisions each year for the handling of snow and ice. Our cars are heated with hot water and not with stoves, as in so many cities, are provided with storm sash and double floors and are comfortable in all weather.

Practically every item entering into the construction, maintenance and operation of the system is today at the highest point ever known.

Rail, which ten years ago cost \$22.55 per ton f. o. b. Minneapolis, is today \$41.60 per ton. Ties, which cost 32 cents each, now cost 72 cents each. Iron poles, which cost \$9.50, now cost \$19 each. Copper, which cost 12 to 13 cents a pound, is now 28 cents a pound. Common labor, which was \$1.50 a day, is now \$2 a day.

We believe that the high standard of equipment which we are endeavoring to maintain is a strong advertisement for the city. No other system in the country operates as uniformly high grade or better-looking equipment, nor takes more care to provide clean, comfortable and safe transportation. We have employed every known device for the comfort and safety of passengers to make our service pre-eminent. Our tracks are unusually heavy and well built and our cars, built by the laboring men of Minneapolis and St. Paul, are of the most modern and expensive construction.

Nowhere in the world are the street railway trainmen provided with such modern appliances to insure them comfort in their work as in the twin cities. Our power houses and other buildings are built of the best materials and prove attractive wherever they are placed. In short, we have not spent money with a niggardly hand, and no limit within reason has been placed on the cost of any improvement, in tracks, cars or buildings, to make our system the very best in the United States, and one of which any Minneapolitan may well be proud.

Area as a Factor.

The area covered by our lines, approximately 55 square miles inside the corporate limits of the city with a population of 270,000, is very much in excess of that of most cities of equal size throughout the country.

Baltimore, with a population of 650,000, has an area of 30 square miles.

Cleveland, with a population of 465,000, has an area of 41 square miles.

Milwaukee, with a population of over 300,000, has an area of 23 square miles.

Detroit, with over 300,000, has 36 square miles.

Cincinnati, with 400,000 population, has 43 miles.

Louisville, with 338,000, has 20.5 miles.

Kansas City, with 200,000, has 26 square miles.

Indianapolis, with 215,000, has 30 square miles.

Thus it can be readily seen that with the proportionately larger area of Minneapolis, the operating cost per passenger carried must be materially increased over the more closely settled and congested cities mentioned.

Our company has always worked for the benefit of Minneapolis in a broad and enterprising way, and has always shown a desire to aid in the city's development.

Taking all this into consideration, and with our intention to maintain a high standard of equipment and service, and with the liberal transfer privileges which obtain here, we do not believe that any street railway company can maintain such service and equipment on a fare of less than five cents.

INTERVIEWING ACCIDENT WITNESSES.

BY F. W. JOHNSON, CLAIM AGENT, THE CONSOLIDATED RAILWAY COMPANY, BRIDGEPORT, CONN.

The writer recently was afforded the pleasure and opportunity of studying at close range the internal workings of the claim and accident departments of admittedly one of the best organized and equipped street railway systems of the east.

As a whole, the organization and methods of the claim department of this particular company could but arouse the admiration of one interested in this branch of railroading. In many directions the company had radically departed from the moss-covered traditions so generally recognized and implicitly followed in accident work. Precedent had been thrown to the winds, and modern, wide-awake, up-to-date methods of getting results in accident work had been adopted. That their enterprise was founded upon good business principles was ably demonstrated by the remarkably satisfactory progress which they had experienced during the past few years.

Method of Interviewing.

To the writer's surprise, however, in sharp contrast to their marked progress in other respects, it appeared that the advancement had not extended to the methods employed in obtaining interviews with witnesses to accidents, or more properly speaking, to the obtaining of evidence relating to these accidents. The company still clung to the antiquated practice of having its investigators secure verbal statements from witnesses, of their knowledge of the mishap under investigation, and then allowing these investigators to afterward reduce to writing their recollection or understanding of the facts of the accident as set forth by the witnesses in these verbal interviews. These reports were then turned in to the office as representing the evidence secured in the investigation of the accident.

Replying to a question as to whether they considered this method of securing evidence to accidents as being entirely satisfactory—or as being preferable to the obtaining of evidence in the form of written statements, taken down in the immediate presence of the witness and then read to him, or by him, after which he affixed his signature as indicative of the accuracy of the facts therein set forth—it was admitted that the scheme was far from satisfactory; also, that the company would be much in favor of the written, signed statement, were it not for the insurmountable obstacles which precluded the possibility of its being used to advantage in their particular territory.

While admitting that they had never put the written, signed-statement method to an actual test in their work, they nevertheless clung to the opinion that it was not feasible in their work, assigning as their reasons for this belief their conviction that people generally would not affix their signatures to statements concerning accidents of which they were witnesses; and secondly, that they did not believe that people would grant their representatives the time required for the giving of written statements. They had found by experience that the average person would readily spare the company's representative six or eight minutes for the giving of a verbal interview, but doubted whether these same people would stand for an extra two or three minutes in time necessary for the taking of a written statement.

Still, they could not say that their present method of securing evidence was entirely satisfactory. Time and time again in the past had evidence obtained in this way proved inaccurate and unreliable. Amazing uncertainties and startling contradictions had repeatedly developed at critical stages in the preparation and trial of cases in court, to the bewilderment of the company's trial attorneys; and likewise

to the consternation of the company itself, when juries reported the results of their deliberations.

Cases were cited in which important witnesses about whom the company had constructed its defense had suddenly developed startling lapses of memory, or an equally wonderful recollection concerning facts of which no mention appeared in the interviews submitted by the investigator who had worked up the evidence in the case. The company generally had its own private opinion as to the causes which may have prompted the sudden reversal of form upon the part of these witnesses, but as the nature of these dark suspicions was not admissible as evidence, the jury perforce remained in blissful ignorance of their existence, and the slaughter of company funds went merrily on, as of old.

Witnesses had stoutly denied ever having made any such statements as those attributed to them in the written reports filed by the investigators, which reports had been relied upon by the company as being accurate accounts of the facts as detailed by these witnesses. Many a case had "gone on the rocks," because important company witnesses had insisted upon testifying in direct contradiction to the facts as set forth in the investigator's report, and upon which the company had relied for a defense of the action.

In practically every instance the investigator had insisted, of course, that he had correctly reported the conversation with the witness, while the witness as emphatically denied this. Meanwhile, supposedly strong witnesses for the defense turned out to be equally powerful factors in furthering the interests of the plaintiff.

Responding to a query as to whether it was not probable that such a method of securing evidence tended directly to foster and to encourage this unfortunate state of affairs, it was admitted that possibly such was the case. But immediately the opinion was again advanced that it was the belief of that company that the average witness would balk when it came to giving written, signed interviews regarding accidents.

The argument is unanswerable. One method is admittedly faulty and unsatisfactory. The other method, which is giving entire satisfaction on scores of roads, large and small, is condemned without being afforded the opportunity of a trial. If a concern itself has not the determination to take down in writing the evidence of a witness, it may be assumed that the witness will not, of his own volition, insist upon this procedure.

Objectors to Signed Statements.

Experience would seem to indicate that the two objections to the taking of written, signed statements in accident work, as advanced by this company, are but creations of the imagination. There are, of course, people who will hesitate to affix their signatures to instruments of this character. Broadly speaking, they may be classified under three headings: First, the ignorant, who instinctively fear being tricked into signing away all of their earthly belongings and hence look with much suspicion upon all documents which require their signatures. Second, the man who has ever made it a life rule never to sign anything which he could possibly avoid, well remembering how his great-grandfather once backed a note for \$70 for a slick chap, and then got stung. Third, the claimant or his friends and acquaintances, who likewise fear that in signing any paper, whatever its form or purport, they may be working injury to the cause of the claimant.

For the grafter who refuses to either give or sign any statement unless he is to receive pay for so doing, we make no provision, preferring to treat his kind with the contempt which they so heartily merit.

It has been conclusively shown, however, that the average witness, aside from those as described, if quoted accu-

rately and fairly, will, in the great majority of cases, willingly affix his signature to the statement. Of those who hesitate or are reluctant, many are speedily won over by a brief, plausible explanation of the advisability of their so doing.

Consideration of the Personnel.

But, mark you, there is one point in particular, in connection with the success or failure of this method of securing evidence, to which we may be pardoned for directing especial attention. Its importance should not be overlooked, nor its value underestimated.

Many a witness will absolutely decline to give a written statement, much less to sign one, for reasons similar to those which actuated you in turning down that chap who called upon you the other morning in an effort to interest you in an investment with which he was connected. His proposition may have been all right—certain it was that he seemed to have good people back of it, but somehow or other there was an indefinite, vague, inexplicable something wrong somewhere. You didn't attempt to analyze the trouble, whatever it was, for the very reason that you were prejudiced against the scheme from the very moment that that fellow opened his mouth to address you.

Possibly if we were to offer the suggestion that it was something about the man himself that influenced you more than anything else against the project, it might prove to be the correct solution of your indifference to his mission. Now that you recall the chap, you do recollect that he approached you upon the matter in an uncertain, hesitating manner that plainly denoted a lack of self-confidence. He lacked ginger, life, energy, confidence, and instinctively you mentally classed him among the dead ones—a man whom you could easily turn down—and as you were very busy at the time, you did turn him down and gave no further thought to the matter.

Picture to yourself, if you will, that same chap in the guise of an accident investigator for the local trolley company, calling upon you for the purpose of securing from you a statement of your knowledge concerning a recent mishap upon its lines. Isn't it a fact that his success or failure in securing the desired evidence will depend very largely, if not wholly, upon the manner in which he approaches you, and consequently upon the impression that he is able to make upon you? If he is loud and coarse, is over-confident to the point almost of impertinence, is meek and humble and thus easily side-tracked, or lacking in self-confidence, has a poor address or is ill-kempt in appearance, will not any or all of these things count against his chances for success with you?

Oftentimes we don't quite like to admit this. Now that we get to thinking it over, our sympathy instinctively comes to the surface, and we try to persuade ourselves that the very fact that the poor devil had the appearance of being up against the world rather would count in his favor in our decision to grant him an interview. Yes, it sounds well, but there's nothing to it. When your private secretary bobs in to announce a man waiting to see you, and in response to your query as to who he is, what his business is and what he looks like, you get the information that he's an odd-looking stick, your decision is, "Tell him I'm very busy this morning." And he goes his way, because he didn't have the appearance and the address necessary to gain results.

While on the other hand, if this investigator is neat and clean in appearance, gentlemanly in manner, self-confident, brief and to the point, in short, the successful young business man of today, his chances for success in gaining that interview are, I assume, much greater. The difference in the ability of different investigators to secure written, signed statements may often be explained by so simple a test as the foregoing.

It is, therefore, of importance that careful consideration should be given to the personnel of the force employed in

this work if the greatest possible measure of success is to attend their efforts.

Time Required for Making Statements.

With respect to the matter of time required for witnesses to give written statements, it would seem that this obstacle could demand serious consideration nowhere outside of the largest of our cities. Just why it should require very much more time to jot down the facts on paper than to discuss the affair without taking notes, the writer does not understand. If it requires from six to eight minutes to converse with a witness in the securing of a verbal statement, it should require but a minute or two longer to jot down that same story in black and white, and with another minute allowed the witness in which to read it through and to sign it, we have an instrument which is of incalculably greater value than a statement possibly could be when obtained under the old method.

The single fact that many railway companies operating in our large cities are daily making use of the written, signed statement in accident work would seem to indicate that not only is this method possible, but also extremely feasible in cities of whatever size.

While it unquestionably is true that in the larger cities the tension is greater, it nevertheless is somewhat difficult to understand just what the relative difference can be between conditions in a very large city and those in the city of more moderate size, when an issue of so comparatively small importance is at stake as would appear to be involved in the question of the difference in time required to take written statements in place of verbal ones.

Can it be argued, for instance, that the inhabitants of a city of 500,000 can spare, on an average, approximately ten minutes to the investigator of trolley accidents, while the people of an adjoining city of 1,000,000 inhabitants can devote but seven minutes to the same task, the alleged difference being due primarily to the difference in the size of the two cities? Rather, would just the reverse seem to be true, for nowhere in the world do people devote so much time to the pursuit of pleasure, of ease, and of idleness as in the very largest of our cities.

The objection raised to the written statement, in the form of time, is a "man of straw," which has served a long and honorable career and is entitled to be laid at rest with full military honors.

Value of Statements over Signatures.

The concern which goes into court the possessor of statements made by its witnesses soon after the occurrence of the accident and while the facts must necessarily have been clearly in mind, which statements were taken down in the presence of the witnesses, practically at their dictation, read by them and afterward signed as indicative of their accuracy, unquestionably has a tremendous advantage over the railway company which comes into court with evidence secured under the old method, well knowing that it is distinctly within the power of its unprincipled opponents to set the case of the defendant company tottering upon its foundations by means too often resorted to, and generally characterized as "the bringing of 'influence' to bear upon important witnesses for the defense, who may be open to reason and to conviction."

In other words, one company has its witnesses well under control, while the other has not. This advantage is strongly demonstrated in what may be termed the "stability of witnesses." Having made a written, signed statement detailing his knowledge of an accident, the average witness feels considerably less inclined to flippantly contradict himself upon important features of the issue, knowing only too well that in the event of his so doing he would immediately

be confronted with the aforesaid document, bearing his signature as a mark of genuineness.

It is quite possible, of course, that a witness may even then attempt to jump the bars. But for every one who would still attempt to escape the obligations thus imposed, an even hundred will remain within the fold because of this very restriction. Whatever inducements may afterward be offered them, or whatever private opinions they may afterward form, experience has shown that they will be scrupulously careful, when it comes to contradicting themselves by testifying at variance to that signed statement.

Furthermore, the signed statement is a most powerful factor in establishing the real facts—the exact truth regarding the manner in which an accident really happened. Immediately after the occurrence of an accident witnesses will invariably tell the truth, the whole truth, and nothing but the truth, in describing the affair as they saw it. Months afterwards, their story oftentimes begins to warp most woefully, frequently the result of influence brought to bear in favor of the plaintiff, or to the satisfaction of some personal grievance entertained by the witness against the defendant company.

Another leading advantage that may be cited briefly is the reassuring confidence regarding exact facts, which a witness feels in testifying concerning an accident that happened some months or years ago, the minor details of which would now be hazy in his mind, but for the opportunity afforded him of refreshing his memory by reading through the statement made by him at the time, and while the facts were clear in his mind. Best of all, he never doubts or questions its accuracy, for at the bottom of the statement appears his own signature. Thus better witnesses and better results in the courts.

We should not leave this phase of the situation without calling attention to the tremendous advantage afforded a concern by these written, signed statements in still another direction.

I refer to the powerfully destructive weapon which is thus placed within the grasp of the company's trial attorney when he has to contend with the viciously unprincipled witness who, having given a signed statement of his knowledge of the accident, afterwards attempts, for reasons best known to himself, to change his testimony in its essential features. Possibly he develops into a hostile witness and is in a position to work irreparable harm to the company's interests.

Witnesses are either with you or against you. There is no middle course. Neither side knowingly puts on the stand witnesses hostile to its own interests, nor is either side clouding its contention by putting on dead-wood—witnesses who neither benefit nor weaken the case. Each side is sturdily engaged in building up its own theory of the cause of the accident, while endeavoring to crush like efforts on the part of its opponent. Therefore, if a witness unexpectedly turns on you, after having given you the true facts, over his own signature, and instead of standing by the truth develops into a backslider in favor of the plaintiff, it is distinctly within your power to literally crush him in so far as his evidence could possibly be of any material assistance to the other side.

Either he deliberately lied at the time of the giving of the signed statement, or else he is lying now. He cannot possibly be right in both directions. It affords a foundation for the strong presumption that his testimony is entirely unreliable, and consequently of no value to either side. In his statement, made the day following the accident, he was positive that "the woman stepped off of the car before it had come to a stop." In three different places and in three different ways did he distinctly reiterate this fact, in the body of the aforesaid statement. Now, two years afterwards, despite this signed statement made while the facts must

necessarily have been clear in his mind, he distinctly recalls having seen the conductor deliberately start the car while the passenger was in the act of alighting. Basking in the warmth of the reassuring smiles of the plaintiff, and of the plaintiff's counsel, he grows emphatic in his positiveness of the accuracy of this latter version of the manner in which the accident had happened. This very positiveness, corroborated by the square-toed contradictions as set forth in the signed statement, plainly expose the shallow purposes of the slippery witness and can but work to the destruction of his value as a witness.

If he won't help you by telling the truth, you place it beyond his power to harm you.

It is well that the subscribing witness himself should read the statement through before signing it. Or if this is impracticable, it is well to have the witness follow the statement through with his own eyes, as it is read to him by the investigator, before he signs it. This method, flanked by the signature of a disinterested party to that of the subscribing witness, very materially reduces the possibility of a witness afterwards claiming that he did not understand the meaning or intent of the paper which he was asked to sign.

Right here, we should again observe that, as in the case of the investigator, the possibilities for advantage to be thus gained with the written statement, in court, will depend directly upon the caliber of the attorney making use of it. While the practice of the courts of different states differs widely, it nevertheless will be found that wherever admissible the aggressive, fighting attorney will obtain gratifying results where the meek, over-cautious trial attorney will fail wretchedly. Nerve and determination are strong helps.

With stable, reliable evidence, an attorney is enabled to figure out the probable outcome of a case with far greater certainty than could possibly be done with the flimsy, wobbly evidence secured under the old method.

Preparation of the Investigation.

In considering the matter of the written, signed statement, it might be well at this point to dwell briefly upon the means to be furnished the investigator, for the securing of the statement. A little careful preparation in advance will doubtless greatly enhance the possibilities for success to be derived from this method of securing evidence. Careful thought may profitably be devoted to the form and style to be followed by the investigators in the taking of statements, as well as to the style or manner of book or paper in which or upon which the statement is to be written.

Blanks Used.

With the great majority of companies with which the writer is more or less familiar, it seems to have been the custom to give but little if any thought to this particular feature of the work. Some of them appear to have confined their efforts chiefly to the securing of the most inexpensive paper possible, whatever its form, style or adaptability for the work in hand. Others supply their investigators with blank forms of various styles, the majority of them being in sheet form similar in appearance to the paper used in their office correspondence. While this latter form answers the purpose fairly well when used in the taking of statements in the office, it nevertheless is inconvenient and unsatisfactory for the investigator to carry around with him in the daily course of business. It is not adapted for outside work.

Still other concerns supply books of various forms, styles and dimensions, the average being somewhat of the style commonly known as stenographic notebooks. These certainly are preferable to the former styles, as the investigator is able to carry them in his pocket, while the board covers afford him something solid upon which to write when he is forced to take statements under disadvantages.

The various leaves of these books, thus used in the tak-

ing of a statement, are detached, pinned together, the subscribing witness having affixed his signature at the bottom of the statement, on the last page, and the entire report is turned in to the office as the evidence of that particular witness.

Experience with various types of books of this sort has shown that they leave much to be desired. Several serious objections will readily occur to mind, but probably by far the most important of them is one which has repeatedly been advanced in the past, when statements of this character, covering several pages and with the signature upon the last page, have been introduced into court for the purpose of refuting the testimony of a witness who has seen fit to radically change his account of the accident—that is, the statement has been tampered with—that certain facts are set forth in the body of the statement, on the third and fourth pages, we will say, which facts were not there when the statement was originally read and signed by the witness in question and that he never made any such statement or statements as those objected to as being spurious, and which now appear as part of his statement, the last page of which bears his signature, which signature he recognizes as his own.

Here we have the written, signed statement of this witness, setting forth what we believe to be the real facts in the controversy. For some reason he has seen fit to reverse his story, and in spite of the signed statement, he gayly over-rides it, meanwhile casting a dark cloud of suspicion upon the methods employed by the company in the gathering of evidence.

The inference to be conveyed to the jury is, of course, to the effect that this unscrupulous corporation has deliberately substituted one or more leaves in the body of this statement and in the handwriting of the investigator who took the statement, said substituted leaves containing matter advantageous to its own interests, and which leaves were not originally a part of the statement when it was read and signed by the witness.

This bait, temptingly placed before the jury, generally appeals to them so strongly, that they hasten to swallow it, hook and all. Apparently, written, signed statements taken in this form are not worth the paper that they are written upon, if witnesses start to wriggle out of their facts.

The suggestion is advanced that this defect is readily overcome by having the witness sign his name at the bottom of each page of the statement. This would do away with the possibility of the claim of substituted leaves. Granted, but if you take very short statements, covering not over two or three pages at the most, and if your investigators secure detailed statements, you doubtless would encounter many witnesses who would draw the line at signing their name from six to ten times, on as many different pages.

Suggested Blank Form.

It is quite possible that a form of witness blank with which the writer has been experimenting for the past two years and which is designed primarily to checkmate the possibility of a claim of substitution of evidence in the body of a statement, may prove of interest, and possibly of assistance to others similarly engaged in claim and accident work.

In addition to doing away with the possibility of the claim of fraud in the statement of a witness, the blank itself affords a quick, convenient, uniform and permanent means of reducing to writing the evidence of witnesses to accidents.

Briefly, the blank may be described as follows: Dimensions, 28 inches in length by 5½ inches in width.

Material, white paper of good quality, with surface suitable for rapid work with a pen. No. 1 writing paper has given good satisfaction

The blank reproduced herewith, beginning just below

the printed form at the top, is ruled to the bottom of the sheet, upon one side, and spaced one-quarter inch. It is folded three times, beginning at a point 7 inches from the top, again 7 inches below the first fold, and so on down; not unlike the form used by some of the steam railroads in their 500-mile mileage books. If folded correctly, this gives a single sheet of paper, 28 inches in length, so folded as to present a blank form 7 by 5½ inches with the printed form upon the top or first page, ready for immediate use.

Thus, in taking a statement, the investigator has no leaves to turn, he simply keeps on writing on one side of a single sheet of paper and extending the paper as he needs it. The object in folding the paper as described is to put it into convenient form for the investigator to slip into his coat pocket when doing outside work.

Experience with the use of this blank has demonstrated, among other things, the following:

One sheet is generally sufficient for the detailed statement of the average witness.

The blank affords a convenient means for obtaining the entire statement of a witness, upon one side of a single sheet of paper, at the bottom of which appears the signa-

CONNECTICUT RAILWAY & LIGHTING CO.
STATEMENT OF ACCIDENT.

CASE No. _____

Name _____ Date _____

Address _____

Business Address: _____

Referring to accident of _____ 190____, I herewith
make the following voluntary statement:

Blank for Recording Accident Statements.

ture of the witness, which may in turn be witnessed by a disinterested party, and then flanked by the signature of the investigator.

Even very long statements rarely require over two sheets, thus requiring but two signatures on the part of the subscribing witness.

The occasional claim of fraud has become a memory of the past.

It affords opportunity for the oath and seal of the notary public to appear directly beneath and upon the same sheet of paper as the signature of the witness.

The blank is convenient in form to be carried by the investigator, and is equally adapted for office work.

The case number upon each statement practically prevents the possibility of evidence going astray from its proper case.

The addition of the business address furnishes a good clue in running down in after years witnesses on court cases of whom you may temporarily have lost track.

By running a line of perforation across the top of the blank, it is readily converted into book form of the interchangeable-leaf type, thus assisting investigators with the board cover as a writing surface, if so desired. It will doubtless be found, however, that eight or ten of these sheets will, of themselves, afford sufficient stiffness for writing, being of fairly good weight when thus taken together.

ASH-HANDLING BUSINESS OF THE BROOKLYN RAPID TRANSIT COMPANY.

That street railway companies are sometimes in a position to produce revenue by applying managerial sagacity to opportunities aside from those of carrying passengers is illustrated in the case of the Brooklyn Rapid Transit Com-

pany, which has an arrangement with the city authorities of Brooklyn for taking charge of the city ashes and street sweepings.

employment of additional men, all contributing to an increase in the cost of disposing of the city's refuse. In 1901 the American Railway Traffic Company was organized as a subsidiary corporation of the Brooklyn Rapid Transit Company, for the purpose of erecting convenient ash receiving stations and of disposing of the ashes and street sweepings received at these points at the price of 35 cents

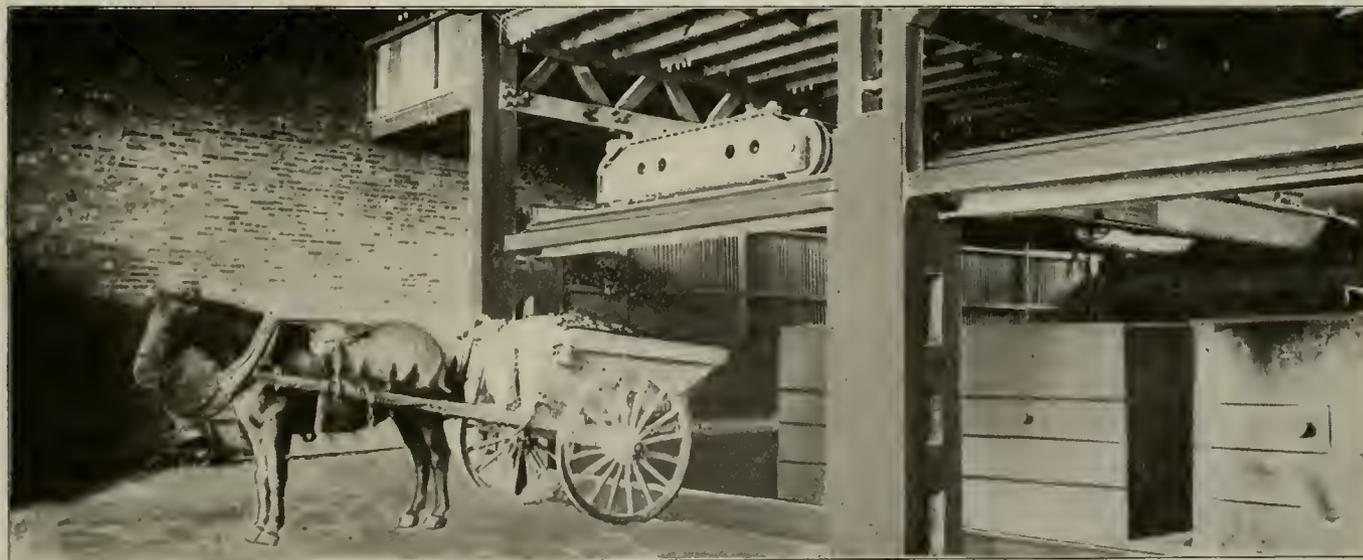


Ash-Handling by the Brooklyn Rapid Transit Company—General View of Receiving Station.

Formerly the city hauled its ashes to dump scows on the river front and to dumping grounds located from one to eight miles from the points of collection, paying in the latter cases from 10 to 15 cents a load for the privilege of dumping, in addition to the cost of the haul. The objection of the

per cubic yard. Thirteen temporary ash stations were built adjacent to surface lines, so located that the maximum dump cart haul should be one mile and the average haul about three-fourths of a mile. From these stations the ashes were conveyed in heavy steel buckets on flat cars to outlying marsh lands and there used as fill, the company receiving a consideration from the owners of these marsh lands.

This business assumed proportions that made it advis-



Ash-Handling by the Brooklyn Rapid Transit Company—Interior View of Receiving Station.

able to erect ash stations of more permanent construction and the company has this year rebuilt three of its stations, at a cost of about \$25,000 each. One is located at the corner of Ralph and Atlantic avenues, Brooklyn, one in Bergen street and the third in Herkimer street. Engravings from photographs of the first station are presented herewith. The

beach resorts to the scow dumping plan and the rapid filling of available dumping grounds within a reasonable distance from collection points, made it necessary for the city to begin to seek for more remote dumping places, which would have involved the maintenance of a large additional number of horses and carts, with the attendant risk of loss, and the

buildings are of simple but substantial construction, are practically fireproof and kept as clean as possible. The exterior is of pressed brick, the cabin without being assigned to the checker for the city street cleaning department. One door is for exit and the other for entrance for the carts, which back on the paved floor within and discharge into the heavy metal buckets. These buckets are then conveyed by electric traveling crane to the waiting flat cars which enter the structure through the low-level entrance at the right.

It is possible to handle 60 carts an hour in these stations and 45 carts have been handled under pressure in a half hour. Inasmuch as such a delivery of ashes is far beyond the necessities or facilities of the street cleaning department, the stations are probably adequate for all time. The flat cars used in this service carry four heavy steel buckets, each bucket having a capacity of five carts, of two cubic yards per cart. Each carload is therefore 40 cubic yards, representing an income of \$14 per load. The American Railway Traffic Company has 25 of these cars in service. This subsidiary company owns the ash stations and the flat cars and hires its own employes.

In the matter of power consumption, the burden is distributed widely over the surface lines and not more than 20 cars are receiving current at one time, five cars at least being always employed in receiving ashes or depositing them at the dumps. The company is now taking out an average of 125 carloads every 24 hours, the cars being operated as far as practicable at night. At the dumps the equipment for unloading consists of one crane and three A-frame derricks with booms.

PHILADELPHIA RAPID TRANSIT DIRECTORS APPROVE MERCHANTS' PLAN.

John B. Parsons, the president of the Philadelphia Rapid Transit Company, has sent a letter to Morris B. Clothier, the president of the Retail Merchants' Association, announcing that the plan submitted by that association for the solution of the traction problem will, with the exception of a few clauses, be unanimously recommended by the directors of the company to the stockholders for adoption. In his letter Mr. Parsons says:

"If your plan is adopted, it will prevent for all time any evils which may come from over-capitalization of franchises granted by the city, and if, in the development of these franchises, large profits accrue, the city will be an equal sharer after the investor has received a legal return for his money.

"Your plan will restore confidence and permit the raising of capital on fair terms for much needed improvements. A feature to which we have yielded acquiescence only after considerable doubt as to its fairness and feasibility is the sinking fund provision with respect to the \$30,000,000 of capital of the Rapid Transit company. We think the company is making a most liberal concession when it contracts to give up at the end of 50 years for actual cost franchises which it holds in perpetuity, and which, it believes, will then be worth many times the cost of the property.

"To add the condition that the company shall set aside, out of its own receipts, the money to provide for the purchase, seems to us unfair to both parties—to the Rapid Transit company in that it is deprived of its earnings, and to the citizens in that charges are placed on this generation for benefits to be enjoyed wholly by the next. Your suggestion that the sinking fund feature should be applied to all further issues of securities is, in our opinion, not feasible and will, we believe, defeat the most important object of your whole plan—the attraction of large amounts of capital. A sinking fund is a device for paying for all improvements and extensions out of the earnings, and if the burden thus placed upon the property is greater than it can stand, its securities will not be attractive and money cannot be raised on them.

"We fully believe that the growth of the city will require a very large expenditure of new capital and that to attempt to work out at this time the details of the manner of raising it might defeat the very end you have in view. We are content to leave this matter in the hands of the city for future adjustment as occasion may arise, agreeing on our

part to permit no new issues of securities or increase in the fixed charges without the express consent of the city."

Mr. Parsons has also sent a letter to Mahlon N. Kline, president of the Trades League, which submitted a plan in opposition to the merchants' plan. In this letter Mr. Parsons points out that the suggestions made by the Trades League are applicable not to the Rapid Transit company, but to the 50 or more underlying companies which make up the system. These companies, Mr. Parsons says, are not controlled by the Philadelphia Rapid Transit Company, "except as lessees and upon the payment of fixed rentals." He adds:

"They are owned by other stockholders, numbering all told 20,324, of whom 2,991 are trustees, executors and guardians. If you think that part of the plan which proposes the scaling of the values held by this large body of citizens is legal or feasible, you will have to address your demands to the companies affected. We, as a contracting party, are bound by our contract and neither wish nor have the power to evade our obligations.

"We cannot give away the property of our underlying companies because it does not belong to us, but with respect to our own property, we will agree to give the city the right to purchase it at cost at the end of 50 years, giving the city, in the meantime, one-half of the profits of operation after paying legal interest on our actual investment, and further providing out of the earnings a sinking fund sufficient to enable the city to pay the amount now invested in the property. In other words, we are giving to the city one-half of the profits for 50 years and the property itself at the end of that time.

"The granting of free transfers is not an improvement in the service, but a reduction in fare. The average rate of fare in Philadelphia has been steadily reduced. In 1876 it was 7 cents for a single fare and 9 cents for an exchange ticket. No such thing as a free transfer was known. In 1886 it was 6 cents for a single fare and 9 cents for an exchange ticket, with no free transfers. In 1896 it was 5 cents for a single fare and 8 cents for an exchange ticket, with no transfers. To-day the average fare received for each rider is 3.68 cents, and 12.81 per cent ride on free transfers. The average length of run of our cars to-day is over 6½ miles, so that the average rate of fare is only about ½ cent per mile.

"On the other side of the ledger, the wages paid platform men have risen as follows: 1886, 12 cents per hour; 1896, 16 2-3 cents per hour; and 1906, 21 cents per hour. Copper, rails, electrical machinery, labor and all materials and supplies have practically doubled in cost in the past 13 years, since the trolley lines were installed."

A plan which will embody the changes considered advisable will be drawn up by the company. Mr. Parsons advises that before it is too late some determination should be reached as to the advisability of action by the state legislature.

The Trades League has replied to the letter of Mr. Parsons. The league refuses to accept the suggestion of Mr. Parsons that its street railway committee confer with the merchants' association. As the league could not favor the merchants' plan its officers think such a conference would be a waste of time.

Electric Tramways in Japan.

The first electric tramway built in Japan was a line eight miles in length opened in Kyoto in 1895. Since then other cities have in succession constructed electric tramways as convenient means of communication for short distances, so that there are now 18 electric tramway companies, with an aggregate capital of nearly twenty million dollars, whose lines already opened total 130 miles, with 82 miles in addition under construction. Most of the railways, however, have been built recently, and do not yet report very profitable business. That the profits will be large, however, is clearly shown by the fact that the electric tramways of Tokyo already pay annual dividends of not less than 10 per cent.

The milk-handling business of the Aurora Elgin & Chicago Railway has increased from an average of 290 cans per day during January, 1906, to an average of 425 cans per day during the same month of this year.

WILL PRESENT FACTS TO LEGISLATURE.

Representatives of about sixty electric railway companies of Pennsylvania met at Philadelphia on February 15 and formed the Temporary Street Railway Association, the object of which is to present facts to the legislature in regard to proposed legislation affecting electric railways, particularly a bill to increase the tax rate on electric railway property and another authorizing electric railways to carry freight. Subcommittees have been appointed to consider the various bills. It is stated that such action is at the request of members of the legislature. W. E. Harrington, president of the Pottsville Union Traction Company and manager of the Eastern Pennsylvania Railways Company, who has been elected chairman of the association, outlined its purpose as follows:

"We propose to present facts to the legislature to demonstrate conclusively that much of the proposed legislation would not only be detrimental to the interests of the many electric roads in Pennsylvania, but would work hardship to the general public—especially the investing public—as well. The

increase the tax on capital stock from five to ten mills, being an increase of 100 per cent on that item, would also work an increase of from 18 to 20 per cent in taxation.

"As to the bill enabling local municipalities to impose tax on all real and personal property of electric railways located in such municipalities, the passage thereof would result in bankrupting a large portion of the electric railways in Pennsylvania. The annual gross earnings of the average interurban road equal about 14 per cent of the actual cost of building and equipping the same.

"Therefore, assuming that local municipalities could assess the property of railway companies at the cost value thereof and impose the average municipal tax, it can be not far from 1 per cent of such value, and in some instances as high as 1½ to 2 per cent. The result based on 1 per cent average tax rate would be the imposition of a tax on such railways equal to slightly over 7 per cent of the gross earnings."

A PLOW CAR FOR STREET SURFACING.

The novel plow car shown in the accompanying illustration was built in the shops of the Denver City Tramway Company. This car is found to save a large amount of hand labor when it is desired to make true or cut down the surface of a dirt street between or adjacent to car tracks. The essential parts consist of a row of cutting points which



Denver City Tramway Car for Street Surfacing

freight trolley bill should be passed by all means. This is the only state in the east which now prohibits the carrying of freight by this means, and it is high time that the interests of the shippers are looked after in Pennsylvania, as well as elsewhere."

Attorney Hampton L. Carson has been retained to examine the provisions of the bills and to assist in drafting substitutes for some of the provisions. A letter has been prepared and addressed to each member of the legislature giving some figures showing the proportion of taxes paid to earnings.

The letter reads:

"For the fiscal year ending June 30, 1905, as shown by the report of the Bureau of Railways, Department of Internal Affairs, 115 street railway companies reported to the bureau, of which only 23 paid dividends.

"The reports also show that the interest on funded and other debt for the same year amounted to \$3,100,582.

"Taxes amounted to \$1,670,648, while dividends paid were only \$705,798, the tax being a little more than one-half the interest charge and more than double the dividends paid.

"Eliminating the cities of the first class, we find that the tax paid by the remaining companies was more than 7½ per cent of the net earnings from operation before deducting taxes, interest and other capital charges, and was about one-half the dividends paid, this change in ratio to dividend being accounted for by the fact that the two operating companies in the cities of the first class paid no dividends during that year. The bill adding one mill to the tax on capital stock, loans and gross receipts being, in fact, an increase of 20 per cent on stock, 25 per cent on loans and 12½ per cent on gross earnings, would work an increase in taxation in the aggregate of from 18 to 20 per cent; the bill to

loosen the dirt in the street so that it can readily be shoveled and a smooth surface obtained for macadamizing.

As may be seen by reference to the engraving the plow points are supported by an iron framework hung between the trucks on the underside of an ordinary flat car. The floor structure of the car is reinforced by wooden trusses above the outside sills.

The frame holding the several plow points is pivoted so that when in operation the points may be adjusted with a lever, which is supported above the car floor. By varying the height of the lever the points are made to cut the surface of the street to any desired depth from 1 to 4 or 5 inches. The framework holding the plowing parts is also supported on transverse guides so that the points may be moved at right angles to the car, and thus dress the surface of the street on either side of the track or between the rails.

In operation the car is drawn by an ordinary motor-equipped work car. The plow car is loaded with scrap iron so that the points will take a firm hold in a solidly packed street surface.

It is stated that the Delaware & Hudson Company has undertaken the securing of accurate data on which to base a decision as to the advisability of electrifying its line between Wilkesbarre and Carbondale, Pa.

PIPING AND POWER STATION SYSTEMS.—XXX.

BY W. L. MORRIS, M. E.

The screen guides are made of cast iron with lugs to key them into the concrete. The screen frames are made of angle irons of heavy section. Such screens should be made of copper wire, not of brass, as brass wire will not stand the sharp bends necessary in screens of fine mesh. A much cheaper screen can be made of iron wire, but the life of such screens is so short that there is no economy in their use.

It will be seen from the illustration that there is a large settling chamber between the screen compartment and the mouth of the intake to permit sand, etc., to settle. It will also be noted that the height of the waterway is such that at low water there is a space of three feet between the surface of the water and the top of the intake. The floor space over the settling chamber is necessary for the cleaning of screens. Sufficient room has been left between the tiers of screens to permit dropping a brush or rake between them to remove leaves, etc., without removing the screen. The warm water discharge from the condenser is not shown in these illustrations. It consists of a line of 12-inch pipe extended to the intake and carried alongside of the intake waterway and outside of the screen-house, discharging through the bank retaining wall at about low-water level.

Spread footings were not required for this screen-house as the foundation rested on rock. Had the bottom been of sand, the bottom of the intake foundation would have been concrete of a considerably greater thickness and possibly reinforced with iron bars. In case of fine sand, which is liable to wash, the footing should be protected and anchored to avoid shifting in case of freshets or floating ice. Figure 251-(11-13) shows the projected footing loaded with heavy stone carefully piled around the screen-house. The footings should be projected in front as well as at the sides and placed sufficiently low that they can be loaded with stone. By finishing the banks and bottom of the intake in this manner much less difficulty will be experienced from sand, etc., being washed in.

If it is necessary to build the intake house near an old dock, filled-in banks or similar location where a firm bottom for foundations cannot be secured, it may be found advisable to use piles and build the top of the piles into the concrete as shown in Figure 252-(11-14). The concrete bottom should be put in at the same time as the walls and the

concrete around the piles, thus giving a footing over the entire surface as well as on the piles. To further increase the stability of this structure, the spread footings shown in Figure 251 may be used, but this necessitates more complicated forms for the concrete. The forms for Figure 252 can be placed in the water after the ground has been removed around the piles and the concrete built up without pumping the water out. The outside forms rest on the bottom and the inside forms are supported on the piles. Better concrete work can be made in this way than by pump-

ing the water from the center, thus causing it to wash through the fresh concrete.

In constructing intake waterways there should be no passage between the water supply and the screen chamber which is not easily accessible. This detail, however, is frequently neglected and in nearly every case without good reason. A water conduit from the center of the stream to the screen-box is shown by the full lines in Figure 253-(11-15). The waterway shown at A is very objectionable as it is sure to clog and cause trouble. If there is not a rapid flow at the intake then it is advisable to place the screen compartment and intake either at the point shown dotted in the center of the waterway with a runway leading to it or at the screen-box, and cut away the banks so that the water will flow directly into the screen compartment as shown in the illustration. If the source of supply is a stream which carries leaves and floating debris, the screen-house or box should not be set into the banks of the stream unless some provision is made to carry off the floating material. The most desirable location for the screen-house is to place it so that the front face is on the same line as the stream and not recessed in the bank, as ice and logs will then accumulate in the entrance space. Neither should the screen-house project into the stream unless it is well protected, as it is liable to be injured in times of flood by floating ice and logs.

Where cooling ponds are used for reducing the temperature of the condensing water, a screen-house such as that shown dotted in Figure 253-(11-15) would be suitable, as it would take water from the center of the pond where it is

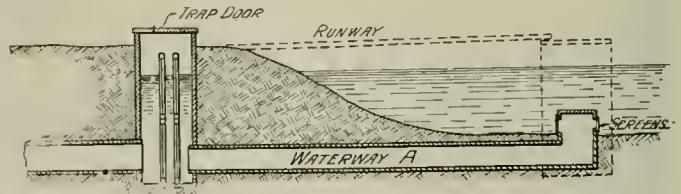


Figure 253-(11-15).

deepest and coolest. Little difficulty would be experienced from leaves, etc. Many installations such as this are operated without an intake crib or screen, the opening into the crib being located well below the surface of the water.

There are many suburban power stations being operated non-condensing that could be very readily operated with a cooling pond and condenser. Cooling ponds can ordinarily be constructed for about one dollar per boiler horsepower, not including waterways, etc. This would make the cost of a 1,000-horsepower engine plant using 15 pounds of steam per engine horsepower, about \$500, or 50 cents per engine horsepower in excess of that where a natural water supply is available.

Cooling towers are frequently used for this service, but these cost at least \$3.00 per engine horsepower, including the foundations, fan-drive, etc. Not only are they more expensive to install, but are much more expensive to operate, owing to the fact that the circulating water must be elevated to the top of the tower. This is usually about 30 feet, and the entire head is lost in dripping over the cooling surfaces. To this loss must be added the power required for driving the blast fans in those types which do not have a natural circulation of air. Cooling towers generally have less than one square foot of cooling surface per pound of steam, the average cooling surface being .7 square foot per horsepower. Cooling ponds should be as large as conditions will permit; not that smaller ponds would not be sufficient to maintain the desired vacuum, but because of the quantity of water which must be circulated if the temperature is high. As an increase in the amount of circulating water increases the amount of power lost, the money thus wasted would more

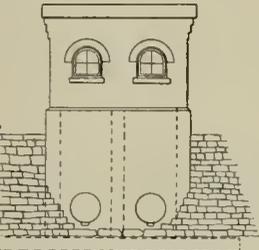


Figure 251-(11-13).

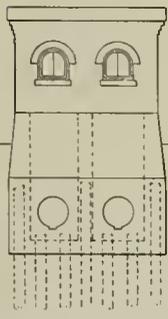
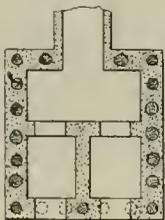


Figure 252-(11-14).

than equal the interest on the investment for a pond of larger dimensions.

This is illustrated by a central station which was condensing about 25,000 pounds of steam per hour and had a pond, the cooling surface of which was 35,000 square feet, or, 1.4 square feet of pond surface per pound of steam. The difference in temperature of the water entering and leaving the condenser was about 25 degrees, thus requiring about 40 pounds of circulating water per pound of steam condensed.

By increasing the cooling surface so that only 20 pounds of cooling water is required, there results a saving of not less than 1 per cent of the power which the engine delivers. If the plant runs 10 hours a day this will amount to 36.5 horsepower hours per year, per horsepower of the engine, representing a yearly saving of 36½ cents per horsepower, or 12 per cent interest on \$3.00 per engine horsepower invested. This would be sufficient to pay the interest on the cost of a pond having 7.8 square feet per horsepower of the engine capacity. That is, however, more than is generally required and five square feet of surface per pound of steam condensed is sufficient and there would be little gained by increasing the investment for a larger pond. If five square feet of cooling surface is provided per pound of steam, a plant having 1,000 horsepower using 15 pounds of steam per horsepower per hour would require a pond having an area of 75,000 square feet, or one about 312 feet in diameter.

There are very few cases of suburban plants where sufficient ground for a pond cannot be obtained, though it may be necessary to locate the pond a considerable distance from the plant.

The fact that a plant is at a considerable elevation above the water supply, whether it is stream or cooling pond, does

The most serious difficulty to be overcome in such installations is the construction of the intake, discharge and condenser well. This will, however, depend upon the condition of the soil and can probably be accomplished by placing the waterway in trenches until the depth becomes excessive and then tunnel the remainder of the distance to the well. The circulating pump and heater pump would be located entirely under water and would therefore not require

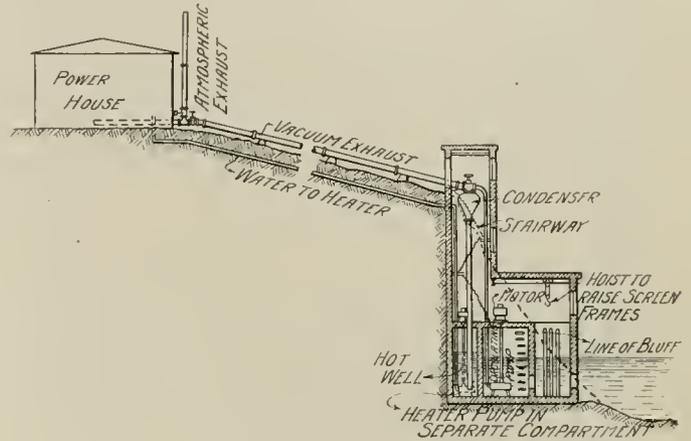


Figure 255-(11-17).

stuffing boxes where the shaft passes through the case. In fact the suction may be taken in the center through both the top and the bottom of the impeller case. The only parts requiring attention would be the shaft journals, and, as the shaft exerts such a slight pressure on the bearings and would generally be lubricated with grease, the care required would be insignificant. The motors would be placed above the engine-room floor, free from heat, vapor, etc., where they could readily be looked after by the operator.

In case the water supply is below a high steep bluff, the condenser shaft could be cut in the face of the bluff and the screen-house built in the cut as shown in Figure 255-(11-17). A rather long exhaust main would then be necessary, the only objection, however, being the increased cost of the line. The fact that the exhaust main would be exposed to the atmosphere would be an advantage as it then would aid in condensing the steam. The expansion and contraction could easily be cared for by allowing the condenser bowl to move freely with the pipe, the tail-pipe being sufficiently long, so that considerable travel, possibly a foot or more, could be taken care of. The water to the heater would, in this case, require being well insulated to prevent freezing. The condenser building and screen-house, etc., should be built of concrete throughout, the walls being about eight inches thick. A reinforced concrete roof and a metal stairway from the ground down to the screen and motor-floor level should be installed. The motors in this installation should each have a switch at the switchboard and each motor should have a separate wattmeter or ammeter so that any variations or unusual conditions can be detected from the power station.

At least once during each watch the engineer on duty should make a careful inspection of the motors, condenser, etc. This duty would in no way be a hardship upon the operator and with this amount of attention no trouble should arise because of the motors being out of his sight. There are many motors in daily use which may be only a few feet from the operator, but are so situated that they are entirely out of view for possibly a day or more at a time.

The wires from the station to the condenser tower should be carried in some form of insulated underground conduit, thereby avoiding any possibility of trouble from lightning. It will be noted that the power house shown in Figure 255 may be located at a considerable height above the condenser allowing the exhaust pipe to run down-hill to the condenser.

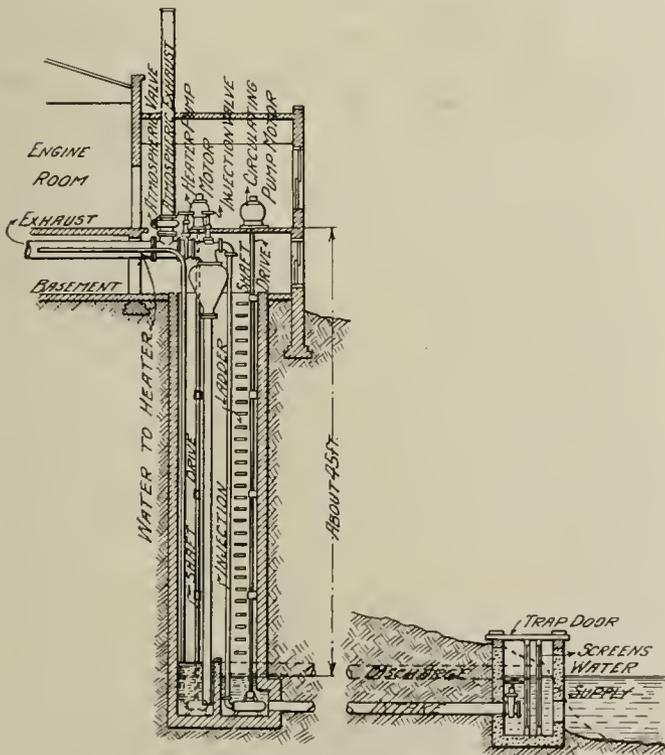


Figure 254-(11-16).

not prevent installing a condenser plant successfully. An elevated jet-condenser is admirably suited for such a layout as shown in Figure 254-(11-16). This is, in many respects, a more plausible arrangement than to run the exhaust up to the condenser bowl located at a higher elevation. The safest arrangement is to have the exhaust drain into the condenser as shown in Figure 254-(11-16), but the conditions are generally such that it cannot be so arranged.

This distance may be 100 feet or more in which case this is about the only simple and practical method of installing a condenser where the water lies so far below the power plant.

Another method, one which would be more complex, is to locate the jet condenser or surface condenser in the power house in the usual manner and raise the water to the condenser. The fall of the water from the power house to the level of the source of supply may be utilized by means of a Pelton waterwheel or other similar device. The waterwheel, electric motor and a turbine pump for raising the injection water being all mounted on the same shaft, the motor would only have to supply the power necessary to overcome the friction in the pipes, loss of head in the condenser and the loss due to the inefficiency of the pump and water motor. Instead of running the exhaust and heater supply pipes from the power station to the condenser house, it would then be necessary to run the circulating water line from the source to the power house.

Whichever plan of supplying the water to the condenser is employed, the water used for condensing should not be raised to a high elevation and the available head thus created be allowed to waste. For instance, a surface condenser may be placed, say, 32 feet above the surface of the water supply, and if all the joints are water tight no loss will be occasioned by raising the water to this elevation and allowing the discharge to fall from this height, provided that the entire section of the pipe from the pump back to the discharge is airtight. The power required to raise water above 32 feet would be lost or wasted in this case, as the limit of height of a water column that the atmosphere will support is 32 feet. To utilize any additional head, some device such as a Pelton wheel or turbine waterwheel would be necessary, as previously described.

The most efficient method of supplying circulating water would be to run the exhaust down to the condenser rather than to raise water more than 32 feet to a surface condenser, or any amount whatever to a jet condenser. The most economical location for a jet condenser of the elevated type is with the overflow as little as possible above the surface of the water supply as it will enable the condenser to discharge its water. This condition is ordinarily obtained by locating the overflow from the condenser at extreme high-water level, allowing the water in the hot-well to raise a foot or so during short intervals.

(To be Continued.)

Welfare Work of the Brooklyn Rapid Transit Company.

An interesting experiment in the Brooklyn Rapid Transit Company welfare work among its employes at the large operating points is about to be inaugurated at East New York, where the company is building an employes' restaurant, to be run by the Employes' Benefit Association on a profit-sharing basis. The restaurant adjoins the clubhouse on Jamaica avenue, and its dining-room, adjacent to the lounging room of the clubhouse, will be pleasant and sunny. The modern kitchen is within easy access. The place will be open night and day and will be run upon strictly temperance lines, though smoking will be permitted.

The success of the Brooklyn Rapid Transit Company in providing for its employes in this way has been so pronounced as to incur the criticism of keepers of saloons that formerly were frequented by hundreds of the company's employes and the railroad officials are well satisfied with the result. The company began its work of combating the tendency of the men to visit the saloons and dance halls by establishing a sandwich and coffee stand in a small building at Culver terminal. This has developed into a place where men can avail themselves of a varied menu at reasonable prices, and the restaurant at East New York will be founded on the experience at Culver Beach. The profit idea is absolutely eliminated, and the food is better and more reasonable than can be had at the public restaurant. Several of the Brooklyn Rapid Transit's newest car barns have been designed with provision for luncheon facilities for the men, and if the idea proves successful at East New York it will undoubtedly be rapidly extended to other terminals.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B.

DEFECTIVELY FASTENED GRAB-IRON ON TOP OF CAR.

McIsaac v. South Jersey Gas Electric & Traction Co. (N. J. Sup.), 64 Atl. Rep. 976. Nov. 14, 1906.

Where it appeared, on the plaintiff's proofs, that the grab-iron upon the top of a trolley car, which the plaintiff, a line or repair man, was required to use, was faultily constructed, in that the screws which held it were too small; and that it was also defective, in that wood into which it was fastened was rotten, the supreme court of New Jersey holds that the court could not nonsuit the plaintiff.

OBLIGATIONS OF ORIGINAL STATUTE APPLY TO EXTENSION AUTHORIZED BY AMENDMENT—DUTY TO KEEP SPACE INSIDE AND OUTSIDE OF RAILS IN GOOD ORDER AND REPAIR MAY REQUIRE LAYING GRANITE BLOCK PAVEMENT.

Mayor, etc., of City of New York v. Harlem Bridge Morrisania & Fordham Railway Co. (N. Y.), 78 N. E. Rep. 1072. November 13, 1906.

As the amendatory statute which permitted the defendant to construct its tracks in a certain street contained no provision on the subject of repairs or repaving it was argued that it was exempt as to such extension from the obligations contained in the provisions of the original act upon that subject. But the court of appeals of New York does not agree with this contention. It thinks it very clear that when the defendant was authorized to construct the extension by an amendment of a section of the original act such extension was subject to the obligations contained in such original act.

Subsequently the municipal authorities entered into a contract for the paving of the street with granite block pavement, the street having had no complete or actual pavement, but being substantially a dirt road. The court holds that, under the circumstances, the original statute referred to requiring the company to keep the space inside and outside its rails "in good and proper order and repair," it could be required by the city to lay a granite block pavement.

The question of what shall constitute keeping a pavement in the tracks of a railroad company in good order and repair, the court says, is to be determined somewhat at least by reference to existing and surrounding conditions, and in the court's judgment it would be altogether too narrow a view to hold that where a municipality had for sufficient reason decided to pave a street with asphalt or other new pavement a railroad might discharge its obligations to keep its part of the street in good order and repair by merely patching up a dirt road or some species of pavement which had become antiquated and out of condition and which was entirely different from that adopted in the remainder of the street.

ADMISSIBILITY IN CASE OF COLLISION WITH HOSE WAGON OF ORDINANCES GIVING SUCH WAGONS AND CARS RESPECTIVELY RIGHT OF WAY.

McBride v. Des Moines City Railway Co. (Ia.), 109 N. W. Rep. 618. Nov. 13, 1906.

This action was to recover for the death of a fireman caused by the collision of a hose wagon with an electric car. Sections of two city ordinances were offered in evidence; one, giving fire engines, hose carriages, etc., the right of way while going to fires; the other, giving the defendant's cars the right of way over teams or vehicles in the street. The supreme court of Iowa holds that the first was properly admitted in evidence as bearing on the question of the duty of the motorman to assume that the hose wagon would not be stopped for the purpose of allowing the car to pass by in front of it, but that, on the other hand, the driver of the hose wagon would proceed on the theory that he had the

prior right at the crossing. While the ordinance did not require a higher degree of care on the part of the motor-man with reference to the fireman on the hose wagon than with reference to any other person, it would charge the motor-man with knowledge of a fact very material in determining whether he exercised the care required under the circumstances. But the section of the ordinance relating to the operation of the defendant's cars and giving them the right of way as to teams or vehicles on the street was properly rejected, because it had no application to the case of a hose wagon belonging to the fire department. The fire department ordinance was later in enactment than the street car ordinance, and its provisions would control as to the specific subject matter referred to therein. Besides, the specific provisions of the ordinance as to the engines and carriages of the fire department constituted exceptions to the general provisions relating to teams and vehicles, as the provisions of a statute or ordinance as to a specific subject matter will prevail over general provisions which, but for the specific provision on the same subject, would have covered the subject matter of the latter.

LIABILITY FOR INJURY TO PASSENGER EXTENDING ARM OUT OF WINDOW OF ELECTRIC CAR—RUNNING CARS ON TRACKS CLOSE TOGETHER—CONTRIBUTORY NEGLIGENCE.

Interurban Railway & Terminal Co. et al. v. Hancock (Ohio), 78 N. E. Rep. 964. October 16, 1906.

Smith v. St. Louis Transit Co. (Mo. App.) 97 S. W. Rep. 215. May 22, 1906. Rehearing denied October 2, 1906.

In the Ohio case the supreme court of Ohio asks whether, assuming that the rule respecting the conduct of a passenger on a steam car is to forbid his extending his arm out of the car window without himself assuming the risk of injury, there should be a different rule applied to a passenger on an interurban electric car. It is of opinion that there should not be. It says that as such cars are now operated throughout the country they run at a rapid rate. Their construction ordinarily, if not necessarily, involves the maintenance near the tracks of poles and barriers of various kinds. Cars running in opposite directions, as well on switches as where there is a double track, are often necessarily run near together. There is, perhaps, more necessity for locating tracks near together inside of municipalities than in the open country, and upon narrow streets it often happens that the company is required to lay the rails at less distance apart than they would prefer to place them, because of crowded conditions and the requirements of the municipal authorities. To say that, as a rule of law, a passenger on such a car may be heedlessly negligent, exposing his person to needless danger, and visit the consequences on the interurban company upon showing negligence on its part, appears to this court to be without reason. Nor is it supported by authority. On the contrary, the generally recognized rule is that the passenger cannot cast upon the carrier responsibility for an event which, except for his own contributing negligence, would not have happened.

The supreme court of Ohio further holds that, in an action against an interurban electric railway company for injury to a passenger by reason of his arm being struck by a car passing upon an adjoining track, it was not error for the court to instruct the jury that if they found that there were four iron bars extending horizontally across the window of the car, equally distant from each other, the top one approximately 12 inches from the window sill, and that the plaintiff while sitting in the car permitted his arm, or any part thereof, to extend or project out beyond or over the rods, and that said act directly contributed to the accident, the plaintiff would be guilty of contributory negligence and could not recover damages.

But in the Missouri case the St. Louis court of appeals holds that if the space between the defendant's tracks was

so narrow as to allow its cars to rub or bump together when passing each other, as the plaintiff's evidence showed they did, the presumption was that the tracks were negligently constructed and maintained, and the jury would be authorized to find the defendant guilty of negligence in operating cars over said tracks. The question of whether or not the plaintiff was guilty of contributory negligence was for the jury to determine, under all the facts and circumstances in evidence.

CAR AND CONTROLLER EXACTLY LIKE ONES IN QUESTION MAY BE INSPECTED BY JURY—RULE FORBIDDING PASSENGERS STANDING ON FRONT PLATFORM IS REASONABLE AND ONE MAY BE EJECTED FOR VIOLATING IT EVEN IF HE CANNOT GET A SEAT—PASSENGER HAS NO RIGHT TO RIDE ON ANY PARTICULAR CAR WHEN SEVERAL OFFER SAME ACCOMMODATIONS.

Dobbins v. Little Rock Railway & Electric Co. (Ark.), 95 S. W. Rep. 794. May 14, 1906.

This was an action for an alleged wrongful ejection from an electric car. One of the questions involved was as to whether or not a moving of the controller by the plaintiff was accidental, as claimed by him, or intentional, as claimed by the defendant. The supreme court of Arkansas holds that there was no error in permitting the inspection of a car and the controller thereon by the jury, the testimony showing that all the controllers on the summer cars were "built exactly alike;" that the "controllers were the same—the same mechanism." It says that the court adopted the best method of giving the jury an idea of the working of the controller. It would not have been improper to have had the controller itself, or one "exactly like it," exhibited before the jury, and to have explained to them the effect of moving same. A fortiori (by a stronger reason) it was not improper to have such a controller examined on the car. This was practicable, and certainly gave the jury the clearest idea obtainable as to how the controller could be moved and the effect thereof on the movement of the car. It would the better enable the jury to determine a pertinent question in the case, namely, the one above stated.

The supreme court also approves, as a correct declaration of law, of an instruction containing the statement: "A regulation forbidding passengers to stand upon the front platform is a reasonable and proper one. It is the duty of a passenger who is standing on the platform to go inside the car when requested so to do by a person having charge of the car, and if there is standing room inside, although there are no vacant seats; and if a passenger refuses to comply with such request, when there is room inside the car which can conveniently be reached, the servants of the company may lawfully eject him from the car."

But if there were several of the defendant's cars standing at the station waiting to be loaded with passengers returning from a picnic, and while so waiting the plaintiff entered one of the cars, became involved in a controversy with the conductor thereof, then, without having paid fare on the car, voluntarily left it to go upon the street where the conductor was standing in order to maintain his contention, when the conductor informed him that he could not ride on his car, directing him to take passage on another car, the court holds that the plaintiff was not denied the right to ride upon the defendant's car, and was not, therefore, ejected therefrom. It says that where there is a train of cars for passengers, all of equal and sufficient accommodation, a passenger has no right to insist upon riding upon any particular car. The disposal of passengers upon the cars (conforming with statute as to separate races) must rest with the company, and, so long as its conduct in this respect is not arbitrary, capricious, unreasonable, and discriminatory, it incurs no liability to a passenger who refuses to conform to its requirements.

News of the Week

Legislation Affecting Electric Railways.

Kansas.—A bill introduced by Representative Gordon of Wyandotte provides that persons for whom seats in street cars cannot be found may ride for a 2-cent fare, and that cars must stop for passengers unless there is a car within two blocks going to the same destination.

Nebraska.—A bill to allow street railway companies to acquire and own interurban railways has been recommended by the senate in committee of the whole. A bill has been introduced to prohibit street or other railways to own interurban railways.

New York.—A bill has been introduced in the state legislature providing for the abolition of grade crossings of railroads and electric railroads. A bill introduced by Assemblyman Frisbie of Schenectady authorizes the governor to appoint as special police officers conductors and motormen on interurban roads.

Pennsylvania.—Several bills have been introduced in the legislature to increase the tax rate on electric railway capital stock and physical property.

Texas.—The house committee on private corporations has reported favorably a senate bill giving to interurban railways the right of eminent domain.

General Harries on 3-Cent Fares.

At a hearing on February 13 before the district committee of the national house of representatives on the bill introduced by Representative Madden of Illinois providing for lower street-car fares and universal transfers in the District of Columbia, Gen. George H. Harries, president of the Washington Railway & Electric Company, made the following statements:

"These bills providing cheaper fares and universal transfers are objectionable from every standpoint. That is, with the exception of the standpoint of the man who wants something for nothing. The street car companies of this city have done more in the way of giving transfers than those of any other city in the country. Indeed, the suggestion of universal transfers is absolutely new, for there never has been a case where one company was compelled to carry passengers of another company free. That the transfers would be reciprocal does not disturb the fact that passengers would have to be carried cheaper by both of the companies exchanging transfers. I am satisfied that the courts would not uphold any law providing for reciprocal transfers, if passed."

Discussing the cost of construction, General Harries said that the overhead trolley system costs \$45,000 per mile, including equipment, while the average cost of construction and equipment of the underground system used in the district is \$132,000. He argued that the companies would not be able to carry passengers for less than the present fare.

"A 3-cent fare," he said, "means a 3-cent service, with 3-cent cars and 3-cent employees. The committee might as well face that proposition right now."

Chicago Traction Developments.

The plans for the reorganization of the Chicago Union Traction Company and its subsidiary companies and their absorption by the new Chicago Railways Company are being formulated. The reorganization will be subject to the acceptance and approval by voters of the ordinance. According to the terms of the ordinance, the reorganization plan must be approved by P. S. Grosscup, judge of the United States circuit court at Chicago, and Professor John C. Gray of Harvard University.

A campaign which will be thorough will be undertaken to secure a favorable vote on the Chicago railways and the Chicago City railway ordinances at the April election.

A joint committee which has been formed representing the Chicago Commercial Association and the Chicago Real Estate Board has called a meeting of representatives of the principal clubs and labor organizations in the city for February 26, when a central non-partisan citizens' committee will be formed "to conduct a campaign of education as to what these ordinances mean to the welfare and prosperity of the public, hoping thereby to secure their adoption by the people."

Owing to the traction issue and to the fact that the mayor who is to be elected will be chosen for four years instead of two years, as in former elections, the approaching campaign will be a vigorous one. Fred A. Busse, the postmaster at Chicago, will probably be the Republican candidate for mayor. The republican platform will urge that the traction ordinances be approved.

The board of election commissioners has decided to reject the emergency referendum petition, which contained three clauses—one providing for a vote on the question of accepting the ordinances, the other providing for rejection of the ordinances and immediate municipal ownership, and the third for repeal of the Sunday blue law of 1845. In announcing their decision the election commissioners made the following statement:

"The objection which has been raised to this petition—that of its validity because it contains more than one question of public policy—never before has been argued before this board. From a careful reading of the statute relating to questions of public policy we find nothing that warrants more than one question being upon one and the same petition, but we do find some things that lead us to believe the intention of the legislature was that only one question should be contained in a single petition."

The result of this decision is that voters will have placed be-

fore them the one issue of acceptance or rejection of the ordinances which was embodied in the public policy petition. The legality of that petition has not been questioned before the board of election commissioners.

Mr. Shonts on New York Rapid Transit.

Mr. Theodore P. Shonts, who on March 4 next will assume his duties as president of the Interborough-Metropolitan Company, of New York, in an address before the Iowa Society of New York on February 15, said concerning the plans of that company:

"Two problems now confront us. The first, and the one pressing for immediate solution, is to devise ways and means, even though necessarily of a temporary character, which will give relief from the aggravations of the existing congestion. To this problem we will give our instant and best attention.

"The second, and the broader one, is to prepare plans looking to the future comprehensive enough to provide adequate facilities for the next 50 years of the city's growth, and on a scale liberal enough to give it better transportation than is furnished the people of any other city in the world.

"This plan should safeguard the rights of the traveling public, the rights of the city, and the rights of the stockholders of the transit companies. My own idea is that the people and the shareholders should be partners in the benefit to be derived from the execution of such a plan.

"I am convinced that the construction and operation of a transportation system along the lines herein indicated will effect a better understanding between the people who pay the fares, the governmental authorities, and the shareholders—the three parties primarily interested in the best solution of the problem before us.

"I hope within a reasonable time to submit to the proper authorities for a full and fair and frank discussion a proposition drawn on the lines I have indicated, with the conviction that an agreement will be reached which will be satisfactory to the municipal authorities, to ourselves, and to every fair-minded and thoughtful citizen."

Wreck on the New York Central Electrified Line.

On February 16 the White Plains and Brewster express on the New York and Harlem division of the New York Central, over which trains have been operated regularly by electricity since February 13, was wrecked at 6:40 p. m. as a result of the train leaving the rail on a curve of three degrees and five minutes at Two Hundred and Fifth street. The coaches were dragged on the road-bed until they toppled over on their sides. The loss of life was great, the persons killed now numbering 21 and the injured 153. A coroner's jury began its hearings on February 19 and the state railroad commission has made an investigation. From the evidence in hand it appears that the train consisted of five of the company's wooden coaches, drawn by two 96-ton electric locomotives, operated by multiple-unit control from the forward cab. The train left the Grand Central station on schedule time at 6:13 p. m. and was due to arrive at North White Plains at 7:02, a distance of 23.99 miles, in 49 minutes.

The electric power is used from the Grand Central station to Wakefield, 15.56 miles, the schedule time being 27 minutes. The schedule of the train was the same as that under which the trains have been operated by steam on this division since November 25 last. The train in question was six minutes late at Mott Haven Junction, on account of the movement of other trains at that point. Between Mott Haven and the scene of the wreck on the curve beyond the Bronx Park are two towers from which reports are made, one at Melrose and one at Bronx Park. These stations are 2.98 miles apart and the schedule speed for this distance is three minutes, or about 57 miles per hour. It developed that the engines are not equipped with any speed-recording device, and that although the motorman had a watch, he had not consulted it at any time during the run. The speed records therefore depend upon the reports of the operators at Melrose and Bronx Park, but it was explained by Ira A. McCormick, general superintendent electrical division, that because the operators do not take account of any time less than a minute, the speed could not be accurately determined; he stated that the train was due to arrive at the Bronx Park station at 6:38, but he could not tell exactly when it did arrive there.

The scene of the wreck was between Fordham and Williams Bridge, which are 1.63 miles apart, the schedule time being two minutes. The Bronx Park station lies between Fordham and Williams Bridge, and at Bronx Park there is a crossing of tracks, making it necessary for motormen to shut off power and slow down. It was shown, therefore, that the maintenance of the regular schedule might require a greater speed than shown in the schedule between Bronx Park station and Williams Bridge in order to overcome the delay at the Bronx track crossing. In the opinion of F. E. Williamson, assistant superintendent of the Harlem division, who it happened was riding in the cab with E. R. Rogers, the motorman, scheduled speed was not being maintained prior to the disaster.

As the train was passing under the north end of Woodlawn bridge the motorman felt a jar or jerk, which seemed to come from one of the coaches, but it was not sufficient to cause him to shut off the power. A moment later he saw a bright flash of light and then shut off the power quickly and applied the brakes. He then knew that the train had left the rails.

From an examination of the track made by R. S. Bailliet, engineer maintenance of way of the Harlem division, it appeared that the pressure on the outer rail displaced a section of the rail, at a point just above Woodlawn Bridge. This was five inches out of place on the northern end and about one inch out of line on the southern end. On the west side of the outer rail all the spikes but one were sheared off clean. The rail on this division

is 100-pound section and the elevation of the outer rail at this curve is $4\frac{1}{4}$ inches.

As to the use of two locomotives it was explained that on the right side of one of the locomotives assigned to that run two of the four underrunning contact shoes were broken. Another engine had two contact shoes missing on the opposite side and it was decided to work the two engines together under multiple-unit control, it being necessary to have shoes on both sides to obtain contact at switches, where the third rail is on the side of the track opposite that on which most of the third rail is installed. After the accident it appeared that all of the shoes on the right side of the first engine were torn off and one of the rear two on the left side was also torn off. On the second engine all the shoes on both sides were torn off.

When the accident occurred a break in the third rail caused the current to be shut off from the section and no serious fire broke out. Immediately after the accident the motorman sent his helper ahead with a flag while he ran to a telephone and notified the power house, so that the entire current was shut off shortly after the disaster. From the examination of the two locomotives the state railroad commissioners concluded that these left the track first and that the cars followed, and not that the last car left the track and pulled the others after it, as was at first reported. It was found that on the forward engine both wheels of the rear truck were on the track and that on the second engine the wheels of the fore truck were on the track and all the other wheels were off. An examination of the five cars by the commission showed that they were not nearly so much damaged as the result of the wreck in loss of life would appear to indicate. Only two of them were in extremely bad condition, having their seats twisted and demolished and their windows broken, but even these were not crushed so that they cannot be quite readily repaired. The other cars were in a better condition. One of them had only two windows broken and the seats in two of them were not disarranged.

Rapid Transit Affairs in New York.

Because of objections by the Interborough Company to some of the clauses in the form of contract which has been drawn for the new Lexington avenue subway the rapid transit commission was unable at its meeting on Thursday, February 14, to adopt the contract and specifications. The commission postponed action for a week. One of the objections was to the clause permitting the commission to order changes to be made in the rolling stock and to supervise generally the operating of the trains in the new subway. It was asserted that this provision would really give the right to the city to operate the tunnel without regard to any rights of the lessee, and it was suggested that it should be left to the courts to decide if changes ordered by the commission were reasonable or not. Another suggestion was that the contractor should pay rental only for the parts of the tunnel actually under operation. George L. Rives, counsel for the commission, advised that, instead of allowing the contractor to pay a rental on a basis of trackage in operation, pending the final completion of the subway, the contractor should pay rental on the amounts of all bonds which had then been issued for the city. Corporation Counsel Ellison desired that the contract shall contain a stipulation that none but United States citizens shall be employed by the contractor and that preference shall be given to citizens of New York over those of other states in employing men.

Before taking up the new contract the board voted to disregard the protests of the Broadway and Fifth avenue merchants against building the Broadway section of the tunnel near the surface by the "cut and cover" method. The commission also decided to retain in the specifications the alternate route which permits a subway under Lexington avenue north of Forty-second street only, by means of a spur connecting this subway with the present tunnel at Forty-second street. At the hearing the previous week residents of Harlem and The Bronx urged the commission to eliminate the spur from its plans so that only bids for an independent subway running from the Harlem river to the Battery could be received.

The board granted permission to the Pennsylvania Railroad to build parts of its tunnels under Thirty-second and Thirty-third streets from Madison to Seventh avenues by means of the open excavation. The property owners have withdrawn objections to the opening of the streets.

The form of contract for the building of the subway loop to join the terminals of the Williamsburg and Brooklyn bridges has been drafted. A public hearing will be held upon it on February 28. It is provided that the loop must be finished within 21 months and the use of the "cut and cover" method is permitted.

The board granted a franchise to the New York Connecting Railroad, which is to connect the Pennsylvania and the New York New Haven & Hartford, for freight transfer purposes, crossing by a bridge over Hellgate. The contract permits the substitution of electricity for steam after three years.

E. P. Bryan, vice-president of the Rapid Transit Subway Construction Company, which built the present subway, has written to the commission an intimation that the company will shortly send in a bill amounting to approximately \$5,000,000 for extra work in connection with the subway contract. The principal items are for the ventilating system, conduits for wiring about six miles of additional track, and the lengthening of the station platforms.

Ontario Railway Board Orders Street Railroads to Use Fenders.—After an investigation and experiments by its representative experts, the Ontario railway board has ordered the street railroad in Toronto to equip all its cars with the Jenkins automatic fender,

which it asserts is the most satisfactory and reliable fender it has experimented with.

Ask for Lower Fares.—The Grand Rapids (Mich.) city council has passed a resolution requesting the Grand Rapids Railway Company to sell six tickets for a quarter; also seven tickets for a quarter to be used before 8 a. m. and between 5 and 6:30 p. m.

American Institute of Electrical Engineers in Its New Home.—The American Institute of Electrical Engineers, which has been located at 95 Liberty street, has moved to its new quarters in the new Engineers' building, at No. 33 West Twenty-ninth street, New York.

Southwestern Electrical & Gas Association.—President H. S. Cooper, Galveston, Tex., announces that the executive committee has decided to hold the next annual convention of the association at San Antonio, Tex., on May 14, 15 and 16. The details have not yet been arranged.

Cincinnati Cars Being Equipped with Vestibules.—The Cincinnati Traction Company is equipping its cars with an enclosed and heated vestibule for the comfort of the motormen, in compliance with a law for the violation of which several of the company's officials were recently indicted.

Petition for Reduced Fare.—State Senator Henry Lockney, of Waukesha, Wis., has filed with the Wisconsin railroad commission a petition for a lower fare from Milwaukee to Waukesha, on the cars of the Milwaukee Electric Railway & Light Company. The round-trip rate is now 50 cents.

Combination Reported.—A merger involving "all the traction lines in the eastern part of Indiana and the southwestern part of Ohio" is said to be under way. According to the report the promoters plan to include not only the traction companies in the large cities in the territory involved, but also the interurban lines.

Philadelphia Elevated Inspected by Invited Guests.—On February 17 a party of officials and invited guests inspected the terminals and track of the Market Street Elevated road. A motor train took the party over the entire road. Though the officials state the road is entirely ready for immediate operation, no definite date of opening to the public has been announced.

Low Fares in District of Columbia.—The national house of representatives on February 11 in committee of the whole approved by a vote of 80 to 55 an amendment requiring all street railways in the District of Columbia to issue eight tickets for 25 cents and to adopt a 4-cent cash fare. Subsequently when the committee had reported to the house, the amendment was defeated by a vote of 54 to 61. The subject was introduced by Representative James of Kentucky, who offered it as an amendment to a bill permitting the Baltimore & Washington Transit Company to enter the District. The entire matter was postponed for two weeks.

Device to Stop Runaway Cars.—The New Jersey & Hudson River Railway has adopted an unusual stopping device for the steep places on the Palisades along the Hudson. The cars descend the cliffs in a zigzag course at an average grade of 7 per cent. In the event of a car running away a siding track, with the switch point always in direct connection with the main track, serves to draw off the car. The rails of this siding are always buried in sand. The friction between the sand and the wheels, of course, brings the runaway at once to a stop. On each side of the switch rail is built a trough, which holds the sand. The rail is covered to a depth of $2\frac{1}{2}$ inches. Numerous tests have proved the efficiency of the apparatus. The device should be of value in saving property and lives.

Accountants' Association Question Box.—Elmer M. White, secretary of the American Street and Interurban Railway Accountants' Association, in the association circular No. 45 announces that the executive committee has decided to continue the "Question Box," believing that it can be made of very great service to the members, but has decided to try a different course from that previously used. The following is the plan adopted for this year:

- 1—All questions are to be edited before being submitted to the members.
- 2—All answers are to be edited before being printed and sent out to the members.
- 3—Only such questions and answers as are of general interest, or upon which additional information is desired, are to be taken up in the convention.

Transfers Good in Two Directions.—The appellate term of the supreme court of New York on February 13 by a vote of two to one decided, in a suit brought by P. C. Kelly against the New York City Railway that, after riding in one direction after payment of fare, a passenger is entitled to a transfer carrying him to his destination, even though it be on a car going in the opposite direction. Two of the justices held that the law requires the company to give a passenger a transfer, when he has paid five cents, from the place of embarkation to his destination, and that the company is not justified in refusing a transfer to a passenger desiring to continue his journey to the point of destination on a line not running in the same longitudinal direction. The prevailing opinion sustains the proposition that the law requires the company to furnish to a passenger a continuous trip between any two points for one fare. Kelly sued in the municipal court for \$50 damages and, when that court decided for the company, he appealed to the appellate term. On account of the dissenting opinion of Justice MacLean the company will be allowed to appeal to the court of appeals. In his dissenting opinion Justice MacLean says: "The phrase 'continuous trip' or 'continuous passage,' made familiar by all railroad tickets, not excursions, is too well

understood to be distorted into an endless journey, to and fro, around and around, the livelong day or night or both, as some might be fain to make out, because of having home housings too hot or too cold, or because of having no housings at all."

Western Railway Club.—A regular monthly meeting of this organization was held in the Auditorium Hotel on Tuesday evening, February 19, 1907. Mr. James Lyman, manager of the engineering department of the General Electric Company, presented an interesting paper on "The Anatomy of a Railway Motor and Control Equipment" which he illustrated by a number of experiments and numerous lantern slides. Some of the latter were of especial interest as they showed the progress which is being made on the work at the New York Central terminal. Some of the other slides presented showed views of the "G.E.-6000" locomotive on its trial trips, as well as sections and views taken in the shop during construction. This is the type of locomotive used by the New York Central.

Right to Handle Freight in Terre Haute.—The city of Terre Haute, Ind., has appealed from the decision of Judge Fortune rendered on February 8, 1907, in the case of the city against the Terre Haute Traction & Light Company, in which Judge Fortune found for the defendant company. The case arose because the traction company used Wabash avenue for the transportation of freight, which it is claimed by the city is against the provisions of the company's franchise. Judge Fortune's decision is based upon the fact that the traction company paid the city \$78,000 and also made improvements to the extent of \$500,000, and further a liberal consideration for its franchise, which permits it "to take, transfer and convey persons and property for hire and tolls." The court's opinion of these clauses is that freight may rightfully be considered property.

Surprise Tests on Lake Shore Electric Railway.—General Manager F. J. Stout of the Lake Shore Electric Railway has stated that surprise tests made on his road to ascertain if the train crews were observing rules in regard to crossings have shown remarkable faithfulness on the part of the men. Mr. Stout said: "Although similar tests have been made at other crossings on our line, a majority of the hundred and more secret tests that have been made by our officials during the past two years have been made at what is known as Elyria waterworks crossing, just west of Lorain, where a Nickel Plate switch crosses our main line. Although an engine crosses our track at this switch but once or twice a month, and a white light is displayed almost constantly there every night, not once have the officials been able to catch a car crew running across without first stopping and the conductor going ahead to see if the track is clear. Our rules concerning crossings are very strict, and we have yet to learn of any employe violating them."

Service Investigation in Milwaukee.—The Wisconsin railway commission has begun its investigation of the case of the city of Milwaukee against the Milwaukee Electric Railway & Light and the Milwaukee Light Heat & Traction companies. John I. Beggs, president and general manager of the company, has thus far been the only witness on the stand, his testimony touching on the complaints made regarding the Howell avenue line service. The examination of Mr. Beggs is being conducted by John Barnes of Rhinelander, chairman of the commission. It is the intention of the commission to take up the charges of overcrowding of cars, poor passenger service and the eventual reduction in the rates. Mr. Beggs also defended the companies in regard to the 7½-cent fare from Milwaukee to Wauwatosa, claiming that under the conditions of the franchises the companies could charge 10 cents, and only make the 7½-cent fare as an accommodation to commuters. The people have been asking the commission to compel the companies to make a straight 5-cent fare.

Committee on Interurban Accounts.—Secretary Elmer M. White of the American Street and Interurban Railway Accountants' Association, has issued a circular letter announcing the appointment by President C. L. S. Tingley of a committee supplemental to the committee on Standard Classifications of Accounts of the association. This committee, as previously announced by the Electric Railway Review, consists of the following members: William H. Forse, Jr., assistant treasurer Indiana Union Traction Company, Anderson, Ind. (Chairman); A. B. Bierck, auditor Long Island Electric Companies, 263 Fifth avenue, New York; A. C. Henry, auditor Lake Shore Railway Company, Norwalk, O. The purpose of the supplemental committee is to formulate a classification of accounts suitable for the use of interurban electric railways. The committee is desirous of securing an expression from each member and suggestions, gleaned from past experience, that will enable them to provide a classification which will meet the requirements of interurban construction and operation. To this end members of the association are requested to forward immediately to Mr. Forse replies, together with any criticisms or suggestions, to the following questions, with respect to construction as well as operating accounts:

Do you use the standard system of electric railway accounting approved by this association?

In what respect do you modify same, if at all?

Do you think it advisable to add new accounts and what ones do you recommend?

Do you recommend any change in the position of accounts under the general headings?

Do you use subsidiary accounts?

Have you made any use of the classification prescribed by the Interstate Commerce Commission for the use of steam railways?

What is your interurban mileage?

Construction News

FRANCHISES.

Cleveland, O.—Application for a franchise through Warren county has been made by the Cleveland & Sharon Electric Railway Company through its president, F. B. Morgan of Cleveland, and its attorney, F. C. Willard. It is stated that the right of way will follow practically the same route from Middlefield to Brookfield on the outskirts of Sharon, Pa., as was granted to the Cleveland & Sharon Traction Company five years ago. The road will be constructed on private right of way nine-tenths of the way and from Middlefield to Cleveland it is said an entirely new line will be built. Several bridges will be built; one over the Grand river in Bloomfield, a long trestle over the Mosquito Creek valley near Kenilworth and two bridges over the Pymatuning river at Kinsman and Orangeville. It is stated that the Eldenbel Construction Company of New York, which has the contract for the construction and equipment of the road, will increase its capital from \$2,500,000 to \$3,000,000 in order to care for the additional expense of erecting these bridges.

Columbus, Ind.—The city council has granted the Indianapolis Columbus & Southern Traction Company a franchise on Madison avenue for the extension to Seymour, Md., now under construction.

Defiance, O.—The bid of the Indiana Columbus & Eastern Traction Company for a franchise in Defiance has been submitted to the finance committee. The bid was accompanied by a \$5,000 check as a guarantee that the line will be built. It is stated that the work of electrifying the old Columbus & Lake Michigan steam road will be started early in the spring. The extension to Bellefontaine is now under way and it is stated that plans for a passenger station at Defiance are being considered.

Elyria, O.—The Cleveland & Southwestern Traction Company has applied for a 25-year franchise to lay additional tracks over the loop line east of the river and north of the Lake Shore & Michigan Southern Railroad; also for the extension of the existing franchises of the company to a period co-existent with the limit of the new franchise.

Los Angeles, Cal.—The city council has granted three franchises in connection with the proposed new subway: two to the Los Angeles-Pacific Railway Company for a double-track line and grade in Flower and Hill streets and Vermont avenue; the other to the Los Angeles Railway Company for an extension of its Mont Vista line to Eagle Rock.

Marion, Ind.—The Marion & Logansport Traction Company has received a franchise from the board of county commissioners for the operation of its line in Grant county.

Murphysboro, Ill.—The Southern Illinois Transit Company, which proposes to build an interurban line connecting Carbondale, Murphysboro, Carterville, Herrin, Johnson City and other points in southern Illinois, has been granted a 20-year franchise in Murphysboro. The company must begin construction within 90 days; must have the road completed from the courthouse to Carbondale within one year; at least \$5,000 must be spent on construction between Murphysboro and Carbondale by July 1, 1907.

Nicholasville, Ky.—The Central Kentucky Traction Company has been granted a franchise to build an interurban line from Lexington to Nicholasville. Construction work is to be begun within 18 months and the road completed within three years.

Norwalk, O.—The Cleveland & Indianapolis Interurban Railway, which proposes to build an electric line between Cleveland, O., and Indianapolis, Ind., has applied for a franchise on certain streets of the city through C. F. Jackson of Norwalk and J. Y. Todd of Toledo, O.

Prosser, Wash.—A franchise has been granted to the Prosser Traction Company to build 1½ miles of road northwest of Prosser to connect with the North Coast Railroad; also to the Columbia river on the south to connect with a road from Priest Rapids which will be built by the Hanford Irrigation Company.

Vina, Cal.—The Northern Electric Company, Chico, Cal., has applied for a franchise to build an electric line the entire length of Railroad avenue. The line will carry passengers, freight, mail and express and will parallel the Southern Pacific for a part of the way.

Vincennes, Ind.—An ordinance renewing the franchise of the Vincennes Washington & Eastern Traction Company has just been passed. The line will enter the city at the north end of Sixth street, south on Sixth to Hart, north on Hart to Second and south on Third to Willow street. The interurban portion of the road will be built from Vincennes eastward through Fritchton, Wheatland, Montgomery and Logoootee. It is stated that assurances have been given that the work of building the line will be started as early in the spring as weather will permit. W. H. Schott of Chicago is interested.

Waco, Tex.—A franchise has been granted to the Buckeye Transit Company to build an electric line from the city limits to City Hall square, two miles. This is part of an interurban line which will connect Waco, Morresville, Marlin and Temple, Tex., about 50 miles.

Winterset, Ia.—The Des Moines Winterset & Creston Electric Railway Company at a special election held for the purpose on February 12 was granted a franchise for the operation of its line

in Winterset. It is stated that the American Electric Railroad, which is projecting a line from Council Bluffs east through Winterset, will also ask for a franchise with the promise to begin construction work in the spring.

Weatherford, Tex.—Col. G. M. Bowie of this city, representing New York capitalists, has been granted a franchise for an electric line in Weatherford which must be completed and in operation by February 1, 1908.

RECENT INCORPORATIONS.

Corpus Christi Street Railway.—This company has been organized to build a street railway in Corpus Christi, from the Alta Vista to the San Antonio & Aransas Pass depot. Capital stock \$25,000. Directors: W. G. Blake, G. R. Scott, G. W. Grimm, A. E. Born and E. B. Cole.

Reading Afterthought & Northeastern Railway.—Incorporated in Iowa with a capital stock of \$150,000, with headquarters at Cedar Rapids. Incorporators, C. E. Henderson and others.

Seattle-Chelan-Spokane Railway.—Incorporated in Washington to build an electric railway. Capital stock, \$17,000,000. Trustees, Charles M. Meeker and G. L. Stevens, 50 Broadway, New York; Mark F. Mendenhall and John W. Fry, Spokane; P. P. Carroll, Francis M. Carroll, Charles & Barron, C. M. Cochran, Elliot Colburn, and E. Wright, Snohomish, Wash.; E. E. Congdon, Butte, Mont. Offices at Spokane, Snohomish and New York City.

Toledo & Columbus Railway.—This company, which was incorporated in 1905, has filed amended articles of incorporation with the secretary of state at Columbus for the purpose of building and operating a railroad with electricity or other motive power with terminals at Toledo and Columbus.

Toronto, Can.—The Toronto Elevated Railway Company, which proposes to build and operate elevated railways in and adjacent to Toronto, has applied for a charter. M. J. Adams, J. H. McKnight, S. R. Wickson and J. M. Sinclair, all of Toronto, are interested.

TRACK AND ROADWAY.

Boston Elevated Railway.—The Massachusetts railroad commission has authorized the route of the proposed extension of the Boston subway system from the Park street station to the Cambridge bridge over the Charles river. Beginning at the Park street station the subway is to pass under the northwest corner of the Common, under Beacon street, under a corner of the State House grounds, passing by the left of the State House and under Joy, Mt. Vernon, Pinckney, Myrtle, Revere, West Cedar and Grove streets at an angle.

Capital Circuit Traction Company.—This company, which intends to build a belt traction line around the city of Indianapolis, announces that the work of surveying has been completed and that work is now progressing satisfactorily on the profile maps. It further is announced that 50-year franchises have been obtained through five towns and the seven county seats through which the road is to operate—Noblesville, Lebanon, Danville, Martinsville, Franklin, Greenfield and Shelbyville.

Chicago & Milwaukee Electric Railway.—Plans have been submitted to and approved by the Milwaukee board of public works for the company's lines in Milwaukee, on Grove and Scott streets and First avenue, and it is stated that construction work will begin at an early date.

Chicago Lake Shore & South Bend Railway.—The Illinois Central Railroad is now building under the charter of the Kensington & Eastern Railway a line from Kensington, Ill., southeasterly to Hammond and Gary, Ind., which will connect at Hammond with the line of the Chicago Lake Shore & South Bend, now being built from South Bend, and on which 16 miles of track has been laid, from South Bend to New Carlisle. The Kensington & Eastern will be double track and the electric road will use one track from Hammond to Kensington. At the latter point five acres of land have been purchased for terminal purposes. J. B. Hanna of Cleveland is president.

Cleveland Alliance & Mahoning Valley Railway.—J. W. Holcomb, Cleveland, O., writes that this company proposes to build an electric railway from Cleveland to Ravenna and Alliance, O., with a branch from Ravenna to Warren, a total of 80 miles. Twenty miles of steam railroad track, from Ravenna to Newton Falls, has been purchased from the Baltimore & Ohio and will be electrified. David Morison, Cleveland, O. president; B. M. Friuk, Salem, O., chief engineer; F. E. Townsend treasurer; C. E. Morley, secretary. Headquarters, 310-11 Electric building, Cleveland, O.

Burley, Idaho.—The commissioners of Cassia county, Idaho, have granted a charter to W. D. Kenyon, Paul R. Kartzke, J. C. Rogers, I. G. Hale and T. B. Lee to build a line of railway from the south bank of the Snake river at Burley to Oakley, 25 miles. The cost of building and equipping the road is estimated at \$100,000 and the scheme is to be financed by Idaho capital.

Dallas Consolidated Electric Railway.—The double-tracking of the Haskell avenue line has been completed. Work is to start at once on the double-tracking of the South Belt line and others. E. T. Moore, general superintendent, Dallas, Tex.

Enid City Railway.—C. H. Bosler, president, Enid, Okla., writes that construction is now in progress on a city line for Enid, six miles long which is to be completed and in operation by

May 1, 1907. The overhead construction is of the span-wire type. Direct current will be used. Power is to be purchased. Construction is in progress on a car barn and repair shop to be erected complete by May 1. The construction is being done by the company under the direction of Mr. Bosler, who is also president of the Lebanon & Franklin Traction Company, Dayton, O., and of the Tulsa Street Railway, Tulsa, I. T. J. R. Yarbrough of Enid is chief engineer.

Ft. Wayne & South Bend Railway.—A contract has been let to the Indiana & Illinois Construction Company for the construction of this road from Ft. Wayne to South Bend, Ind., for which, it is stated, most of the right of way has been secured. The construction company, of which Gen. A. B. Nettleton of Chicago is president, was organized for the purpose of building this road. The road will be built on a private right of way, as far as possible, and it is intended to handle freight. G. A. Wulcup of Chicago, president.

Halifax & Suburban Electric Company.—A company has been organized in Halifax, N. S., with this title for the purpose of constructing an electric railway from Halifax through Rockingham, Bedford and Sackville to Waverley, N. S. The company, it is stated, has secured the charter of the Bedford Electric Company, which was incorporated by the Nova Scotia legislature in 1903, with power to construct an electric railway within the territory named. The promoter is H. E. Harding, of St. John, N. B., who is said to have interested United States capital in the project, and the Halifax directors of the company are G. E. Boak, ex-Mayor Kefe and W. Chisholm.

Helena & Butte Electric Railway.—It is stated that \$240,000 has been subscribed for the purpose of building an electric railway from Helena to Butte, Mont., and that a company will be incorporated under the above name in a few days.

Illinois Traction Company.—The work of surveying the line from Springfield to Jacksonville, Ill., which is to be built this year, has been commenced. A belt line around the city of Springfield is also being surveyed. It is stated that the construction work this year will be done by the company and not by contractors, as heretofore.

Indianapolis & Louisville Traction Company.—John E. Greeley of Jeffersonville, Ind., first vice-president, has announced that by July 1 cars may be run from Indianapolis, Ind., to Louisville, Ky. The Indianapolis Columbus & Southern Traction Company is completing the section between Columbus and Seymour. The Indianapolis & Louisville is building from Seymour to Sellersburg and has completed tracklaying from Seymour to Scottsburg. The Louisville & Southern Indiana Traction Company is completing the section between Sellersburg and Louisville. Mr. Greeley said that cars would be in operation between Indianapolis and Scottsburg by May 1. John C. C. Mayo, of Paintsville, Ky., is president.

Ithaca & Seneca Falls Interurban Railroad.—An official report from J. N. Hammond, secretary, Seneca Falls, N. Y., states that this company, recently incorporated, proposes to build an electric railway from Ithaca to Seneca Falls, N. Y., 43 miles, the route for which has been surveyed. Contracts are to be let for the entire construction and equipment. Jacob Rothschild, Ithaca, N. Y., is president; F. M. Bush of Ithaca is treasurer.

Kentucky Central Traction Railroad.—G. J. Lampton of Louisville, Ky., is promoting an electric railway from Bowling Green to Louisville, and it is stated that a company with the above title will be incorporated at an early date and the building of the first section, from Elizabethtown to West Point, commenced. As soon as this line is completed it is planned to build from Elizabethtown to Bowling Green.

Kokomo Marion & Western Traction Company.—It is reported that this company has decided to begin work at once on an extension from Kokomo, through Russiaville, Forest, Michigantown, Frankfort and Crawfordsville to Terre Haute, Ind. T. C. McReynolds, manager, Kokomo, Ind.

Lewiston & Southeastern Electric Railway.—Contracts have been let to Schofield & Co. of Philadelphia for building this company's proposed line from Lewiston, Idaho, south via Westlake to Grangeville, with a branch from Westlake east to Ilo and thence south to Nezperce, a total of 135 miles. Considerable grading has been done. W. P. Wood, chief engineer, Lewiston, Idaho.

Lynchburg Traction & Light Company.—We are officially advised that there is no foundation for the report that this company proposes to build an extension from Lynchburg, Va., to a connection with the Tidewater Railway at Claytor's Ford bridge, and that it is not at this time interested in any such project.

Mansfield Southern Traction Company.—Vice-President Thomas W. Latham of Cleveland stated recently that this company, which proposes to build from Mansfield to Mt. Vernon, O., has expended \$20,000 in surveys and securing right of way, and that construction will begin at an early date.

Mesaba Traction Company.—We are officially advised that this company proposes to build an electric railway from Biwabik to Hibbing, Minn., 40 miles via McKinley, Sparta, Eveleth, Virginia, Mt. Iron, Bull and Chisholm. Surveying is in progress from Mt. Iron to Hibbing 18 miles, with 10 miles, as far as Sparta, completed. Grading is to begin June 1, and contracts are to be let in April. F. B. Myers of Biwabik is president; T. McGilvray, Duluth, chief engineer.

Missoula, Mont.—It is reported that C. A. Jakways of Ovanda,

Mont., is promoting an electric railway from Great Falls to Missoula, via Lincoln, Ovanda and Bonner.

Mineral Wells, Tex.—Surveys have been made for a line from Mineral Wells to Lakewood Park, under the direction of Cicero Smith and E. E. Lisknue.

National City & Otay Railroad.—This company, which operates a steam road, is equipping about 10 miles of its line between San Diego and Chula Vista, Cal., for electrical operation. H. N. Savage, of National City, Cal., chief engineer.

Nauvoo, Ill.—C. W. Lucas is promoting an electric railway from Nauvoo to Carthage and Hamilton, Hancock county, Ill.

New York Auburn & Lansing Railroad.—The Auburn Construction Company of Auburn, N. Y., has completed the grading on this line from Auburn via Fleming, Scipio, Venice, Genoa and Lansing to Ithaca, N. Y., 35 miles. Track has been laid from Auburn to Genoa, 20 miles.

Northern Texas Traction Company.—The second survey for the route of the interurban railway between Ft. Worth and Cleburne, Tex., which is to be built by Stone & Webster of Boston, has been commenced and it is stated that construction work will begin in a short time. H. T. Edgar, manager, Ft. Worth, Tex.

Northwestern Elevated Railroad (Chicago).—The work on the Ravenswood extension is progressing so rapidly that it is stated the line should be ready for operation by May 1. All of the structural steel is in place, the four miles having been completed in a little more than a year. Rails have been laid from a junction with the main line at Clark street to the western terminus at Kimball avenue, northeast of Irving Park. The station walls are up and most of the buildings are roofed.

Omaha & Council Bluffs Street Railway.—It is reported that this company has ordered 1,300 tons of rails to be used in various extensions, including several city lines, a line to the School for the Deaf, and possibly a line from Plattsmouth to Ft. Crook. W. A. Smith, general manager, Omaha, Neb.

Omaha Lincoln & Beatrice Railway.—E. C. Hurd, chief engineer, Lincoln, Neb., writes that this company's line from Omaha to Lincoln, Neb., 56 miles, should be finished this year. It is now in operation between Lincoln and Bethany Heights, 6 miles. The route includes Papillion, Springfield, Ashland, Greenwood, Waverly, Bethany Heights, University Place and Lincoln. Grading is completed from South Omaha to Sarpy City, 3 miles, and grading on the remainder of the line will begin in March. Harvey Musser, of Akron, O., is president.

Richmond, Ind.—Local promoters of the proposed traction line between this city and Hamilton, O., say that plans have been sufficiently matured to begin active preparation for the work. Details in connection with the right of way will be taken up at once. A number of farmers already have conferred with the promoters in an effort to have the road pass near their homes. It is said that arrangements have been made whereby the road can gain entrance to Cincinnati through lines already in operation.

Roodhouse-Virden Railway.—C. W. Payne of Roodhouse, Ill., and H. C. Simon of Virden, Ill., will soon begin securing right of way for an electric line between these towns.

Sandy Valley Railway.—R. H. Phillips, manager and chief engineer, Washington, D. C., writes that this company's line will extend from Chevy Chase Lake, Md., the northern terminus of the line of the Capital Traction Company of Washington, D. C., to Ellicott City, Md., the western terminus of the line of the United Railways & Electric Company of Baltimore, Md. The route is 28 miles long and includes Kensington, Wheaton, Norbeck, Olney, Sandy Spring, Ashton, Highland and Clarksville. The Kensington Railway, which has a line in operation from Chevy Chase Lake to Kensington, 2½ miles, has been purchased. Preliminary surveys have been completed and the final survey has been made for three miles out of Kensington. Grading is to begin in April, and will be done by the company. The road will be built on a private right of way and 70-pound rails will be used. Charles F. Brooke, president, Sandy Spring, Md. Headquarters, 1140 H street, Washington, D. C.

Schuylkill Valley Traction Company.—It is reported that plans have been completed for the extension of this company's line from Ringing Rocks to Boyertown, Pa., via Gilbertsville, which will complete the line from Philadelphia to Reading. The work will include several steel bridges with concrete foundations. F. A. Lyson, chief engineer, Reading, Pa.

Shore Line Electric Railway.—This company, which has been organized in Connecticut with \$1,000,000 capital stock, proposes to build an electric railway from Stony Creek to Saybrook, Conn., along the shore of Long Island Sound, to Centerbrook and Ivorytown on the Connecticut river. It is stated that 70-pound rails and ties have been ordered and that a contract is to be let at once for the grading, so that work may be started at once at Ivorytown. Much of the right of way has been secured and some of the required franchises have been granted. The route includes, besides the towns mentioned, Sachem's Head, Guilford, East River, Madison, Clinton, Grove Beach, Westbrook and Essex. B. P. Learned of New London, Conn., president; Frank W. Allen, also of New London, treasurer.

Spokane & Big Bend Railway.—W. H. Plummer, president, Spokane, Wash., writes that this company proposes to build an electric line from Spokane to Crystal City, Wash., 70 miles, via Coulee

Center, Reardan, Davenport, Loraine and Egypt. Surveys have been completed and the right of way is being cleared between Spokane and Reardan. Grading is to begin in 90 days and contracts are to be let in 30 days. T. C. Austin, Spokane, chief engineer.

Spokane, Wash.—C. A. Barron, general superintendent, announces that the Seattle-Chelan-Spokane Company, incorporated for \$12,000,000; the Snohomish Valley Railway Company, \$2,500,000, and the Puyallup Valley Northern Rapid Transit Company, \$3,000,000, will build an electric road from Spokane to the Sound, 450 miles, to be completed in 1909. Contracts for part of the work have been awarded. Mr. Barron says the bonds for the Snohomish line have been sold.

Stroudsburg & Wind Gap Street Railway.—This company, composed of citizens of Bethlehem, Nazareth and Stroudsburg, Pa., proposes to build an electric road from Wind Gap to Saylorville, Pa., which will complete the connection between Philadelphia and Delaware Water Gap. A power plant will be built at Pen Argyl. J. B. Williams, Stroudsburg, president.

Toledo Railways & Light Company.—It is announced that this company has contracted for relaying eight miles of track on its lines in Toledo.

United Railways.—Plans have been completed for beginning work on the Front street line in Portland, Ore., and within a week it is promised construction will be started. L. B. Wickersham has been appointed chief engineer, and is now arranging the preliminaries. Men are at work curving rail and preparing other materials so that when work is started it will not be delayed by these operations. The plan of Chief Engineer Wickersham is to start full crews of men at work on both the north and south ends of the Front street line, at the terminal yards in North Portland and on Hood and Moody streets in South Portland. It is planned to lay 114-pound girder or grooved rail along the entire line within the city limits. The rail is seven inches high and is laid on a subgrade of concrete.

West Jersey & Seashore Railroad.—It is reported that this company, which recently electrified its line between Camden and Atlantic City, N. J., is clearing the right of way preparatory to constructing two additional tracks. The road is now double track.

Western New York & Pennsylvania Traction Company.—This company, which recently acquired the Bradford (Pa.) Electric Street Railway and the Olean (N. Y.) Street Railway, is said to be preparing to build a new electric line between Bradford, Pa., and Carrollton, N. Y., to connect at Carrollton with another line between Olean and Salamanca. It is announced that practically all of the right of way has been obtained. It is possible that a line will be built from Salamanca to Little Valley, Cattaraugus county, New York.

POWER HOUSES AND SUBSTATIONS.

Birmingham Railway Light & Power Company.—This company it is announced is about to enlarge its power plant on Powell avenue between Eighteenth and Nineteenth streets, Birmingham. The plans have been completed and the appropriation has been made for these additions. The plans call for an increase of 6,600 horsepower in the boiler plant, and the installation of one 2,000-kilowatt railway generator and a 750-kilowatt lighting generator of the General Electric Company's manufacture. M. A. Groover, Birmingham, chief engineer power station.

Elmira Water, Light & Railroad Company.—A 1,500-kilowatt Curtis turbine is to be installed for this company during the coming summer, at its power station at Elmira, N. Y., and provision is being made for the addition of another 1,500-kilowatt turbine to provide for the rapidly increasing business. To make room for the new machinery it is stated it will be necessary to dispose of about \$75,000 worth of machinery at a great sacrifice. George W. Reynolds, Elmira, N. Y., engineer power station.

Hattiesburg Street Railway.—It is stated that contracts will be let next month for building and equipping a power house for the proposed street railway system in Hattiesburg, Miss. H. A. Camp, president.

Huntsville Railway Light & Power Company.—It is reported that this company has decided to increase the capacity of its power plant at Huntsville, Ala., by the purchase of \$30,000 to \$40,000 worth of new equipment. Francis N. Lawton, Huntsville, general manager.

Portland Railway Light & Power Company.—It is stated that this company's new power plant at Cazadero, Ore., will be in operation some time this week. The equipment includes three turbines of 5,000 hp. capacity and the plant is designed for an ultimate capacity of 25,000 hp.

Roanoke Railway & Electric Company.—This company has announced that it will spend \$225,000 to erect a modern power house capable of supplying about 3,000 horsepower. The new plant is to be built on property which the company recently bought from the Norfolk & Western Railway Company. It is thought that the new plant will be of sufficient capacity to meet the demands of the lighting and power loads as well as furnish power for the street cars. In addition to the \$225,000 which the company is to spend on the power plant, it will also spend about \$18,000 on improvements to its street railway facilities. It is expected to have the plant in operation by midsummer.

Personal Mention

Mr. L. S. Kirker, who has been manager for the City & Elm Grove Railway Company of Wheeling, W. Va., for a number of years, has resigned.

Mr. E. L. Schmock has resigned as auditor of the Kokomo Marion & Western Traction Company, Kokomo, Ind., to become assistant secretary of the Cleveland Painesville & Eastern Railroad, with headquarters at Willoughby, O.

Mr. H. R. Goshorn has been appointed general claim agent of the Philadelphia Rapid Transit Company to succeed Mr. S. L. Rhoades, who resigned some time ago to become general supervisor of claims of the Casualty Company of America.

Mr. George H. Hoyle has resigned his position as chief engineer of the Berkshire Street Railway Company, Pittsfield, Mass., to engage in similar work in the eastern part of the state. Mr. Hoyle will be succeeded by Mr. H. B. Webber, of Boston.

Mr. J. W. Smith, formerly manager of the Electric Traction Company, of Philadelphia, Pa., has been appointed general manager of the City & Elm Grove Railroad, of Wheeling, W. Va., to succeed Mr. L. S. Kirker, resigned on account of ill health.

Mr. Walter W. Wheatly has resigned as president and general manager of the Mexico Electric Tramways, Limited of Mexico City, Mex. Mr. Wheatly was formerly connected with the Brooklyn Rapid Transit Company and the Public Service Corporation of New Jersey.

Mr. John Flood, who has served for 16 years as superintendent and assistant superintendent of the Steubenville (O.) Traction Company, has resigned to accept the superintendency of the Tri-State Traction Company, which operates a line from Steubenville to Wellsburg, W. Va.

Mr. Charles E. Thomas, for the past two years master mechanic of the Berkshire and Hoosac Valley Street Railway companies of Pittsfield and North Adams, Mass., has resigned his position, effective on February 16, to become superintendent of rolling stock for the New York City Railway Company.

Mr. Frank R. Henry, auditor United Railways Company of St. Louis, has been appointed editor of the question box of the Accountants' Association, and members should promptly send their questions to him. The secretary suggests that in writing questions care should be taken to make them full and clear, and if necessary, in order to do so, illustrate the question.

Mr. J. R. Curtis, formerly general superintendent of the Cleveland Painesville & Ashtabula Railroad Company, Geneva, O., has resigned to become superintendent of construction of the new Cleveland Alliance & Mahoning Valley Railway Company, which is building a road connecting Cleveland, Alliance, Warren and other points in the Mahoning valley.

Mr. J. H. Pardee has resigned as general manager of the Rochester & Eastern Rapid Railway, at Canandaigua, N. Y., to become manager of the railway operating department of J. G. White & Co., of New York. Since 1898 Mr. Pardee has been manager of the Rochester & Eastern, the Canandaigua Gas Light Company and the Ontario Light & Traction Company. Since last fall he has been secretary of the Street Railway Association of the State of New York.

Mr. A. G. Maish, formerly superintendent of the Des Moines City Railway Company, has been selected to fill the position of assistant general manager, an office recently created for the purpose of allowing the general manager, Mr. G. B. Hippee, to devote more of his time to the enlarging of the interurban properties. Mr. W. G. Owens, superintendent of way and structures, who has been associated with the company for the past 15 years, will succeed Mr. Maish as superintendent of the operating, maintenance and construction departments. Mr. Owen's successor has not as yet been named.

Mr. P. P. Crafts, for the past three years general manager of the Iowa & Illinois Railway, Clinton, Ia., has resigned his position to become, on April 1, general manager of the electric department of the Ft. Dodge Des Moines & Southern Railway, with headquarters at Des Moines. This is the new name for the old Newton & Northwestern steam road which is being electrified for interurban service. For six years, including his successful management of the Illinois & Iowa Railway, Mr. Crafts has been identified with the street railway systems of the middle west, a portion of that time having been spent at Saginaw, Mich., with the same interests that now control the Ft. Dodge Des Moines & Southern. Previous to this period he served in various managing and engineering positions with the Stone & Webster syndicate in Boston. He is also vice-president of the Iowa Street and Interurban Railway Association.

Mr. Ernest Gonzenbach, vice-president and general manager of the Sheboygan (Wis.) Light Power & Railway Company, has added to his duties those of general manager of the Greenshore (N. C.) Electric Company. The latter company operates a system of street railway lines and electric lighting, gas and city pumping plants in the thriving city of Greenshore, N. C. Mr. Gonzenbach is now the active manager of both properties and divides his time in accordance with the needs of the situations. Two years ago when he assumed the management of the Sheboygan Light Power & Railway Company there existed unusual political and operating

conditions opposing the best interests of the property. These conditions have since been radically changed and during the two years in which Mr. Gonzenbach has had charge of the Sheboygan property the gross receipts have increased about 25 per cent and the net receipts more than 100 per cent.

Mr. F. W. Brooks, assistant general manager of the Detroit United Railway, Detroit, Mich., has been appointed general manager, to succeed Mr. J. C. Hutchins, who has held the office of president and general manager and who will continue hereafter only as president. Mr. Brooks has been connected with the Illinois Central, Queen & Crescent and Texas Pacific railroads and has been connected with the Detroit street railways since 1895, when he became general manager of the Rapid Railway. When the Rapid Railway was taken over by the Detroit United Railway a few years ago he was appointed assistant general manager.

Mr. Albert H. Stanley, general manager of the street railway department of the Public Service Corporation of New Jersey, has tendered his resignation to accept the position of general manager of the United Underground Electric Railways Company of Lon-



Albert H. Stanley.

don, England, effective on April 1. The latter company is largely owned by American capital, the firm of Speyer & Co., New York, and the Old Colony Trust Company of Boston being large holders, and it is the belief of these interests that the London Underground Electric Railways properties will benefit largely from the experience of an executive who is thoroughly familiar with American street railway practice. The ability and record of Mr. Stanley make him an ideal official for this position. Mr. Stanley was born in Derby, England, and came to this country 27 years ago. He is 34 years of age. He started in street railway service 17 years ago as a clerk in one of the sub-offices or car stables of the Detroit United Railway Company, when it was a horse-car line. Mr. Stanley worked up through every department of the company and was placed in charge of the property as superintendent in January, 1901. He remained in this position until October 1, 1903, when he was invited to assume charge of the street railway department of the Public Service Corporation, as assistant general manager. Four months later, on February 1, 1904, he was made general superintendent of the railway department in charge of both operation and construction. It has been largely through the efforts of Mr. Stanley that the properties comprising the Public Service Corporation have been unified into the present effective system. The numerous lines have been brought into a harmonious system, subject to standard practices, and with definite standards of equipment, etc. Since 1903 the company has purchased 560 cars, has built shops having a capacity of 2,000 cars and has 150 cars under construction. Seventy-six miles of track and 23 miles of extensions have been built, giving the system a total mileage of 560 miles, which produces a revenue of \$10,000,000 yearly. In speaking of Mr. Stanley's resignation Mr. Thomas N. McCarter, president of the Public Service Corporation, said: "It is with the very greatest regret that the officials of Public Service have learned of Mr. Stanley's intention to leave us. He has put in here approximately three years and a half of indefatigable labor, and has been more than any other individual charged with the responsibility of the complete rehabilitation of the railway department of the Public Service, with results that are rapidly beginning to manifest themselves. He has earned the respect and admiration of us all. He leaves us to take up, if possible, even a more troublesome task, and takes with him our best wishes and affection. No one has been chosen yet to succeed him."

Pennsylvania Railroad and Electric Roads.

Regarding the bills introduced in the Pennsylvania legislature by Senator Campbell, which were mentioned in the Electric Railway Review of February 16, 1907, the Philadelphia Ledger says: "It was believed in this city, Harrisburg and Pittsburg, that the bills were in the interest of the Pennsylvania railroad or its allies. The movement seems to be following in a measure that of the New Haven road in New England and the Erie in New York state. Several men told why the Pennsylvania would be extremely anxious to have an amicable understanding with—or what would be better, a financial interest in—all the electric railways that stretch across the state. Two of the most important facts pointed out as bearing on the case are the immense amount of money borrowed by the Pennsylvania in the last few years and the appointment of a commission to go to Europe to study the use of motors in railway operation. The commission, which returned two weeks ago, will, it is understood, make a favorable report on the use of motors for suburban traffic."

Financial News

Baton Rouge (La.) Electric & Gas Company.—Control of this company has been purchased by Stone & Webster of Boston and the following new officers have been elected: C. D. Wyman, president; A. K. Todd, secretary; A. S. Pratt, treasurer; J. B. Leonard, assistant secretary and assistant treasurer. According to its last statement the company has outstanding \$80,000 capital stock and \$34,000 bonds.

Columbus Delaware & Marion Railway.—The company will increase its capital stock from \$2,500,000 to \$5,000,000. The purpose is to extend the line eventually to Cleveland.

Dallas (Tex.) Consolidated Electric Street Railway.—An ordinance has been passed by the city council of Dallas, and is now before the Texas legislature, to permit the consolidation of the three Dallas companies—the Dallas Consolidated Electric Street railway, the Metropolitan Electric Street railway and the Rapid Transit railway. The companies, together with the Dallas Electric Light & Power Company, are controlled by the Dallas Electric Corporation.

Detroit Jackson & Chicago Railway Company.—This company, which recently acquired the Detroit Ypsilanti & Ann Arbor Railway for the Detroit United railway, has given a trust deed to the Security Trust Company of Detroit, to secure an issue of \$4,000,000 bonds, which will be applied as follows:
 To pay outstanding bonds already issued\$1,610,000
 To retire bonds authorized, but not issued..... 990,000
 To pay to stockholders of the Detr. Ypsilanti & Ann Arbor 805,000
 For improvements, extensions, etc. 595,000

Detroit United Railway.—The \$2,000,000 of 5 per cent, 3-year collateral trust notes, of which mention was made in the Electric Railway Review of February 9, are dated February 15, 1907, and are secured by a deposit of the following collateral: \$1,000,000 Detroit & Port Huron Shore Line preferred stock; \$1,899,200 Detroit & Port Huron Shore Line common stock; \$125,000 Detroit & Port Huron Shore Line first mortgage 5 per cent bonds; \$100,000 Detroit & Lake St. Clair first mortgage 5 per cent bonds; \$1,400,000 Detroit United Railway consolidated 4½ per cent bonds.

Henderson (Ky.) City Railway Company.—The property owned by this company was sold at receiver's sale in Henderson on February 18 to C. A. Hirsch, president of the Fifth National Bank of Cincinnati, for \$80,000.

Hudson & Manhattan Railroad.—This company, which is building the McAduo tunnels and is to operate electric lines under the North river from Jersey City and Hoboken to Manhattan island, has filed a mortgage for \$100,000,000. It has been estimated that the cost of constructing the tunnels and establishing terminals in New York and New Jersey, together with the construction and equipment of the new roads, will be about \$60,000,000.

Indiana Union Traction Company, Anderson, Ind.—For the year 1906 gross earnings were \$1,943,101, as compared with \$1,522,229 in the previous year, an increase of \$420,872. The statement with a comparison follows:

	1906.	1905.
Gross earnings	\$1,943,101	\$1,522,229
Operating expenses	995,266	796,590
Net earnings	\$ 947,835	\$ 725,639
Interest and taxes.....	680,818	556,062
Net income in excess of taxes and interest on underlying bonds.....	\$ 267,017	\$ 169,577
Dividends on stocks of Union Traction Company of Indiana and Muncie Hartford & Fort Wayne Railway Company and interest on Indiana Union Traction Company bonds	151,514	.....
Dividend on Union Traction Company of Indiana preferred stock and interest on Indiana Union Traction Company bonds.....	.....	100,000
Net income—surplus	\$ 115,503	\$ 69,577

Indianapolis & Louisville Traction Company.—This company, which is building a road between Seymour, Ind., and Sellersburg, Ind., to form a part of the line from Jeffersonville, Ind., to Indianapolis, has elected the following directors: W. L. Lyons and John E. Greeley of Louisville; Alexander C. Thompson of Pittsburg; John C. C. Mayo of Paintsville, Ky.; William E. English of Indianapolis; H. H. Bechtel of Cincinnati; G. S. Speer, Samuel Adams and A. S. True of Chicago. The directors elected the following officers: John C. Mayo, president; John E. Greeley, first vice-president; Alexander C. Thompson, second vice-president; W. L. Lyons, treasurer; Samuel Adams, secretary. The capitalization of the company is as follows: Common stock, \$2,500,000; preferred stock, \$500,000; first-mortgage bonds, \$1,250,000.

Interborough Rapid Transit Company of New York.—An issue of \$10,000,000 5 per cent 3-year notes, to be dated March 1, 1907, has been sold to William A. Read & Co. of New York and Lee, Higginson & Co. of Boston. The proceeds will be used to pay off the floating debt and to provide for new construction on the Brooklyn extension and for the development of trolley lines on Long Island. August Belmont, chairman of the board of directors of the Interborough-Metropolitan company, says it is expected that the Brooklyn extension will be ready for operation not later than July 1. When the extension is completed the company will have invested in this construction \$6,000,000 more than the amounts payable by the city on account of such construction, and as the

rental payable to the city is based upon the actual expenditure for the construction of the road, the company will receive the benefit of a reduction in rental equal to the interest on the amount of its own investment in this construction. Mr. Belmont adds that the investment of the company in the New York & Queens County railway, the New York & Long Island Traction Company and the Long Island Electric railway amounts to about \$4,500,000. He says the management has under consideration a comprehensive scheme for financing the Long Island properties which will repay to the treasury of the Interborough Rapid Transit Company the amounts advanced. Mr. Belmont concludes by saying that the Interborough Rapid Transit Company expects that at maturity of the new notes, if not before, the indebtedness can be refunded on terms more favorable than are possible at present. —The gross earnings of the system, including the subway and Manhattan divisions, for the quarter and the six months ended December 31, show large gains over the corresponding periods of the previous year. The reports compare as follows:

	1906.	1905.	Increase.
Quarter ended December 31—			
Gross earnings	\$ 5,815,232	\$5,181,602	\$ 633,630
Operating expenses	2,365,166	2,137,354	227,812
Net earnings	\$ 3,450,066	\$3,044,248	\$ 405,818
Other income	194,656	225,792	*31,136
Total income	\$ 3,644,722	\$3,270,040	\$ 374,682
Fixed charges	2,472,906	2,306,759	166,147
Surplus	\$ 1,171,816	\$ 963,281	\$ 208,535
Six months ended December 31—			
Gross earnings	\$10,307,252	\$9,086,699	\$1,220,553
Expenses	4,497,464	4,204,801	392,663
Net earnings	\$ 5,809,788	\$4,981,898	\$ 827,890
Other income	343,728	385,634	*41,906
Total income	\$ 6,153,516	\$5,367,532	\$ 785,984
Charges	4,704,114	4,294,431	409,683
Surplus	\$ 1,449,402	\$1,073,101	\$ 376,301
*Decrease.			

Manila Suburban Railways Company.—An issue of \$2,500,000 5 per cent 40-year bonds has been authorized. The bonds are guaranteed, principal and interest, by the Manila Electric Railway & Lighting Corporation, which controls the electric railway, light and power system of Manila. The Suburban company will construct and operate suburban lines which will connect with the larger system, and will furnish lines and power in the outlying districts. The bonds were offered to the public at 92½.

Municipal Traction Company and Forest City Railway, Cleveland.—Leopold Einstein, vice-president of the Depositors' Savings & Trust Company, and R. A. Brown have retired as directors. They were succeeded by Francis E. Wright, president of the Bollinger & Riley Company, and Charles F. Seelbach, secretary and treasurer of the Forest City Foundry Company and vice-president of the Lincoln Savings Bank.

New York City Railway.—The report for the year ended December 31, 1906, shows gross earnings of \$17,636,707, an increase over 1905 of \$616,674, or 3.6 per cent. Owing to a reduction in operating expenses, the increase in net earnings was \$709,711. The deficit after the payment of charges was \$2,097,104 as compared with \$2,555,268, a decrease of \$458,164. The statement for the year, with comparisons, is as follows:

	1906	1905	1904
Gross earnings	\$17,636,707	\$17,020,033	\$16,994,285
Expenses	9,558,287	9,651,324	9,320,321
Net earnings	\$8,078,420	\$7,368,709	\$7,673,964
Other income	1,172,264	1,261,681	1,177,576
Total income	\$9,250,684	\$8,630,390	\$8,851,540
Charges	11,347,788	11,185,658	10,751,136
Deficit	\$2,097,104	\$2,555,268	\$1,899,596

In the quarter ended December 31, the gross earnings amounted to \$4,552,656, as compared with \$4,453,875, while the deficit was \$607,722 as compared with \$515,631.

The general balance sheet as of December 31 last shows assets of \$37,649,297, as compared with \$31,896,215 a year previous. Cash on hand increased from \$220,300 to \$1,091,710, while the profit and loss deficit increased from \$5,566,555 to \$7,697,744, and loans and bills payable increased from \$5,200,000 to \$9,550,000.

United Railways Company of St. Louis.—Earnings in January, 1907, compared with the corresponding month of last year as follows:

	1907.	1906.	Increase.
Gross earnings	\$826,337	\$781,788	\$44,549
Operating expenses	577,870	491,368	86,502
Net earnings	\$248,467	\$290,420	*\$41,953
Charges	231,541	232,051	*514
Surplus	\$ 16,926	\$ 58,365	*\$41,439
*Decrease.			

Waverly Sayre & Athens Traction Company, Waverly, N. Y.—It is reported that negotiations are in progress for the purchase or control of this company by the Erie Railroad Company. The Erie is said to be the owner of the Elmira Corning & Waverly electric road which will parallel for a long distance the Erie right of way between those three places. The Waverly Sayre & Athens is to be extended to Binghamton. With this extension the two roads would have a through line from Corning to Binghamton, N. Y., with a branch from Waverly to Athens, Pa.

Manufactures and Supplies

ROLLING STOCK.

Oregon Electric Railway, Portland, Ore., has ordered 12 heavy passenger coaches.

Chicago Lake Shore & South Bend Railway, South Bend, Ind., has placed an order for 25 interurban cars.

Lima & Toledo Traction Company, Lima, O., is reported to have placed an order for 12 interurban cars.

Boston & Northern Street Railway, Boston, has ordered 27 double-truck cars from the J. G. Brill Company.

Camden Interstate Railway, Huntington, W. Va., has ordered 5 new cars from the G. C. Kuhlman Car Company.

Albany & Hudson Railroad, Hudson, N. Y., has ordered 2 double-truck cars from the Wason Manufacturing Company.

Northern Ohio Traction & Light Company, Akron, O., will soon receive from the G. C. Kuhlman Car Company 10 new convertible cars, 45 feet in length.

Beloit Traction Company, Beloit, Wis., has ordered six 22-foot closed cars and will place an order this fall for four open cars for delivery in the spring of 1908.

Shawinigan Falls Terminal Railway, Shawinigan Falls, Que., has placed an order with the Canadian General Electric Company for one 600-horsepower electric locomotive.

Pittsfield Electric Street Railway, Pittsfield, Mass., has placed an order with the Wason Manufacturing Company for 1 passenger car and with the Russel Car & Snow Plow Company for 1 snow plow.

Illinois Traction System, Champaign, Ill., is reported to have placed an order with the Danville Car Company for 6 electric locomotives, 12 cars for city service, 30 interurban cars and 20 express trailers.

Springfield Street Railway, Springfield, Mass., has placed an order with the Wason Manufacturing Company for 5 double-truck closed cars and ten 14-bench double-truck open cars. The closed cars will be 30 feet in length.

Montreal Street Railway, Montreal, Que., as reported in the Electric Railway Review of February 16, is building 25 pay-as-you-enter type cars in its own shops and in addition to these 100 of the same type are under contract with other car builders.

Wausau Street Railway, Wausau, Wis., has purchased through the Knox Engineering Company, Chicago, three cars for city service to be built by the Cincinnati Car Company. This item appeared incorrectly in our issue of February 9 as the Warsaw Street Railway.

Galesburg & Kewanee Electric Railway, Kewanee, Ill., has ordered 3 single-truck Brill semi-convertible cars from the G. C. Kuhlman Car Company. These cars will be 31 feet 4 inches in length over all, will be equipped with cross seats, Brill 21-E trucks and GE-80 double motor equipments.

Worcester Consolidated Street Railway, Worcester, Mass., was reported in the Electric Railway Review of February 16, as being in the market for new cars. An order has been placed with the J. G. Brill Company for ten 15-bench open cars and 15 closed cars 30 feet in length. They will have Brill trucks. An order has also been placed with the Wason Manufacturing Company for 1 snow plow.

South Chicago City Railway, Chicago, has purchased from the Indianapolis & Cincinnati Traction Company four interurban cars each equipped with four motors of 50 horsepower and is building in its own shops 11 compartment cars for heavy city use, to be equipped with GE motors and Taylor trucks. The company is also constructing 10 cars in its shops, which are being built by the splicing together of two open trailer cars.

Chicago Electric Traction Company, Chicago, has ordered 15 single-end semi-convertible compartment cars for interurban service from the G. C. Kuhlman Car Company, 10 of which are for delivery before May 20 and 5 prior to June 15. They will be 45 feet 6 inches in length over all, will have a seating capacity of 52 persons, thirteen windows on each side, the smoking compartment taking in four windows. The rear platform will be 6 feet, 6 inches long and the front platform which is enclosed for the exclusive use of the motorman will be 5 feet long. A speaking tube runs from the motorman's cab to the platform in the rear. The cars will be equipped with stationary seats, Magann storage air brakes, Brill trucks, 4 GE-80 motors to each car, Monarch deck roof, steam coach hood in front and destination signs of colored glass.

Indianapolis Columbus & Southern Traction Company, Columbus, Ind., placed an order the latter part of last year for three interurban cars with the Niles Car & Manufacturing Company. An order was also placed with the same company for eight interurban passenger cars and two freight cars for the Indianapolis & Louisville Traction Company, now under construction between Jeffersonville and Seymour, Ind. The passenger cars are single end cars, 50 feet in length over all, with main compartment, smoking compartment and baggage room heated with the Peter Smith heating system and equipped with Baldwin trucks. The freight cars are of the standard interurban type, 50 feet in length over

all, will be equipped with Baldwin trucks, General Electric 600 and 1,200-volt motors, air brakes, train control and will be heated with soft coal burners.

SHOPS AND BUILDINGS.

Indiana Union Traction Company.—The car houses of the Muncie-Hartford City division at Bluffton, Ind., were destroyed by fire recently. The loss is estimated at \$18,000, with \$11,000 insurance.

Spokane & Inland Railway.—Excavations are being made for an \$18,000 freight depot at Palouse, Wash., which will consist of a main building 60 by 60 feet and a freight shed 36 by 100 feet.

TRADE NOTES.

H. W. Johns-Manville Company, New York, has removed its Boston office from 77-79 Pearl street to 59 High street.

F. P. Harrison Electric & Manufacturing Company, New York, reports a large shipment of Deltabeston fields and coils to the Pacific Electric Railway Company at Los Angeles, Cal.

H. F. Vogel Contracting & Railway Supply Company, Rialto building, St. Louis, dealer in general supplies and sales agent for the Danville Car Company, is now the exclusive selling agent for the Anderson-Smith arc headlight.

Standard Electric & Chemical Company, Chicago, has been incorporated with a capital of \$10,000 to manufacture and deal in electrical and chemical specialties. The incorporators are: George E. Fuller, George Dierssen and Herbert Green.

D & W Fuse Company, Providence, R. I., has recently awarded a contract for a new foundry building which will be erected at an early date. Owing to the company's increasing business it was thought advisable to construct a new foundry.

John F. Allen, 370-372 Gerard avenue, New York, has just shipped two additional riveters to the American Car & Foundry Company and two have been shipped to the Atchison Topeka & Santa Fe Railroad for use at its Topeka, Kan., shops.

Chicago Pneumatic Tool Company, Chicago, following its established practice of maintaining stores in the larger cities of the United States for the purpose of exhibiting its tools in operation, has opened a store at 820 Arch street, Philadelphia, Pa.

Stone & Webster Engineering Corporation, 84 State street, Boston, engineers and contractors of electrical properties, has retained Converse D. Marsh of the Bates Advertising Agency, New York, as advertising advisory counsel for the corporation.

Dagg Boiler Equipment Company, New York, has been incorporated with a capital stock of \$50,000 to build roads, railway light and power plants, etc. Incorporators: Bond S. Neff and Arthur D. V. Lyons, both of New York, and Everett M. Corner, of New Rochelle, N. Y.

Universal Portland Cement Company, Chicago and Pittsburg, announces the appointment of F. T. Bentley as western traffic manager with headquarters at the Rookery, Chicago, and L. C. Bihler as eastern traffic manager with offices in the Carnegie building, Pittsburg.

Garford Company, Elyria, O., has just shipped a carload of Shelby trolley poles, for which it is general agent, to San Francisco for use upon the new cars of the United Railroads of that city. The company also has orders booked for another carload for shipment to the Pacific coast.

American Conduit Manufacturing Company, Pittsburg, has recently completed improvements to its factory which will largely increase its output of rigid iron conduit. Several changes have been made in order to keep pace with its steadily growing business and demand for its product.

Dodge & Day, Philadelphia, have been commissioned by the Denison Manufacturing Company of South Farmington, Mass., to make a report on its power requirements in its factory; also have been retained by the Royal Motor Car Company of Cleveland, O., as advisory engineers for its new plant.

New Era Manufacturing Company, Kalamazoo, Mich., is putting upon the market "Phosphoro Bronze" which is a new bronze mixture claimed to be an ideal metal for locomotive and car journal bearings. The formula for this bronze will be mailed to railway officials and others interested upon request.

E. D. Hindman, formerly with Elmer P. Morris Company, New York, has joined the sales force in the railway department of the Stuart-Howland Company of Boston. Most of his time will be spent in New York city and his attention will be devoted to the territory of New York, Pennsylvania and New Jersey.

O. A. Stranahan recently resigned his position as sales manager of the Allis-Chalmers Company, Milwaukee, and has acquired an interest in the Electrical Installation Company, Chicago, where he has been elected a director of the company and will have an active part hereafter in the company's affairs.

Underfeed Stoker Company of America, Chicago, has recently received, an order from the Chicago & Milwaukee Electric Railway for 24 Jones stokers to equip eight 600-horsepower Babcock & Wilcox boilers installed in its new power station at Waukegan, Ill. This is the fourth order the company has received from this road and makes a total of 37 Jones stokers ordered since January, 1903. A second order has also been received from the Campana Alemana Transatlantica De Electricidad, Buenos Aires, Argentine

Republic, S. A., for 45 Jones stokers to equip its various power stations in that city. This order is the result of a trial order for three stokers installed in its station at Montevideo by G. F. Kelley, erecting engineer of the Underfeed Stoker Company of America.

Southern Immigration Bureau, 144 East Seventh street, New York, furnishes laborers to all sections of the western and southern states, as well as throughout the country. The company possesses special facilities for handling this line of business and will furnish laborers in any number and of whatever nationality required.

Electrical Installation Company, Monadnock block, Chicago, at its annual meeting elected as its president C. H. Kimball of Muskegon, Mich., who was formerly vice-president, and O. A. Stranahan of Milwaukee, a director of the company. The company now has 185 miles of electric railway under contract in Indiana.

F. P. Harrison Electric & Manufacturing Company has found it necessary, owing to a large and increasing demand for the Cow-Boy brand Deltaheston armature and field coils manufactured by it, to increase the capacity of its factory. A large brick bake oven building, having a capacity of 15,000 field coils, has just been completed.

Ridgway Dynamo & Engine Company, Ridgway, Pa., has completed a large addition to its works and is now putting it into service. The addition is a one-story steel structure, 200 feet in length and 65 feet wide, with solid brick walls and slate roof. The building will be used as an erecting shop and storage warehouse for finished machinery.

Berger Manufacturing Company, Canton, O., is making provision in its new sheet mills for the production of a special quality of sheets for electrical purposes. As this company owns and operates its own steel plant in addition to its twelve-mill sheet plant it can control the quality of sheet bars, thus insuring a soft sheet with a low hysteretic constant.

Genuine Bangor Slate Company, Easton, Pa., maker of genuine Bangor roofing slate and other slate products, announces that considerable interest is being taken in its slate roofs by electric railway companies. The company claims a roof manufactured by it will outlast the building and is entirely free from expense for repairs, the slate also acting as a good insulation against electricity.

Stuart-Howland Company, Boston, Mass., reports a very large volume of business in its electric railway supply department. During the month of January last the business was greater than that of the whole year 1905. It has been found necessary to add a new salesman to this department to keep pace with the growing business. This company makes a specialty of armature and field coils, commutators, segments and overhead line material.

Lorain Steel Company, Philadelphia, Pa., has awarded to W. J. Rose & Sons, of Johnstown, Pa., the contract for the erection of a new one-story building 376 by 400 feet and to cost approximately \$200,000. The building will be constructed of steel and be fireproof. Upon the completion of the addition, the plants for the manufacture of switches, signals and electric appliances used on street railways will be placed in it. Work will begin at an early date.

Chicago Pneumatic Tool Company, Chicago, at a meeting of the stockholders held in Chicago on February 18, re-elected all of the retiring directors, which are as follows: A. W. Maconochie, James C. Taite, Charles M. Schwab, J. R. McGinley, J. W. Duntley, W. O. Duntley and W. A. Mitchell. The company has recently purchased the buildings of the Franklin Machine & Tool Company of Franklin, Pa., at a cost of \$200,000, which will be used in connection with the air compressor plant.

Sterling-Meaker Company, Newark, N. J., announces that its business for 1906 was more than 50 per cent greater than for the preceding year and that on January 1 the company had unfilled orders to the amount of \$30,000 notwithstanding the fact that they were employing twice as many men as a year ago. The company is a well known manufacturer of the Sterling safety brake, the Giant brake, the Sterling fender, the Sterling trolley base, the Berg fender and the Sterling sand box.

American Blower Company, Detroit, Mich., announces that a large addition to its steel plate fan shop is about completed and will be ready for operation in about thirty days; also that the company's architects are at work upon plans for a large addition to its power plant and to its engine construction department. The new type of vertical self-oiling engine which this company has put upon the market has met with such success that in order to meet the demand an entire re-arrangement of its plant was necessary.

Standard Motor Truck Company, Pittsburg, has appointed George W. Evans & Co. of Seattle, Wash., its northwestern agents for the territory comprising the states of Washington, Oregon, Idaho, Montana and British Columbia and Alberta, Can. The company has also recently received orders for the following equipment: 200 swing bolster maximum traction trucks of the 0-45 type for the Brooklyn Rapid Transit Company; 200 of its 1-50 type for city and suburban use for the Boston Elevated Railway; 100 short wheel base outside hung motor of the 0-50 type for the Detroit United Railway; also several large orders for the Consolidated Railway of New Haven, Dartmouth & Westport Street Railway, Boston & Worcester Street Railway, Oklahoma City Railway Company, York Street Railway and other small orders aggregating

over 900 trucks for which the company has received orders during the last three months.

Green Engineering Company, Chicago, in order to handle its steadily increasing business, purchased last year nine acres of ground in East Chicago upon which the company has erected a new shop, approximately 740 by 130 feet, embracing a large foundry, machine shop, warehouse, pattern shop and power house. The buildings are of all-steel construction with concrete side walls and tile roofing, making them practically fireproof. The company has also constructed 1,200 feet of switch track on each side of its plant.

McIntire-Marshall Construction Company, Park building, Pittsburgh, will build an addition to its plant at Carnegie, Pa., for use as a rivet shop. The building will be 84 feet wide at the main span, the total length to be 154 feet 8 inches. Provision is made for four 5-ton longitudinal crane runways together with additional runways to carry riveting machines. The plant at Carnegie was purchased in June, 1905, from the American Structural Steel Company and since its operation under its present management has shown an increased output.

Charles M. Higgins & Co., manufacturers of the well-known Higgins' drawing inks, have increased their business during the past year over one-third of the year previous. The general use not only in this country but throughout the world of their drawing inks, mucilage and paste is increasing steadily. Some time ago the company opened a store at 11 Farringdon avenue, London, E. C., as a distributing depot for their line in England. The Chicago office of the company is in the Fisher building, the main office and factory being located in Brooklyn, N. Y.

J. P. Sjöberg & Co., 533 West Thirty-second street, New York, N. Y., have recently delivered to the New York City Railway Company 600 of their new patent sliding-sash vestibules, and these have been installed on the New York city cars. The vestibule affords thorough protection to the motorman and in no way obstructs his view. The Brooklyn Rapid Transit Company of Brooklyn, N. Y., has adopted this vestibule as standard on all of its cars and has recently placed an order for 400 vestibules, which completes the contract for equipping the whole system.

J. G. Brill Company, Philadelphia, is reported to have announced that the plan for the reorganization of its company, which has been under way for some time, has been accomplished. The capital stock has been increased from \$600,000, to \$10,000,000, part of which has been taken by the three other companies associated with it, namely, G. C. Kuhlman Car Company, American Car Company and the John Stephenson Company. It is stated that negotiations are under way for the equipping of another car-building company in the east. James Rawle, formerly secretary of the company, has been elected president to succeed Martin G. Brill, who died some months ago. No changes in the operation of the different plants will be made at this time under the new management.

B. F. Sturtevant Company, Boston, reports the sale of its generating sets to the Richard Borden Manufacturing Company, Fall River, Mass., Eastern Brass & Machine Works, Easton, Pa., Roughsedge & Ramsey, Prince Albert, Sask., Can., and the Bowker Construction Company, New York City; also the large manufacturing plants which have been equipped with its heating and ventilating system: Reeves & Co., Columbus, Ind., National Tube Company, McKeesport, Pa., Graton & Knight Manufacturing Company, Worcester, Mass., and the Canadian Pacific Railway, Toronto Junction, Ont. The company has also made the following sales for its new type of high pressure rotary blowers: General Fire Extinguisher Company, Atlanta, Ga., Rivett Lathe Company, Brighton, Mass., J. B. Clark Manufacturing Company, Rockford, Ill., and the Winchester Repeating Arms Company of New Haven, Conn.

H. W. Johns-Manville Company, 100 William street, New York, held its annual convention of its many branch managers and department managers during the last week in January at the New York office of the company. Representatives of the various branches and factories were present, making the meeting not only profitable but interesting. Within the past few months the company has opened new branch offices at New Orleans, La., Dallas, Tex., and Baltimore, Md., making sixteen branch offices throughout the United States in addition to its local representatives at various points. The company has recently opened a branch office at 214 Main street, Buffalo, N. Y., in charge of George A. Schmidt, who has been connected with the company for a number of years. B. F. Boscoe has been appointed assistant manager of this branch and will make his headquarters at Rochester, N. Y. Harry V. Patton will also be associated with the new Buffalo branch.

D. E. Baxter & Co., Incorporated, railroad contractor, 27 William street, New York, which has the contract for the construction and equipment of the Charleston & Summerville Electric Railway, from Charleston to Summerville, S. C., has placed orders for 3,150 tons of 70-pound rails, 850 kegs of railroad spikes and 12 switches, delivery to be made in the early part of May. The construction of this road is progressing rapidly, the contractor having two large forces at work from both ends to the center. The fireproof concrete power house building in which will be installed the Snow gas engines, generators and electrical appliances for operating this road will be commenced immediately. The overhead construction will be for single-phase transmission, with 120-foot spans, No. 000 hard drawn, grooved copper trolley wire. As the president of the road is anxious to complete it as soon as possible to take care of the summer travel the contractor is increasing its forces that this may be accomplished. It has been assured by the Snow Manufacturing Company that the delivery of

machinery will be prompt. A spur will be run from the main line to the new Charleston navy yard, thus affording the United States government easy transportation for its men to and from work. A majority of these men either reside in Charlestown or Summerville and are now compelled to take a circuitous route. The weather has been such that no delay has been experienced, the contractor not having lost a day since work began in November, 1906.

G. Drouve Company, Bridgeport, Conn., has secured an order to install the Lovell sash-operating device at the New York Central railroad shops at White Plains and Harmon, N. Y. The installation includes apparatus to operate the sash in the inspection, locomotive, car and machine shops and comprises 4,400 feet of the operating device. The company is completing an Anti-Pluvius skylight installation for the Pond Machine Tool Company on its new shop addition. The Anti-Pluvius skylight is water-tight, weather-proof and non-deteriorating, and is erected by the unit system of construction, without putty or cement. The company makes a special bid for large contracts, having only recently finished the skylighting of the Delaware Lackawanna & Western Railway Hoboken terminal train shed, 125,000 square feet of skylight being used on this work. A strong claim made by the company is that it guarantees positive immunity from leakage and condensation, as also from breakage of glass (excepting from strictly external causes).

Pressed Steel Car Company, Pittsburg, at the annual meeting of its stockholders held in Jersey City on February 20, re-elected the retiring directors and made public its financial report for the fiscal year ending December 31, 1906. The report shows that the surplus after deducting the dividends on the preferred stock was equal to 17.25 per cent on the common stock, but no dividends were declared on the common stock because the management desired to increase the working capital and strengthen its position. The income account of the year together with the general balance sheet is as follows:

	1906.	1905.
Net earnings	\$3,381,884	\$1,106,901
Depreciation, etc.....	350,000	175,000
Balance	\$3,031,884	\$ 931,901
Preferred dividends.....	875,000	875,000
Balance	\$2,156,884	\$ 56,901
Common dividends.....	.....	.....
Surplus	\$2,156,884	\$ 56,901
Previous surplus.....	2,588,775	2,531,874
Total surplus.....	\$4,745,659	\$2,588,775

Assets.			
	1906.	1905.	Increase.
Properties and franchises.....	\$26,853,093	\$25,818,622	\$1,034,471
Securities owned	2,488,554	2,052,554	436,000
Taxes and insurance.....	49,402	24,936	24,466
Accounts receivable.....	1,073,048	1,826,112	146,936
Materials on hand.....	4,979,815	4,920,253	59,562
Cash	2,065,579	478,040	1,187,539
Totals	\$38,409,491	\$35,520,517	\$2,888,974

Liabilities.			
	1906.	1905.	Increase.
Common stock	\$12,500,000	\$12,500,000	.....
Preferred stock	12,500,000	12,500,000	.....
First mortgage notes.....	2,500,000	3,090,000	*\$500,000
P. S. C. money mtg. McK. Rs. p. 4 1/2	235,000	235,000	.....
P. S. C. money mtg. Allgheny p. 4 1/2	75,000	75,000	.....
Accounts and bills payable.....	5,381,119	4,156,381	1,225,738
Accrued salary and wages.....	201,763	184,018	17,745
Accrued interest	52,200	62,593	*10,393
Accrued preferred dividends.....	218,750	218,750	.....
Surplus	4,745,659	2,588,775	156,884
Totals	\$38,409,491	\$35,520,517	\$2,888,974

*Decrease.

ADVERTISING LITERATURE.

Genuine Bangor Slate Company, Easton, Pa.—“Slate and Its Uses” is the title of a handsomely executed and instructive pamphlet designed to be convincing in its array of facts and arguments in favor of slate as compared with other materials used for roofing purposes. The claim that the company is the largest producer of slate in the country is not likely to be disputed, nor, after reading this book, does there seem any argument except that of less first cost with which to controvert the claims for slate. The various chapters set forth what a genuine Bangor slate roof will and will not do, its service and qualities in comparison with roofs of tin, steel, shingles, tile and compositions of tar, asphalt, asbestos, gravel, etc., with quotations from various authorities in support of the points made. The pamphlet is beautifully illustrated from photographs of buildings—residences, churches, factories, government institutions—showing clearly the attractive effect produced by the use of slate roofing and in themselves suggestive of the unquestioned durable character of the material.

HOMER COMMUTATORS.

An excellent example of the trend of the modern idea of specialization is illustrated in the manufacture of commutators by the Homer Commutator Company, Cleveland, Ohio. In this case not only does the company devote itself exclusively to the manufacture of high-grade commutators, but each man who operates one of the machines designed especially for the manufacture of commutators is a specialist in the operation of his

particular machine. Some of the men now employed have been with this company since it first began the manufacture of commutators. The result of this specialization is more perfect workmanship which, combined with the best of material, assures a product of the highest type.

An exact fit between the shell and the commutator bars is an important point to be observed in the manufacture of a commutator, because if the fit is not perfect the commutator will not remain tight; and further, the expansion and contraction from heating when in operation will cause it to warp, resulting in serious sparking and in a very short life for both commutator and brushes. This company has given special attention to perfecting methods of securing the perfect fit so desirable and necessary to avoid the disastrous effects above mentioned, and it is prepared to manufacture high-grade commutators of any style in all sizes from the smallest used on a fan motor to that of the largest direct-current generator.

BLAKE TUBE FLUX.

There are many reasons why it is advantageous to have soldering flux placed on the market in such a form that it will remain clean and yet easily be applied to the surfaces to be joined. With soldering paste contained in the usual form of boxes there are the disadvantages that if the box is not kept covered at all times the paste becomes dirty, and for this reason part of it may be wasted; with the soldering flux in covered boxes it is necessary for the linemen or whoever may use it to apply the flux with some sort of brush or dauber. This practice is not only unhandy but is wasteful of the material. To obviate these disadvantages and effect a saving for the user of soldering flux, the Blake Signal



Blake Tube Flux—Method of Application.

& Manufacturing Company, 246 Summer street, Boston, has placed on the market the “Blake Tube Flux.”

As will be noted by the accompanying illustrations, this tube is of the customary collapsible form and has a tapering spout through which the soldering flux is applied directly to the surfaces where it is needed. The flux contained in these tubes was formerly known by the trade name of “Climax.” The manufacturer states, however, that the tube and flux have been much improved. The new product is said to have many advantages over the ordinary flux, among which are the following: It is an insulating material, non-corrosive, and is enclosed in tubes so that it may conveniently and economically be applied as desired. It would seem that soldering flux enclosed in such tubes would form a very useful part of a workman’s kit.

Special attention is called to the aluminum spout, which material will permit of contact with a soldering iron without melting



Blake Tube Flux—Collapsible Tube.

and thus closing the outlet for the flux. The collapsible tubes are made of heavier metal than before and are coated with tin both inside and out. This coating prevents the tube from being torn or damaged. Reference to the illustration showing the method of applying the paste in soldering armature leads to commutator segments will make plain the convenience of the Blake Tube Flux for the use of the shop man or lineman.

DEVELOPMENTS IN THE ORGANIZATION OF THE OHIO BRASS COMPANY.

In order to better serve its rapidly increasing trade, the Ohio Brass Company has recently made arrangements for the establishment of two new branch offices and has made several additions to the personnel of its home office. These new branch offices will be located at St. Louis, Mo., and Atlanta, Ga., and will carry an ample stock of standard materials for quick shipments, which will be selected to fulfil the requirements peculiar to their respective territories. The establishment of these offices will enable the company to take care of its trade in the southwestern and southeastern territories more efficiently than ever, and will greatly facilitate prompt filling of orders.

The St. Louis office will be located at 10 North Fourth street and will be ready for business on March 1. This date will mark the termination of the Ohio Brass Company’s arrangements with the Watts & Uthoff Supply Company, which has acted as sales agent in that territory for several years past. The office will be

under the management of E. C. Brown, who, for many years, has been actively identified with the electric railway trade and will be assisted in the office by N. W. Biggart, who has been transferred from the home office for that purpose. Traveling salesmen will be added to this office as soon as its organization has been completed, and customers in the St. Louis territory will now be even better served than heretofore.

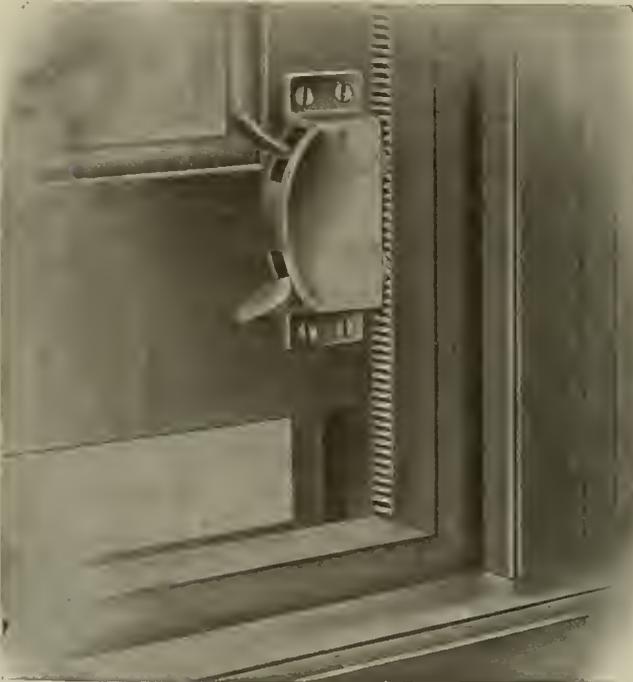
The new branch office at Atlanta, Ga., will be ready for business on March 15 and will be under the management of J. E. Slimp. R. L. Courtney will assist Mr. Slimp in the office and a staff of traveling salesmen will be organized as soon as the office is formally opened. Mr. Slimp needs no introduction to his many friends in the southeastern territory, who will doubtless be pleased to learn that in his new capacity as sales manager of this office he will be in a position to keep in closer touch with them than heretofore.

The Atlanta office will be located in the Peters building, room 308, corner of Wall and Peachtree streets. The warerooms will be in the same building and sufficient stock will be carried to fill all rush orders.

Several acquisitions have recently been made to the home office force at Mansfield. These additions are made necessary by the rapidly increasing volume of business, consequent to the completion of the Ohio Brass Company's new factory buildings, and are as follows: J. F. Little is assistant in the line material division of the railway sales department. He was formerly connected with the sales department of the Western Electric Company in Chicago. C. C. Beck has assumed the position of commercial engineer, having been previously assistant superintendent of the Ideal Electric Company. C. V. Marks is personal assistant to the secretary. H. C. Moran is assistant in the rail bond department, having been previously connected with the Western Electric Company. A. W. Campbell is assistant in the office of the vice-president. H. W. Young, formerly with the Cutler-Hammer Manufacturing Company of Milwaukee, Wis., is assistant in the advertising department.

THE NATIONAL WINDOW FIXTURES.

The National Lock Washer Company of Newark, N. J., which manufactures a complete line of curtain fixtures, also has upon the market a number of window fixtures. These include a sash balance roller and attachments for lifting a window, a sash lock with ratch-



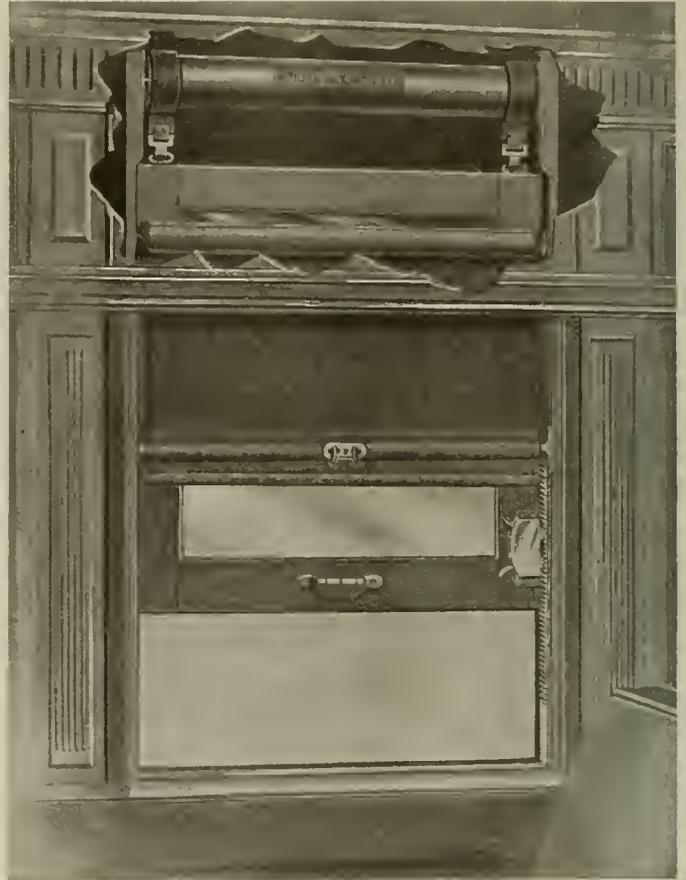
National Sash Lock.

et strip and screws for locking a window at any desired height and sash springs comprising four face and two edge springs for making a window dust and draft proof. The company believes that by the proper application of these devices, it will be possible for even a child to raise or lower with ease the heaviest car sash in wet or dry weather, and that when the window is closed it will be practically dust and draft proof. The fixtures do not necessarily have to be used together, but the combination makes the window arrangement serviceable and effective.

The National sash lock is designed to hold and positively lock the window sash at any height and to prevent rattling. A feature taken into consideration in planning its construction was to make it possible to place the window loosely in the frame, so that the sash could be easily raised and lowered. The lock is operated by simply pressing and releasing levers which are so arranged that raising the lower lever unlocks the upper, but a reversal of the process has no effect on the lower lever, an arrangement, the pur-

pose of which is to give the operator complete control of the weight of the sash.

The National sash balance is a specially made spring roller, held in brackets placed out of sight at the highest part of the sash slide. The roller is held to the sash by two belts, one at each end of the roller. These belts are connected with the roller by brass straps locked in the roller groove, and the lower ends connected to the sash by hooks secured to the belting by brass straps. These hooks fit into eyes screwed into the top of the sash, so as to make the sash readily removable. The screw eyes are made with a special thread that it is believed will sustain many times the



National Sash Balance Roller and Attachments.

weight required. They can also be raised or lowered one or more turns to equalize the belt on each side. If stronger tension is required, one belt at a time can be unhooked and passed around the roller. If less tension is required the belt can be unhooked and one turn taken off, making it unnecessary to move the roller in order to regulate or adjust it. The wearing parts are all of sheet brass. Under ordinary conditions the tension of the balance roller is said to lift all but about three pounds of the weight of the sash.

RECORDING FARE REGISTERS.

The Recording Fare Register Company of New Haven, Conn., is offering two new styles of fare registers designated as types-F and G.

The aim in the design of these registers has been to reduce the number of working parts and springs. To accomplish this end, gearing alone has been employed in the construction of the internal mechanism of these registers.

The enclosing cases are of seamless drawn cartridge brass, finished in antique copper. The face dials are of steel, enameled any color desired, or to match the car finish. Large plain numbers which can be easily read at a distance are used for the trip and total figures.

The "set back" is entirely automatic, the knob returning to position instantly upon the cancellation of the trip or changing of the direction indicator.

A printed record is made by the type-G register, giving the direction, trip number and a total statement for each trip. Type-F is of exactly the same construction as type-G, with the exception that it does not have a record-printing mechanism.

Both of these registers can be fitted with a "not-set" indicator, which requires an extra push of the knob to unlock the register after canceling a trip or changing the direction. This avoids the possibility of fares being registered while the conductor is off the car.



Type-G.

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In a decision rendered on February 19 by Smith McPherson, judge of the United States circuit court at Des Moines, Ia.,

Perpetual Franchise Is Upheld.

the contention of the Des Moines City Railway Company that its franchise is perpetual is upheld. Judge McPherson holds that notwithstanding the claim of the city that all rights which were granted under the ordinance of 1866 expired in 1898, the city since the latter date has repeatedly recognized the validity of the franchise. The court rules that only the monopoly feature of the franchise expired in 1898. In the decision the court states that attempts to violate contracts are one of the evils of municipal governments of the day. The court shows that the Des Moines city council, desiring to aid in building up the city, granted a franchise when Des Moines had about 6,000 people, and that the system was maintained for 14 years with an expenditure of \$200,000 and no profits; and that when profits were in sight the council granted rights to other companies and litigation commenced. Although the company's contentions are upheld in a broad way, the court calls attention to the fact that the company is under a continual obligation to furnish adequate and efficient service. The attorney for the city announces that the case will be appealed to the United States supreme court.

Cleveland's mayor is at work again, and according to his views 3-cent fares are only a step in the right direction. The goal is no fare at all; that is, no fare that the street-car-rider will know that he pays, it is all to be added to taxation. Mr. Johnson is quoted as follows: "What I really want is free street cars. Eventually I hope to see them as free to the passengers as the air they breathe. Street cars ought to be as free as elevators. A proper system of taxation would support street car lines without burden to the workingman, who could choose his home where he would,

No-Fare Street Car Systems.

and congested districts would disappear." It is difficult to treat with patience this suggestion that it would not burden any workingman to have the cost of urban transportation for the public added to his taxes or the taxes paid by his landlord or the storekeeper with whom he deals.

Many power plant operators seem to think that if a good engineer is employed for their plants everything has been done that is necessary to assure economical results. This, unfortunately, is not the case unless the engineer in charge realizes the value of good firing. Far more economical results could be obtained from the average

High-Class Men in the Boiler Room.

plant if the same amount of thought and care were given to the operation of the boilers as is generally given to the engines. To accomplish economical results it is necessary to employ a competent man who has made a study of the different methods of firing and knows how to handle a given grade of coal to obtain the best results under any given conditions. This man should be given absolute charge of the boiler room and not be subject to the engineer's orders, which, in most instances, would directly oppose the proper course to be pursued. Experience is not the only way by which to judge whether or not a man is qualified for such a position. A sound theoretical knowledge of the laws of combustion, coal and the steam boiler are absolutely essential. An instance of what can be done by such a man, even in a small plant, is illustrated by a case which lately came to our notice. The boilers in the plant, to which reference has been made, are fitted with mechanical stokers and were in charge of an expert recommended by the stoker manufacturer. Before the "theoretical stoker" took charge of the plant the coal consumption was 65 tons per day and the town had threatened the management with lawsuits because of the smoke nuisance. Under the scientific management the coal consumption was reduced 12 tons per day and hardly a trace of

smoke was visible. The saving in coal was about thirty dollars a day, omitting the reduced cost for carting ashes. The expenses incurred about seven dollars, leaving a net saving of twenty dollars per day. It should be remembered that it is the brains and not the muscle that reduces the coal bills.

In power plants of the hydro-electric type where a standpipe equipment is installed to prevent damage from water hammer, considerable trouble is likely to be encountered from the freezing of the relief column of water unless special measures are taken to heat the pipe interior in cold weather. It has been found by experience

Preventing the Freezing of Standpipes.

that the surging of the water in the pipe seldom exceeds 18 inches, which is not enough of a movement to prevent the water from freezing against the sides of the pipe, and in case of long continued cold weather this is likely to cause injury to the standpipe by bursting it, to say nothing of the danger to the main pipe line and water wheels. An ingenious temporary method of preventing freezing was recently tried successfully in a plant where ice was forming rapidly on the inside of a standpipe 110 feet high and 5 feet inside diameter. Immediate action was necessary, for there was no time for anything but emergency methods. Fifty 50-candlepower incandescent lamps were connected in a loose circuit and lowered into the pipe from the top. The current was then turned on and the heat from the lighted lamps cleared out the ice in a short time. As a permanent arrangement the standpipe was surrounded by a double air chamber made of matched boards lined with tar paper and sealed at the top. In the bottom of the chamber were installed 14 simplex car heaters of 600 watts capacity each, and in the top was mounted a 2,500-watt coil on a circular wooden float, the diameter of the upper heating coil being about 42 inches. The coil rises and falls with the surging of the water, and is prevented from being thrown out by being fastened in at the top of the pipe with No. 6 steel wires. This scheme has been found thoroughly effective and it has the advantages of being exceedingly flexible, efficient and readily controlled from remote points.

The breakage of window glass on interurban cars sometimes becomes so frequent that a management's special attention is called to the matter, and it at once becomes important to reduce the record. Aside from the expense of replacing the old lights and the ever-present possibility of damage suits, it sometimes happens that connecting roads will not receive a car with a single broken pane, the result being that the car must be taken off the line and suffer a total loss of earning capacity while these trivial repairs are made.

Glass Breakage on Interurban Cars.

High-speed cars seem to suffer more from glass breaking than equipments making moderate schedules, and the excessive vibration of windows is no doubt a predisposing cause. Rough track, minor collisions with teams or other vehicles, carelessness of passengers and other causes readily suggest themselves, but perhaps the point in the car which suffers most heavily is the front vestibule. Too rapid dropping of windows by motormen is a frequent cause of breaks, and again, the contact of the car with a foreign body like a large bird flying through the air or with a broken guard wire hanging in an unsuspected position is often sufficient to make trouble. Progressive roads use the unbroken or unshattered pieces of glass from such windows in headlights, gauge dials and other places, but the actual cost of a break is so far beyond any second-hand economy in materials that rigid rules enforcing careful handling of windows by employes should be the procedure. The use of window stops, double catches to prevent dropping too suddenly, and in some cases double windows, all help to mitigate the trouble. Many breaks cannot be helped, but when the reports begin to come in with

great frequency, it is well to look into both the operating and the constructive ends of the matter. It may pay in some cases where the speeds are very high to use plate glass in the front vestibule windows.

ECONOMY IN MOTOR REPAIRS.

Throughout the entire range of electric railway shop practice there is no more important work than the speedy, economical and reliable repairing of motor armatures, commutators and field coils. In many shops the organization of labor, equipment and material in the painting, carpentry and truck departments is better than that of the armature or motor repairing room. The work of motor maintenance deserves the most careful study; it is, when properly done, as complicated a business as can be found in any average industrial plant. There is no place on the road where inferior work will so quickly be rewarded by equipment failures as in the winding of armatures and fields, and it is doubtful if there is any part of the shop where the use of labor-saving methods pays higher interest on their cost.

Even in small shops it pays to provide first-class transportation facilities in all directions. Time is often lost and physical strength wasted in transferring armatures from the pits or truck inspection tracks to the lathes and winding cradles of the motor-repair department. The majority of railway motor armatures are not larger than an ordinary nail keg in bulk, but their actual weight of from four or five hundred to a thousand pounds needs to be impressed on any management which hesitates to spend money for overhead travelers and hoists on the large scale which the promptest and most efficient work demands. Hand trucks are essential in the winding room, but a complete overhead single-rail crane system, with lateral and possibly diagonal branches is worth all that it costs in the expedition of production which it makes possible.

In any large motor-repairing department the variety of work and the number of employes needed to push it through quickly are too great to justify anything but a liberal policy with respect to the arrangement of the men and machinery. At every point where the work can be done by an automatic machine there is little doubt that it will pay to install it, provided the demand for the machine's service is somewhere near continuous.

Sometimes the mistake is made of buying expensive equipment for only occasional operation, the result being that the fixed charges are altogether too high in proportion to the work turned out. Improved machinery with special guarantees of economy generally costs a good deal of money, especially in its early days on the market, when the expense of development and designing has to be recouped by the manufacturers. Simple, home-made devices may be less efficient in their operation, but for intermittent service it will usually cost less to run them than to pay the total annual charges on elaborate appliances.

It is as important that work be carried progressively through the winding room of a repair shop as that processes shall be continuous in a large factory. The orderly arrangement of spare parts and general supplies is often conspicuously absent in the work of such shops, and the resulting delay and friction are too patent to require emphasis. The motor-drive has now been almost universally applied to the equipment of the winding room, but there is still room for the use of more efficient types of motors, with a wider range of speed-control. Confusion too frequently exists in the wiring for insulation and resistance tests; circuits are seldom properly labeled, even when carrying dangerous voltages. The testing out of armature coils, commutator bars and field resistances offers an attractive field for the installation of special lamp resistances, instrument connections and adjustments, and in some of the more progressive winding rooms

these testing circuits are carried along the walls and columns with taps and plug connections at convenient points so that the work of the armature and field winders can be tested in progress.

In the operation of large winding departments there is a much wider field of activity for the individual worker than in many other kinds of shop practice. The replacing of armature coils, for example, calls for selective intelligence of a high order. The work is routine production as a whole, but in the carrying out of its details the steps are so varied that there is a chance for much loss of time to creep in if coils, insulating supplies, tools, wedges, etc., are not arranged in an orderly way. The personal characteristics of the winder largely determine the time required to finish the particular armature in hand, and this is so chiefly because of the high percentage of hand work which obtains. Systematic processes involving the specializing of the different jobs are desirable for the best results. In a large motor-repair department it is generally profitable to keep one or more men busy at commutator turning, or other lathe jobs, while others rewind fields and armatures, test coils and commutators, repair brush-holders, etc. Too often the lighting of winding rooms is inferior in quality; unshaded incandescents hung about in disorderly festoons give a bad illumination of specific areas, and as a result the quality of work at night suffers badly.

No feature of the work of motor repairs is too small to deserve consideration—the larger the force employed, the more essential it becomes to see that each particular job shall be done in the quickest and best way. The supply of compressed air throughout the department for cleaning, the installation of electric hoists for regular service and also for operation in place of pneumatic hoists at times when the load is too small to make it good economy to operate a large compressor, the use of special abrading and taping apparatus in stripping and rewinding coils, multiple dipping and drying in the ovens all count in securing economical repairs.

INTERURBAN TROLLEY BREAKS.

The breaking of a trolley wire on a long interurban line is such an annoyance that every reasonable means of avoiding it ought to be planned. Careful inspection of the wire as it comes from the reel is one of the first things to look after, for experience has shown a marked tendency of trolley copper to break at the points where small chips, nicks and other flaws exist. With the ordinary methods of suspension considerable bending strain is put upon the trolley wire just as it enters and leaves the ear by a fast running trolley wheel, for the upward pressure at the point of contact is sufficient to strike quite a sharp blow in case the wire hangs unevenly. It is a serious question if grooved trolley wire is not inferior to round copper for high speed interurban service.

The use of catenary suspension commends itself for a large share of new high-speed work, and the feasibility and strength of this method of hanging trolley wire is widely appreciated. For the best results the distance between suspension points needs to be chosen with care. Established interurban roads often cannot readily change over to catenary suspension for the reason that if their pole lines are already crowded with high-tension circuits, feeders, telephone and signal wires, the extra height needed for the catenary messenger wire is scarcely available without bringing the low-tension conductor too near the high voltage line. The use of heavier ears and hangers, and the maintenance of first-class alignment in the trolley seem to be about the only remedies for too frequent breaks, provided the original wire is inspected thoroughly.

On an interurban line it is usually out of the question to repair breaks by a tower wagon drawn by horses. Sometimes the motorman and conductor of an approaching car can make a temporary hitch to a tree or pole by using an in-

sulated pair of tongs or a wooden come-along with a coil of rope attached and which can be carried on each car, without much space being occupied. In other cases an emergency crew can proceed to the spot by regular car, arrangement being made to carry their light repair ladders on the roof. When a road can afford to do so, a special repair car with a tower attachment which can be operated quickly by one or two men is a great convenience, particularly if it is equipped with powerful motors and plenty of tools and supplies. In purely urban service there is not much of a field for an electrically driven tower car, but on long interurban lines it is fast coming to be a necessity.

SECTIONALIZING CAR HOUSE WIRING.

The common practice in the wiring of car houses is to tie all circuits of the same potential together. Trolley wires over parallel pit or storage tracks, auxiliary power circuits leading to inspection quarters and small shops, heater lines and lighting leads are generally so interconnected that there is no possibility of separating them so as to leave some of the lines alive and others dead. Of course, on the equipment side of the switches everything may be cut off readily, but on the supply side flexibility has seldom been sacrificed to protective convenience.

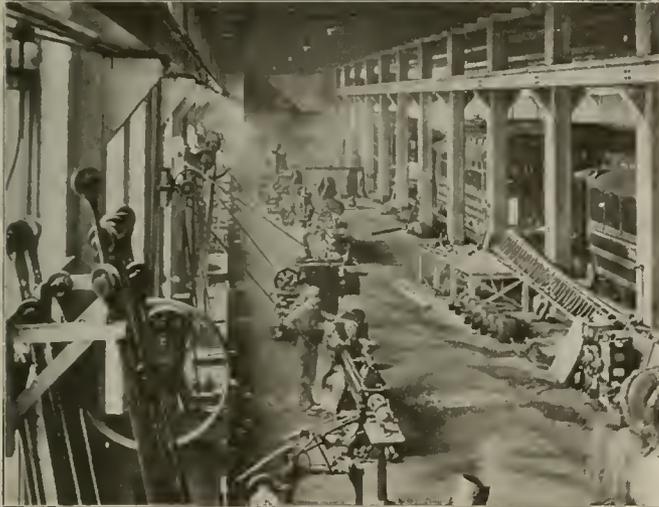
It is obviously attractive to be able to tap a 600-volt circuit at any point where current is temporarily or permanently needed, but from the standpoint of fire risk a more generous use of switches at such places would unquestionably be a good thing. Most operating companies have pretty definite rules in effect that trolley poles must not be allowed to remain against the wire on cars standing in the car house, but it is a fact that the rule is a hard one to enforce at all times. A good many fires have resulted from this cause, and a recent blaze which practically wiped out a car house full of rolling stock was attributed to the combination of an unchecked snow plow heater equipment which was evidently left accidentally in circuit with the trolley against the wire.

Considering these points it is certainly worth while to think seriously about sectionalizing car house wiring in such a way that when a track in the house is covered with stored cars on which no work is being done the trolley above can be cut out and killed. Section insulators are cheap enough, and the cost of controlling all the trolley wires in a given section of the car house from a single point by single-pole knife switches mounted on a suitable panel would be slight in proportion to the additional insurance thus afforded against fire loss. It would also be a comparatively easy matter to install a home-made automatic alarm which could be cut in circuit at night to ring a bell or light a series of red incandescent lamps in case any part of the car equipments on the storage tracks should be accidentally or carelessly left in complete circuit.

The wiring of old car houses, especially if shops are connected with the buildings, is seldom all that might be desired in the way of arrangement, even though it may satisfy the insurance requirements. Pit lighting circuits, testing lines, motor and lighting wires can profitably be controlled from a common central point and waste of current prevented by installing pilot lamps or even a simple magnetic needle indicator to show when the circuits are alive. Electric sand drying apparatus often consuming several kilowatts has to be left in circuit for long periods each day, and if no indicator in the shape of a lamp is inserted in the lead wires to the resistance coils, the tendency is to leave the current on longer than is necessary. It should be easy to trace the wiring in any car house or shop, regardless of the type's being open or enclosed in conduit. Special switches can be desirable at individual pieces of machinery or at particular points where a large number of lamps have to be cut in and out at the same time. Definite and regular arrangement tends toward safety and economy.

200-ton wheel-press is also provided for pressing on commutators and removing armature shafts from the laminations. Armatures are raised and lowered between the machine shop and the winding room through a trap door in the floor, by means of block and tackle. Later it is intended to do this work with an electric hoist.

One of the accompanying illustrations shows the winding stands, hoist and carriage used for handling armatures.



New Shops and Car Storage at Nashville—Interior of Machine Shop.

inch T-rails are used over the pits. These are supported every 6 feet and at a height of 3 feet 11 inches above the pit floor by 6-inch cast-iron pipes filled with sand and set in concrete. At the top of each pipe a casting, 7 by 10 inches, is provided with four holes for anchor-bolts which hold the rail to the pipe. Provision is also made, by means of a 5 by 5-inch lug cast on the outside and near the top of each post, for stringers on which it is intended to lay plank walks be-



New Shops and Car Storage at Nashville—Interior of Carpenter Shop.

The armature repairs are simplified to a great extent by the comparatively uniform types of motor equipment, there being four types, namely, G. E. 800, 1,000, 67 and 57.

Car Storage House.

The building occupied by the car house is divided longitudinally into five bays, each 35 feet wide, by the reinforced concrete pillars, 14 by 14 inches in cross section, which sup-

port the roof. These stringers act as tie-rods for steadying the rails of each pit. The pit tracks are laid with 11-foot centers.

At either end of the building concrete floors extend from the ends of the pits to the curbing on the property line of the street. These floors and the floors of the pits as well as the tracks are sloped to the north and the west, affording an



New Shops and Car Storage at Nashville—Interior of Paint Shop.

port the roof. Each bay contains 607.5 lineal feet of pit track, making a total of 3,037.5 lineal feet of pit track in the building. This apartment is separated from the machine shop by a firewall.

In developing the pit details many original features were adopted. The floors and end walls of the pits, like the floors throughout the building, are of concrete construction. Seven-

effective drainage and a means for clearing the sheds of cars in case of fire. Sewer traps are located at convenient points about the building.

On account of the usually mild climate that prevails in Nashville, it was not thought necessary to enclose the entrances to the car house. The roof of the building, however, is extended 12 feet 6 inches beyond the building line

proper on the Third and Fourth avenue sides. This projection prevents rain and snow from driving under the roof. Fifty-four wired-glass skylights admit a generous amount of light for the day inspection work.

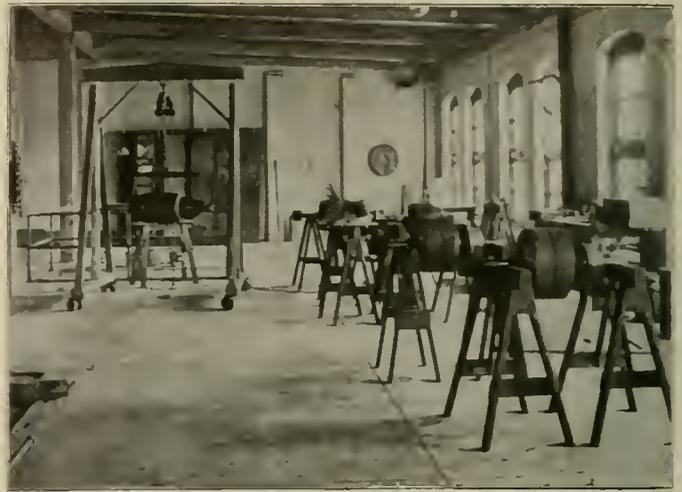
This building was designed for the night storage of all

made in the company's shops. As is shown in the illustration, neatly designed drying racks are placed about the room.

In the carpenter shop separate alternating-current General Electric induction motors are used to drive each machine. The following woodworking machines, supplied by



New Shops and Car Storage at Nashville—Varnish Room.



New Shops and Car Storage at Nashville—Winding Room.

cars operated during the day. Cars brought in at night are given a place over the pits where they are left until again taken out for service. By this arrangement it is not necessary to maintain a switching crew to place the cars for night inspection. The off-season cars are stored in houses on Wharf avenue, Division street and West Nashville.

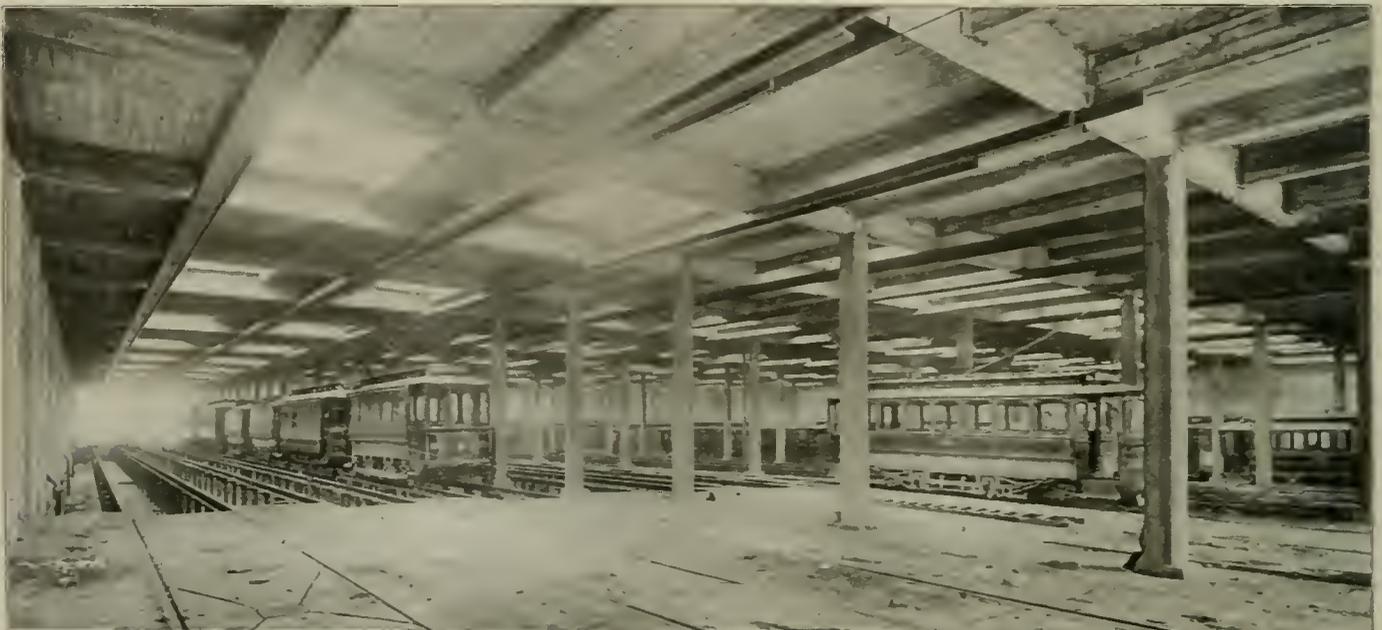
Paint and Carpenter Shops.

The building occupied by the paint and carpenter shops is divided into two parts by a brick wall. The paint shop is 49 feet wide and the carpenter shop 69 feet. Both rooms are 190 feet long and have concrete floors and reinforced con-

Fay & Egan, and the motors used in operating them, have been installed.

Tools		Motors
24-inch resaw	20	horsepower
24-inch side planer.....	15	horsepower
9-inch four-side molder.....	15	horsepower
9-inch Universal woodworker.....	10	horsepower
Cut-off saw	5	horsepower
Rip saw	7½	horsepower
3-inch four-side molder.....	5½	horsepower
7-inch tenoning machine.....	5½	horsepower
Mortising machine	5½	horsepower
32-inch scroll saw.....	5½	horsepower
30-inch double-head shaper.....	7½	horsepower
Drum and disc-sanding machine.....	3	horsepower
Universal sash and door clamp.		

The only variation from the plan of having one motor



New Shops and Car Storage at Nashville—Interior of Car House Showing Concrete Construction.

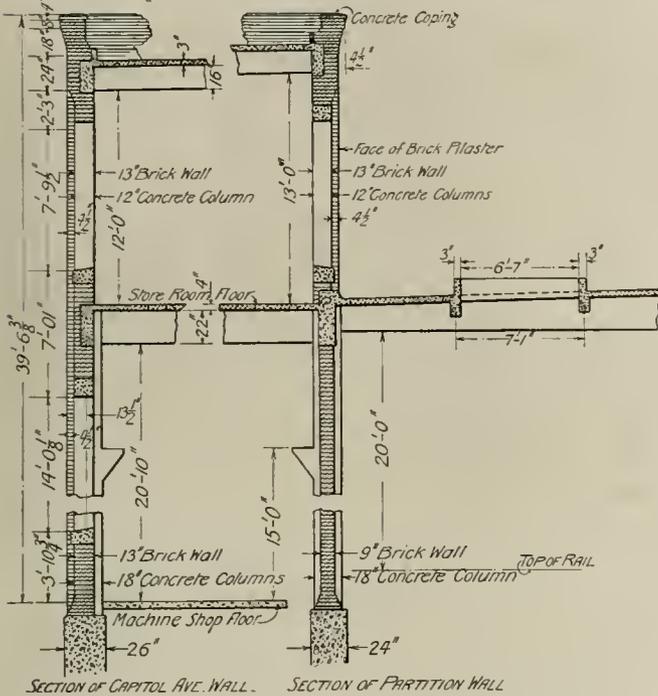
crete roofs. The floor of the paint shop is sloped for drainage so that cars can be washed there if necessary.

The varnish room, a photograph of which is reproduced, occupies the same position in the paint shop that the mezzanine floor does in the carpenter shop. The room has a floor area 44 by 48 feet. In it paint and varnish are applied to all car panels, window frames and doors and to all portable parts

for each tool is at the rear of the building, where a line-shaft 16 feet long, driven by a 5-horsepower motor, drives an emery wheel, knife grinder, drill-press and grindstone. Work benches built of 4-inch maple planks laid on edge and each equipped with an Emmert Brothers universal vise, are furnished each cabinetmaker employed in this department. The equipment for this building was selected with a view toward

the construction at a later date of all new cars needed by the company. Up to this time the carpentry work has been limited to the repairing of cars.

The mezzanine floor, 44 by 69 feet, at the rear of the carpenter shop is used as a storeroom for finished lumber



New Shops and Car Storage at Nashville—Section Showing Construction of Brick and Concrete Walls.

products and for emergency car-body repairs. When it is necessary to set the mortising, planing or shaping machines for any class of work, it has been found economical to work up quantities of stock and keep such supplies on the mezza-

the arrangement of tracks and special work leading to the various departments. At either end of the car house a main switch-track was laid, from which lead all the house tracks. By this means, switching of cars can be carried on without interfering with cars operating on the main tracks passing the buildings on Third and Fourth avenues. Tracks leading from the repair pits to the carpenter and paint shops enable cars to be shifted without delay between these departments.

All the offices and enclosed shops of the new buildings are heated by hot water supplied by a No. 3 Mercer boiler, which is located in the basement of the main building. Mr. George W. Swint is master mechanic in charge.

The New Tunnel for the Metropolitan Street Railway Company of Kansas City.

Plans recently were submitted by the Metropolitan Street Railway Company, Kansas City, Mo., asking the board of public works to permit the construction of a tunnel and viaduct from Broadway to Mulberry street. If the plans are accepted the company will begin the construction of the tunnel and viaduct at once, it being expected that work can be begun on March 15, 1907, and the tunnel and viaduct completed by January 1, 1908. The principal object of the new plans are in reality simply to eliminate the last cable road in the city. The new viaduct and tunnel are necessary to reduce the grade as electric cars would not be able to climb the 13¼ per cent grade on the route formerly followed by the cable road. The only feasible way which could be found to get over the bluff at Twelfth street and down into the bottoms on the other side of the hill is by the plan proposed.

The plans show an open cut extending 120 feet from Broadway and from this point a tunnel extending 3,600 feet to within 150 feet of Mulberry street, the objective point on the opposite side of the bluff. The grade as far as Mulberry street will be 5½ per cent and from there it will increase to 7 per cent. In order to avoid an excessive grade



New Shops and Car Storage at Nashville—Fourth Avenue Structure with Projecting Roof and Doors.

nine floor ready for immediate use. As many of the company's cars are of one type and the parts interchangeable, this can be done advantageously.

On property adjoining the carpenter shop is the company's lumber yard, where quantities of seasoned lumber are stored.

In designing the new buildings much attention was given

the viaduct will be built in the form of the letter "S," and will intersect the face of the bluff at about the same elevation as the present viaduct, but instead of climbing the face of the bluff as formerly, it will enter the tunnel at that point. The viaduct will have a double path for foot passengers from Mulberry street to the entrance to the tunnel on the bluff.

MILWAUKEE SERVICE INVESTIGATED BY WISCONSIN RAILROAD COMMISSION.

At the conclusion of its session on February 27 the Wisconsin state railroad commission, which has been hearing the evidence in the case of the city of Milwaukee against the Milwaukee Electric Railway & Light and the Milwaukee Light Heat & Traction companies, adjourned until March 19. John T. Kelly, the city attorney, announced that with the exception of a little additional testimony the city has completed its case. Mr. Kelly declared that the service which is maintained now is adequate and satisfactory and that if it is continued no further complaints will be made. It is to ask questions regarding the permanency of the present service that he desires to call witnesses on behalf of the companies. The companies will furnish to the city attorney such information as he requests to aid him in completing his argument to the commission.

T. A. Clancy, the chief of the fire department, was introduced by the city to testify regarding collisions with electric cars during the last seven years. The city attorney said that the object of this testimony was to show the need of air brakes on the cars.

At the hearing on February 20 C. M. Black, general manager of the Kansas City Railway & Light Company, gave some interesting testimony. After an investigation of conditions in Milwaukee, Mr. Black testified that the cars were not crowded for a run exceeding two miles, and that the standing loads were not carried to exceed $1\frac{1}{4}$ or $1\frac{1}{2}$ miles.

One of the attorneys for the Milwaukee company said that evidence would be introduced showing that the Milwaukee system operates 176 cars during the day and during the rush hours puts on 191 extra cars. There are 120 miles of single track in Milwaukee. Mr. Black expressed the opinion that this number of extra cars in use during rush hours was larger than could be found anywhere else in the country. When Mr. Black was asked if he thought better service could be given in Milwaukee during the rush hours he said that owing to the difficulty of getting trainmen he did not see how it would be possible. He added that all the street railways in the country had been confronted with the same problem during the last 10 years and had found it difficult to furnish men with enough continuous hours of labor to satisfy them. It was very difficult to get men to run extra cars for one or two hours.

Mr. Black stated that he had observed street car conditions in Cleveland, Philadelphia, Washington and many other cities and could say freely that there was less crowding in Milwaukee in rush hours than in any of the other cities with the exception of Washington. During non-rush hours Mr. Black said he did not see a single car containing more persons than seats.

The actual expense of operation of one car for an hour or an hour and a half, Mr. Black said, without allowances for depreciation or maintenance, would be \$5, whereas the earnings of one car would be not over \$4. If transfers were given, the actual earnings would be less than \$4. Mr. Black said that no company would contract to operate a car into the city and back to the barns for an hour and a half for \$5 a day because it would lose on the contract. Mr. Black said that the Kansas City company is unable during the rush hours to collect all the fares and that it would be glad to spend money on any plan which would improve the situation. The Kansas City company has 225 miles of single track and operates 515 cars during the busy hours, Mr. Black testified.

In speaking of the relations of electric railway companies with their employes Mr. Black said that rigid discipline is absolutely essential and that many men will not submit to it. While many men may be qualified in other

ways for the service they may be hasty in temper or slow in reporting for work, causing disarrangements of the schedules. Owing to the fact that men object to irregularity in their hours of work and rest, street railway companies have peculiar difficulties to hamper them in obtaining labor.

When the question of brakes was brought up Mr. Black stated that Milwaukee is level compared with Kansas City. In the latter city both the air brakes and hand brakes are used on cars; air brakes on cars weighing 40,000 pounds or over. Mr. Black had examined the hand brakes used in Milwaukee and believed that no advantage would be gained by using air brakes there. In Kansas City, he said, in spite of rigid inspection, there are accidents when air brakes are relied on. Mr. Black expressed the opinion that air brakes make motormen more venturesome and that new employes would have more accidents while learning to operate air brakes than when they were learning to use hand brakes. As to the comfort of the occupants of the car, he said, there would be little difference between the effect of air brakes and hand brakes if the mechanism of the hand-brakes is in good order and the motormen are skilled. Mr. Black said the condensation in pipes might freeze in Milwaukee and the air brakes fail.

As to whether it is better to run all cars to the center of the city and around a loop, returning over the same route, or to run them through from one side of the city to the other, as is the custom in Milwaukee, Mr. Black said he favored the Milwaukee system because it necessitated the use of fewer transfers and caused less congestion and delay at the intersection of lines.

R. A. Leussler, secretary of the Omaha & Council Bluffs Street Railway Company, was one of the experts who testified on behalf of the companies. He said that it is difficult to maintain discipline among extra men. His observations in Milwaukee satisfied him that the hand brakes were efficient there. Mr. Leussler stated that in Omaha the cars are equipped with air brakes, but that hand brakes are installed also as a matter of precaution.

William O. Wood, assistant general superintendent of the Brooklyn Rapid Transit Company, testified that he inspected the traffic in Milwaukee at all rush hours of the day, including the theater traffic, within what he termed the congested district, 1-3 miles from the center of the city. In speaking of the traffic during non-rush hours, Mr. Wood said: "It is more than sufficient—an extravagant service." He thought that it would be impossible to increase the number of cars at rush hours because of the lack of men and because the character of the work causes a division of hours of labor, which is a hardship on the employes. Mr. Wood said:

I believe that the air brakes cannot be recommended as better than the hand brakes, which are safer. Motormen with air brakes rely upon their maximum efficiency and use them to the limit. When the air brakes fail the time is too short to apply hand brakes. The traffic in Milwaukee is very dense about 6 o'clock. I do not believe any good purpose would be served if additional cars were put on. They would delay the service and people would not wait, but would pile on the first car.

In reply to a question, Mr. Wood said he did not think it unreasonable to make a man wait 10 minutes for a car on a light line. He testified that on one evening ten persons crowded on a car who should not have done so, though they were told that another car was following.

J. T. Funk, superintendent of the Louisville Railway Company, stated that in Milwaukee more cars were run in proportion to the people carried than in any other place with which he was familiar. He testified that he never saw a large crowd handled in better manner than the theater crowd in the evening before his testimony was given. While on some cars there were heavy loads, these would not have been avoided by the use of additional cars, as the tendency of people is to crowd on cars rather than to wait. In his opinion an increase in the number of cars

would not be an advantage to the traveling public because it would cause congestion at busy points. He preferred hand brakes to air brakes, and, considering the speed of the cars, said that hand brakes were efficient in Milwaukee. He pronounced the air brakes a failure in Louisville, as their use had permitted costly accidents.

George Kuemmerlein, Jr., assistant superintendent of transportation of the Milwaukee Electric Railway & Light, testified that the company would rather have 75 people in a car than 90. "With 42 sitting down and 30 standing inside the car," he said, "the conductor can collect the fares without difficulty. Our supervisors keep us informed as to the traffic and we put on cars or take them off according to conditions."

John I. Beggs, president of the Milwaukee companies, appeared before the railroad commission on February 19. In answer to the statement from Lynn S. Pease, representing the citizens of Wauwatosa, that the highest figure which he had noticed of persons boarding any one car was 212. Mr. Beggs said that it would be impossible to get that number of people on one car. When the statement of Mr. Pease was analyzed it appeared that 212 fares had been taken, which Mr. Beggs showed was a different matter. The collection of as many as 212 fares on one car was exceptional, Mr. Beggs said. In reply to a question as to what he considered a crowded car, Mr. Beggs said:

A maximum load at any one time would be a number of passengers standing equal to the number seated; that would be about 90 passengers. That is an extreme load; it is seldom realized. The seating capacity of a Wells street car is 42 in winter and 44 in summer. We could not crowd more people on than that, but they crowd themselves on; we prefer to keep them off. I have not yet been able to find a lawyer who would assure us that we would be justified in using force to keep people off our cars. I hold that such a load as I have named is not an unreasonable condition. If passengers crowded on as they do in New York we would be carrying 150 passengers to the car. Milwaukee does not know what crowded cars are. If you will supply a penalty which we can enforce upon passengers who crowd upon a car that is loaded unduly we shall see that it is enforced, and that within a reasonable time cars are furnished for the people left over.

In reply to the question whether he would approve the issue of such an order by the railroad commission, Mr. Beggs said that he would, and added: "I hope that the commission in time will be clothed with sufficient power to apply such a penalty."

Mr. Beggs, in continuing with the evidence, said that the plan to supply conductors with commutation tickets for Wauwatosa so that they might be purchased readily by passengers was impracticable as the conductors who carried Wauwatosa tickets would also have to carry tickets for all other suburban and interurban lines and that a safe would be required to hold all the tickets.

The complaint on which the present investigation by the railroad commission was based states that while residents of Wauwatosa pay two fares, passenger on the Howell avenue line to Tippecanoe ride for a single fare. In explanation of the discrepancy, Mr. Beggs said:

Tippecanoe is a sore point. The line was built on a \$40,000 bonus before I assumed the management. We have held to one fare because it was one of the conditions, and we always stick to our agreements. The line does not pay for the conductors and motormen. I once offered the people their \$40,000 if they would agree to let us abandon the line.

The Manhattan Railway Company of New York, now leased to the Interborough Rapid Transit Company, is installing a new safety device on the controllers of the elevated trains, which it is expected will materially reduce the chances for accidents and enforce strict attention to business on the part of the motormen. The new device, which is an addition to the functions of the "dead man's handle," is so arranged that it will be necessary for the motorman to keep his hand on the controller when coasting as well as when the power is on. The cars are being equipped with the new improvement at a rate of about five cars per day.

BOSTON & MAINE WANTS CONWAY (MASS.) ELECTRIC RAILWAY.

Dr. John B. Laidley, secretary and manager of the Conway (Mass.) Electric Street Railway Company, appeared before the committee on railways of the Massachusetts legislature on February 20 to urge the passage of the bill allowing the Fitchburg railroad to buy control of the Conway company. The objection was raised that the bill would give the Boston & Maine, which controls the Fitchburg, an opening wedge so that it might secure control of many electric railway companies along its lines. Dr. Laidley did not see how the bill would allow this. The attitude of the Boston & Maine, as he understood it from Lucius Tuttle, the president, was that that company wanted to acquire the Conway company in order to have the electric power and power rights which it controls. Dr. Laidley understood that the Boston & Maine wanted to use more electric power in the Deerfield yards.

Dr. Laidley gave a history of the Conway company. Before the steam railways were built Conway, he said, was prosperous and well populated, but as Conway was not on the line of any of the roads it declined after they were built. In the ten years previous to 1894 Conway lost more than 400 of its population. The townspeople tried three times to induce the steam railways to build a branch, but after surveys had been made the plans were abandoned because the railways did not believe they would get sufficient business to pay them for the cost of construction. In 1894 the Conway people secured from the legislature a special charter allowing them to build an electric railway for freight, as well as passengers; and to run freight cars through the town streets and build sidings leading to the stores and mills. This privilege was secured because the Conway people proved to the legislature that the situation was unique, and that Conway, in order to maintain itself, needed all the privileges obtainable.

As there are only 1,300 people to give passenger business on six miles of railway between South river station on the Fitchburg division of the Boston & Maine and Conway, it was necessary to depend on freight for much of the revenue, and the Conway company has been able to come out only about even. Dr. Laidley said that the company earned last year, even with the officials giving their time, about \$4,000 over operating expenses, and this sum was required for interest charges. The company has never paid a dividend.

By acquiring private land the Conway company, in 1896, secured the right to enter the town of Deerfield, and later it secured the right to sell power to a private company organized by Dr. Laidley to furnish electric light and power in Conway. The line, Dr. Laidley said, has 78 curves and grades as high as 8 per cent. The road uses a combination car for passengers and light express and mails; but also hauls small freight cars which have a capacity of eight to 10 tons of coal and six to eight tons of grain. These cars are switched directly to the doors of the mills and stores.

When he was asked how the Boston & Maine could operate the electric railway more profitably than could the Conway company, Dr. Laidley replied that the Boston & Maine could borrow at rates sufficiently low to save enough money to make the difference between a deficit and a surplus; moreover, he said the Boston & Maine could develop the power rights now owned by the company in the South river, and could find a market for all the power that could be developed.

Dr. Laidley showed that the railway had benefited Conway by reducing the cost of delivering freight and express and by inducing new factories to locate there, preventing by this means the population from moving away. In the five years after the railway was built the town added 200 to its population. The railway had been operated for 12 years without an accident. If the Boston & Maine acquired the property, Dr. Laidley thought the track and roadway would be kept in better condition; the property could be taxed instead of having its taxes lessened, and the indebtedness of \$100,000 could be handled to better advantage.

DISPATCHING CARS BY TELEPHONE, DENVER CITY TRAMWAY.

BY S. W. CANTRIL, SUPERINTENDENT.

The system of operating street cars by telephone from a central station was introduced in Denver a little more than 17 years ago. The idea originated in the mind of Mr. Charles K. Durbin, then superintendent of the Denver Tramway Company. At that time the lines were operated, for the most part, by cable. This method was prompted, no doubt, by motives of economy, as it was believed that the few cars then owned by the company could be operated by one man through the use of telephones and the wages of numerous starters thus saved.

Although the apparatus and switchboard used at that time were of the crudest kind and have since given way to the up-to-date appliances provided by the local telephone

The dispatcher's office is located in a company building situated in a most convenient place at the central loop. Here also are the headquarters of the superintendent, company's surgeon, overhead line department, wrecking crew and general repairmen, with all of which the dispatcher has direct connection by telephone.

Usefulness in Time of Fire.

The dispatcher also receives all city fire alarms, and the company thereby is enabled to learn the location of fires as soon as the fire department. Being in close touch with the working force mentioned above, the dispatcher at once reports the location of a fire to the proper officials, together with any information that may have come to him from trainmen in close proximity. If there is danger that cars may be blocked by lines of hose, the crew of the hose-bridge wagon is ordered to the scene. This wagon is constructed for carrying a number of bridges, and as the wrecking de-



Dispatching Cars by Telephone—Office of Dispatcher, Denver City Tramway.

company, the principles of directing the movements of cars by telephone have changed but little. With a small beginning of 5 lines, which have since grown to 30, the telephone seems fully as adequate to meet the requirements as it was at first. Naturally, some of the methods originally employed have been modified in the light of later experience, and the telephone lines extended and multiplied as new track was built, old lines carried farther into growing residence districts, and the car service increased to meet the demands of Denver's rapidly increasing population.

General Arrangement of System.

The lines of the Denver City Tramway Company are particularly well adapted to being handled by a dispatcher. In the business center of the city and adjoining each other are two small loops, which mark the down-town terminal of nearly all the lines. A few long cross-town lines pass through the city within one block of each other, and there is but one line which is two blocks distant. The tracks are so connected, however, that the cars of any isolated line may be run into the central loops, if necessary, and other cars put in their places.

partment is conducted on similar lines to those of a fire station, a quick hitch is made so that by the time hose is laid across the tracks the bridges are on the ground and cars soon are running as usual.

An Aid to Operation.

The telephone dispatching system affords the superintendent the greatest facility for keeping in touch with every detail of the operation of cars. If an accident occurs, the particulars are at once communicated to the dispatcher, either through a regular reporting station or the most convenient telephone in a residence or business house along the line, and no time is lost in summoning the necessary officials, city ambulance or wrecking crew. Should a car become fully or partially disabled, the crew immediately notifies the dispatcher, giving the nature of the trouble. Being fully acquainted with the situation, the dispatcher arranges to have necessary repairs made when the car reaches the central loop, and, if expedient, to take the car off the line and fill the space with one of the emergency cars at his command.

The flexibility of the car service and the rapidity with

which the dispatcher is enabled to adjust the headway of any line are the strongest points in favor of the telephone system. In every city the condition of travel demands the addition of extra cars or trippers on most lines, at certain periods of the day. In the morning, for instance, the riding is chiefly toward the business center and the extra cars, as far as possible, take their places and are spaced from the outer terminal, each extra running between two regular cars. In the afternoon the condition is reversed, and the regulars are held back at the outer terminals to make places for the extra cars which are sent out from the center of the city, thus maintaining an even headway throughout. As the extra cars are withdrawn from the line, the dispatcher again equalizes the spaces as fast as cars are reported at the terminal and no confusion results. Any congestion of the cars of a line caused by accident or blockade is adjusted in the same manner, speedily and without difficulty.

Another advantage of the telephone dispatching system is, that it enables the superintendent to keep in close touch with the conditions of travel after the evening rush and theater patrons are properly cared for. At this time of day the dispatcher begins to retrench the service and sends cars to the car houses as they can be spared without interfering with traffic. The Denver City Tramway Company has a regular method of "pulling-down" the lines at night, but if the dispatcher finds that the travel is such as to demand increased service, he may hold a full quota of cars on one or more lines and, if necessary, use cars which are not needed on other lines. In this way, through the agency of but one man who is enabled to keep fully alive to the needs of patrons on all lines, the service is reduced to a minimum.

Method of Dispatching.

As to the method of dispatching cars by telephone, a brief description may be of some interest. The dispatching circuits are operated similarly to a party line, each circuit having from two to four reporting telephones of different car lines. Care is taken not to place two busy telephones on the same circuit.

A train-sheet 26 by 24 inches in size, with spaces for car numbers of all lines and ruled spaces opposite for their leaving time from the reporting stations, is fastened to the desk in front of the dispatcher. On long lines, where cars are reported at each terminal, the car numbers are duplicated for each reporting station. After a car has been switched at the end of a line, the conductor calls the dispatcher from a telephone placed in a convenient receptacle. He tells the dispatcher the number of his car and the name of the line upon which he is running. Aided by his familiarity with the running time and his experience in making quick computations, the dispatcher announces without hesitation the proper leaving time of the car. The conductor then repeats the time given by the dispatcher to make sure that he heard aright, receives the dispatcher's "O. K." if correct, and prepares to depart as directed. At the same time the dispatcher records on the train-sheet, opposite the car number, the time of leaving. The running time of all lines and the time allowed for running between given points along the line are published for the benefit of all trainmen. As soon, therefore, as the motorman receives the leaving time at one terminal from the dispatcher and the conductor, he knows at what time his car is due at the other terminal and just when his car should pass the "time points" along the route.

Utility of the Train-Sheet.

At the end of the day the train-sheets show the time at which each car left the terminals of the line or lines upon which it ran. This record proves a valuable one in many ways, especially when it is necessary to gather information concerning an alleged accident. The dispatcher's train-sheets also are valuable for use in the auditing department. For

Annotations:

- ☑ Indicates car to be pulled off.
- Indicates time car was not on.
- Indicates parking space occupied.
- Indicates car taking space at different depots.
- Indicates car taking space at post office hour end of line.
- Indicates time car was changed.
- Small figures are time given when car numbers are not on extra.
- All characters explained in manual.
- ☐ appear in red ink on original train sheet.

Dispatching Cars by Telephone—Portion of Train-Sheet Exhibiting Dispatcher's Records for Several City Lines. (Original 24 by 26 inches.)

instance when cars are taken off the line the conductor receives orders from the dispatcher, giving the leaving time of such car "to the house." Knowing the time allowance from the terminal to the car house the conductor computes, by means of a printed wage-schedule furnished him by the company, the exact amount of his and the motorman's wages and pays both out of the car receipts. This unique and economical plan of paying wages has been used with great success by the Denver City Tramway Company for the past 18 years. With the dispatcher's sheet before him, together with the trip-reports of the conductor showing the time the car was "signed in" and "out" of the house, the auditor has no difficulty in ascertaining the exact length of time a car has been in service, and it becomes an easy matter to verify the work of conductors.

When lines are running smoothly a dispatcher will answer from 10 to 15 calls per minute and can handle from 150 to 175 cars. If, however, something occurs to interfere with the service on one or more lines, which demands more than ordinary attention, he is unable to do full justice to more than 125 cars.

Dispatching on Interurban Lines.

The company's interurban lines also are operated by use of the telephone system, but are in charge of a separate dispatcher. On account of the fact that these lines are single-track, the traffic being divided between passenger, freight, work and special trains, the responsibility of the dispatcher is much greater although the calls he answers are few in comparison with those of the city lines.

Reporting stations are placed at every siding, the color of the telephone box indicating whether or not it is a regular reporting place, or only to be used when running under special orders. The wiring of the offices of the city and interurban dispatchers is so arranged that the interurban office may, in busy times, relieve the city dispatcher, by taking charge of one or more lines. At about midnight the interurban office is closed and the night city dispatcher assumes the duty of running the owl cars and the interurban freight trains.

One Operating Center.

The night dispatcher acts as an intelligent watchman over the entire system. He is authorized to call out such officials, foremen or repairmen as he may deem necessary for the best interests of the service. He is at all times alive to the weather conditions. Should a storm arise, with danger of blockade from snow, he notifies division superintendents and sees to it that the crews of snow plows and sweepers are called. He also calls the roadmaster, who provides the necessary trackmen to keep the switches and crossings free of snow. If the condition of the rails is bad and there is danger that the first cars may be late in getting to their destinations, the dispatcher arranges to have them leave the car-houses a few minutes earlier so that the patrons may suffer no inconvenience.

At pleasure resorts and other places where the travel becomes very congested and somewhat erratic, the efficiency of the dispatching system is greatly augmented by the presence of an inspector or other official of the company, who, being directly on the ground, can attend to the proper loading and unloading of passengers, and keep the dispatcher informed as to the needs of the service. In this way extra cars may be hurried out to bring in the crowds, or they may be diverted to other lines as the travel decreases.

There are 1,614 street cars operated in Great Britain, by other than electric power. There are now more than 400 miles of electrically operated railway track in Great Britain and a total mileage of electrically operated tramway track of 3,362.

EMPLOYEES' RECORDS OF THE MEMPHIS STREET RAILWAY COMPANY.

An interesting and novel method of handling accident reports is in use on the lines operated by the Memphis Street

WITNESSES		Form 300-10a-9-18	File No. _____
Name	Address	MEMPHIS STREET RAILWAY COMPANY.	
		ACCIDENT REPORT.	
		Memphis, Tenn., _____	190__
		Car No. _____	Line _____
		Time _____	M. Direction of Car _____
		Place of Accident _____	
		Distance from Car when first seen _____	
		Speed _____	(At time of Accident)
		Speed _____	(Just before Accident)
		No. of Passengers on Car at time of Accident _____	
		Direction of Vehicle _____	Speed _____
		Weather: Fair, Cloudy, Rainy, Foggy _____	
		Condition of track _____	
		Condition of Car _____	
		At _____	Street Crossing
		At _____	R. R. Crossing
		Track at Place of Accident _____	(Up Grade / Down Grade / Level)
		Curve or Straight Track _____	
		Exact Position of Conductor at Time of Accident _____	
		Reported by Phone—Time _____	Phone No. _____
		To _____	

Employees' Records at Memphis—Obverse of Accident Report—Original 4 by 8 1/2 Inches When Folded.

Railway Company at Memphis, Tennessee. This city has an estimated population of nearly 200,000 people, and as the company operates 140 cars on schedule there are unavoidably

Was Person Injured a Passenger? _____

INJURY TO PERSONS.			
Name	Address	Color	
_____	_____	_____	
INJURY TO PROPERTY			
Property Injured	Name of Owner	Address	License No.
_____	_____	_____	_____
Name of Driver	Address	Color	
_____	_____	_____	
Give full particulars as to cause of accident, extent of injury and what done with injured party or damaged property.			
Statement of Crew _____			

Conductor _____	Badge No. _____	Motorman _____	Badge No. _____

Employees' Records at Memphis—Reverse of Accident Report—Original 8 by 8 1/2 Inches.

many accidents that occur during the year. Believing that an early and thorough investigation into the cause of accidents, trivial and otherwise, places the claim agent in a better position to defend the company's interests, attention has been

ting obsolete ones, the Turner ordinance was placed in such code as a live ordinance and one of present binding force.

The city council has directed new lines to be built since 1898, and since that date 30 miles have been built at great cost, and by so doing the city construed the ordinance as the company now contends, and the city ought to be and is stopped from denying the contract, tearing up the tracks or declaring the company a trespasser. The complainant owns the tracks built by the Turner company and its successor, and by conveyances of record owns the franchises as well, which were assignable.

The fact that the life of complainant as a corporation is limited to a term of years is not decisive, because it has the right under our general corporation laws to renewal. And if it had not, its assets, including the franchise asset, belong to the stockholders subject to the rights of its mortgage and general creditors. In 1866 there was no specific statutory authority for granting permission to occupy the streets with the street car lines. Des Moines had then but about 6,000 people, and it was about as large as any other city of the state. But Dr. Turner and others had confidence in its growth. And the then city council desired to aid in building up the city, by enabling people to reside beyond the business district. So that the ordinance was enacted under a statute giving general control only over the streets. The system was thus inaugurated, and carried on for 14 years, with an expenditure of \$200,000, and no profits. Then when profits were in sight, the council granted rights to other companies and the litigation commenced.

Many cases of the highest authority are called to my attention, to emphasize the undoubted and most familiar rule, that a public grant must be given the construction most favorable to the public, when it is susceptible of two or more constructions. But neither statutes nor ordinances are to be frittered away by construction. Like contracts, they are to be held up by the four corners, examined and given a fair construction. Let it be kept in mind, that for what appeared sufficient reasons, the legislature has from time to time limited the time of several municipal utility corporations and their rights to the streets. But not so with the street railway lines.

And let it be kept in mind that to prevent the ordinance from being void by creating perpetual monopoly that the monopoly feature was limited to 30 years of time, now expired.

Questions of rates, or transfers, or taxation are not involved. Nor are questions as to the efficiency of service, that which interests the people more than all else in connection with a street railway system. And with efficient service, and reasonable rates, the people are content. And with these in mind the legislature was content, not to allow the monopoly for all time, but to allow one company in common with all others to have a continuing franchise. And when it fails to furnish such service the remedy is plain.

But in the meantime there is a contract that must be observed by the city.

In discussing the decision N. T. Guernsey, general counsel for the company, said:

As I analyze it the propositions established are the following:

(a) That the federal courts have jurisdiction to hear and determine the controversy.

(b) That under the statutes of the state the city had the power to grant a perpetual right.

(c) That the 30 years' limitation in the Turner ordinance applied only to the exclusive right to operate by animal power, which expired January 1, 1898.

(d) That under the Turner ordinance as amended the company has a contract granting it a perpetual, but not exclusive, right to maintain and operate its tracks.

While the opinion of Judge McPherson unequivocally recognizes the perpetual right of the company, he is careful to call attention to the fact that out of this right arises the obligation on the part of the company to furnish adequate and efficient service. In other words, it is not a right which can be exercised to the detriment of the public, but which must be exercised for its benefit.

Terminal Station in Milwaukee.

President A. C. Frost of the Chicago & Milwaukee Electric Railroad appeared before the joint committee on judiciary and railroads of the Milwaukee city council on February 27 and stated that the company had taken a 99-year lease of the property on Second and Wells streets and will erect a terminal station at that point, to cost \$200,000. The announcement was made in connection with an application for a change in the company's franchise to give access to the new station. Mr. Frost stated that the building will be four stories in height and in addition to space for cars and waiting rooms will contain the offices of the company. Provision is to be made for cleaning the cars after each trip. Tracklaying on the line is now completed to within 12 miles of the southern limits of the city. It is planned to have cars running into the south side of the city by September 1. The time when cars will enter the business district depends on the completion of the Sixth street viaduct.

SAND-SUPPLY CAR AT KNOXVILLE.

The illustration herewith shown was made from a photograph of the interior of a sand-supply car used by the Knoxville (Tenn.) Railway & Light Company for sanding the track during bad weather and for replenishing its supply in the sand boxes of the regular cars.

The company's car barn, where the sand drier is located, is far removed from the transfer station and the main arteries of travel and as a result it is seldom that a regular car gets to the barns before completing its day's schedule. Inasmuch as many of the car routes are hilly and the conditions of the tracks necessitate the free use of sand it was found necessary to devise a means of supplying the cars with sand during the day. This sand-supply car was accordingly fitted up to meet the requirements.

The car is one of the type of single-truck equipments formerly used on the system. Along both sides of the interior of the car bins about three feet high and having a capac-



Sand Supply Car, Knoxville, Tenn.

ity of five cubic yards of sand have been provided. Leading from each of these bins, at a point midway from each end, is a sand pipe which conveys the sand from the hopper to the rails of the track. The flow of the sand is regulated by cut-off valves which are worked by levers located inside of the car. In addition to these track leads there are four plug taps, one being located at each corner of the car.

Once each day the car is run over the sections of slippery track throughout the city, after which it is sent to the main waiting station, where all cars stop. When it is necessary to replenish the sand-supply boxes on the regular cars the plug taps are opened and by the use of pails the sand boxes are filled. The top of the car is provided with racks and running boards which make it possible in case of trouble to press the car into service as a tower car in repairing the overhead lines.

While taking a curve near Portage, O., on February 23, a southbound car on the Toledo & Interurban Railway left the rails and turned completely over, injuring the eight passengers and the conductor and motorman. The accident is said to have been caused by spreading rails. The car was completely wrecked.

DEVELOPMENT OF THE OKLAHOMA CITY RAILWAY COMPANY.

As an example of the remarkable growth of the electric railway industry, the phenomenal development of the Oklahoma City Railway Company since the opening of its line February 8, 1903, is most interesting. At that time the company operated five miles of track and four cars. It now operates 45 cars on 30 miles of local track and 10 cars are under construction. There is further under construction at present an interurban system which when completed will have a total length of more than 150 miles within a 35-mile radius of Oklahoma City.

The Oklahoma City Railway Company was organized entirely by local men and only a small part of the capital is owned by outside interests. Though the line has heretofore changed hands, the officials are and have been in every instance residents of Oklahoma City who have been interested in the development of their city, many of them since the opening of the territory. In 1903 there were two main lines of 2½ miles each traversing the two principal streets of the city. These lines remained in operation until about two years ago, when the company passed into the hands of the present management. Since then besides maintaining the existing lines new lines have been opened and the system improved in accordance with modern ideas. At North Oklahoma City it is proposed to connect with an interurban line running to Guthrie, the route having been surveyed and partly graded.

The company under its present management recently formulated a plan to construct a line running 31 miles north to Guthrie, another 35 miles south to Purcell, one 28 miles west to El Reno and finally a 40-mile line east to Shawnee.

A novel scheme was adopted in order to make possible the proposed interurban lines. This consisted in buying a large tract of land which was partly turned into a pleasure park and partly into a residential park. The land surrounding the park has been divided into building lots, part of which have been sold, and the money from these sales has been used to build Belle Isle park and build about 10 miles of interurban track.

Belle Isle park covers an area of about 300 acres of magnificent land admirably suited for park purposes. There has been constructed in the park an artificial lake of 225 acres and the remainder of the park will be left as a forest. To form the lake, it was necessary to construct a dam 30 feet high and 250 feet long and a spillway to permit the overflow of water during rainy periods. The dam will be 30 feet wide at the crest and will accommodate two public roadways and a double track. This park when completed will have no amusement features other than boating and bathing as it is necessary to make it as attractive as possible in a quiet way because of the residential surroundings. It is estimated that the park has cost \$250,000 to build.

The first effort to make the extensive interurban system a reality was the securing of a private right of way at each of the terminal points. The lines have all been surveyed and grading has been practically completed on the Guthrie division and will soon be begun on the remaining divisions. The Guthrie division represents the most modern type of roadbed; though the grading for the most part has been through a level country a number of ridges were encountered, necessitating a series of cuts and concrete bridges. The bridges are an example of the liberal and substantial manner in which this work is being carried out, most of the bridges being built to accommodate a double track with a public roadway on each side. A public roadway has also been built alongside the track over most of the right of way. About 10 miles of this line is now practically completed, this portion extending as far as Belle Isle park. The El Reno, Purcell and Shawnee divisions have been surveyed as before stated

and grading will be begun on these within the next few months. The population of the territory traversed by this network of interurbans will be approximately 150,000.

The city track construction will be standard gauge, and rails of Shanghai section embedded in concrete will be employed. A 12 by 24-inch continuous concrete girder will extend under each rail, the two concrete girders being joined by a 6-inch concrete slab in which the steel channel cross-ties set on 4-foot centers will be embedded. The rails are embedded 3 inches in the 12 by 24-inch continuous concrete girders, thus leaving the exposed rail but 4¼ inches above the roadbed. The rails, it will thus be seen, are supported, not only by the ties and the concrete girders, but on the entire surface between the tracks as well. This construction, though expensive to install, should make a very fine roadbed well adapted for high-speed work and should repay its cost in durability and the reduced liability to derailment and accidents.

The total bonded indebtedness of the Oklahoma Railway Company is \$650,000. Since the present management has taken charge of the property no dividends have been declared as all the available money and earnings have been used on improvements and the construction of the interurban system.

IMPROVEMENTS AT MOBILE, ALA.

Important changes were made in the properties of the Mobile Light & Railroad Company during the year 1906. Chief among these changes was the separation of the railway from the lighting interests and the sale of the latter in August to the Mobile Electric Company.

The sale included the transfer of all the power plant lighting units, the transmission lines, city franchises (so far as the same refer to the furnishing of current for lighting purposes), and all contracts and obligations of the electric department. Though this leaves the Mobile Light & Railroad Company exclusively a railroad company the old name will be retained. Since the sale was consummated the officials have devoted their entire attention to the development of the railway interests and, as is shown by the statement of earnings recently issued gratifying results have been obtained. During the year 1905 the gross earnings of the railway department were \$411,692.86, and in 1906, \$516,614.98, an increase of \$104,922.12 for the year.

The work of rebuilding the 46 miles of track throughout the city is now in progress and as soon as the 1,100 tons of steel, now on hand, is laid the reconstruction work will be completed. In the paved streets 92-pound girder rails have been used, and in the streets not paved 70-pound T-rails have been adopted as a standard. For supporting the girder rails a concrete stringer is used.

In this construction creosoted ties, spaced 10 feet apart, center to center, are laid in the prevailing sand substrata. Between these ties is laid a concrete stringer 9 inches deep, 16 inches wide at the bottom and 18 inches wide at the top. The rail is set on this stringer, after which the concrete is extended three inches above the base line of the rail, where it joins with the foundation of concrete laid for the asphalt pavement. This stringer is usually built under contract by the pavement contractor, and the concrete is mixed in the same proportion and at the same time as that for the pavement foundation. The rails are tied together every seven feet by steel tie rods. This form of construction has been in use for several months and so far has given satisfactory results.

The new work planned by the company for the present year includes the construction of about five miles of new track, the erection of two car storage barns and the building of a large summer and winter resort hotel at a point three miles from Mobile on the shores of Mobile bay. The street railway lines will be extended to this hotel and an effort will be made to make it one of the popular resorts of the south.

emplary service is rewarded by promotion, as herein referred to.

A bulletin bearing the names of the conductors and motormen to whom demerit marks have been given, and the reason for the same, is posted in the employe's room at the barns every Saturday. In addition to this a bulletin of the ten divisions, the men entitled to the various runs and the changes that have been made through the discharge or reduction in rank of trainmen is posted. These bulletins are watched for with interest and have come to be important factors in the system of operation.

Discipline reports are filed with the records of employes which are kept in the office of the company. The report forms which are shown herewith are comprehensive and contain the more common abuses for which it is found necessary to discipline trainmen.

The operating department of this railway is always in close touch with the men in charge of its cars and keeps them informed of the existing conditions. Once each month the superintendent gives employes an informal talk on the progress made toward furnishing the public with better service and on prevailing undesirable practices among the men.

DOUBLE-LIFT BRIDGE OF ILLINOIS TRACTION SYSTEM, AT PEORIA, ILL.

An interesting bridge is being built by the Illinois Traction System across the Illinois river at Peoria. The approach is an earth embankment supported by concrete retaining walls. The length of this approach is 145 feet. The steel structure is carried on deck-plate girders alongside of the new power house, described in last week's issue, and on through plate-girders over a number of railroad tracks to the pier at the west bank of the river. These girders are supported on concrete piers and steel bents. The grade of the approach on the Peoria side is 3.88 per cent. Above the railroad tracks the grade is level and it then descends to the west river pier on a grade of .65 per cent. The clearance of the girders above the railroad tracks is about 23 feet.

The main part of the bridge across the river consists of four riveted through-truss spans 142 feet, 10-inch center to center of piers and a bascule span of the "roll type" 173 feet in length from center to center of back piers. The grade on this portion of the bridge is 2 per cent, descending to the east.

The river piers are all built of concrete masonry, reinforced with corrugated iron rods of the Johnson pattern. Piers 1 and 6 rest on piles driven down to solid rock. Piers 2, 3 and 5 in the channel were built directly on the rock, the excavations having been made inside of cofferdams constructed of steel sheet piling. The river piers are 5 feet thick under the belt, 20 feet between shoulders and have semicircular ends. The side batter of the piers is $\frac{3}{4}$ inch per foot. The bascule span furnishes a clear opening of 125 feet. It is of the deck type, and has two leaves, the length of the span being 141 feet center to center of bearings when closed.

This bridge is built for an assumed continuous load of cars 45 feet long, each car weighing 75 tons. This is much greater than the present interurban load and corresponds to a train of 100,000-pound coal cars in regular railroad service.

The substructure was completed under contract by MacArthur Brothers Company, Chicago. The superstructure was manufactured and is being erected by the Strobel Steel Construction Company, Chicago. It is believed that when completed the bridge will be found very satisfactory in operation and of more than sufficient strength to carry any future load. We are indebted to H. C. Hoagland, electrical and mechanical engineer, Illinois Traction System, for the preceding description.

FAMILY TALKS.

Mr. J. W. Brown, superintendent of transportation of the West Penn Railways Company, Connellsville, Pa., is introducing a novel method of keeping the car employes of this company informed as to their department. This consists of a series of "family talks," issued weekly. These "talks" are couched in everyday language and the names of motormen and conductors are given where their actions deserve commendation and omitted where there has been an infraction of the rules. The idea, however, is to show that the actions, both good and bad, of the platform men are noticed at all times. One of this series of "family talks" follows:

Most of the boys are still keeping their eyes on the gun and it shows in our not having had any serious accidents lately. Some fellows are still being careless about little things, and we won't get in the blue-ribbon class till some few men either brace up and play ball or else graduate from the service. I think it's going to be a case of brace up; we don't want to lose any of the family. Watch out for these women that take sudden notions about getting on or off the car. Be ready to keep them from causing you to make out an accident report and your company to pay out a lot of damage money. No use to get mad and talk about them either; tell them courteously that it's dangerous to act in the way they just did and perhaps an occasional one will remember it and be more cautious the next time.

Davy Flick and John Battenfield turned in a good report of a little trouble with a mule at Keystone Tipple the other day; try and get more addresses the next time. Davy; you were long on witnesses but a trifle shy on streets and numbers.

George Rankin and Chris Vardell had one of those notionate female cases last week where a woman did not decide to get on the car till after it had started. Sorry it happened, but a good report helped some, seven witnesses with their addresses.

Bob Sharpe and Howard Shaner had some trouble with 312 the other evening and were derailed at Smith's Switch. The boys made a good report, nine witnesses and their addresses.

Harry Ford and Jim Mayfield made a good report on a horse scaring at West Overton the other day; ten names, but a bit shy on addresses.

Two motormen and two conductors running out of one of the coke region towns last week sat up nearly one entire night playing poker; they were not playing on the premises of the company, but do you think that a man is in good shape to take out a run the next day who sat up all night in a poker game? Doesn't look good, does it? Better drop that for your own sake as well as ours; we can remedy the trouble as far as we are concerned but the effect on yourself is bad. Costs too much to live these days to throw it away on poker games.

Saw Shanaberger helping people on and off his car in a businesslike way the other day; special attention to some old ladies. Some fellows get this wrong end to and think it should be special attention to good-looking young girls.

Now, all aboard for good work during the holiday season. Heaps of go carts, big bundles, hobby horses and all sorts of things to delay a conductor and make a motorman fidgety, but don't forget that your wives, your mothers or sweethearts are also shopping and you would not want them to be treated discourteously by anyone just because they had a lot of packages. Let's keep in a good humor.

Yours truly,

J. W. BROWN.

Electrification of Main Lines of Railway.

The Prussian minister of railways has, according to the Cologne Gazette, long had under his consideration a scheme for the use of electricity on certain main lines of railway, and the question of its adoption has now been answered in the affirmative. In the first instance an experiment will be carried out on the section of rail between Kiel and Altona, a distance of 62 miles, and it will depend on the results of this test whether the system will be introduced on still greater lengths of railway. The electrification of this line from Altona to Kiel will not only apply to the passenger traffic, but all the goods traffic also will be worked by electricity. This will be done in order to prove whether in the present state of electro-technical development it is possible to arrange for handling the whole of the traffic on a railway over which many trains are run with the entire suppression of steam traction. The necessary preliminary steps for carrying out this work have already been put in hand, and it is therefore possible that the electric working of this railway may be commenced during the course of the present year.—Railway Times (London).

THE USE OF CONTACTORS WITH PLATFORM CONTROL.

One of the most valuable operating advantages of the multiple-unit control systems now in service is found in the removal of heavy current breaks from the car platforms. The short-circuiting of controllers, opening of circuit breakers and the blowing of large fuses in close proximity to timid passengers are fertile causes of damage suits on account of alleged fright or actual injury resulting from loss of self control. It seems almost impossible to teach the general public that the operation of automatic open circuiting devices and even the occurrence of controller grounds are almost invariably incidents capable of doing no harm to passengers who remain quietly in their seats. For this reason many cars have been equipped with multiple-unit control, even on roads where the likelihood of train operation is exceedingly remote.

A comparatively recent step forward in ordinary car-

forward, the main circuit is closed automatically by the relay switch in the base of the controller, and the cutting out of resistance and series-parallel combination changes are effected in the usual manner.

The circuit breaker tripping coils in the platform hoods do away with the necessity of an ordinary open circuiting automatic switch at these points. The supply of the current to the contactor solenoids is cut off whenever the main current in the tripping coils exceeds a predetermined limit. These tripping coils can be as readily reset by hand as an ordinary circuit breaker, and the contactors cannot be operated until both tripping coil switches are closed. The main contactors are placed in series to increase their positiveness of action. The rheostats are located beneath the car as usual, and the wiring can be readily carried in armored conduits. The main hand-operated switches in the vestibules are used only to cut the current supply off the car for definite intervals. The auxiliary contactor-solenoid circuit is energized

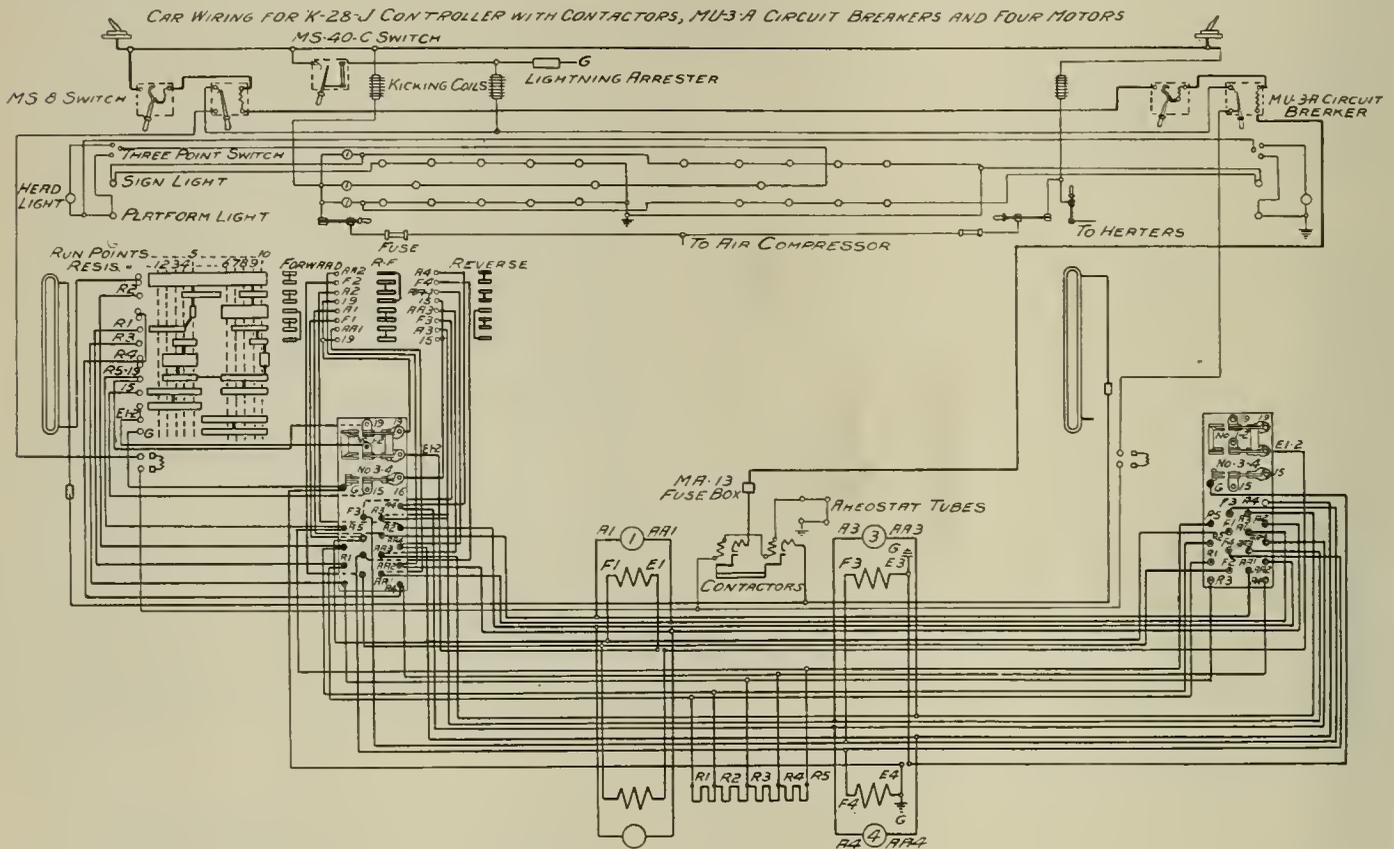


Diagram Showing Car Wiring with Multiple-Unit Contactors In Series with Cylindrical Controller on Car Platform.

control methods is illustrated herewith, the object of the designers being to adapt the contactor system of opening the main circuit beneath the car to ordinary hand controller equipments, without going to the expense of fully adopting multiple-unit control. In the drawing shown, the connections are given for a General Electric K28 controller modified so as to remove the main opening and closing of the trolley circuit from the platforms. The circuits are for four motors, and the auxiliary car lighting and heating connections are included in the sketch.

In this arrangement the trolley current cannot enter the platform controllers until it passes through two manually operated main switches and two circuit breaker tripping coils in the platform hoods, through a main fuse beneath the car and two contactors in series, also located beneath the car. In the bottom of each controller is a mechanically operated auxiliary contact, which, when closed, energizes the solenoids of the contactors and brings trolley potential to the platform controllers. When the platform controller handle is turned

beyond the tripping coil switch by a connection with the lighting and heater supply circuits.

There is no feature of this method of control which permits the operation of cars in multiple unit trains, but it has the advantage of simplicity and does not require the same technical skill in maintenance as does the more complex train control. Thus far it has not been fitted with automatic accelerating devices, but there is a prospect that this will soon be done. Experience with this method of hand control shows that with the independent contactors large currents can be handled with greater safety and certainty than was possible with the drum-type of controller alone; for a wider air-gap and stronger magnetic blow-out are provided, and the contacts of the independent switches open more quickly than is feasible with the revolving drum controller.

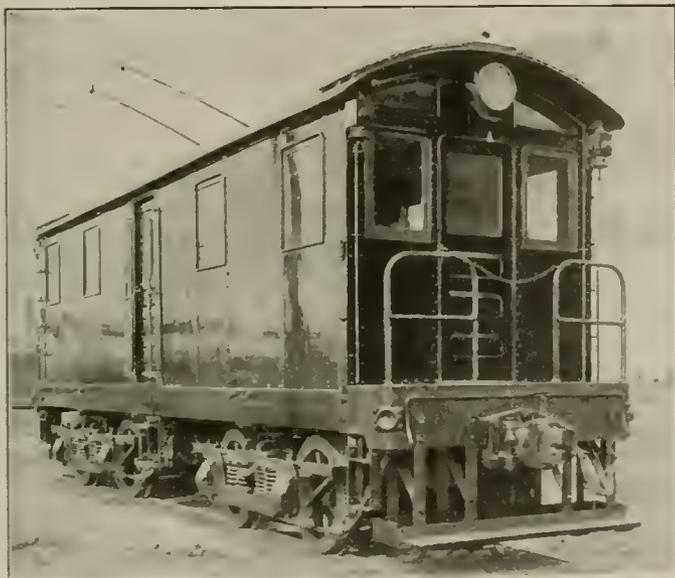
Favorable results have attended the use of the combined contactor and cylindrical control in Milwaukee, Baltimore, on the Atlantic Shore Line, and on other roads, and have demonstrated a field of large usefulness for it. Any controller of

the K-type can be fitted with the equipment and the entire cost of the work where a large number of cars are to be changed over should not greatly exceed \$200 per car. A feature of some convenience in the wiring is the possibility of cutting out two motors on the same truck, instead of one motor on each truck, when the installation is made new.

NEW ELECTRIC LOCOMOTIVE FOR THE BROOKLYN RAPID TRANSIT COMPANY.

The Brooklyn Rapid Transit Company has just completed at its Thirty-ninth street shops an electric locomotive, which was built entirely for switching service in South Brooklyn, where the terminal business of the company is showing a rapid increase.

This locomotive, of which an engraving from a photograph is presented herewith, is of all-steel construction and was designed by the mechanical department of the Brooklyn Rapid Transit Company. The locomotive has a weight of 57 tons, which makes it too heavy for use on any of the elevated structures, but the switching work on the old steam franchise roads in South Brooklyn will keep the locomotive well employed. The locomotive will haul 20 loaded standard box



New Electric Locomotive for the Brooklyn Rapid Transit Company.

cars or gondolas. The motive power consists of four Westinghouse 50-B motors, each of 150 h. p. There are two independent Westinghouse multiple unit control sets, a controller head, and an air controller being located at each end of the locomotive. It also has a combined straight and automatic air brake equipment of the Westinghouse E T-type. The body, which as stated is of all-steel construction, is 31 feet long over the buffers and 7 feet 3 inches wide over the sheathing. The distance from the top of the rail to the top of the trolley stand is 13 feet 1 inch and the height inside is 7 feet 10½ inches. The floor of the locomotive is framed with 18 heavy iron bars 6 inches wide and 2¼ inches thick, extending the full length of the body, giving it rigidity. The sides and roof are built of steel bars and angles covered with No. 10 steel sheathing. The roof is further covered with ½-inch white-wood and finished with No. 6 cotton duck. The power is taken by two standard elevated trolley stands. The locomotive is carried on two 4-wheel trucks, built by the Baldwin Locomotive Works. These are spaced 16 feet center to center. Each truck has a wheelbase of 5 feet 10 inches and 37-inch wheels. The locomotive has a deep-throated air whistle and head-lights of 50 c. p. at each end. Swinging doors afford access to a shallow end platform while sliding doors have

been built upon each side of the locomotive. The interior is painted green and the exterior black, with Brooklyn Rapid Transit standard lettering in aluminum.

New Viaduct for the Metropolitan Street Railway.

The recent opening of the new 1¾-mile intercity viaduct between Kansas City, Mo., and Kansas City, Kan., on Sunday, February 24, marks the final step in the construction of one of the most complete traction systems in the country. By its use the unsatisfactory conditions due to the congestion of traffic on the Fifth street line of the Metropolitan Street Railway will be greatly relieved if not entirely eliminated and the running time between the two cities considerably reduced.

The new tracks of the Metropolitan Street Railway are laid with 86-pound T-rails on ties embedded in concrete and center-pole construction only is used.

Eleven cars of the heavy double-truck type, transferred from some of the other lines of the company, are now operated over the viaduct division and 15 additional cars have been ordered for this service. The new route is from Eighteenth street and Minnesota avenue in Kansas City, Kan., to Fifteenth and Main streets, Kansas City, Mo. In Kansas City, Mo., the cars operate from the viaduct up Fifth street to Delaware avenue and from there south to Fifteenth and Main streets, at which point they are switched for the return trip.

The cars are operated on a 5-minute headway from 6 a. m. till 7 p. m. From 7 o'clock until midnight a 10-minute headway will be maintained and from midnight on cars will be run every 15 minutes. As there are no grade crossings the danger from accidents due to collision is reduced to a minimum; the running time also is shortened 12 minutes and passengers now can make the round trip in less than an hour.

The viaduct is said to have cost more than any other project of its kind in the United States. It was financed and built by the Kansas City Viaduct & Terminal Company, an organization composed of eastern capitalists, and represents an outlay of nearly \$1,500,000.

DIRECTORY OF ELECTRIC RAILWAY ASSOCIATIONS.

American Street and Interurban Railway Association. Secretary, Bernard V. Swenson, 60 Wall street, New York.

American Street and Interurban Railway Accountants' Association. Secretary, Elmer M. White, assistant treasurer Birmingham Railway Light & Power Company, Birmingham, Ala.

American Street and Interurban Railway Engineering Association. Secretary, S. Walter Mower, general manager Southwestern Traction Company, London, Ont.

American Street and Interurban Railway Claim Agents' Association. Secretary, B. B. Davis, claim agent Columbus Railway & Light Company, Columbus, O.

American Street and Interurban Railway Manufacturers' Association. Secretary, George B. Keegan, 2321 Park Row building, New York, N. Y.

Canadian Street Railway Association. Secretary, Allan H. Royce, president Toronto Suburban Railway, Toronto, Ont.

Central Electric Railway Association. Secretary W. F. Millholland, secretary and treasurer Indianapolis Traction & Terminal Company, Indianapolis, Ind.

Colorado Electric Light Power & Railway Association. Secretary, John F. Dostal, Denver Gas & Electric Company, Denver, Colo.

Iowa Street and Interurban Railway Association. Secretary, L. D. Mathes, general manager Union Electric Company, Dubuque, Ia. Next meeting, Clinton, Ia., April 19 and 20.

Massachusetts Street Railway Association. Secretary, Charles S. Clark, 70 Kilby street, Boston, Mass. Meetings held in Boston on second Wednesday of each month, except July and August.

Northwestern Electrical Association. Secretary, R. N. Kimball, Kenosha, Wis. Annual meeting, Milwaukee, Wis., January, 1908.

New England Street Railway Club. Secretary, John J. Lane, 12 Pearl street, Boston, Mass. Meetings held on fourth Thursday of every month.

Pennsylvania Street Railway Association. Secretary, Charles H. Smith, superintendent Lebanon Valley Street Railway, Lebanon, Pa.

Southwestern Electrical & Gas Association. Secretary, R. B. Stichter. Annual meeting, San Antonio, Tex., May 14 15 and 16.

Street Railway Association of the State of New York. Secretary, J. H. Pardee, general manager Rochester & Eastern Rapid Railway, Canandaigua, N. Y.

PIPING AND POWER STATION SYSTEMS.—XXXI.

BY W. L. MORRIS, M. E.

Discharge from Condenser.

The elevation of the discharge waterway from an elevated jet condenser should be determined by the location of the hot-well overflow, but for surface condensers the water should be discharged at the same elevation as it is taken, whether the water supply is at high or low water. A surface condenser can and should be operated without any perceptible loss of head in the circulating water, other than that caused by the friction of the water in the pipe, condenser tubes, etc.

An elevated jet condenser necessitates two losses of head: First, that due to the difference in weight between the solid cold water in the injection column and that flowing through the condenser and tail pipes. The other loss is due to the fact that the condenser would be located in relation to extreme high water, and would ordinarily be operated at a lower level, necessitating a loss of power due to the quantity of water used and raised from the level of the water supply to the level of the overflow. These combined losses of head will be about 10 feet in case the water is being pumped from 4 feet below the high-water level.

A surface condenser would not have these losses, but a loss of head is occasioned which does not exist in the jet condenser. This loss of head is occasioned by the circuitous and restricted path of the cooling water through the small condenser tubes. The loss may be more or less than that of the jet condenser, depending upon the cleanliness of the condenser tubes, but this alone is too slight an advantage to be a deciding factor in selecting the type of condenser to be used.

The jet type is the most economical condenser if suction instead of pressure pumps are employed such as are used with the elevated types. There are, however, many objectionable features in the suction jet condenser that cannot be eliminated unless the condensing chamber is elevated. Figure 256-(I 2-1) shows a jet condenser of this type arranged to secure the greatest efficiency possible and at the same time be fairly reliable. The unfortunate feature of this arrangement is that efficiency must be sacrificed to insure uninterrupted operation. To secure the greatest possible efficiency with this device, it is necessary to make the distance, A, such that a column of water of that height would be the equivalent of a column of mercury whose height is equal to the vacuum which it is intended to maintain. This would necessitate A being 28 feet for a 25-inch vacuum. It would also be necessary for the discharge to be carried down into the discharge waterway, the water in which is as nearly as possible at the same elevation as the intake or supply water. If this type of condenser could be operated and constructed in this manner it would be working under exactly similar conditions, and have the same efficiency as a condenser of the elevated type.

The atmospheric pressure in the type shown in Figure 256-(I2-1) would support the water-leg A, and the pump would simply have to overcome the difference in weight of the two

columns. The elevated-jet type of condenser has its discharge leg (tail-pipe) of length A, and as this is a longer column than the vacuum will support, a pump is used to counterbalance the difference between the injection and discharge legs. To secure the same economy for the condenser shown in Figure 256 as could be obtained with the elevated jet type, it is necessary to install it in the manner stated. This, however, is impracticable for two distinct reasons: One because the pump would not be able to lift water 28 feet, and the other because the moment the vacuum drops below 25 inches the water would fail to flow into the condenser and the entire vacuum would be lost. One is a difficulty met in starting the condenser, the other in regular operation. The less the distance A, the more certain is the operation. Many condensers of this type are in operation with the lift A, as great as 16 feet and with a vacuum as low as 14 inches.

In order to start a condenser with such a high lift it is necessary to use a "false injection," that is, a water supply delivered to the injection pipe under pressure as shown at b, in Figure 256. In this case a foot-valve must be provided at the lower end of the injection pipe and a gauge attached at the top of the line to show when the vacuum has raised the water into the condenser from the intake. The false injection is used only until a sufficient vacuum has been formed in the condenser bowl to raise the water from the intake. Another method of supplying a false injection is through a separate line and sprayer fitted in the bowl as shown by dotted lines at c. This avoids the necessity of a foot-valve and the attendant losses by friction in the flow of the water.

This type of condenser, it will be noted, has a much lower efficiency than the elevated type. Even if the lift A is made as great as 16 feet, there is a loss of head of 12 feet over that of the elevated type, making a total of about eighteen feet including the loss through the condenser bowl. This loss would be but six feet in the elevated condenser, or in other words, only one-third the power would be required for handling the circulating water, assuming the pumps to be of the same type and make. If the discharge connection from the condenser is in any way open to the atmosphere at the upper end as at d, in Figure 256, then the loss of head will be still greater, possibly the full 28 feet. In this case the power required would be four and a half times that of the elevated type. The discharge from the pumps should be kept perfectly air-tight as this line is carrying air and water from the pump the same as the tail-pipe on the elevated type. If it were possible to discharge the water at a much lower elevation than the intake then the pump could be entirely dispensed with and the water would flow through the condenser and maintain the vacuum, becoming in operation a device similar to the elevated condenser.

The discharge would in this case have to be at least 34 feet long and the distance from the surface of the intake to the surface of the discharge water must not be less than 24 feet. This also is true of the elevated jet condenser, except that the latter will operate with a smaller difference between the water levels, as far as starting up is concerned, but would require the same difference in the water levels as the suction type if operated without the pump when the vacuum has dropped to 14 inches.

Another important advantage in the use of the elevated type of condenser over the suction jet condenser is in the style of pumping machinery which can be used. In the case of the suction jet condenser the pump must handle a much larger volume per horsepower, as it not only has to pump the water, but the air which was contained in it as well. As this air has expanded from atmospheric pressure to the pressure in the condenser, the total volume to be handled by the pump is about eight times the volume of the injection water alone. Further, the class of work which the suction pump must do is very severe, both on the pump and the valves, owing to

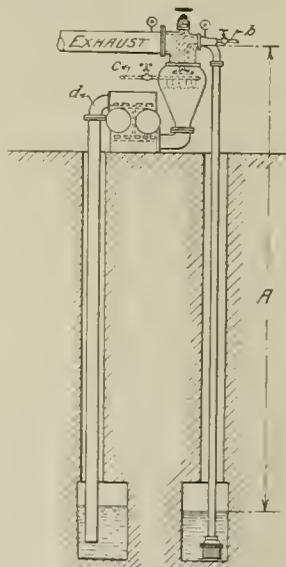


Figure 256-(I2-1).

the shock which is caused when water and air are handled together in one pump. As the pump for the elevated condenser handles only water and that at a low pressure, the centrifugal pump is admirably suited for this class of service. It can be operated very economically either from a pulley on a jack shaft or direct-connected to an electric motor. The power required for the water-ends of the two types of pump is nearly the same when the same work must be done by each.

The steam required to drive a steam pump is generally many times that required by centrifugal pumps if driven by the main engines. The steam pump would require more than 100 pounds of steam per horsepower per hour while the main generating unit would probably use less than 20 pounds per horsepower per hour. Hence, the steam required for operating centrifugal pumps would be from one-fifth to one-fourth that required by the steam pump.

If there is an insufficient supply of auxiliary exhaust steam for heating the feedwater it would be more economical to run the condenser pump by steam. The reason for this is evident, as a pound of steam for the main engine would contain 1.100 British thermal units, while the pound of steam used in the pump would require but 50 British thermal units. This will be the difference between the heat in a pound of steam at boiler pressure and a pound at atmospheric pressure, as the remainder of the heat is returned to the boiler in the feedwater.

In determining the form of drive to be employed for auxiliary machinery, the ability of the plant to utilize the exhaust steam must be considered. In the ideal steam plant the highest economy is obtained when the exhaust from the steam driven auxiliaries is just equal to the steam that the feedwater will condense. The efficiency of these machines is then as great as possible, for all the heat which is not converted into work is returned to the boiler. All the auxiliaries in such a plant which furnish exhaust steam in excess of that required to heat the feedwater should be run condensing so as to require the least amount of steam per horsepower developed. The general belief that as many machines as possible should be run condensing is incorrect. The greatest economy is secured when only a sufficient number of the engines are run condensing to supply just enough steam for heating the feedwater.

The hotwell is necessary for the successful operation of the elevated jet condenser, as it provides a seal to keep the tail-pipe filled and prevent the access of air to it, which otherwise would reduce the vacuum obtainable. In figure 220 there was shown a satisfactory method of taking feedwater without disturbing the water in the hotwell. Figure 221 showed a pump box such as would be used with a suction pump jet condenser or a surface condenser. With such apparatus there is no necessity for a hotwell or water seal. A pump box would not be required for a surface condenser, as the feed could be taken from the condenser chamber as shown in Figures 226 and 228. The most satisfactory arrangement for the pump box shown in Figure 221 is to place it in the discharge waterway at the lower end of the discharge for such installations as shown in Figure 256, and allow the feed pump to raise the water out of its compartment. As previously stated there should be no opening to the atmosphere at the upper end of the discharge, shown at d, in Figure 256 (I2-1), to accommodate a pump box above the floor.

It is true that the feed pump must raise the water higher when the pump box is placed at the discharge waterway, but it should be remembered that the feedwater is only about 3 per cent of the condenser water, and it is therefore more economical to raise 3 per cent the additional height rather than to raise the 97 per cent.

(To be Continued.)

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B.

LIABILITY FOR INJURIES TO PASSENGER LEAVING CAR TOO SOON THROUGH WRONG CALLING OF STREET—NO LEGAL DUTY TO SEEK SHELTER AT HOUSES—ILLNESS FROM EXPOSURE TO WEATHER—BURDEN OF PROOF.

Georgia Railway & Electric Co. v. McAllister (Ga.), 54 S. E. Rep. 957. Aug. 13, 1906.

The negligent conduct of a street-car conductor in calling a street crossing before his car had arrived at the street announced, thereby inducing a lady passenger to alight, at night and during a severe rainstorm, at a strange place remote from her destination, the supreme court of Georgia holds, is to be regarded as the proximate cause of injuries sustained by reason of her slipping and falling upon a curbstone which she was unable to see, because of the darkness, while endeavoring with due care to make her way homeward along a street with which she was unfamiliar.

The passenger was under no legal duty to apply for shelter at houses in the vicinity of the place where she was induced to alight from the car, rather than attempt to reach her destination on foot over a highway which was in a reasonably safe condition for travel by pedestrians.

If she could not by the exercise of ordinary care have discovered that she was invited by the conductor to disembark at a point short of her destination, she was entitled to recover damages because of illness brought about by exposure to the weather after leaving the car; the burden being upon her to show that her illness was caused by such exposure, rather than by other causes for which the defendant company was not responsible.

In such case, no presumption of negligence is raised by law against the defendant from the bare fact that the plaintiff sustained an injury, and the burden rests upon the plaintiff to prove the allegations of fact upon which she relies for a recovery.

INJURY TO PASSENGER FROM MISSILE THROWN AT MOTORMAN—NO PRESUMPTION OF NEGLIGENCE—EVIDENCE OF PRIOR SPORADIC ATTACKS INADMISSIBLE.

Woas v. St. Louis Transit Co. (Mo.), 96 S. W. Rep. 1017. Oct. 17, 1906.

The plaintiff testified that while sitting on the second seat from the front of a car he saw a man standing in the middle of the street with something in his hand, making violent motions towards the car. The next he knew he was on an operating table with a doctor taking glass and broken bones out of his face. A policeman testified to having seen some person throw something at a car. The supreme court of Missouri, division No. 2, holds that a demurrer to the evidence was correctly sustained as the plaintiff wholly failed to bring himself within any rule of law which would render the defendant liable for the assault of the person made upon its motorman.

It is clear in this case, the court says, that the burden of showing negligence was upon the plaintiff, and that the presumption of negligence which arises in favor of the passenger traveling on a train from the mere fact of an accident has no application to a case like this. Such a presumption only arises where the injury can be reasonably attributed to some defect in track, cars, or machinery or the movement of the train, or the conduct of the servants in charge thereof.

Furthermore, the court holds that there was no error in excluding certain evidence offered by the plaintiff to show that prior to the date of the accident certain persons had thrown missiles at the defendant's cars on account of their failure to stop and allow passengers to board the cars, as the questions asked would have permitted the witnesses to

have told of sporadic cases of the throwing of missiles at the cars during a period extending over years prior to said date. It gives as reasons that the testimony referred to was entirely too indefinite as to time, and that it did not purport to show any such state of affairs as to bring home notice to the defendant of any danger to the plaintiff of the assault by which he was injured.

TOILET ROOMS AND WATER TANKS REQUIRED—PLACES FOR SALE OF TICKETS—FARE LIMITED BY THAT ON LINE BUILT OR PURCHASED.

West Bloomfield Township v. Detroit United Railway Co. (Mich.), 109 N. W. Rep. 258. Oct. 29, 1906.

Cars having no toilet rooms or water tanks, the supreme court of Michigan holds, do not meet the requirements of a franchise of being of modern design and supplied with suitable appliances for a suburban railway to insure the comfort and convenience of passengers.

Placing on sale near its terminus, in a drug store in the city of Pontiac, family tickets for which its franchise provided, the court further holds was not a compliance by the company with its contract that family tickets should be sold by it from any point in the township of West Bloomfield to and in the city of Pontiac, and vice versa. It says that it was not contemplated that the citizens of Bloomfield should go to Pontiac to buy tickets. Everyone had a right to purchase a family ticket at the place where he had a right to board the cars with his family for passage. These roads do not have ticket offices stationed through the country. They do their business on the cars, and, wherever passengers have a right to take the cars, there they have the right under the franchise to purchase these tickets.

A provision in the franchise that "the rate of fare from any point in said township to the city of Detroit, and vice versa, shall at no time exceed the rate then charged by the company from Pontiac to Detroit, and vice versa," the court holds referred to the company mentioned in the franchise, but it included any line which the company or its assignee might at any time build or purchase. It says that if the company had built another line from Pontiac to Detroit it could not have charged a higher rate over the old line than it did over the new. The terms of the franchise must be construed strictly against the company. When it purchased the Detroit & Pontiac line it became a line of the company. The rate charged from Pontiac to Detroit over that line is now 25 cents. The company can charge no more over the other line of its road. It cannot thus destroy the competition for which the township in fact contracted.

COMPANY NOT LIABLE FOR INJURY TO PASSENGER FROM COMING INTO CONTACT WITH TROLLEY POLE WHEN CHANGING SEAT ON OPEN CAR WITH ASSENT OF CONDUCTOR—NO DUTY TO WARN PASSENGERS OF ORDINARY DANGERS FROM TROLLEY POLES OR PILLARS OF ELEVATED RAILWAYS.

Tietz v. International Railway Co. (N. Y.), 78 N. E. Rep. 1083. November 13, 1906.

A passenger of large proportions on an open electric car in swinging out to take another seat came into contact with a trolley pole. The proof was that the distance between the grab handles on the outside of the upright stanchions of the car and the trolley pole was 21 or 22 inches. The court of appeals of New York does not think that in the simple assent of the conductor to the proposal of the plaintiff to change his seat there was any assurance on the part of the conductor that it would be safe for the passenger to do so without the exercise of due care on his part in executing the necessary movement. Nor does it think that under the circumstances the railway company should be held responsible for the failure of the conductor to warn the passenger.

The court concedes the correctness of the general proposition that if the company had created a danger it was its

duty to warn its passengers against that danger, but under the theory on which this case was submitted to the jury the company had not created any danger in the proper sense of that term. Doubtless the presence of trolley poles is dangerous to any one riding on a car who may come in contact with them. So, also, there are dangers in the operation of every steam railroad, but these dangers are inherent in the operation of the roads and do not fall within the rule stated. If there was anything exceptional in the proximity to the track of the trolley poles or any other obstruction it would have been the duty of the conductor to warn the plaintiff of its existence, but the court cannot see that it was his duty to warn the passenger of a danger which is merely an ordinary incident of such railroad travel.

Take the case, the court says, of the trolley roads which run under the elevated railroads in the city of New York. It cannot be that it is the duty of the conductor to warn every passenger of the presence of the pillars of the elevated railroad, nor can he be expected for this purpose to distinguish between residents of the city accustomed to travel on the road and passengers who are strangers.

JUDICIAL NOTICE TAKEN THAT STREET RAILWAY COMPANY IS CARRIER OF PASSENGERS—OWNERSHIP OF CAR IMMATERIAL—SUFFICIENT IDENTIFICATION OF CAR AS ONE USED FOR PASSENGERS—ALLEGATION AS TO BEING A PASSENGER ENOUGH—NOT NECESSARY TO SHOW THAT COMPANY OWED DUTY—SUFFICIENT SHOWING AS TO EMPLOYEES.

Indianapolis Street Railway Co. v. Ray (Ind.) 78 N. E. Rep. 978. October 24, 1906.

The principal object of the legislature in authorizing, and of corporations in constructing, street railways, the supreme court of Indiana says, is the carriage of passengers. It is so recognized by statute and is a matter of such common knowledge that the courts will take notice that a company organized and operating a street railway under the laws of this state is a carrier of passengers.

This was an action to recover damages for injuries sustained by the plaintiff Ray in alighting. The court says that the defendant was operating the particular street railway, and, if the plaintiff was a passenger on "one of the cars of that road," that is, used in the operation of that road, it made no difference whether the car belonged to the defendant or not.

Again, the court says that here was a car provided with electric signals to be sounded by passengers to announce their desire to get off, a car known as a summer or open car—one with seats running across the car from side to side, and with a running board to assist passengers in getting on or off the car. This was a sufficient identification of the car as one used for passengers.

As to the objection that it was not alleged that the plaintiff paid or offered to pay fare, or that she had a pass, or was on the car by contract, invitation or consent of the defendant, the court says that it was alleged that she was a passenger on the car. This averment required her to prove that she had complied with the conditions that constituted her a passenger. How she became a passenger was evidentiary.

Nor was it necessary to show that the defendant owed the plaintiff a legal duty. The plaintiff was a passenger, and, being a passenger, the defendant owed her a duty. Moreover, a corporation can act only by its agents, and the allegation that a motorman and conductor had charge of "one of the cars of the defendant's road," that is, one of the cars used in operating its road, and upon which the plaintiff was a passenger, sufficiently showed the relation of employer and employes, and that such employes, being charged with the management of the car, were performing a duty that devolved upon the employer, and for which the latter stood responsible.

News of the Week

Central Electric Railway Association Meeting Postponed.

The executive meeting of the Central Electric Railway Association which was to be held in the Traction Terminal Building, Indianapolis, on February 28, 1907, has been postponed until Saturday, March 2, 1907, owing to the inability of Messrs. Spring, Carpenter and Emmons to attend. The meeting of the board has been called to consider topics of discussion for the entire year ahead, select the subjects of most vital interest to the majority of the members, and assign the subjects to experts in each special line. This is an advisable move on the part of the board, as it will give the members selected sufficient time to prepare their discussions, so that lack of time will hardly be a valid excuse for failure to respond to the request. A report of the committee shows that while the value of the interchangeable traction coupons collected of the roads which are members of the association was \$7,320.24 in December, 1906, the coupons collected for January, 1907, amounted to \$8,409.49. These interchangeable coupons are now accepted on 37 roads, including the two recent additions to the association—the Marion Bluffton & Eastern Traction Company and the Toledo & Chicago Interurban Railway Company.

The next annual meeting of the association will be held at the Algonquin Hotel, Dayton, O., on March 28.

Philadelphia Traction Situation.

A bill has been introduced in the Pennsylvania legislature which, if passed, will give authority to the city of Philadelphia to enter into contracts with the Philadelphia Rapid Transit Company based on the plan approved by the directors of the company. While the bill was drafted with reference especially to conditions in Philadelphia, it is general in terms and may be applied to other similar corporations and other municipalities. The bill provides that any city, borough or township, and any passenger railway company leasing and operating the franchises and property of such company may enter into contracts affecting and regulating the franchises, powers, duties and liabilities of such companies, and the regulations and respective rights of the contracting parties.

Such contracts may provide for payments by the companies to the local authorities in lieu of the performance of certain duties or the payment of license fees or charges; for the appointment by the local authorities of persons to act as directors of such companies in conjunction with the directors elected by the stockholders; and for the ultimate acquisition by the local authorities upon terms mutually satisfactory of the leaseholds, property and franchises of the contracting companies.

Another bill which has been introduced in the legislature provides that whenever the municipalities of the state shall deem it proper to organize corporations for municipal purposes they shall be authorized to contract with the purchasers of such securities as may be issued by said corporations for the payment of interest and the sinking funds necessary to redeem the securities at maturity, and to levy and collect such taxes as may be necessary therefore; provided, however, that the holders of the stock of such corporations shall hold it as trustees for the municipalities and that all revenues earned by the corporations shall be deposited to the credit of the municipalities.

Accident on New York Elevated Road.

An unusual accident occurred on the Third avenue elevated line of the Metropolitan Street Railway Company, New York city, on February 26, which at first caused a report to be circulated that the elevated structure itself had given way. It appears that a seven-car train left One Hundred and Twenty-ninth street and Third avenue southbound at 9:02 a. m., its destination being South Ferry. The train arrived at Chatham Square Junction at 9:32 a. m. The switches at the junction were set for the main track on the South Ferry track.

The motorman proceeded south and six cars passed over the switch safely, and the front truck of the seventh car also passed over safely, but the rear truck of the seventh car split the switch and took the City Hall track, causing the car to be derailed with the front truck on the South Ferry track and the rear truck on the City Hall track, which resulted in twisting the car crosswise over the triangular space at the junction of the two tracks. In this space there was a small frame shanty, or tool house, standing on a wooden platform supported by steel channel bars. When the rear truck of the car left the rails the car, half derailed, was dragged on for about 60 feet, so that the rear trucks crashed into the wooden platform and fell to the street below, breaking some of the auxiliary steel work upon which the platform and shanty rested. The trucks carried with them some of this steel and wooden frame work; and two or three of the channels, being wedged out of position, fell on end to the ground below, crushing through to the conductor rail conduit at one point. When the workmen subsequently pulled down the broken steel parts they made a complete wreck of the tool house and platform, which crashed to the street. The car from which the rear trucks had fallen remained with one end hanging over the intervening space between the two branches of the elevated system.

There were only six or seven passengers in the car and fortunately these escaped with slight bruises. Fortunately also no car or team happened to be in the street below at the place where the trucks fell through, although a car had passed under the structure a moment before. The accident caused a good deal of confusion and delay to traffic, particularly on the surface line.

The service on the elevated structure was restored within two hours and during this time trains were stalled from Fourteenth street to Brooklyn bridge. The power was cut off of the third rail as a precaution. The delay to the surface cars was somewhat longer, owing to a short circuiting of the track circuit and to the necessity of removing the debris and making some repairs in the conduit.

Legislation Affecting Electric Railways.

California.—A bill has passed both houses of the legislature restricting the hours of labor for street railway employes to eight hours a day.

Minnesota.—A bill has been introduced into the house of representatives providing that street railway companies shall sell eight tickets for 25 cents, with the usual transfer privileges. Another bill provides for six tickets for 25 cents during the rush hours of morning and evening.

New York.—The Dowling "loop bill," which provides for an elevated railroad connecting the Brooklyn and Williamsburg bridges in New York city, was passed by the assembly on February 26.

Texas.—Both houses of the legislature have passed a bill granting to electric interurban railways the right of eminent domain outside of cities and towns. The right to operate through cities and towns over the local lines is also given. The especial object of the bill is to enable Stone & Webster of Boston, Mass., to build an electric railway from Houston to Galveston, Tex. Section 1 provides: That all corporations chartered for the purpose of constructing, acquiring, maintaining and operating lines of electric railway between any cities and towns in the state of Texas for the transportation of freight or passengers, or both, shall have the right of eminent domain, as fully to all intents and purposes, as is now conferred by law upon steam railroad corporations, and shall have the right and power to enter upon, condemn and appropriate the lands, rights of way, easements and property of any person or corporation whomsoever for the purpose of acquiring rights of way upon which to construct and operate their lines of railways and sites for depots and power plants; provided, that no cemetery grounds, nor any part thereof, shall be so taken or condemned.

Cleveland Traction Situation.

It is now stated that President Andrews of the Cleveland Electric Railway and President Du Pont of the Municipal Traction Company, who have been working for several weeks on their estimate of the value of the Cleveland Electric property, may be able to report at the next meeting of the city council on March 4. Reports on the value of the real estate were presented independently by J. G. W. Cowles and V. C. Taylor on February 24. The physical valuation had to be calculated first, because the method adopted of arriving at the franchise values included some deductions in the matter of interest that could only be computed after the physical value had been decided. The franchise values are being worked out on a basis of earnings. The methods used in determining the value of the Chicago street railway property last summer, on which Mr. Du Pont was engaged, has been closely followed.

Mr. Du Pont is quoted as saying that an immediate extension of the Cleveland street railway service is required and as forecasting the construction of a subway or elevated line. He said:

"Cleveland is rapidly becoming a city of such size that traffic facilities other than surface lines will have to be provided to give adequate and proper service. One thing in the way of subway construction is its great cost. To begin with a short tube on Superior avenue, say from the arcade to the Wilshire building, and running under the square, would probably solve the problem for the time being. Within ten years, however, Cleveland must be provided with a rapid transit system running the entire length of the city. This will be especially so after the annexation of Lakewood and Collinwood. My idea is that this line should parallel the lake and be an elevated structure. The fast train service that could be provided would largely solve the time problem for years to come. With an elevated road providing fast service it would probably be better to divert some of the parallel surface lines. By this I mean the operation of more cross-town lines to act as feeders for the elevated road furnishing the fast up and down-town service."

Trolley Express Hearing in Massachusetts.

An important hearing bearing upon the trolley express problem was held before the legislative committee on street railways at Boston on February 26. Interest centered in the desires of street and interurban railways serving the outer suburban sections of eastern Massachusetts to secure entrances into Boston and other large centers for freight and express cars. The bill on which the matter came up requires connecting companies to haul each other's passengers in passenger cars, and baggage and freight in baggage cars, under such regulations as the railroad commission may determine.

The Boston & Worcester street railway has secured assent to its trolley freight and express business from the local cities and towns on its line, between Chestnut Hill and Lake Quinsigamond. A demand for express service has arisen from business men, florists, market gardeners and farmers, but the company has hesitated so far to begin such service because, the company says, the city systems in Boston and Worcester have not been willing to handle express cars on terms satisfactory to the interurban line. President Shaw of the Boston & Worcester stated that his company now has an agreement whereby the Boston elevated takes four cars per hour from the end of its lines at

Chestnut Hill, hauls them into Park Square and out again, collecting all fares on its lines and operating the cars with its own men. The city system pays nothing for the use of these cars, and all other passengers arriving at Chestnut Hill on the Boston & Worcester have to transfer to the elevated cars. Mr. Shaw stated that his road last year brought into Boston 2,800,000 passengers which would otherwise not have come, and urged that the Boston elevated should take all the interurban line's cars and haul them in and out as it does the present four per hour, paying for the use of the cars just what it would cost the company to keep in repair the same number of its own cars, or about 2.5 cents per car mile. Mr. Shaw stated that equitable co-operation between terminal and through roads was essential to any profitable and satisfactory express service.

The hearing was continued until March 15, to give those who oppose the bill an opportunity to be heard.

Rapid Transit Affairs in New York.

All that now remains to be done before bids are asked for building the Lexington avenue subway is to obtain the approval of the board of estimate and of the corporation counsel of the form of contract and the specifications. The rapid transit commission at its meeting on February 20 adopted the terms of the contract and specifications, and it is probable that bids will be asked for within a week. The form of contract adopted follows closely the draft drawn by the committee on contracts. The alternate routes remain. Bidders will be able to choose whether they shall compete for building a road from the Harlem river to the Battery, or only from the Harlem to a junction with the present subway at Forty-second street.

At the recent hearings held by the commission the Forty-second street loop was objected to by many delegations on the ground that this route would permit only the Interborough company to bid. The objection has been unheeded by the commission, as have the protests of the Broadway and Fifth avenue merchants, who insisted that any interference with the surface of Broadway would mean ruin to many storekeepers. The commission has decided that the new subway must be a near-surface one and it will be constructed as was the lower Broadway tunnel, by the "cut-and-cover" process. The commission also ignored the objections made by the Interborough company to several of the clauses in the contract. The company opposed the power the commission has reserved to order changes in the rolling stock and in equipments and to go to court to enforce its orders, the burden of proof that such orders are unreasonable being placed on the contractor.

Another strong protest made by the company is that if a part of the line is completed and operated before the whole is finished the operator shall pay rental on the basis of all the bonds issued by the city for construction up to that time, instead of computing the rental on the length of trackage placed in operation.

The only important modification made in the contract was the insertion of a clause complying with Section 13 of the American labor law and providing that none but citizens shall be employed in the construction of the tunnel and that preference shall be given to citizens of this state.

The commission determined to give consideration to the application made by F. B. Behr for a franchise to build a monorail elevated road from Atlantic avenue, Brooklyn, to Coney Island.

The commission ordered the payment of \$352,000 to the Interborough company for the installation of the ventilating plants at the subway stations.

Chief Engineer Rice reported that the plans and specifications for the so-called Tri-borough route, from the Bronx down to Brooklyn and Coney Island, would be ready in six weeks.

The Interborough Rapid Transit Company has ordered 250 new cars, 50 for use in the subway and 200 on the elevated lines. The new subway cars will be of the same type as those now in service, except that the doors will be 50 inches wide instead of 39 and will have steel instead of wooden fillings.

The report of the February grand jury of Kings county, which has been presented to Governor Hughes, contains a lengthy arraignment of the Brooklyn Rapid Transit Company in regard to the poor condition of the service in Brooklyn.

Chicago Traction Situation.

The Citizens' Non-Partisan Traction Settlement Association was formed on February 26 by 30 of the leading organizations of the city to conduct a campaign for approval of the Chicago traction ordinances at the April election. Pamphlets will be issued, mass meetings will be held and subsidiary organizations will be formed to carry on the work. The declaration of principles which was adopted says:

"For a generation past the people of Chicago have confronted in a gradually decaying street transportation system a menace to public health, individual comfort and municipal prosperity, and an offense to community pride.

"In a condition of desperation at the abominable character of the street car service and exasperated by attempts of the companies to maintain rights questionable at the best, a large number of citizens became advocates of municipal ownership and by a majority of votes cast on the subject the people of Chicago indorsed that theory, resulting in the election two years ago of a city administration pledged to the carrying out of that policy. That administration was at once confronted by financial limitations making immediate municipal ownership impossible, by reluctance on the part of the transportation companies to surrender doubtful rights and, on the part of the people, by an imperative demand for an improved public service.

"The expiration of some of the existing franchises and court

decisions invalidating others and defining the rights of the respective parties clarified the situation and made the owners of the street railway properties ready to enter into conference with the representatives of the city and to make concessions demanded in the interests of the public which would not jeopardize their admitted remaining interests in these properties and would safeguard further investment.

"After almost continuous conferences covering eight months between the committee on local transportation of the city council of Chicago and representatives of the traction companies identical ordinances have been prepared enabling the city to deal with the subject of transportation as a whole and providing for complete rehabilitation along the most modern lines, to be begun immediately and completed within three years, giving to the public the most up-to-date equipment, equal to any in the United States at the present time."

The declaration concludes: "We, the undersigned, on behalf of the organizations which we respectively represent, do hereby announce our approval of the ordinances as passed, believing them to be in their essential features equitable and to constitute a fair settlement of a vexatious and long unsettled problem, and urge the voters of Chicago at the forthcoming election of April 2, 1907, to support these ordinances as the only practical method of securing prompt reform of transportation methods and the rehabilitation of the transportation system of Chicago in a way which will be fair to all interested parties and will safeguard the interests of the future and assure municipal ownership whenever such ownership shall be found practicable."

Frederick Bode of the Chicago Commercial Association was made president; William A. Bond of the Chicago Real Estate Board, vice-president; and A. H. Wetten of the real estate board, secretary and treasurer.

The democratic city convention on February 23 renominated Edward F. Dunne for mayor. The democratic platform is based on municipal ownership and defeat of the traction ordinances. The platform says that while the ordinances pretend to "provide for municipal ownership, they are, in fact, private franchises for twenty years or more; that while they pretend to divide profits on operation with the city, they afford no assurance whatever of any income to the city; that by means of construction profits they would make possible an enormously excessive price for purchase by the city; that by authorizing unlimited contracts for power they would enable the companies "to saddle upon the city in case of municipal purchase" the obligation of contracts with private power companies at any price and for any length of time.

Western Society of Engineers.—A regular meeting of the society will be held in the society rooms, 1737-41 Monadnock block, Chicago, on Wednesday, March 6, 1907, at 8 p. m. Mr. L. T. Hotchkiss will present a paper on "Some Details of Concrete Construction," and Dr. W. Michaels, Jr., will present a paper on "How to Prevent Failure in Concrete Construction."

Rules for Safety at Drawbridges.—Since the drawbridge accident on the West Jersey & Seashore Railroad at Atlantic City last summer the New York State Board of Railroad Commissioners has made a thorough examination of conditions existing at drawbridges on the different roads of the state and has adopted rules as to the greater protection of these bridges. The rules provide for protection by home and distant signals 50 and 1,500 feet, respectively, from the end of the draw, with derails not less than 500 feet from the end of the draw, where possible, all interlocked so that the first movement to open the draw will set both signals in warning. The movable rails on ends of drawbridges must extend beyond the end of the bridge and connect with shore rails by a miter joint, the ends to meet in a trough and be interlocked.

Demurrer to Indictments of Cincinnati Traction Officials.—Atorney Miller Outcalt on February 23 filed a demurrer to the recent indictments against W. Kesley Schoepf, Robert E. Lee and Newton Wickersham of the Cincinnati Traction Company, in which they were charged with not complying with the law which specifies that street car vestibules shall be closed and heated, as mentioned in the Electric Railway Review of February 9. The demurrer sets forth that the indictments do not charge any offense against any valid law; that an attempt is made to charge an offense which does not exist under the laws of Ohio; that the indictments contain matter redundant and irrelevant and do not require a plea from the defendants. It also states that the indictments fall to state by what lawful authority a duty was imposed upon the defendants to maintain screened vestibules. A general demurrer was also filed to the indictments against J. H. Schoepf, Newton Wickersham and William E. Blasing in which they are charged with withholding records of the traction company from the grand jury.

Minnesota Court Denies Right of Eminent Domain.—The United States district court at Minneapolis on February 27 handed down a decision that the electric railways of Minnesota have no right of eminent domain to condemn land. The case was that of the Minneapolis & St. Paul Suburban Railway Company against the village of Excelsior, Minn., a summer resort 20 miles west of Minneapolis, for the purpose of testing the right to condemn property for a right of way. The case, which, it is stated, will be appealed to the supreme court, was started by a petition to the court to appoint a commission which should condemn certain land in Excelsior and Tonka Bay along the route of the proposed extension from Excelsior to the upper lake at Birch Bluff. It was opposed by property owners along the proposed route. The court, holding that the company is a street railway company, finds that

it has no right to "acquire property by eminent domain within the limits of any city or village." As to the tracts of land situated outside of the village, which the company attempted to condemn, the court finds that these tracts would not be useful or necessary unless a right of way were acquired inside the village, and denies the petition.

Subway Exits to Philadelphia Department Stores.—By a plan which has been partly agreed upon by the engineers of the Philadelphia Rapid Transit Company and Gimbel Brothers, Llt Brothers and Strawbridge & Clothier, the owners of three large department stores, one large station is to be built in the Market street subway at Eighth street, with entrances into each of the department stores, as well as passageways from one side of the railroad tracks to the other, making it possible for shoppers to go from one shop to another without going into the open street. It is understood that the department stores will build large show windows underground, so that patrons using the subway may enjoy the displays that now attract them on the street surface. Representatives of the stores have been holding conferences with the officers and engineers of the railway company to discuss plans for a station which would add to the comforts of their patrons. No definite plan has been selected, but all of those under consideration are designed so that shoppers may enter the shops directly from the station platform. Like other stations along the line, the one at this point will be 350 feet long, but it will be much wider than the others to provide for the immense traffic. The station will be centered at Eighth street, extending half way along the block east and west. It has not yet been determined how patrons are to cross the tracks. Two plans have been drawn, one for a passageway under the tracks and the other for a bridge.

United Railways Prosecuted for Allowing Mail Cars to Stand in Street.—The prosecution of the United Railways Company of St. Louis by the city for allowing mail cars to stand on Eighth street, between Pine and Chestnut streets, threatens to terminate in a conflict between the city and the postoffice authorities over use of the street as a terminal for the mail cars. A case against the United Railways is pending before Judge Tracy in the first district police court, to whom it was submitted on an agreed statement of facts. He is to render a decision on March 2. In the meantime the United Railways has shifted the burden of the trouble to the government by threatening to discontinue the street car mail service if the company is fined for letting cars stand on the street. General Manager McCullach served notice to this effect on Assistant Postmaster Stice several days ago. Mr. Stice took the matter up with the department at Washington, and received an opinion from W. S. Shallenberger, third assistant postmaster general, saying: "The contemplated action would, if carried out, be an interference with the contract relations between the United States and the transit company and result in a delay to the mails." He suggested that the district attorney be consulted to determine whether it would be a violation of any federal statute to interfere with the operation of the cars. Mr. Stice has tried to arrange a schedule which will not bring two or three cars together at that point, but finds it impracticable without working great delay in handling the mails. Two of the cars stand there over an hour and others from that time down to ten minutes.

Research Fellowships in Engineering at the University of Illinois.—The University of Illinois has extended and strengthened the field of its graduate work in engineering by recently establishing ten research fellowships in the Engineering Experiment Station. These fellowships have an annual value of \$500, and are open to graduates of approved universities and technical schools, both American and foreign. They must be accepted for two consecutive collegiate years, at the expiration of which period, if all requirements have been met, the master's degree will be granted. Preference will be given to men who have had some experience in practical engineering work outside of college. The appointments will be made upon the recommendation of the station staff of the Engineering Experiment Station and upon the approval of the faculty of the graduate school and the president of the university. The Engineering Experiment Station, it may be explained, is a department connected with the College of Engineering. It was established in 1903 for the purpose of carrying on investigations along various lines of engineering, and for the study of problems of importance to professional engineers and to the manufacturing and industrial interests of the state. The work of the station and the college is closely related, the heads of the several departments of the college of engineering constituting the station staff. The investigations are carried on by the members of the staff directly, sometimes by a fellow as graduate work, sometimes by a member of the instructional force of the college, and frequently by special investigators belonging to the station corps. The various laboratories of the station and the college offer exceptional facilities for investigational work, being well-equipped with the most modern apparatus. During the past four years about \$300,000 has been appropriated by the state legislature for the maintenance and extension of this equipment, and it is believed that the same liberal policy will be continued. By offering these research fellowships at \$500, and throwing them open to graduates of both American and foreign universities, the station hopes to secure a picked body of men imbued with the true spirit of genuine investigators who will do graduate work of high grade. It is expected that valuable results will accrue to the station, and that a body of experts will be developed, some of whom may be attached later to the regular corps of station investigators. A circular giving full information will soon be issued, and can be obtained upon application to L. P. Breckenridge, the director of the Engineering Experiment Station, Urbana, Ill.

Construction News

FRANCHISES.

Allegheny, Pa.—The Millvale Etna & Sharpsburg Street Railway Company has asked for a franchise to operate its line on Bridge street from East Ohio street, over the bridge of the West Penn Railway and the "back channel" of the Allegheny river to Herr's Island, and across the island to the western approach of the Thirtieth street bridge. Action has been referred to the corporations committee.

Allegheny, Pa.—The Pittsburg Railways Company has applied for permission to connect its tracks in Brighton road and Shay avenue by a line beginning at Brighton road, along Woodland avenue to Superior and Shady avenues; also for a franchise to lay tracks in East Robinson street from Federal to Sandusky streets in order to make a loop for the Pleasant Valley and Perryville cars. Referred to the committee on corporations.

Brunswick, Ga.—F. D. M. Strachan has applied for a 50-year franchise for a street railway and for a lighting plant.

Cheektowaga, N. Y.—The Cheektowaga Railway, recently incorporated to build from Cheektowaga to Buffalo, N. Y., 6 miles, has been granted a 50-year franchise to build a double-track road through the town, from Clinton street and the Buffalo city line to the town line of Lancaster.

Chico, Cal.—The Northern Electric Company has secured a five-year franchise to run its proposed freight line on Fifth street; also for a line on Eighth street for both passenger and freight service.

Dixon, Ill.—The Northern Illinois Electric Railway has received an extension of its franchise to February 20, 1908. The line as proposed will be built from Dixon to Amboy, Ill., with an extension to DeKalb. It is stated that negotiations practically have been completed for financing the work and that construction of the line within the time prescribed is assured.

Dubuque, Ia.—The Southwestern Wisconsin Railway has applied for a franchise to enter Dubuque with its proposed interurban line. It is stated that the company will replace the high bridge with an entirely new structure using the old piers which are considered amply able to sustain the additional load which will be put upon them by the running of the interurban cars over the bridge. It is planned, also, to build a high steel viaduct 700 feet long which will carry the line into the flats between Fourth street and the Illinois Central tracks. From there a wooden trestle will be built to a point near the steam railroad tracks in Sixth street. From Sixth street over the railroad tracks and to the surface intersection of Sixth and Clay streets another steel viaduct 550 feet long will be constructed. The construction of these viaducts and trestle work will make a continuous bridge from East Dubuque to Clay street and will cost, with the purchase price of the bridge, over \$100,000. Mr. F. W. Hild, chief engineer, 317 Bank & Insurance Building, Dubuque, Ia.

East St. Louis, Ill.—The East St. Louis & Suburban Electric Railway has secured a franchise from the St. Clair county highway commissioners to lay tracks on Harding avenue, connecting with the Lansdowne line, to Caseyville avenue, and east on Caseyville avenue.

East St. Louis, Ill.—The East St. Louis & Suburban Railway has applied for a franchise on Tenth street from St. Clair to Illinois avenue and on Illinois avenue from Tenth street to Third street. This change in the original plans for the routing of the line is said to have been due to the recent acquisition by the Suburban company of the McKinley franchises in East St. Louis.

Ely, Nev.—The Ely Electric Railroad Company has applied for a franchise to build an electric line from Kimberly, Nev., the new mining town, to the smelter of the Nevada Consolidated Copper Company, for freight, ore and passenger service.

Evanston, Ill.—The Chicago Evanston & North Shore Electric Railway has been granted a 50-year franchise for a line on Torrence avenue through the city to Bowmanville. Frank R. Grover and George W. Wilcox are interested.

Fairfield, Ia.—The Iowa-Missouri Traction & Power Company has secured a franchise to operate its proposed interurban line through Fairfield. It is stated that work will be started on April 1, and completed within the present year. The line will extend north to Marengo, Cedar Rapids and Vinton, with a branch to Oskaloosa, and on the south to Memphis, Mo.

Ga'ena, Ill.—A 25-year franchise has been granted to the Illinois & Western Railway Company to build an electric line in Ga'ena and to points in the mining district of southern Wisconsin. A loop district has been outlined in the business section and it is stated that work on construction will be started in the spring. Under the name of the Tri-State Light & Power Company the same company was empowered to take over the lighting plant, paying \$8,850 for the equipment, with another provision for the purchase of the plant, which will furnish light and power for commercial purposes.

Goshen, Ind.—The Goshen South Bend & Chicago Railway a part of the proposed line from Chicago to New York, has secured a franchise in Goshen to build its line through that city.

Ithaca, N. Y.—The Auburn & Ithaca Traction Company, which

proposes to enter this city on Cayuga street, has received a six-months extension from the city council to permit of its getting a certificate of necessity from the state railroad commission.

Michigan City, Ind.—A new franchise is being drawn up by the Chicago Lake Shore & South Bend Railway to take the place of the old one by the terms of which a double track will be laid in Franklin street. An additional bond of \$10,000 is offered besides other provisions regarding the pavement, poles, wires and other equipment.

New York, N. Y.—The Union, the Southern Boulevard and the New York City Interborough railway companies, all controlled by the Interborough-Metropolitan Company, have applied to the board of estimate for permission to make 39 extensions to the railroad systems in The Bronx. If these extensions are granted it will mean the adding of more than 50 miles to the surface railroad trackage of The Bronx. A special committee of the board has made a personal inspection of the territory to be covered by the proposed new roads. These franchises were applied for over a year ago, but some changes have been made in the route applied for.

Ogden, Utah.—The Ogden & Northwestern Railroad has secured a franchise to operate an electric line in Brigham City, Utah. The line now runs to Hot Springs, about nine miles north of Ogden, and 12 miles additional track will have to be laid to reach Brigham City. The franchise must be accepted within 60 days and the preliminary survey made within one year.

Riverside, Cal.—The Crescent City Railway Company has been granted a franchise to build a trolley line from Riverside to the plant of the Southern California Portland Cement Company in West Riverside, across Fairmont Park, North Almond, North Market and North Orange streets and Colton avenue. It is stated that ties and rails are waiting at Colton, ready for delivery whenever they are wanted and that work will be started as soon as possible and will be completed within two months after it is begun.

Silvis, Ill.—The Moline Rock Island & Eastern Traction Company has asked for a 50-year franchise to build either a single or double-track line in Silvis, to be completed within four months. It also provides for the use of the tracks by other companies for interurban service. It is stated that the Rock River Traction company already has made arrangements for this purpose.

Wheeling, W. Va.—The Wheeling Sherrard & Cameron Interurban Electric Railway has applied for a 50-year franchise to build an electric railway in Marshall and Ohio counties from Wheeling by way of Sherrard to Cameron, W. Va.

RECENT INCORPORATIONS.

Atlanta Stone Mountain & Lithonia Railway.—Incorporated in Georgia to build an interurban line from Decatur in De Kalb county, through Ingleside, Clarkston, Scottdale and Stone Mountain to Lithonia, 20 miles. It is said that the line will connect with the Georgia Railway & Electric Company's line now running to Decatur. Capital stock, \$50,000. Incorporators: A. O. Venable, A. B. Kellogg, R. M. Thompson, S. H. Venable and others.

Belleville & Interurban Railway.—Incorporated in Illinois to build an electric line from Belleville, Ill., to Smithton, 7 miles. Capital stock, \$100,000. Incorporators: Jacob Gundlach, Jr., Benjamin A. Gundlach, R. W. Hofsommer, George Hippard and Thomas A. Bell. Mr. Bell is the promoter of the company, with offices in the Commercial Building, St. Louis, Mo.

Burgettstown Florence & Paris Street Railway.—This company has applied for a charter to build an electric line on Washington street in Burgettstown and from there to Florence, Paris and other points in Pennsylvania, with possibly an extension later to Steubenville, O. Incorporators: Charles W. Dahlinger, John W. Thomas, Robert L. James, A. H. Mercer and I. W. Bigham.

California Rapid Transit Company.—Incorporated in Arizona with a capital stock of \$10,000,000 to build an electric line from San Francisco through Burlingame, San Mateo, Redwood City, Palo Alto, San Jose, Monterey to Carmel River, Cal., about 140 miles. A branch line from a point near San Jose will run through Alameda county by way of Alameda, Oakland and Berkeley to Point Richmond, ending at Martinez, Contra Costa county, a distance of 75 miles. There also is contemplated another branch 22 miles long from Redwood City through Palo Alto to connect with the line at or near San Jose; also another branch 13 miles long from a point between Redwood City and Palo Alto to the Bay of San Francisco, crossing at Dunbarton Point and from thence to Niles. The total aggregate mileage of the main line and its branches will be 250 miles. William C. Alberger, president and chief engineer; William Minto, vice-president; L. E. Lee, secretary; W. H. H. Hart, treasurer. It is stated that \$250,000 of the stock has been subscribed by the following: W. J. Morgan, H. C. Cutting, W. H. H. Hart, A. H. Butler, M. D. Eddy, H. P. Bowie, C. W. Clark, L. E. Lee, William C. Alberger, William Minto and the California Tunnel Company.

Canyon City & Royal Gorge Electric Railway.—Incorporated in Colorado to build and operate an electric railway in Canyon City, South Canyon, East Canyon, Lincoln and Orchard parks, Park Center and to other points in Fremont county. The company is authorized to do a general passenger and freight business; also to erect buildings and place machinery for an electric plant to

furnish light and power for commercial purposes. Capital stock, \$1,250,000. The principal office will be in Canyon City. Incorporators: Ex-Governor James H. Peabody, D. E. Gibson, W. H. Peabody, E. M. Smith of Canyon City; W. W. Umberhauer and Thomas J. Budd of Philadelphia; Col. Willis Wood and William Huttig, Kansas City.

Davenport & Burlington Interurban Railway.—Incorporated in Iowa to build an interurban line from Burlington to Davenport, backed, it is stated, by eastern interests. Capital stock, \$250,000. C. G. Hipwell, president; Thomas Dougherty, vice-president; and A. E. Carroll, secretary and treasurer. The C. G. Hipwell Construction Company, with the same officers and directors as the interurban company, also has been incorporated with a capital stock of \$250,000.

Electric Securities Company.—Incorporated in Ohio with a capital stock of \$50,000 to finance the proposed Cleveland Alliance & Mahoning Valley Railway, which proposes to build a line from Cleveland to Ravenna and Alliance, O., with a branch to Warren. Officers have been elected as follows: Henry Boemke, president; J. W. Holcomb, vice-president; John Morley, secretary; F. H. Townsend, treasurer. Henry Everett, C. R. Morley and David Morrison compose the board of directors. It is stated that work will be pushed as rapidly as possible.

Henderson Traction Company.—Incorporated in Kentucky with \$150,000 capital stock. Incorporators: Walter Schmidt, Cincinnati; James W. Garrison and Samuel McDonald, Louisville; C. C. Tennis, Pittsburg, Pa.; A. O. Brown & Co., New York, and J. H. Lyne, Henderson, Ky.

Kennett & Coatesville Railway.—Incorporated in Pennsylvania to build an electric line from Kennett Square to Coatesville, Pa., 12 miles. Capital, \$120,000. J. Walter Taylor, Kennett Square, is president.

Mineral Wells & Lakewood Park Street Railway.—Incorporated in Texas to build an electric line in Mineral Wells, Tex. Capital stock, \$25,000.

Paducah Southern Electric Railroad.—Incorporated in Kentucky to build an electric railway from Paducah to Hickman, Ky., by way of Mayfield and Fulton, Ky., and Union City, Tenn. W. A. Martin, president, and H. H. Loving, secretary, Paducah, Ky. E. W. Whittemore, Paducah; George Rush, Brockport, Ill., and D. R. Archer, Chicago, with the officers of the company, compose the board of directors.

Oklahoma City El Reno & Southwestern Interurban Railway.—Application for a charter to build an electric line in El Reno and to Oklahoma City, Medford, Chickasha, Hobard and Lawton has been filed by this company.

San Francisco Alameda & Eastern Railway.—Incorporated in California to build an electric line in Alameda, Cal., franchise for which was obtained about a year ago, to be operated in connection with a ferry service in San Francisco. The terminal will be the western end of a mole that will extend from the western shore of Alameda south of the Alameda mole of the Southern Pacific. It will cross the marshes intersecting Webster street near the old power house of the Oakland Traction Consolidated and in Alameda will follow Clement avenue to the eastern limits of the city; there also will be a branch line running south on Broadway. The total mileage of the proposed line is 11 miles. Capital stock, \$2,000,000, of which \$11,000 has been subscribed. Incorporators, F. M. Greenwood, A. D. Schindler, A. H. McHuron, W. H. Spaulding and L. Q. Haven. A. D. Schindler is general manager of the Northern Electric Company, Chico, Cal.

Sparta-Melrose Electric Railway & Power Company.—Incorporated in Wisconsin to build an electric railway from Sparta to Melrose, Jackson county, 20 miles. Capital stock, \$300,000. Incorporators: G. L. Cromwell and T. T. Hendered, Milwaukee; Howard Teasdale, Sparta, Wis.

Sunbury & Trevorton Electric Railway.—Incorporated in Pennsylvania to build a line from Sunbury to Plum Creek, 2½ miles. Capital stock, \$15,000. Monroe H. Kulp, Shamokin, Pa., president.

Vallejo & Northern Railway.—Incorporated in California to build a line from Sacramento to Vallejo, Cal., 105 miles. Capital stock, \$2,500,000. Incorporators: Melville Dozier, Jr., George S. Lakie, C. Francis Kinsey, and John C. Veitch of Oakland, and T. C. Gregory of Suisun.

Wabee & Wawasee Railway.—Incorporated in Indiana to build a 12-mile electric line from Syracuse to Wabee Lake, Kosciusko county, to Milford; also from Syracuse to Lingle Lake, for passenger and freight service. Directors, A. St. Newberry, W. D. Frazer, C. I. Rellay and J. P. Dolan. It is stated that parties connected with the Sandusky Portland Cement Company of Syracuse, are back of the project.

West Point (Va.) Traction Company.—Incorporated to operate an electric line for freight and passenger service. Incorporators: J. W. Marshall, president; G. E. Guvernator, vice-president; J. W. Owens, secretary and general manager. A. Julian Bagby and W. C. Dunham also are interested.

York, Pa.—The Red Lion & Airville Traction Company has been granted permission by the council of Red Lion Borough to build its line over certain streets. The proposed line will connect York and Delta, Pa., 25 miles, by way of Airville, and serve

other towns along the route. A. K. Frey, Samuel Fulton, Hugh Ross and others are interested.

TRACK AND ROADWAY.

Asheville Rapid Transit Company.—It is reported that this company has let a contract to the Railways Construction & Securities Company, 141 Broadway, New York, to build its proposed line from Asheville to Overlook Park, N. C., eight miles. J. K. Vosbell of Baltimore, Md., is president, and Charles E. Van Bibber, 60 Wall street, New York, is chief engineer.

Atlantic Shore Line Railway.—This company is now building a line 15.5 miles long from York Beach, Me., to Kennebunkport, Me., to connect the eastern and western divisions. The western division, the old Portsmouth Dover & York Street Railway, which was acquired early in 1906, connects Dover and Portsmouth, N. H., with South Berwick, Elliot, Kittery and York Beach, Me., 41 miles. The eastern division, the original Atlantic Shore Line Railway, connects Springvale, Sanford, West Kennebunk and Kennebunkport with Biddeford, Me., 37.5 miles. The new line now under construction, besides connecting the two divisions of the system, will complete the connection between Portland, Me., and Boston, Mass., by electric railway. W. G. Meloon of Portsmouth, N. H., is general manager.

Augusta Winthrop & Gardiner Street Railway.—This company has been recently acquired by a syndicate headed by John R. Graham of Bangor, Me., and it is stated that the new owners contemplate building an extension to Waterville and to a connection with the Lewiston Brunswick & Bath Street Railway at Sattatus.

Bay Counties Electric Railroad.—This company is making surveys and securing right of way for a line from Belvidere, near San Francisco, to Lakeport, Cal., via Greenbrae, San Rafael and Novato.

Beloit Traction Company.—O. S. Baylies, secretary and treasurer, 79 Dearborn street, Chicago, writes that contracts have been let for the materials and equipment for six miles of city line in Beloit, Wis. The company will do the construction work. Power will be furnished by the Rockford Beloit & Janesville Railroad, with which the new company is associated, and whose tracks will be used for about one mile. The Rock river will be crossed on a city bridge. No. 00 trolley wire will be used. The rails will be 45 and 60-pound T-rail fastened with Weber joints. Joel B. Dow, president; Charles A. Gault, vice-president; both of Beloit, Wis.

Benton Harbor-St. Joseph Railway & Light Company.—It is announced that this company will build an electric railway from the Graham & Morton docks in St. Joseph, Mich., to Paw Paw Lake.

Brooklyn Rapid Transit Company.—Supreme Court Justice Marean, in Brooklyn, has issued a mandamus directing Bird S. Coler, borough president, to permit the Brooklyn Rapid Transit Company to build tracks on Nostrand avenue from Flatbush avenue to Avenue U, and also directing the company to proceed to build the line. Mr. Coler held up the application for several months, on the ground that the franchise granted by the old town of Flatbush was invalid.

Butte Electric Railway.—It is reported that rails have been ordered for four miles of double tracking on the Butte, Mont., city lines, on South Main, Walkerville and Silver Bow streets.

Calgary, Alta.—It is reported that the city council has decided to build a municipal street railway, 12 miles long. W. F. Thorold, city engineer.

Carmichaels, Pa.—John C. Gwynne of Carmichaels is promoting an electric railway from Rice Landing to Carmichaels, Pa., and thence to a connection with the West Penn Railways at Masontown, 11 miles.

Chicago Lake Shore & South Bend Railway.—J. B. Hanna, president, South Bend, Ind., writes that 15 miles of track has been laid, from South Bend to New Carlisle, Ind., and that tracklaying is proceeding at the rate of ½ mile per day. All of the grading contracts have been let and about 20 miles of rail is on hand, to be laid as fast as grading is completed. All of the steel has been contracted for and will be delivered in instalments until May. A 66-foot right of way has been purchased for the entire distance. There is one tangent of 14 miles and there are none but high-speed curves on the whole line except in cities. The overhead construction is of the single catenary type, the poles being long-leaf southern pine, creosoted and set in concrete 6½ feet. Seventy-pound rails are being used. The road extends from a connection with the Illinois Central Railroad at Kensington, Ill., where a terminal site has been purchased to South Bend, 78 miles. J. W. S. Relgle, South Bend, chief engineer.

Coatesville & Kennett Railway.—George H. Dodge, secretary and treasurer Kennett Square, Pa., has announced that financial arrangements have been made for building the line from Coatesville to Kennett Square, Pa., and that engineers will begin in a few days to make the preliminary surveys. The road will be built entirely on a private right of way.

Dallas Interurban Electric Railway.—Charles N. Wilson, president of the American Engineering Company of Indianapolis, has closed a contract with this company, incorporated about two weeks ago, for the construction of about 73 miles of electric railway, including about 30 miles of city lines in Dallas, Tex., and a line from Dallas to Greenville and Sherman. Mr. Wilson states that work is to begin next week. D. D. Waggoner of Dallas, president.

Denver & Rio Grande Railroad.—It is reported that the Central Colorado Power Company of Denver, Colo., is furnishing estimates and specifications for the electrification of the line between Denver and Colorado Springs.

Dunkirk, N. Y.—It is reported that A. N. Broadhead, president of the Chautauqua Traction Company, is interested in a project to build an electric railway from Jamestown to Dunkirk, N. Y., via Gerry, Sinclairville, Moons, Cassadaga, Lily, Dale, Stockton and Fredonia, about 25 miles.

Elizabethtown, Ky.—A corps of engineers has begun the survey of a line from Elizabethtown to West Point, Ky., 22 miles.

Ft. Wayne & Springfield Interurban Railway.—It is reported that this company, which recently opened its line from Ft. Wayne to Decatur, Ind., is now considering the extension of its line south through Chattanooga to Celina.

Garvin, I. T.—The Choctaw Veneering Company has graded 4 miles of electric railway from Garvin south toward the Red river and will begin tracklaying in about two weeks.

Hattiesburg (Miss.) Traction Company.—Bids will be received until March 6 for furnishing material and for the construction of an electric railway in Hattiesburg, Miss. E. J. O'Bierne of Atlanta, Ga., engineer.

Hutchinson Interurban Railway.—The directors have decided to extend the doubletracking of the system in Hutchinson, Kan., from the Santa Fe railroad tracks at Third avenue to the Fair Grounds.

Illinois Traction Company.—It is reported that surveys are being made between Seneca and Yorkville, Ill. This is one of the alternative routes included in the plans of the Illinois Traction Company for the line from Mackinaw to connect with either the Aurora Elgin & Chicago Railway or the Chicago & Joliet Electric Railway for Chicago, as announced in the last week's issue of the Electric Railway Review. Congress has granted a permit to the St. Louis Electric Bridge Company, a subsidiary company, to construct a bridge over the Mississippi river between Venice, Ill., and Salisbury street, St. Louis, Mo. The line from Champaign to Decatur is now in operation from Champaign to Monticello.

Indianapolis & Cincinnati Traction Company.—It is stated that financial arrangements have been made for extending this line, which now connects Indianapolis and Connersville, Ind., to Hamilton, O., by a double-track line, connecting at Hamilton with one of the existing lines to Cincinnati. A private right of way has been secured from Connersville to the Ohio state line at College Corner, 17 miles west of Hamilton. Charles L. Henry of Indianapolis, president.

Jackson Electric Railway Light & Power Company.—This company has decided to build an extension 1 mile long on Jefferson street, Jackson, Miss., as soon as the rails can be obtained. Another extension on Gallatin street is also contemplated.

Johnstown Ebensburg & Northern Railroad.—It is reported that a contract has been let to the Pierce-Barnes Company of Boston, Mass., for building this line from Johnstown to Gallitzin, Pa.

Kansas City Springfield & Southern Railway.—C. C. McFann, general manager, has announced that all the right of way has been secured between Springfield and Ash Grove, Mo., for the line which is to be built from Springfield to Nevada.

Keokuk, Ia.—A company has been organized at Keokuk with J. E. Peterson of New London, Ia., president, to make surveys and do the preliminary work toward securing an interurban railway connecting Keokuk with various points in southeastern Iowa.

Lafayette & Chicago Railway, Rensselaer, Ind.—The Lafayette & Chicago Railway, incorporated last July to build an electric railway from Lafayette to Hammond, Ind., 114 miles, has applied for a franchise. It is stated that Chicago capitalists have agreed to finance the road when the right of way is secured.

Lake View Traction Company.—It is reported that work will begin soon on the proposed line from Memphis, Tenn., to Clarksdale, Miss., about 100 miles. R. F. Tate, of Memphis, is president.

Louisville & Southern Indiana Traction Company.—Surveys are being made for an extension to French Lick and West Baden, Ind., via Mooresville and Greenville, and thence paralleling the New Albany & Paoli turnpike to Paoli, passing through Palmyra, Fredericksburg, Hardinsburg and Chambersburg.

Mankato Electric Traction Company.—W. L. Hixon and H. E. Hand are promoting an electric railway in Mankato and North Mankato, Minn., 10 miles to be built at first. It is stated that C. W. Jackson of New York has agreed to finance the project, taking \$100,000 of stock and underwriting \$175,000 first-mortgage 5 per cent gold bonds. The company is to be chartered in New Jersey under the above name.

Metropolitan Street Railway.—Plans for the viaduct and tunnel which this company proposes to build in Kansas City along Twelfth street, from Mulberry to Broadway, have been submitted to the board of public works.

Minneapolis Rochester & Dubuque Traction Company.—This company, which proposes to build from St. Paul, Minn., to Dubuque, Ia., has filed in the various towns a map of the proposed route as determined by the final surveys, including the following towns and cities: St. Paul, Minneapolis, Wayzata, Chaska, Shakopee, Faribault, Owatonna, Hayfield, Rochester, Spring Valley, Minn.; Cresco, Ia.; Decorah, Frankville, Postville, Colesburg, Marshfield and Dubuque. It is stated that the right of way has

been secured from Dubuque to Owatonna. William P. Mason of Minneapolis, secretary.

Missouri & Kansas Interurban Railway.—This company, which now has a line between Kansas City and Olathe, Kan., operated with Strang gasoline-electric motor cars, is making surveys for a branch line from Lenexa through Merriam and Shawnee to Rosedale. Fred O'Flaherty, chief engineer, Lenexa, Kan.

Napa Valley Electric Railroad.—Twelve miles of the 16-mile extension from Napa to St. Helena, Cal., has been graded and tracklaying will begin as soon as the steel has been delivered. L. J. Perry, Napa, general manager.

Oregon Electric Railway.—Grading and trestle work has been started in South Portland for the line from Portland to Salem, Ore. Property has been purchased in South Portland for terminal purposes and right of way. The steel structure of the bridge over the Willamette river at Wilsonville, which was built by the Pennsylvania Steel Company, is expected in a few days. W. S. Barstow & Co. of Portland, the engineers in charge, have about 250 men at work, with three pile-drivers, a steam locomotive and a steam shovel, and rapid progress is being made on the grading and trestle work. Ties and timbers have been delivered.

Owosso, Mich.—E. M. Hopkins of Detroit, Mich., announces that a contract has been let to the Van Rensselaer Construction Company of New York for the construction of the Grand Rapids Belding & Greenville Railway, the Grand Rapids & Ionia Railway, the Ionia & Owosso Railway and the Owosso & Pontiac Railway. Construction is to begin at once. Mr. Hopkins is president of all four companies.

Paducah Southern Electric Railroad.—H. H. Loving, Paducah, Ky., writes that this company, recently incorporated, will build an electric line from Paducah to Hickman, Ky., 75 miles, via Mayfield, Fulton, Ky., and Union City, Tenn. Contracts are to be let as soon as the preliminary work is completed. Office, 100-102 Fraternity building, Paducah.

Pittsburg McKeesport & Greensburg Railway.—The directors have authorized the construction of 6 miles of overhead work. The line between Gross Siding and Oxford Park will be double tracked. It was also decided to proceed at once with the construction of the Manor cut-off, which will reduce the distance between Manor and Irwin 1 mile. Work will also soon commence on the Mt. Pleasant and Scottsdale extensions.

Portland & Mt. Hood Railway.—Agents of this company are now engaged in purchasing property in and near Portland, Ore., as right of way for the proposed line to Mt. Hood.

Redlands & Yucaipa Electric Railroad.—C. S. Chesnut, Redlands, Cal., writes that this company, recently incorporated, will begin grading about April for its proposed line from Redlands to Oak Glenn, Cal., 20 miles. O. D. Collins of Redlands, chief engineer.

Roanoke Railway & Electric Company.—This company is now completing the double-tracking of several of its lines in Roanoke, Va., work which was started last year. Later in the spring it is expected to lay heavier rails on several of its lines. The new track is to be laid on a concrete roadbed.

Rock Island Southern Railroad.—It is reported that preparations are being made for surveys from Monmouth to Macomb, Rushville and Beardstown, Ill. The surveying party has just completed surveys between Monmouth and Rock Island. F. H. Lanchshire, chief engineer, Davenport, Ia.

Roodhouse-Virden Railway.—C. W. Payne, secretary, Roodhouse, Ill., writes that right of way is now being obtained for an electric railway from Roodhouse to Virden, Ill., 32 miles, via Felter, Scottville and Modesto. E. M. Husted of Roodhouse is president.

Rosedale, Kan.—K. W. Stewart and the Commercial Club of Rosedale are raising funds for the construction of an electric railway from Rosedale to Shawnee, Kan.

St. Joseph Valley Traction Company.—M. L. Swinehart, chief engineer, Lagrange, Ind., is securing right of way for the proposed line from Elkhart to Middlebury, Ind.,

St. Louis, Ill.—It is reported that an English syndicate has engaged a local engineering firm to make a preliminary survey and estimates for the construction of a subway system.

Sacramento Gas & Electric Company.—The Hawk Hawley & Carly Company of Sacramento, Cal., has the contract for the immediate construction of an extension from Highland Park to Curtis Oaks, the new subdivision, through Curtis Oaks to Oak Grove, and thence to the entrance of Oak Park, Sacramento.

Seattle Electric Company.—This company is now at work on an extension of its Westlake boulevard line from Eighth avenue to the intersection of Pike street and Fourth avenue.

South Carolina Public Service Corporation.—Surveys are now being made for an electric line from Orangeburg to Aiken, via Springfield, N. C.

Spokane & Inland Empire Railroad.—Surveyors have begun work on the double-track subway to connect the passenger and freight terminals in Spokane, Wash. After the preliminary surveys have been made President Jay P. Graves, Consulting Engineer William F. Zimmerman and Chief Engineer Lupfer will visit New York, Philadelphia and Boston for the purpose of studying the subways in those cities.

Topeka & Southwestern Railway.—The Lamprecht Construc-

tion Company of Topeka has the contract for building this line from Topeka, Kan., to Council Grove, Ia., and it is stated will sublet contracts in a few days. W. L. Taylor of Topeka, president.

United Cities Traction Company.—This company is building an electric belt line for both freight and passenger service from Ft. Smith, Ark., to Ft. Smith, Okla., 4½ miles, principally for the purpose of transferring freight from a manufacturing site at Ft. Smith, Okla., to the Missouri Pacific St. Louis & San Francisco, Kansas City Southern, Ft. Smith & Western and Midland Valley railroads, which center at Ft. Smith. One mile out of Ft. Smith, Ark., has been graded and right of way is now being secured. The overhead construction is of the span type. Eighty-pound steel will be used for the first 1½ miles and 60-pound for the remainder. The ties are 6 by 8 inches by 8 feet space 2 feet center to center. Maximum grade, 3 per cent. Ira L. Reeves of Muskogee, I. T., is president and chief engineer.

United Railways.—It is stated that preparations are being made for beginning construction on the Front street line in Portland, Ore. The construction crews are being assembled and Chief Engineer Wickersham is distributing materials. It was expected to begin work last week, but the expected steel rails did not arrive. C. E. Loss, of Portland, president.

Utica Southern Railroad.—An official report from E. H. Risley, secretary, Utica, N. Y., states that contracts will be let probably in April for the construction of a line connecting Clinton, Hamilton, Norwich and Waterville, N. Y., 26 miles. Frank H. Baxter of Utica, chief engineer.

Wawasee Ligonier Topeka & Lagrange Railway.—J. N. Babcock of Topeka, Ind., has been elected president of this company, recently incorporated to build from Lagrange to Wawasee, Ind. Preliminary surveys are being made and it is the intention to begin building operations early in the spring.

Western Massachusetts Street Railway.—Surveys are being made for an extension from Huntington to Lee, Mass. H. C. Page, general manager, Springfield.

Willamette Valley Traction Company.—It is announced that this company will begin the construction of the proposed street railway system of Eugene, Ore., early this month and that 100 men are to be put to work. The company's engineers have completed the work of making the preliminary survey of the line from Eugene to Springfield. A. Welch of Portland is general manager.

Yazoo City, Miss.—The Sanders-Johnson Company has made a proposition to the city council to build a street railway, taking bonds in payment; line to be 3.1 miles long; contract price, \$53,776. Plans and specifications are to be reported on by an engineer employed by the city.

POWER HOUSES AND SUBSTATIONS.

Alabama City Gadsden & Attalla Railway.—This company has announced that E. B. Flitts & Co., Atlanta, Ga., have been awarded the contract for erecting a \$10,000 pumping station, and a 2,600-foot pipe line from the pumps to the company's power house at Gadsden.

Cedar Rapids & Iowa City Railway & Light Company.—This company is reported to be contemplating increasing the capacity of its power house by the addition of prime movers and generators having a capacity of 1,500 kw. This will, of course, also involve a considerable increase in the boiler-room capacity. The changes and additions, it is estimated, will cost approximately \$100,000. William G. Dows, Cedar Rapids, is the general manager.

Chicago Lake Shore & South Bend Railway.—President J. B. Hanna, South Bend, Ind., writes that a site has been purchased for the power house at Michigan City, Ind., 2½ acres of ground on the river front. A contract was let last week to the Westinghouse Electric & Manufacturing Company for the power house machinery, substations and car equipments. The generators will be three 1,500-kw. turbine units. The car equipments will be four 125-hp. single-phase motors each.

Freeport Railway Light & Power Company.—It has been announced that this company will construct a power plant at Brown's Mill, Freeport, Ill., at a cost of \$35,000. The new station will furnish power for the railway and also for local lighting. A. J. Goddard is the president and general manager.

Haverhill & Amesbury Street Railway.—This company is planning to erect a substation on Ring's Island, Mass. Permission has been applied for to erect poles and string wires through Salisbury for the transmission wires. L. E. Lynde of Merrimac, superintendent.

Illinois Traction Company.—It is reported that work will begin at once on the erection of an addition to the power house at Danville, Ill., to provide for the installation of a 2,000-kilowatt generator, direct connected to a pair of 36 by 60-inch twin engines.

Pacific Traction Company.—It is reported that this company has purchased a site and is making the preliminary arrangements for a power plant of large capacity to furnish power for the proposed system of electric railways in Tacoma, Wash., and the line to American Lake, although the location has not been announced. B. J. Weeks, general manager, Tacoma.

Stockton (Cal.) Electric Railway.—This company is installing in the power house of the Stockton Gas & Electric Company, which furnishes power to the railway, a 600-hp. auxiliary generating plant.

Personal Mention

Mr. H. J. Clark of Ft. Dodge, Ia., has been appointed general superintendent of the Citizens' Railway & Light Company, Muscatine, Ia., succeeding Mr. Frederick D. Polvin.

Mr. W. C. Smith of Pittsburg, Pa., has been appointed general superintendent of the Mahoning & Shenango Valley Traction Company, Youngstown, O., succeeding Mr. T. C. Armstrong, resigned.

Mr. F. L. Morse has resigned as assistant to President Bancroft of the Utah Light & Railway Company, of Salt Lake City, Utah, effective on March 1. Mr. Morse has held his present position for about three months. The reason given for his resignation is that business interests require his presence in New York.

Mr. D. Thomson has been appointed general manager of the DeKalb-Sycamore Interurban Traction Company, with headquarters at DeKalb, Ill. Mr. Thomson has had 21 years' experience in electric lighting and electric railway work in Canada and the United States, as superintendent and manager of various companies.

Mr. A. A. Anderson, general manager of the Indianapolis Columbus & Southern Traction Company, at Columbus, Ind., has been appointed general manager also of the Indianapolis & Louisville Traction Company, which is building a line from Jeffersonville north to a connection with the Indianapolis Columbus & Southern at Seymour, Ind.

Mr. J. A. Doane, who was formerly a dispatcher at the Wheaton, Ill., office of the Aurora Elgin & Chicago Railway, has been appointed chief dispatcher of the Elgin & Belvidere Electric Company at Marengo, Ill. Mr. Doane has been engaged in street and interurban railway operation in various capacities for the past 15 years and is well qualified for his new position.

Mr. Roscoe R. Anderson, chief clerk of the department of transportation of the Rhode Island Company, Providence, R. I., and for the past 14 years identified with this company in various capacities, has been chosen superintendent of transportation, to succeed Mr. Samuel Riddle, resigned to become general manager of the Chicago South Bend & Northern Indiana Traction Company.

Mr. Richard Wendt has been appointed master mechanic of the Elgin & Belvidere Electric company and has assumed full charge of the company's shops and rolling stock at Marengo, Ill. Mr. Wendt has for the past six years been associated with the Aurora Elgin & Chicago Railway Company at Wheaton, Ill., during which time he has been successively foreman in charge of the high-tension lines and of the third rail and night foreman at the Wheaton car repair shops.

Mr. Samuel Riddle, for the past two years superintendent of transportation of the Rhode Island Company, Providence, R. I., has resigned to become general manager of the Chicago South Bend & Northern Indiana Traction Company, with headquarters at South Bend, Ind., effective on March 1. This is the new company recently organized by the Murdock interests of Indiana, to take over the Northern Indiana Railway. Mr. Riddle was born about 30 years ago in Glenriddle, Pa., and graduated from Swarthmore College in 1897 with the degree of bachelor of science. After leaving college he was associated for some time with Dr. W. A. Drysdale, consulting mechanical and electrical engineer of Philadelphia, and later served in various capacities with companies engaged in the installation of electric lighting and power plants. In 1905 he assumed the duties of superintendent of transportation with the Rhode Island Company, succeeding Mr. Albert E. Potter, which position he has held until his present appointment. Mr. Roscoe R. Anderson is his successor.

Obituary.

Thomas Robinson, president and general manager of the Florence Electric Street Railway, died at his home in Florence, Colo., on February 7.

Ensign James B. Cahoon, U. S. N., vice-president and chief engineer of the Eldenbel Construction Company, New York, died at New Rochelle, N. Y., on February 16, 1907. He was born at Lyden, Vt., in the year 1856. He entered the naval academy at Annapolis, Md., and after graduating in 1879 entered active service as an ensign, being stationed at Newport, where he performed special service in the electrical department. Because of an injury received to one of his eyes while in this department, he was retired from the naval service and entered the employ of the Thomson-Houston Company, of Lynn, Mass. Upon the consolidation of this company with the General Electric Company, of Schenectady, he went with the latter company as head of the expert department. In 1894 he took the position of manager with the Elmira Railway & Electric Light Company, of Elmira, N. Y. In 1899 he was made manager of the Underground Electric Light Company at Syracuse, N. Y., where he remained two years. In the year 1901 he came to New York and associated himself with the banking house of Emerson McMullin & Co., as consulting engineer. Later he went with Farson, Leach & Co., New York. In the same capacity. After leaving this firm he went into business for himself, and opened an office as consulting engineer. Later he became associated with the Eldenbel Construction Company and in 1906 was elected to the office of vice-president and chief engineer of this company. Mr. Cahoon was ex-president of the National Electric Light Association.

Financial News

Alton Jacksonville & Peoria Railway, Jerseyville, Ill.—Stockholders of this company, on February 24, authorized an issue of \$800,000 bonds, and an increase in the capital stock from \$300,000 to \$800,000. The road will extend from Alton to Jerseyville, Carrollton, Whitehall, Roodhouse, Jacksonville and Peoria, and is now under construction from Alton to Godfrey. Part of the new capital will be used to complete the line to Jerseyville.

Chicago & Milwaukee Electric.—Earnings for January, 1907 compare with January, 1906, as follows:

	January, 1907.	January, 1906.
Gross earnings	\$62,631.55	\$43,443.33
Operating expenses	33,491.94	22,693.57
Net earnings	\$29,139.61	\$20,749.76

The Chicago & Milwaukee Electric Railroad Company has sold to the Western Trust & Savings Bank of Chicago \$2,000,000 convertible notes, dated March 1, maturing in two years, and bearing 6 per cent interest. The notes are secured by a deposit of \$2,500,000 Chicago & Milwaukee Electric Railroad Company, Wisconsin division, first mortgage 5 per cent bonds of 1925. On or before September 1, 1908, the holder of each \$1,000 note has the option of exchanging it at par and interest for a \$1,000 Chicago & Milwaukee Electric, Wisconsin division, first mortgage 5 per cent bond at 98 and interest, the company paying the difference in cash. The proceeds of these notes will be used for the completion of the road into Milwaukee, and to pay for the Milwaukee terminal and for additional equipment.

Chicago Subway Company.—Arrangements have been made to establish six general freight houses where the freight of small shippers will be received and distributed for the various railway companies. While the Illinois Tunnel Company, the operating company of the subway, will have direct connections with the largest shippers, these general freight houses will accommodate small shippers. It is estimated by the tunnel management that 2,000 small shippers will take advantage of the new facilities, which will be ready for use within 90 days. The exact location of the freight houses has not been fully decided upon, but there will be two houses on the north side; one on the south side, south of Fourteenth street and west of State; one near the South Water street district; one northwest of the center of the city, between the north branch of the Chicago river and Halsted street, and one southwest of the center of the city, between the south branch of the river and Halsted street.

Cincinnati Newport & Covington Light & Traction.—The property owned by this company has been leased for 99 years to the Columbia Gas & Electric Company, which guarantees the interest on all bonds, 4½ per cent dividends on the preferred stock and 3 per cent on the common stock for the first year; and agrees to increase the common stock dividend ½ of 1 per cent each year until 6 per cent is reached, when the dividend is to be continued on a 6 per cent basis. The Columbia company, as a guaranty, will deposit \$1,250,000 cash in Cincinnati banks. Stockholders of the Cincinnati Newport & Covington have the right to subscribe for an amount equal to 50 per cent of their holdings of either preferred or common stock in the new Columbia 5 per cent bonds, which will carry 100 per cent of common stock as a bonus. The Columbia company was incorporated in September, 1906, as the Columbia Corporation, with \$11,000,000 capital stock. The name has since been changed, the authorized stock has been increased to \$50,000,000 and \$25,000,000 bonds have been authorized. The Columbia Gas & Electric has leased the Cincinnati Gas & Electric, and has acquired most of the stock of the Cleveland Gas Light & Coke Company and the People's Gas Light Company of Cleveland.

Cleveland & Southwestern Traction Company.—Earnings for January are reported as follows:

	1906.	1907.
Gross	\$46,567.14	\$49,558.10
Operating	27,549.55	29,604.34
Net	\$19,017.59	\$19,953.76

Interurban Railway & Terminal, Cincinnati.—A re-organization of the finances is proposed whereby the outstanding five per cent bonds will be surrendered for preferred stock. The capitalization of the company, when the plan is completed, will be as follows: Bonds, \$1,650,000; preferred stock, \$1,000,000; common stock, \$2,500,000. The company owns the terminal station on Sycamore street, Cincinnati, and operates electric roads to New Richmond, Lebanon and Bethel. The Lebanon line is to be extended to South Morrow, O.

Milwaukee Electric Railway & Light.—An additional \$1,000,000 of the refunding and extension mortgage 4½ per cent bonds has been sold. They are offered by N. W. Harris & Co. and Spencer Trask & Co. at 95½ and interest.

Missouri Water Light & Traction Company, Nevada, Mo.—M. P. Murray, of St. Louis, was appointed receiver of this company on February 20, on application of the Missouri Lincoln Trust Company of St. Louis, trustee for the bondholders.

Louisville (Ky.) Railway.—Gross earnings for the year 1906 amounted to \$2,523,343, as compared with \$2,298,619 in 1905, an increase of \$224,724, or 9.7 per cent. Operating expenses and taxes were \$1,563,314, as compared with \$1,422,953, an increase of \$140,361. Net earnings were \$960,029, a gain of \$84,363. Other income

amounted to \$69,653, making a total income from all sources of \$1,039,682, an increase of \$96,815. After charges and dividend disbursements, the surplus was \$82,705, an increase of \$3,044. From the surplus there was charged off for depreciation \$70,000, an increase of \$5,000 from the previous year, leaving a final surplus for the year of \$12,705. The figures compare as follows:

	1906.	1905.	1904.
Gross passenger earnings.....	\$2,523,343	\$2,298,619	\$2,045,264
Expenses and taxes.....	1,563,314	1,422,953	1,307,165
Net earnings	\$ 960,029	\$ 875,666	\$ 741,099
Other income	69,653	57,201	*
Total	\$1,029,682	\$ 932,867	\$ 741,099
Charges	350,271	351,500	257,710
Balance	\$ 679,411	\$ 581,367	\$ 383,389
Dividends	596,706	501,706	375,750
Surplus	\$ 82,705	79,661	7,639
Charged off for depreciation, etc....	70,000	65,000	.....
Surplus for year.....	\$ 12,705	\$ 14,661	\$ 7,639
Operating expenses and taxes—per cent of gross passenger earnings	61.9	61.9	†63.8

*Included in gross earnings.
†Based on gross income from all sources.

The balance sheet as of December 31, 1906, is as follows:

ASSETS.	
Securities owned (Including interurban lines).....	\$1,264,605
Bills and accounts receivable	118,572
Material, supplies, live stock, etc.....	193,922
Cash	310,426
Real estate and buildings.....	958,249
Machinery and car equipment.....	1,940,739
Permanent way, franchise, etc.....	10,838,857
Total	\$15,625,370
LIABILITIES.	
Capital stock paid in.....	\$7,456,500
Bonded debt outstanding.....	6,999,300
Funds for taxes and insurance	114,530
Interest and dividends accrued.....	325,829
Payrolls and accounts payable.....	80,450
Profit and loss account.....	648,761
Total	\$15,625,370

Moline (Ill.) East Moline & Watertown Railway.—An increase in the capital stock from \$125,000 to \$200,000 has been authorized.

Montreal Street Railway.—Gross earnings from all sources for the four months ended January 31 were \$1,063,992.44, an increase of \$126,392.95, or 13.2 per cent, from the corresponding period of the previous fiscal year. Earnings for January and for the four months to January 31 compare as follows:

January—				
	1907.	1906.	Increase.	Per cent.
Total earnings.....	\$371,956.42	\$238,230.15	\$133,726.27	14.16
Operating expenses	189,497.60	158,829.92	30,667.68	19.31
Net earnings.....	\$ 82,458.82	\$ 79,400.23	\$ 3,058.59	3.85
Total charges	40,165.13	37,090.49	3,074.64	8.29
Surplus	\$ 42,293.69	\$ 42,309.74	*\$ 16.04	*.04
Expenses per cent of car earnings	69.68	66.67	.....	3.01
Four months to Jan. 31—				
	1907.	1906.	Increase.	Per cent.
Total earnings.....	\$1,063,992.44	\$957,599.49	\$126,392.95	13.20
Operating expenses.....	705,920.60	616,133.72	89,786.88	14.57
Net earnings.....	\$ 378,071.84	\$341,465.77	\$ 36,606.07	10.72
Total charges	159,173.36	102,837.85	56,335.51	54.78
Surplus	\$ 218,898.48	\$238,627.92	*\$ 19,729.44	*8.27
Expenses, per cent of car earnings	65.12	64.34	.....	.78

*Decrease.

Newtown (Pa.) Electric Street Railway.—A bill has been filed by the Real Estate Title Insurance & Trust Company of Philadelphia to set aside the sale of the electric railway.

Oakland (Cal.) Traction Company.—A trust deed has been given by this company to the Union Trust Company of Oakland, to secure an issue of \$12,000,000 bonds, bearing 5 per cent interest and maturing in 28 years. The bonds will provide money for improvements, and for refunding indebtedness of subsidiary companies.

Owensboro (Ky.) City Railroad.—An increase in the capital stock from \$50,000 to \$150,000 has been authorized.

Southwestern Traction Company, Iola, Kan.—A trust deed to the Knickerbocker Trust Company, New York, to secure an issue of \$4,000,000 bonds, has been filed in Iola. The company will build a line through the southeastern part of Allen county, Kansas.

Syracuse (N. Y.) & South Bay Street Railway.—The property owned by this company was purchased at receiver's sale on February 21 at Syracuse for \$251,000 by Clifford D. Beebe, representing a local syndicate. The road was planned to extend 15 miles from Syracuse to Oneida Lake. The syndicate will complete the road.

West Penn Railways, Pittsburg.—Additional first mortgage 5 per cent bonds to the amount of \$422,000 have been listed on the Philadelphia stock exchange, making a total amount listed of \$4,360,000.

Manufactures and Supplies

ROLLING STOCK.

Long Island Railroad, Long Island City, N. Y., is figuring on 9 double-truck cars.

Dayton Covington & Plqua Traction Company, Dayton, O., is figuring on 2 new cars.

Sheboygan Light Power & Railway Company, Sheboygan, Wis., is asking prices on 9 large cars.

Louisville & Eastern Railroad, Louisville, Ky., is figuring on 4 double-truck and 6 single-truck cars.

Rockland Thomaston & Camden Street Railway, Rockland, Me., is reported to have ordered 2 passenger cars.

Niagara St. Catharines & Toronto Railway, St. Catharines, Ont., expects to place an order soon for 16 cars.

Greensboro Electric Company, Greensboro, N. C., is asking prices on 9 cars, 3 of which will be 40 feet in length.

Norfolk & Southern Railroad, Norfolk, Va., has placed an order with the J. G. Brill Company for 5 double-truck cars.

Roanoke Railway & Electric Company, Roanoke, Va., has ordered 4 double-truck cars from the J. G. Brill Company.

Kansas City St. Joseph & Excelsior Springs Railway, Kansas City, Mo., will purchase new rolling stock later in the year.

Inter-Urban Railway & Power Company, Hot Springs, Ark., expects to purchase 8 combination cars during the coming summer.

Metropolitan West Side Elevated Railway, Chicago, is reported to have placed an order with the Pullman Company for 20 cars.

Interborough Rapid Transit Company, New York, is reported to have ordered 200 cars for elevated service and 50 steel fire-proof cars for subway use.

Duluth Street Railway, Duluth, Minn., has placed an order for 15 double-truck cars to be built at the shops of the Twin City Rapid Transit Company.

Clinton Street Railway, Clinton, Ia., is in the market for two single truck cars. These will have 22-foot bodies with 5-foot platforms and St. Louis trucks.

Camden Interstate Railway, Huntington, W. Va., has ordered 5 cars from the G. C. Kuhlman Car Company, 8 cars from the Niles Car & Manufacturing Company and 1 car from the Jewett Car Company.

Metropolitan West Side Elevated, Chicago, has placed an order with the Pullman Company for 20 passenger cars, full details and description of which will be found in the Electric Railway Review of February 9, 1907.

Omaha & Council Bluffs Street Railway, Omaha, Neb., has placed an order with the American Car Company for 30 closed cars 28 feet in length and 5 closed cars 34 feet in length, all for delivery August 1, 1907.

Atlantic Shore Line, Kennebunk, Me., has ordered 8 cars from the J. G. Brill Company, 2 of which will be open cars, 4 semi-convertible with smoking compartment and 2 semi-convertible with baggage compartment. They will all be 40 feet in length and will be used for interurban service.

Illinois Traction System, Champaign, Ill., as noted in the Electric Railway Review of February 23, has placed an order with the Danville Car Company for 6 electric locomotives, 12 closed cars 22 feet in length for city service, 30 interurban cars, 55 feet long over all, 20 interurban trailers, 40 feet over all and 20 express cars.

Connecticut Valley Street Railway, Greenfield, Mass., was reported in our issue of February 16 as about to purchase 8 new cars. We are advised that the matter of their purchase at this time has been deferred because of unsatisfactory delivery. The company has just contracted for 5 quadruple equipments, Westinghouse 12-A motors to be used in equipping open cars.

SHOPS AND BUILDINGS.

Illinois Traction Company.—Options have been secured on half a block of land in the business district of Decatur, Ill., on the south side of Wood street between Water and Main streets, on which to erect a two or three-story building for a passenger and express station and for offices.

Lake Shore Electric Railway.—Bacon & Huber of Toledo, O., are now working on a set of plans for new shops and an office building to be erected this year, at a point not yet determined.

Portland Railway Light & Power Company.—This company has purchased the block bounded by First, Second, Pine and Ash streets, Portland, Ore., for \$350,000, on which to erect a five or six-story passenger terminal and office building. It is planned to make this the central terminal for all lines entering the city, including the proposed Portland-Salem line of the Oregon Electric Railway. The engineering department is now preparing the plans and it is stated that construction will begin at an early date.

Sacramento Gas & Electric Company.—This company is contemplating the construction of a car house opposite the present car house in Sacramento, Cal.

Toledo Railway & Light Company.—This company has signed a lease for the Crystal Theater building on Superior street, Toledo, and will immediately remodel the building into an inter-urban passenger station.

Toledo Urbana & Interurban Railway.—Superintendent Charles F. Smith, Findlay, O., has been in Toledo conferring with city officials and officials of the Toledo Railway & Light Company in regard to the freight house which the company proposes to erect on South St. Clair street. The particular business which brought Mr. Smith to Toledo was regarding the turnouts from the St. Clair street tracks. Plans for the building are now being prepared and work is to begin at an early date.

Warren Street Railway.—The car barns at Warren, Pa., were destroyed by fire last week. The loss is estimated at \$125,000.

TRADE NOTES.

Northwestern Electrical Equipment Company, St. Paul, Minn., suffered a loss of \$15,000 to its plant by fire on February 12.

Midvale Steel Company, Philadelphia, has plans under way for the erection of a large iron wheel house to be 164 by 256 feet.

Automatic Electric Signal Company, Milwaukee, Wis., has been incorporated with a capital stock of \$25,000 by George L. Baldauf and others.

Chicago Railway Equipment Company will, on March 15, remove its down-town office, in Chicago, from 702 Great Northern building to 413 Fisher building.

William H. Cushman, M. Am. Soc. C. E., formerly chief engineer of the Juniata Hydro-Electric Company, of Huntingdon, Pa., has opened an office at 18 Exchange place, New York city, as a hydraulic engineer.

Findlay S. Douglas has been appointed manager of the motor and generator sales department of the New York office of the Sprague Electric Company. Mr. Douglas has been connected with the sales department of the company for a number of years.

Westinghouse Electric & Manufacturing Company, Pittsburg, has commenced the erection of a new factory building to cost \$500,000. It will be eight stories high, a fireproof structure of brick and steel construction, with ground dimensions of 400 by 70 feet.

W. W. Hoyt, who for a number of years has been general yardmaster of the New York Central & Hudson River Railroad at West Albany, N. Y., has become connected with the Quincy Manchester Sargent Company, with headquarters at the New York office, in the West street building.

Lord Electric Company, Fuller building, New York, has found it necessary on account of the increased demand for the Thomas soldered rail bond and the Shaw non-arcng lightning arrester, to increase its factory facilities, and they are now in better position to make prompt deliveries on all orders.

Mudge & Neefus, 20 Broad street, New York, have organized as railway and electrical engineers and are prepared to give advice on the design and construction of motors, generators, brakes and systems of control, and will devote special attention to the installation of electric conveying machinery for factories and industrial plants.

J. A. Fay & Egan Company, Cincinnati, at its annual meeting of stockholders elected the following officers and directors: President, Thomas P. Egan; vice-presidents, D. P. Egan and Fred Egan; treasurer, A. A. Faber; secretary, William Green; and Grif-fith Rawson, John E. Bruce, W. H. Doane, C. P. Egan and Rudolph Kleyboite.

Aluminum Company of America, Pittsburg, Pa., has just received an unusually large order from the Dayton Globe Iron Works Company, of Dayton, O., which includes 24 turbines to be installed in its plant at Massena, N. Y. The shipment will aggregate 750 tons or approximately 60 carloads, and will be delivered from July to October, this year.

Massachusetts Chemical Company, Walpole, Mass., in order to meet the demands of its rapidly growing business has built a large addition to its factory and equipped it with the best of modern rubber machinery. These improvements have doubled the capacity of the plant and will enable the company to handle business more promptly than heretofore.

American Bridge Company, New York, has plans under way for extensive improvements to its plant at Elmira, N. Y., to cost about \$1,000,000. When the additions are completed the plant will have a capacity capable of turning out from 4,000 to 5,000 tons per month. Considerable machinery for structural work will probably be purchased in the near future.

Ambursen Hydraulic Construction Company, of Boston, has been awarded the contract for the building of a second dam on the Juniata river at Huntingdon, Pa., for the Juniata Hydro-Electric Company. This will be 30 feet high above foundations in the roadway, measures 500 feet in length and includes a power house. This company has also received a contract from the Bar Harbor & Union River Power Company for the construction of a reinforced concrete dam for its power development on Union river, at Ellsworth, Me. In addition to the dam, which will be 60 feet

high, a power house, canal, transformer house and other work will be constructed.

Revolute Machine Company, 523 West Forty-fifth street, New York, has received an order from the Baldwin Locomotive Works for an outfit of its Revolute blue-printing machines to replace those which were destroyed in its recent fire. It is stated that the drafting department of the Baldwin Locomotive Works will be equipped exclusively with this type of blue-printing machine hereafter.

Electric Storage Battery Company announces that it has opened a sales office at Atlanta, Ga. This office is at 1126-27 Candler building, and is placed in charge of Harold H. Seaman, formerly engineer of the Cleveland sales office of this company. He will handle all matters pertaining to the territory of Tennessee, North and South Carolina, Georgia, Florida, Alabama and Mississippi.

Cohen-Schwartz Rail & Steel Company, St. Louis, Mo., has moved its general offices to suite 508 Mechanics' American Bank building. This move was necessitated by an increasing business which demanded larger quarters for general offices. The company is installing at its Mound street yard an alligator shear which weighs 60 tons, claimed to be the largest west of the Mississippi river, if not west of Pittsburg.

Davies Electric Corporation, Tacoma, Wash., has been incorporated with an authorized capital stock of \$150,000 and has taken over the business of the Davies Brothers Electric Company. The officers of the company are: President and engineer, Marcus C. Davies; vice-president, Dr. Ernest C. Wheeler; treasurer, H. W. Davies; secretary and business manager, A. W. Lewis. The company will manufacture electrical fixtures.

Charles I. Earll, Bowling Green building, New York, manufacturer of the Earll trolley retriever, reports a record duplicate order from the United Railways & Electric Company, Baltimore, Md., for 80 No. 5 retrievers. These machines are to be placed on the new cars (80) soon to be delivered by the John Stevenson Company, and this will make over 200 Earll retrievers in use on the United Railways & Electric Company's lines.

Illinois Bolt, Nut & Forging Company, recently organized, has elected the following officers: P. H. Joyce, Sr., president; Lloyd J. Smith, vice-president and M. L. Hunt, secretary and treasurer. The following were elected directors of the company: P. H. Joyce, Sr., Lloyd J. Smith, M. J. McDonough, A. W. Tyler and George Chilton. Contracts have been let for the buildings and the largest part of the machinery. The plant will be operated electrically and is expected to be in operation by April 1.

Russell Car & Snow-Plow Company, Ridgway, Pa., has during the past two months received several orders for the Russell snow plows, of which it is the sole owner and manufacturer. The Northern Pacific placed an order for three snow plows of the largest type and the Great Northern two, all of which were shipped promptly and are now in service. The Canadian Northern purchased two snow plows and these are now being used for the heavy work along its lines that have been blocked for several weeks.

Wire & Telephone Company of America, Rome, N. Y., suffered a loss by fire to its wire drawing plant on February 23 but the buildings in which it manufactures magnet wire, rubber covered goods and telephone products were not damaged in the least. Arrangements have been made with other wire mills for the drawing of its wire and no delay in the delivery of its products will be felt. A new wire drawing plant with a greatly increased capacity has been contracted for and will be pushed to the earliest possible completion.

ADVERTISING LITERATURE.

Hanna Engineering Works, 820 Elston Avenue, Chicago.—Hanna riveters of various types for use by bridge shops, boiler shops, tank works, locomotive works and for other railway and manufacturing purposes are illustrated and described in a brief manner in a folder.

Abenague Machine Works, Westminster Station.—Gas or gasoline driven direct-connected air compressor outfits are the products of this concern and one of them is described in an 8 page illustrated pamphlet. The outfit shown is designed for bridge erection and the smaller structural iron work.

Gardner Machine Company, Beloit, Wis.—"Gardner's No. 4 Improved Disc Grinder" is the subject of an illustrated leaflet which presents data showing the effective manner in which the grinder has been used in different services, as for instance, for grinding pump bonnets, automobile parts, centrifugal pump cases, drop forgings brass castings and iron piston rings.

Allis-Chalmers Company, Milwaukee, Wis.—Bulletins No. 1497 and 1420 deal respectively with the Bennetts pouring spoon, an accessory for converting stands designed to prevent a large amount of the splash and splatter attendant upon the pouring of the converter, and with gold milling in the Black Hills. The latter is in substance a paper prepared by Professor H. O. Hofman of the Dakota School of Mines.

Power and Mining Machinery Company, Cudahy, Wis.—Catalogue No. 7 describes in detail the complete lines of cement making machinery manufactured by this company. The progress which has been made in the Portland cement industry in this country is remarkable and has occasioned the increase of the output in the United States from 42,000 barrels in 1880 to 35,000,000 barrels

in 1905. A corresponding progress has been made in the manufacture of machinery for the production of Portland cement. Some of the most modern devices are described in the catalogue of the Power and Mining Machinery Company.

Westinghouse Machine Company, Pittsburg, Pa.—"The Westinghouse Storage Battery for Stationary Use" is the subject of a publication designated as Catalogue S. The type-S storage battery described in the catalogue is the result of many years of systematic study of many familiar and comparatively unknown storage batteries manufactured both in this country and abroad. The battery is of the pure lead sulphuric acid type.

Green Fuel Economizer Company, Matteawan, N. Y.—Fans, blowers and exhausters are described in a 96-page book recently published by this company. Dimensions are given for a large number of sizes and types of steel plate fans for heating and ventilating, drying, mechanical draft, etc., and for a number of sizes and types of planing mill exhausters for handling shavings and other light materials. Typical installations are described in detail.

Dossert & Co., 242 West Forty-first Street, New York.—Dossert solderless connectors and terminals for solid wires and stranded cables are described in an attractive pamphlet under the title of "The Dossert Solderless Cable Joints." These joints contain a number of new features and improvements which are designed to supersede methods of soldering cables. The connectors can be applied in a few minutes and possess maximum conductivity and great tensile strength.

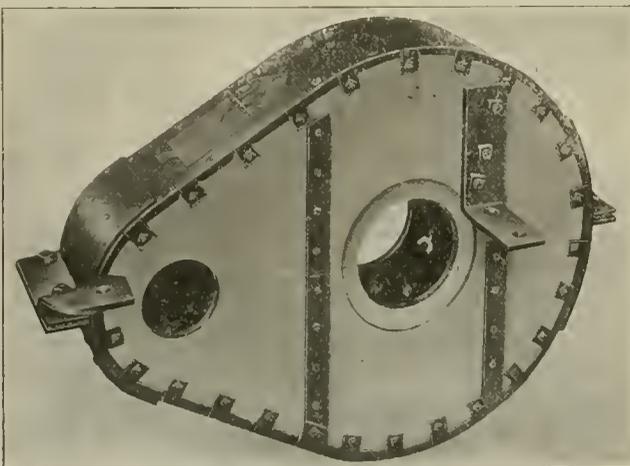
Jeffrey Manufacturing Company, Columbus, O.—Bulletin "B" deals with the grab-bucket system and coal and ashes handling machinery for power houses with particular reference to the power plant of the Scioto Valley Traction Company and the Cincinnati Traction Company. Bulletin "C" also illustrates Jeffrey coal and ashes handling machinery for power plants, employing close contact and overlapping-lip swivel buckets. The application of the system to the plants of a number of commercial houses is shown.

Union Switch & Signal Company, Swissvale, Pa.—During the present year, this company will issue monthly calendars, illustrating the day and night indications displayed by the fixed signals most generally employed on American railroads and the meanings of such indications as determined by the Railway Signal Association, the American Railway Association and other authorities. The first two of the series show, respectively, interlocked track signals of the one-arm high two-position type and a two-arm high home two-position type.

Richard Dudgeon, Broome and Columbia Streets, New York.—This firm has issued a handsomely illustrated catalogue and price list of Dudgeon jacks with special reference to the new form just being introduced to the market. Several forms of the jack in the early stages of its development are also illustrated and the pamphlet is therefore a brief history of the evolution of the hydraulic jack. The latest form is clearly shown in sectional views with key description of the various parts and the price list gives the items of cost of the several components.

A COMBINATION STEEL AND WOODEN GEAR CASE.

The desirability of reducing the weight of the equipment on electric cars has from time to time led manufacturers to design sheet-steel and wooden gear casings, many of which, however,



A Combination Steel and Wooden Gear Case.

through faulty design have proven inadequate in respect to strength and wearing qualities.

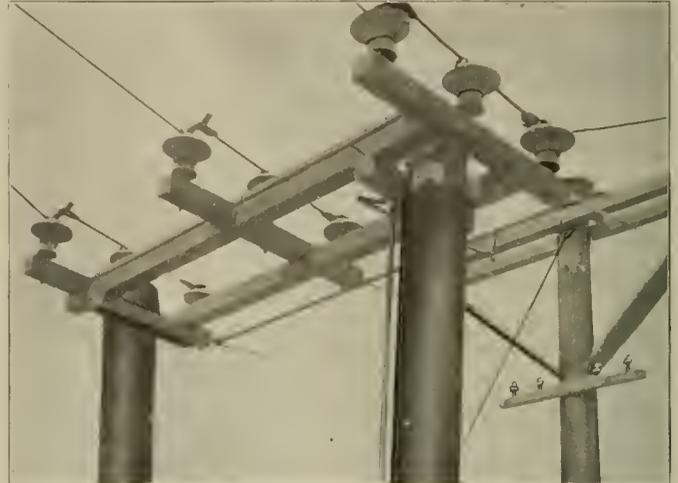
To overcome past difficulties and fulfil the requirements of lightness, wearing qualities and strength, the Columbia Machine Works & Malleable Iron Company, Chestnut street and Atlantic avenue, Brooklyn, N. Y., has introduced a combination sheet-steel and wooden gear-case, which embodies many points of superior merit.

As will be seen from the accompanying illustration, the edges of the gear-case, which conform to the shape of the gear and pinion, are made of pressed sheet-steel flanged over, making the

sides both rigid and giving a better connection between the iron and the wooden sides. In addition to the flanging there also are a large number of heavy iron lugs turned over and securely bolted to the wooden part of the casings, besides the large number of screws around the edge of the wood, as shown in the illustration. The hangers are made of wrought iron and so attached to the casing that the weight is equally distributed between the hangers in such a manner as to reduce the strain in the casing to a minimum. The wood used in the construction of these gear-cases is well seasoned and stiffened by additional iron straps, and the whole is so constructed that the gear case is both water and dust tight. It is divided horizontally and a door is provided in the side of the case for examining and lubricating the gears.

POLE-TOP AIR-BREAK SWITCHES FOR HIGH-TENSION TRANSMISSION LINES.

With the development of high-tension transmission lines the difficulty of handling large currents at high potentials has constantly increased, and with the extension of lines to great dis-



Open-Air High-Tension Switch.

tances considerable trouble has also been experienced from high-tension static discharges on the line, even when not in use. This difficulty has caused considerable trouble when it has become necessary to repair or adjust the oil switches in the power house and substations. Linemen and electricians at work on the lines and at the oil switches have often received serious static discharges when working on apparently dead lines. To obviate this difficulty it was necessary to develop a suitable type of switch which could be used on extremely high-tension lines, and which would give a visible proof to the linemen and electricians that the oil switches were disconnected from the generators or transformers and the line. This difficulty was experienced by the California Gas & Electric Corporation, of which Mr. F. G. Baun was electrical engineer. To overcome these difficulties Mr. Baun invented and later patented a well-designed form of pole-top switch which, it is said, is capable of breaking or making a circuit carrying 300 kilowatts at 100 kilovolts potential, and oil switches designed to break circuits of any capacity at 100 kilovolts.

The pole-top switches, one of which is clearly shown in the accompanying illustration, are now manufactured by the Pacific Electric & Manufacturing Company, San Francisco, Cal., which has also secured the patents and manufacturing rights for the oil switches, and in addition is prepared to equip an entire transmission line from the power house to the substations.

The pole-top switches such as shown in the accompanying illustration are generally located on both sides of an oil switch so that the electrician can open them for cleaning or making repairs with perfect safety. Another usual arrangement for power houses is to locate one of these pole-top switches outside the power house and a similar one on the side of the wall of the power house or switch room on the generator or transformer side of the oil switches.

The construction of these air-break switches is simple and rigid and the insulation is fully sufficient for safe operation at the potentials for which they are designed. It will be noted that they consist of three insulators, two of which carry the contacts and the center one, which is mounted on a pivot so that it can turn, carries a cross-arm and the switch blades. The bottom of the movable insulator carries a crank to which is attached the operating rod, the motion of which opens or closes the switch. The three insulators and their attachments, which form one switch, are mounted in place on a heavy wooden cross-arm. One or more of these, according to the number of lines which are to be opened simultaneously, are mounted in a row as shown in the illustration and the operating rod, which may be worked from the ground or the power house, is connected to the crank on each of the movable insulators. These air-break switches may also be arranged to be operated mechanically or electrically from the remote station.

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The extreme temperature fluctuations of the present winter, sometimes showing a variation of 30 or 40 degrees in 24 hours, have imposed severe strains on metals as well as men, and there is little question that violent and sudden frosts in northern climates furnish the sole explanation of certain breakages in bolts, trolley harps, truck parts and other equipment of electric railway service. Cold weather is always an enemy to punctual schedules and thereby a possible primary cause of accidents; it is taken into account as much as possible by active motive power officials, but the silent and powerful effects of sharp frost on physical equipment are less realized. Unfortunately there is apparently but one way to offset the danger of fluctuating cold, and that is to increase the inspection given to trucks, brake rigging and other vital parts of the cars while on the road. The track also needs closer attention, where the rails and spikes are fully exposed. The simple test of tapping with a hammer is helpful in discovering cracks or looseness, which, if neglected, are liable to cause disaster. Redoubled vigilance is unquestionably essential in cold weather. It does not seem to be at all a matter of the amount of stock allowed in individual pieces of equipment.

One of the stock arguments frequently used by advocates of water-tube boilers is the ease with which damaged tubes may be removed and replaced. It is suggested that, as ordinarily fitted, damaged tubes cannot, as a rule, be more easily removed from water-tube boilers than from the fire-tube type. When a tube fails such failure in the usual case is caused by an opening along the weld or it has bagged from being worn thin. In either of these events the original shape of the tube has been changed. Due to such disfigurement, difficulty is generally experienced when an attempt is made to remove a leaky tube, and often it is found impossible to pull such open or bagged tubes through the header. It then becomes necessary for

the boilermaker to cut out several adjacent tubes so that he can have working space in which to manipulate tools for cutting the damaged tube into sections that may be removed through the restricted space. Why, then, would it not be an improvement in the present practice if the tubes were rolled with the head-end of a diameter larger than that of the remaining portion? This practice is observed in marine work and it would seem that it might have an adaptation on land. In localities where boiler feedwater is poor and it is necessary to frequently replace tubes, the slight additional cost for rolling the head-end to a larger diameter would be insignificant as compared with the time and labor saved in the removal of tubes. There also would result a further saving in wear and tear on the headers. It is well known that the practice of jerking or forcing bulging tubes through headers so damages the tube-holes that when new tubes are inserted excessive rolling is required before a water-tight joint is obtained, and unless special care is taken the joint between the new tube and the header will require frequent expanding to prevent leakage. Continued working of the metal at the head-end of the tube will result in a final fatigue of the metal. The plan suggested or perhaps an alternate one of using copper sleeves between the tubes and the header should afford methods for preventing leakage and escaping some of the repair work now necessary.

That regular, uniform stoking is absolutely essential for the attainment of high boiler efficiency is well known. It is worthy of note, however, that this particular subject receives entirely too little attention, though it is one of vital importance, not only for economy, but also for the prevention of smoke. This neglect of the most essential principle of boiler economy is found as often in plants with mechanical stokers as in the hand-fired plants. The reason for this is, no doubt, because it is thought that, the stoker being mechanical, all that is required is to see that the coal chutes do not clog and that the ashes are

dumped. Such management of a mechanical stoker will result in serious wastes of fuel, needless smoke and frequently damage to the boiler setting, stokers and tubes. In plants having mechanical stokers the head stoker should see that the automatic feed is continually adjusted to just meet the demand on the plant. He should not permit the firemen to feed in a large amount of coal and then allow it to burn low before feeding in a fresh supply. Careless handling of mechanical stokers will produce wastes of fuel just as will carelessness in a hand-fired plant. A good plan for stoking in hand-fired plants is to place a clock over each boiler, having only a minute hand and having its dial divided into stoking periods, say a heavy mark every five minutes. Each time the hand is on a mark the fireman should spread a little coal on the fire. To secure the maximum output of hand-fired boilers it is absolutely necessary to have a firing schedule so arranged that all the furnaces are stoked and cleaned in rotation. This will avoid having a number of fires in a thi condition at any one time and a large number of fire doors open at the same time. It is suggested that if properly heeded these simple points should assure not only the maximum output of the plant, but smokeless and economical operation as well.

THE SAFETY OF HIGH-SPEED TRAINS.

The electric locomotive makes it possible to operate trains at much higher speeds than the present schedules for steam trains provide for, and this is one of the principal advantages to be expected from the introduction of electricity for main line passenger traffic. The Berlin-Zossen experiments demonstrated the possibility of operating trains at a speed of 125 miles per hour and the result has been the serious proposal to build an electric line between Berlin and Hamburg, Germany, and operate trains at a speed of 100 miles per hour. On account of the present distrust of schedules providing for an average speed of little over 50 miles per hour and maximum speeds of 60 to 70 miles per hour, it is well to inquire whether any proposal to limit the speed of passenger trains by legislation should be encouraged.

The ability to operate high speed trains with safety is the most severe test of the efficiency of railroad engineering. It is a measure of the development of the railway structure and its rolling equipment, as well as of the skill and faithfulness of the employes. Fast trains are for this reason a matter of pride with railroad officials as they indicate that the property belongs in the first class and it rates high in the efficiency of its mechanical operation, provided such trains are run with safety. But when fast trains are operated under conditions not suited to their requirements, there is a greater liability to accident and the public is interested in the question of the limit of speed which is consistent with safe operation.

The speed of passenger trains is limited by law to some extent in France, and was at one time in Germany and Austria, but the tendency is to remove such restrictions, and it would be retrograding and discouraging to progress and improvement to impose by legislation any speed limits for passenger trains in America. The result would be especially to retard those improvements which are constantly tending to make fast trains safer.

The ability to handle high speed trains successfully is the natural result of highly developed railroading and progress in general efficiency of mechanical operation is best shown by the gradual reduction in the schedule time of limited trains between large cities. It is the severe requirements of high speed which have developed the steam passenger locomotive to such great power and speed capacity. Our magnificent Atlantic and Pacific type locomotives and the balanced compounds are the natural result of the desire

to reduce the schedule time of express trains. High speed trains have shown the necessity for stronger cars and steel passenger cars have resulted from this demand. While only a few years ago the use of steel cars in America was regarded as something very remote, experience with high speed trains has so demonstrated their necessity that the industry engaged in building steel passenger cars is now well developed beyond the experimental stage.

The air brake has been improved and made more efficient with each successive requirement for shorter stops with high speed trains. In fact, the latest improved high speed brake is far in advance of the requirements of ordinary service and it is that which will make faster schedules possible and train control safe at the higher velocities. The quick acting brake would stop a train, running on the level, at 70 miles an hour in 1,800 feet, and the high speed brake reduced this to about 1,400 feet, while recent improvements in the high speed brake will make it possible to stop a train with such initial velocity in about 1,200 feet. These wonderful improvements in the air brake would not have been developed if there had been any restrictions passed on the speed of passenger trains and we had been compelled to operate at the ordinary speeds of 40 to 50 miles an hour, which many persons now think would be the best condition. The operation of high speed trains has been the principal cause for the division of track into blocks and the equipment of railways with block signals, and the later improvements, the ingenious and effective automatic block signal, and finally the automatic stop. All these may fairly be said to be the result of the necessity of high speed traffic.

The weak point in the whole system appears to be the track, especially on curves, as it is here that high speed trains most frequently fail. The theoretical elevation of the outer rail which is proper for high speed trains is not given because the same track is used for slower freight trains, and to insure safety it is necessary to either slow down fast trains at sharp curves, or use separate tracks for them, and the danger occurs when the reduction in speed is not always made.

The wooden tie in various stages of decay and the common spike which has been redriven do not result in favorable conditions for the safety of high speed trains. American locomotives have driving wheel pressures on the rail about twice that used on ordinary locomotives in foreign countries and 50 per cent greater than their most modern engines, but the track fastenings here are not equal to the best practice in Europe. The screw spike which is there used has about twice the resistance to withdrawal of the common spike used here and its resistance to lateral displacement is $1\frac{3}{4}$ times that of the common spike. The screw spike is now used experimentally to a limited extent in this country, but this simple method of making track more secure for fast trains must recommend it for more general use. The steel tie will be used to a larger extent as the supply of good oak timber becomes exhausted, and though still in the experimental stage, it will be so improved, especially in the method of securing it to the rail, that it will prove an important factor in the effort to produce more substantial and safe track. We may have, some day, creosoted longitudinal stringers for the rail support, and a well-drained roadbed of concrete, but these things will not come if fast trains are regarded as an evil to be avoided and their use generally discouraged. High speed trains may properly be called vast testing machines, and though they do not measure maximum stresses in track and equipment, they are relentless in showing weak points and are the most potent factors in suggesting improvements which tend to the betterment of the service, and to develop all those details which make railway travel safer and more comfortable. High speed is expensive from every point of view. The consumption of fuel is enor-

mously increased, more expensive equipment is required, the cost of maintaining track largely augmented, and train or tonnage capacity materially reduced. For these reasons 2-cent fares are the more to be deplored. In the operation of trains at high speeds safety is insured only by eternal vigilance and the constant and heavy expenditure for the most efficient appliances (which are expensive) and everything which reduces the ability of the railroads to procure these is a menace to the safety of passenger travel.

VALUE OF A SHORT-TERM FRANCHISE.

Since the street railway first became a factor in transportation in America, there has been pursued, with a few exceptions or perhaps even only partial exceptions, the policy of charging reconstruction and renewals to capital accounts instead of providing for them out of earnings, a course absolutely contrary to the principles of sound business administration. Dividends were paid that were not earned; in effect they were paid out of the capital. In many cases this was doubtless because of ignorance; in others the act was deliberate and done with the purpose of inflating stock values and providing a basis for marketing bonds. One effect of this has been the deception of investors; this is perhaps a matter of small importance as affecting the industry in general. Another and vastly more important effect has been the deception of the general public, which has been taught to believe that a 20-year franchise confers "enormously valuable rights in the streets."

The public is not to be blamed for demanding universal transfers, reduced fares and contributions in the guise of street paving, street lighting, etc., when, on their own showing, the street railways were earning, and what is more were paying, in dividends many times normal interest returns on the investment, and issuing stock rights with a liberal hand. As company after company yielded to public demands when franchise renewals were needed the belief that the street railway business was an extremely profitable one became better and better established. This continued acceptance of unreasonable conditions has finally resulted in many companies undertaking to furnish a service that costs more than the fare received, while at the same time strengthening the opinion of the public that the fare is too high.

The data published in the Electric Railway Review for February 23, last, furnish a basis for some interesting deductions as to the value of a short-term franchise to the Chicago Union Traction Company.

Inasmuch as this company operates and has to make good the deficit of the Chicago Consolidated Traction Company the operations of the latter should also be considered. Since data as to the value of the physical property of the Consolidated are not available, it is necessary to make some assumptions, which it is intended shall be well within the facts.

For the year 1904 the reports cited show:

Gross Income:	North Chicago	\$ 3,195,981
	West Chicago	5,567,439
	Consolidated	1,548,374
	Total	\$10,312,394

The cost of the replacement of the physical property of the North and the West Chicago companies is known. Assuming that the value of the physical property of the Consolidated company is in the same ratio to its income as for the others, which is very favorable to the weak company, the result is:

Plant and Equipment:	North Chicago	\$ 5,506,367
	West Chicago	11,039,795
	Consolidated	2,923,707
	Total	\$19,469,869

Assuming the depreciation and maintenance on the Consolidated to be 23 per cent of gross earnings as for the other lines (which is also favorable to the weak company)

the figures show, when reserves for accrued depreciation have been made, deficits as follows:

Deficit:	North Chicago	\$123,523
	West Chicago	521,355
	Consolidated	55,715
	Total	\$700,596

Examination of the income and expense accounts of the three companies (see Electric Railway Review, February 23, 1907, page 249) shows that the only returns received by capital for 1904 are those paid in "Interest, rentals, etc." which were:

Interest, rentals, etc.:	North Chicago	\$ 573,429
	West Chicago	1,210,950
	Consolidated	673,351
	Total	\$2,456,821

Now, let it be assumed that all the bonds, notes, receiver's certificates and other obligations on which this total for interest and rentals is paid are absolutely fictitious and entitled to no return, and that this sum of \$2,456,821 may be added to the net income shown in the reports cited. Before paying dividends there would have to be deducted the deficit of \$700,596 already shown, which would leave a balance of \$1,756,225. This sum is equal to 9.02 per cent of the cost of the physical property subject to depreciation, which has been taken as \$19,469,869, on the basis stated. This "cost of physical property subject to depreciation" does not include the land on which buildings are located, so that the cost of plant and equipment here assumed would need to be increased considerably in order to equal the investment absolutely necessary for the operation of the railway.

If the Consolidated Traction company be omitted from the calculation and the Union Traction be relieved from paying the deficit of the Consolidated, the Union Traction company would show, after making full provision for depreciation, a net income in 1904 equal to only 9.24 per cent of the cost of physical property subject to depreciation.

In the two succeeding years the company showed greater receipts, both gross and net, but in order to secure these additions were made to the physical property. The amounts of such additions not being known, no deductions as to the earnings in terms of cost of plant and equipment can be made. If no additional capital had been invested the fiscal year ending 1906 (after eliminating the deficit of the Consolidated company, \$102,979) would show earnings of only 11.6 per cent on the cost of replacing the tangible property, exclusive of land, which the North Chicago and West Chicago companies had in 1904.

Thus when absolutely all of the "water" has been squeezed out of the company's capital it can show about 10 per cent per annum on the investment.

The need of urban transportation facilities will always obtain, and it might be argued that 10 per cent per annum is too great a return on an absolutely safe investment. Street railways have, however, to contemplate and insure against what may be called the risk of supersession.

Within 50 years, street railways have had their methods revolutionized twice. The horse or steam dummy railway, which was for 30 years the principal means of intraurban transportation, was superseded by the cable railway in large cities. After little more than 20 years all the cable railways in American cities have been superseded by electric lines and there is no certainty that changes almost equally complete and revolutionary will not within the next 20 years require the abandonment of existing equipment. This applies, not only to the cars themselves and the railway construction, but also to the power plants. The earlier electric railway power stations were practically obsolete before they were in complete operation, and within 10 years from the introduction of electricity as a motive power for street railways the direct-connected unit had almost entirely displaced the original belted generating machinery. Within the last six or seven years the steam turbine has been developed and has

made serious advances in territory where a few years before it was considered that the reciprocating engine would always be supreme. There is no certainty that the steam turbine will hold its present position as a prime mover for railway power plants. The claims of gas engines are being strongly pressed and the owner of an electric power station today has little reason to believe that in 20 years from now his successor in business would be willing to purchase the plant at cost, even though it was in as perfect condition as it is today. In 20 years from now the management of the company which wishes to succeed the present one may have entirely different ideas as to the proper type and size of car, as to the most desirable method of transmitting current to the motors, and as to the type of electric motor itself.

For these reasons the conservative management which operates under a limited-term franchise must provide out of earnings during the franchise term a sum sufficient to retire the capital stock at the end of the term unless investors are to take serious risks. Assuming a 20-year franchise term, and that the company can find a 5 per cent investment for its amortization reserve, there would need to be set aside each year to insure the return of the capital investment unimpaired, 3.03 per cent of the capital. This would reduce the stockholder's profit to less than banker's interest rates. In other words, a 20-year street railway franchise is merely permission to take a gambler's chance of earning the same return that is paid on a farm mortgage loan.

There is nothing novel in these arguments in favor of giving proper consideration to depreciation and amortization. They have been presented before, but nearly always in academic discussions which it was considered might be of possible interest to remote posterity, or as pleas in court when some reduced-fare ordinance was to be attacked. But in America they never have been reduced to practice. Some companies have made a little progress, but none have gone far enough. To make insufficient provision for depreciation and amortization on the ground that the company's earnings are not large enough to bear the proper charges on these accounts, and at the same time to pay dividends on stock, is to beg the question.

THE VALIDITY OF PERPETUAL FRANCHISES.

The decision of the United States circuit court, rendered by Judge McPherson, involving the franchise of the Des Moines City Railway Company, summarized in the *Electric Railway Review*, for March 2, last, brings up anew the question of the validity of perpetual street railway franchises. This decision does not settle the question. Nothing but a decision of the supreme court of the United States can do that. But this decision, as the judge himself suggests, opens the way for an appeal direct to the United States supreme court. It has been stated that this case will be taken there; but it still remains to be seen whether that court will decide the question, or will find that some other way is the proper one to dispose of the case, as has occurred heretofore when this question seemed to be involved in the litigation taken up.

The attitude of the courts generally seems to be unfavorable to perpetual franchises. Possibly the judicial expressions on the subject, such as they are, may be said to be more hostile in the state than in the federal courts.

Based upon the decision of the supreme court of Alabama, in 1885, in the case of Birmingham & Pratt Mines Street Railway Company v. Birmingham Street Railway Company, 79 Alabama Reports, 465. Booth, in his "Law of Street Railways," section 17, lays down the principle that, "in the absence of constitutional limitations upon its powers, the sovereign legislative authority in a state may grant privileges exclusive in character and perpetual in duration; but a municipal corporation cannot make such grants without

explicit legislative sanction." He also finds in the leading New York case of *Milbau v. Sharp*, decided in 1863, 27 New York Reports, 611, that a resolution of the common council authorizing persons to construct and operate a street railway upon certain conditions, without limitation as to time, is a contract void because it would deprive the corporation of its proper power of control and regulation.

Nellis, in his work on "Street Surface Railroads," states that "under the authority usually delegated to municipalities an exclusive or perpetual right to use a street for a street surface railroad cannot be conferred."

But Judge McPherson, in upholding the validity of the perpetual franchise of the Des Moines City Railway Company, seems to express the present view of the federal courts. At the same time perpetual franchises are not likely to be very liberally treated by them, even if sustained.

The supreme court of the United States has said, in the case of *Detroit Citizens' Street Railway Company v. Detroit Railway*, decided May 23, 1898, 171 United States Reports, 48, that "easements in the public streets for a limited time are different and have different consequences from those given in perpetuity. Those reserved from monopoly are different and have different consequences from those fixed in monopoly. Consequently those given in perpetuity and in monopoly must have for their authority explicit permission, or, if inferred from other powers, it is not enough that the authority is convenient to them, but it must be indispensable to them." Previously to this the court also said, in the same case, that "the power of a municipality to grant an exclusive privilege to occupy its streets for railway purposes must be given in language explicit and express. There were many reasons which urged to this—reasons which flow from the nature of the municipal trust—even from the nature of the legislative trust, and those which, without the clearest intention explicitly declared, insistently forbid that the future should be committed and bound by the conditions of the present time, and functions delegated for public purposes be paralyzed in their exercise by the existence of exclusive privileges."

This is sufficient, perhaps, to show the present position of the courts on this question. It is true that there are not many decisions directly on the subject, but, taking the question of jurisdiction and other points involved in the case under consideration, it appears that there were enough cases cited bearing more or less on the point so that Judge McPherson says that his opinion would be a volume in size if he were to notice all such authorities.

Of course, in states where there are constitutional limitations or statutes prohibiting the granting of franchises for more than a fixed term of years there cannot be a valid perpetual franchise granted while such provisions remain in force. Moreover, perpetual franchises, when obtained, would seem to be subject to forfeiture in much the same way as other franchises.

It may also be noted, in passing, that in this case the city apparently thinks to evade the constitutional prohibition against the passing of any law impairing the obligation of contracts by having adopted a resolution, instead of an ordinance, declaring the company's rights at an end, though Judge McPherson looks upon this as a distinction not making any difference, in this case.

Destroying Chicago River Tunnel.

The Great Lakes Dredge & Dock Company on March 5 began destroying the La Salle street tunnel under the Chicago river, through which the cars of the Chicago Union Traction Company operated until it was determined to destroy it because it obstructed navigation. The work should be completed in April. The tunnel was completed in 1871 and cost \$569,000.

**OPENING OF THE NEW MARKET STREET ELEVATED
RAILWAY OF THE PHILADELPHIA RAPID
TRANSIT SYSTEM.**

BY EDWARD HUNGERFORD.

Philadelphia, the fifth American community to adopt an elevated railway as a means of quickened urban transit, opened its new high-speed route through Market street from the public buildings at Fifteenth street to the Delaware county line on Saturday afternoon, March 2. The opening was an event of moment and the Philadelphia Rapid Transit Company, which controls the new road as well as all the street surface railways of the city, celebrated it by sending out several thousand invitations to railway and newspaper

has had charge of the rapid transit project from its inception, even planning such details as the men's uniforms and train schedules, felt that a good part of his work had been consummated with success. Train service was begun upon a five-minute headway, 19 minutes being allowed for the five-mile run to Fifteenth street. Public curiosity had been aroused to a pitch that crowded the trains if not the commodious stations. Owing to the incomplete state of the power equipment for the new road, two-car trains are being operated. Within a few weeks three-car trains will be placed in operation and this, it is anticipated, will be ample for traffic requirements for some time to come. In addition to the terminals only the local stations at Thirty-second street, accommodating the West Philadelphia station of the Pennsylvania railroad at Fifty-second street and Sixtieth street,



Market Street Elevated, Philadelphia—Showing Loading Platforms of Terminal Station at Sixty-ninth and Market Streets, with Philadelphia & Western Station at Left.

men throughout the country as well as to prominent Philadelphians. The response to these invitations was generous and a large party of interested men, including President James McCrea of the Pennsylvania; President George F. Baer of the Reading, and President John B. Parsons, Vice-president and General Manager Charles O. Kruger and other operating officers of the Philadelphia Rapid Transit system, boarded special trains on the new railroad and rode out to the county line (Sixty-ninth street) where they made a close inspection of the large terminal station, shops and yards that have been erected there.

On Monday morning at 6:30 o'clock the road was formally opened for regular passenger traffic by the dispatching of a downtown train from the Sixty-ninth street terminal and Assistant General Manager Frederick H. Lincoln, who

where free transfer is made with intersecting cross-town surface lines, are now complete. The other local stations on the elevated, at Thirty-sixth, Fortieth, Forty-sixth, Fifty-sixth and Sixty-third streets, are all framed and their early completion is only a matter of carpenters' and painters' details.

The Market street line, as planned from the beginning, is part elevated and part subway construction. Previous articles, showing the progress of the work, were published in the Street Railway Review of September, 1905, and in the Electric Railway Review of January 5, 1907. Beginning at the Delaware river the line is planned beneath the surface for nearly two miles to the Schuylkill river, where it emerges upon a five per cent grade upon a bridge and becomes an elevated structure for more than four miles to Sixty-ninth

street. Three-quarters of a mile of the west end of the road is upon the surface, laid in rock ballast and absolutely protected by high iron fences with concrete foundations. The line is double-tracked save that a short section of the subway between the Schuylkill river and the public buildings has been four-tracked, the outer tracks being given over to the operation of through surface cars from West Philadelphia.

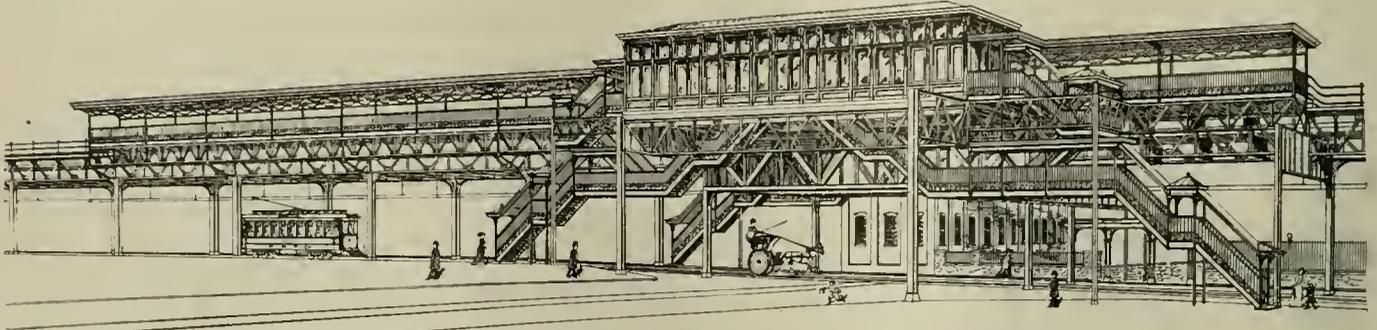
The Subway Section.

Starting from the temporary elevated and surface car terminal in the shade of the public buildings and the great

running contact rail of the New York Central type, the wood casing being painted a bright red to make it particularly conspicuous.

The Elevated Section.

The elevated trains crossing the Schuylkill river rise from sub-surface to over-surface on a three-span bridge, 563 feet in length and especially designed to meet its peculiar problem—the bringing of the elevated tracks up a sharp grade as well as bringing the surface trolley tracks up an easier grade to the street surface level of West Philadelphia. The elevated structure represents the best foreign prac-



Market Street Elevated, Philadelphia—Exterior View of Station at Thirty-second and Market Streets.

Broad street station of the Pennsylvania Railroad, the four-track line traverses a subway with inside dimensions, 48 feet 6 inches, by 14 feet 6 inches, the roof of which is supported by three parallel rows of steel columns placed between tracks and 5 feet apart on centers. Efficient ventilation is assured by means of stair openings in stations and ventilating shafts, many of which have been attached to the long

tice in the designing of such structures. Lattice girders have been universally used and an attempt made to make the road both pleasing and dignified. It rests upon concrete piers, pyramidal in shape, 8 feet square at their base, 2 feet 6 inches square at the surface and reaching to a depth of from 8 feet to 30 feet below the street level. Each is protected from vehicular traffic by steel fenders. At the top of each pier



Market Street Elevated, Philadelphia—Interior View of Subway Station at Fifteenth and Market Streets.

side walls of the Pennsylvania train shed and designed so as to appear as part of that structure.

The outer or surface car tracks are laid in cast iron chairs, on wooden sleepers, but the inner tracks, upon which the heavy all-steel trains run, have the rails resting upon short sleepers which are nothing more nor less than yellow pine blocks which in turn are bolted to 12-inch longitudinal channels set in concrete. Power for train service both in the subway and upon the elevated is derived from an under-

heavy steel bolts are imbedded in the concrete as anchorages for the upright steel columns, which are spaced in pairs, 24 feet apart from center to center, each pair averaging a 50-foot distance from its neighbor, and rising almost to the height of the rail. The longitudinal trusses which carry the floor of the elevated system are approximately 6 feet 6 inches deep, while the cross girders separating the floor system directly are spaced 10 feet apart. Expansion joints have been placed to each four spans or about 200 feet apart. The

structure is designed to carry cars weighing 100,000 pounds apiece, 25,000 pounds on each of four axles, the initial rolling stock weighing 80,000 pounds each at the load.

Possibly the most interesting feature about this elevated structure in itself is the fact that it is built with a solid floor, a city ordinance making this feature a necessity. This flooring is of steel made in longitudinal troughs and spliced with cover plates and angles so as to render it water-proof. Upon these troughs rest Vulcanite Portland cement made into a 1-3-6 concrete, reinforced with a lattice of steel rods and poured in to cover four inches as a minimum over every portion of the steel floor. The concrete is protected by one inch of granolithic and upon this has been placed the rock ballast that receives the sleepers of the standard track. Both tracks are protected the entire length of subway and elevated by a check or guard rail. The weight of the entire

are located, and these stairs are so connected with cross passages as to make each of common use. An unusual feature has been adopted by bringing the entrance stairs up within the station buildings. Passometers are used to give access past the ticket windows to the trains and also for exit past another ticket window at those stations where transfers are given to connecting surface lines. Exit turnstiles have also been installed at the stations. A continuous platform or railed sidewalk, near the level of the car floors, connects all stations, for the use of workmen or for use as emergency exits.

The Terminal Stations.

The downtown temporary terminal is now at Fifteenth street. It has been used for surface cars to West Philadelphia for some time past but entrance and egress to and from these cars is kept upon the sidewalk and separate and dis-



Market Street Elevated, Philadelphia—Interior View of Subway Near Fifteenth and Market Streets.

structure is about 98,000,000 pounds or about 5,050 pounds a lineal foot. Into its construction, including the stations, went 560,000 pounds of cast iron, 47,000,000 pounds of steel and 19,900 cubic yards of concrete. In construction an average day saw 70 feet of structure set up, 50 feet riveted and 132 feet of concrete floor laid, 300 feet having been laid on one day.

The Local Stations.

Local stations at each of the points heretofore mentioned are of a single type and are well adapted to a great growth of traffic. The center platform type does not appear, all stations being double. The platforms will accommodate eight-car trains, are of exceptional width and have adequate shelter against inclement weather. The twin buildings contain ticket offices, toilet rooms and waiting rooms, are framed of wood and steel, covered with copper on the exterior and finished within in oak. Four stairs reach each sidewalk corner at the street intersections, above which the stations

are separated from elevated traffic, a metal screen at the platform edge of the elevated terminal in the subway keeping surface car passengers from alighting there. A broad stair leading from the street through the Arcade building, on the south side of Market street at Fifteenth street, gives access through the basement of that building to the ticket offices of the terminal. Passometers have been eliminated at this point in favor of chopping boxes.

The terminal at the county line, or Sixty-ninth street, is an extensive brick structure in three parts, each devoted to the use of a distinct railroad and acting as a common interchange for passenger traffic between them. The Philadelphia Rapid Transit Company built and owns the structure, which has been made a most attractive architectural feature with a great waiting room 97 feet by 117 feet that would do credit to any line. Candy booths and such concessions line the walls of this room while a broad extension at its rear gives access for incoming and outgoing passengers on the Market

street elevated, which has its terminal just underneath. There are two regular tracks and one emergency track for the elevated there, a discharging platform 17 feet wide and 350 feet long serving one of the regular tracks and a loading island platform, 33 feet by 350 feet, between the other regular and the emergency tracks. Broad stairs lead directly from these platforms to the waiting room extension which is bridged over them.

At the level of the waiting room and just to the east of it is a five-track stub terminal of brick and steel which serves the Philadelphia & West Chester Traction Company, a rapidly expanding suburban trolley car service which already has lines reaching to Ardmore, to Newtown Square and to West Chester, 22 miles distant. Across the Market street elevated terminal tracks and platforms is the unfinished terminal of the Philadelphia & Western, the high-speed electric line which is being built to Overbrook, Ardmore, Bryn Mawr, Wayne and other nearby suburban communities of importance and which will ultimately, it is promised, be extended through to York, Pa.

The elevated tracks, at this point on a low surface level, describe an easy loop of 150 feet radius west of this station for the quick reversal of trains. Beneath this loop two tracks at a still lower level lead to the shops and lay-up yards of the line, which are about 700 feet northwest of the terminal station building. These structures of brick and concrete in the most approved and modern type of construction comprise an inspection shed, truck repair shop, machine, miscellaneous repair shop, store rooms, locker rooms, shop office, etc. Abundant provision has been made for future extension both of yard and of shop facilities.

Equipment.

The new road starts operations with 40 all-steel passenger cars, which, it estimates, will fulfil all needs for some time to come. Its trains, of three-car length for the present, are composed entirely of motor cars, each car having two GE-66 125-horsepower motors using type MC-36 control, with motorman's cab in the vestibules on the diagonally opposite corners of the car. The cars have Westinghouse airbrakes and Curtis trucks with Symington journal boxes. Each car is heated by 18 Consolidated heaters and lighted by 25 16-candlepower incandescent lamps, in addition to a headlight and two markers on each end.

The cars, which were built by the Pressed Steel Car Company, have been built with non-combustible floors, outside sheathings of cold rolled steel and the underframed having as its feature deep fish-belly side sills, which were made necessary by the introduction of center doors into each side of the car. The interior finish of the car is of a fine grade of mahogany, the ceilings being of a birdseye neutral shade for a better reflection of light. The vestibules open directly into the cars, their outer doors as well as the center doors being arranged for pneumatic opening and closing by the guard's handle. When all doors are tightly closed the fact is communicated to the motorman by a buzzer above his head. Pantagraph safety gates have been applied on the corners opposite the motorman's cabs and Mason safety treads at each door.

There are 24 side windows to the car with Pantasote shades, the seating arrangement of which is similar to the Manhattan elevated or subway type. The center set of transverse seats on each side have been installed in front of the center door. These can be easily removed when press of traffic renders it advisable for the road to begin the use of these center doors.

The exterior of the cars is painted a deep red with lettering and striping in gold. Each car is lettered "Market Street Elevated Passenger Railway" beneath the eaves and bears its serial number in the center of each panel beneath the windows.

Each car weighs nearly 33 tons unloaded. The length over platforms is 49 feet 5 inches, the inside length of the car being 39 feet 6 inches. The width over all is 8 feet 7 inches, the inside width being 7 feet 7 $\frac{3}{4}$ inches. The height from rail to top of floor is 3 feet 10 inches, height from floor to ceiling center 8 feet 6 $\frac{1}{2}$ inches, height from rail to top of car 12 feet 7 inches, opening for vestibule side door (between door posts) 2 feet 9 inches, width of end door opening 3 feet 2 $\frac{1}{2}$ inches, width of center doors opening on each side 3 feet 4 inches, distance from center to center of trucks 34 feet 6 inches.

Signals.

Both the elevated and the subway stretches have been equipped with the electro-pneumatic block signal system, manufactured by the Union Switch & Signal Company, one rail of each track having been reserved for this purpose. Home and distant signals have been placed at short intervals along the line and the modern practice of using green as a safety, yellow as a caution and red as a danger indication has been followed. In addition to the "overlap" system of blocks, an automatic stop of the same type as used in the New York subway has been installed at each signal to apply the airbrake to each train which attempts to run by the stop indication. Any defect in the track will also operate to throw the signals to danger.

All switches along the line are interlocking and are controlled by the electro-pneumatic devices manufactured by the Union Switch & Signal Company.

No special provision has been made for power for the new line besides the gradual enlargement of the Beach street house by the addition of three turbo generators. The company has been planning extensive additions to its entire power plant but as yet has made no public announcement of its plans along this line.

Progress is being made both on the inter-line terminal loop that is to encircle the public buildings and on the continuation of the Market street subway for another mile down to the Delaware river and the busy ferries that lead to Camden and many Jersey towns. It is expected that this portion of the line will be in operation in about a year.

Still further additions to Philadelphia's beginnings in real rapid transit are now being detailed. It is already being planned to build a double-track elevated in Delaware avenue from Arch street, close by and connecting with the easterly end of the Market street line, north five miles along the water front to Frankford, through a busy and congested manufacturing district now particularly difficult of access.

The limited car service between Columbus and Zanesville, Q., on the eastern division of the Indiana Columbus & Eastern Traction Company, will be doubled, beginning on Monday, March 11. The service now consists of two cars, each way, daily. Next Monday two additional limited cars will be put on, to leave Columbus at 6:55 a. m. and 12:55 p. m. This will make four cars each way a day. The distance of 64 miles is made in two hours by the limited cars. This means that, with the necessary slow running through towns and cities, a speed of from 50 to 60 miles an hour has to be maintained at various points on the line.

The Indianapolis & Cincinnati Traction Company will put a new schedule into effect on March 11, between Indianapolis and Greensburg, Ind., running every other car as a limited. The limited cars will stop on signal only at each town, and will require an additional fare of five cents for each 20 miles or part thereof. The limited cars will leave Indianapolis at 45 minutes after the even hour, and will leave Greensburg on the even hour. Local cars will leave Indianapolis 30 minutes after the odd hour, and will leave Greensburg 45 minutes after the even hour.

DEPRECIATION RESERVES OF THE MILWAUKEE AND ST. LOUIS RAILWAYS.

In the Electric Railway Review for February 23, 1907, page 245, there was published a table showing in a number of different units the expenditures made or reserves provided for maintenance and depreciation by the Chicago Union Traction Company and the Glasgow Corporation Tramways. Herewith are shown the corresponding figures for The Milwaukee Electric Railway & Light Company (railway department) and the United Railways Company of St. Louis.

In view of the fact that Mr. John I. Beggs, who administers these Milwaukee and St. Louis properties, has for many years strongly urged the need of recognizing and providing for that deterioration of physical property, commonly called depreciation, which takes place in spite of the best of current maintenance and repairs, and for the amortization or redemption of the capital in the case of companies having limited-term franchises, a statement of the policy that has been pursued by him will be of interest.

Mr. Beggs assumed the management of The Milwaukee Electric Railway & Light Company (which was a reorganization, made in 1896, of the Milwaukee Street Railway Company that had become bankrupt in 1895) in 1897 when the company was not earning sufficient to pay interest on its bonds, to say nothing of dividends on stock. At that time the Milwaukee street railway system was in urgent need of "immediate rehabilitation," the heaviest trolley wire being only No. 1 and the most of it No. 4, and the heaviest rail

and was then transferred to the credit of "Depreciation Reserve," giving that account a credit balance of \$89,697.37. On December 31, 1906, the total to the credit of the "Depreciation Reserve" account was \$593,554.72. These figures are for the railway department only.

There were two reasons for making this transfer and temporarily abandoning the attempt to provide an "Amortization Reserve": (1) It was believed that the capital represented by the stock should receive some return at the earliest moment practicable. (2) It was believed that the necessary "Amortization Reserve" wherewith to pay the bonds as they would mature and to refund the capital stock when the franchises would expire, could be accumulated later when the property had attained a greater earning capacity.

It is considered by Mr. Beggs that the 10 per cent of gross earnings which The Milwaukee Electric Railway & Light Company now sets aside for its depreciation reserve is less than should be thus reserved in order to equal the amount of depreciation of plant and equipment that has actually accrued, and furthermore, that the company should have now an "Amortization Reserve" sufficient in amount to compensate for those years of its franchise term that have already elapsed.

In the case of the United Railways Company of St. Louis the same policy in regard to depreciation that Mr. Beggs had established in Milwaukee was inaugurated the day that he assumed the management of the St. Louis company. For the last two years there has been set aside for this fund five per cent of the gross earnings. This amount is not con-

Comparisons of Totals of Maintenance and Depreciation Charges for the Fiscal Year, 1906.

	Fiscal Year Ending	Gross Income, Per Cent of	Per Mile of Track Operated, Dollars	Per Revenue Passenger, Cents	Per Passenger, Cents	Per Car-Mile, Cents	Per Car-Hour, Cents
North Chicago Street Railroad	Aug. 31	22.00	\$1.96	1.118	0.658	6.58	49.67
West Chicago Street Railroad	Aug. 31	24.00	7.669	1.214	0.710	6.82	52.32
Glasgow Corporation Tramways	May 31	35.24	8.364	...	0.677	7.46	53.25
Milwaukee Electric Railway	Dec. 31	17.97	4.606	0.777	0.580	4.65	40.83
United Railways of St. Louis	Dec. 31	15.09	4.016	0.750	0.520	4.35	41.20

Note: For Chicago and Glasgow the total of depreciation and maintenance is in per cent of gross receipts; for Milwaukee and St. Louis it is in per cent of gross earnings.

being only 56 pounds per yard with much of the strap rail laid for horse roads still in service.

Although, as stated, the company in 1896 and 1897 was not earning fixed charges, it was stipulated by Mr. Beggs, before he would undertake the management, that beginning immediately there should be set aside from earnings the sum of \$15,000 per month to be used for reconstruction and renewals and the creation of a depreciation reserve, and that no dividends on the preferred stock should be expected for five years. (Payment of dividends on the preferred stock was, however, begun after four years.) In 1897 the \$15,000 per month, or \$180,000 per year, to be set aside or used for renewals amounted to about 15 per cent of the gross earnings. The sum reserved for this purpose was kept at \$15,000 per month until the gross earnings had increased to about \$1,800,000 per annum, and since then, up to the present, the sum set aside for depreciation and renewals has been 10 per cent of the gross earnings. Because of the need of rebuilding track and replacing worn-out equipment it was not expected that the funds set aside for depreciation would accumulate as a reserve, and in fact for several years the expenditures for renewals and replacements greatly exceeded the amounts specified for this purpose, and in 1900 the "Depreciation Reserve" showed on the wrong side of the ledger.

In 1898, a year after the policy of providing for depreciation was adopted, there was also set up an "Amortization Reserve" to provide for the redemption of the capital when the franchises should expire, which would then have been, on the average, in 1924. The company was granted a new franchise, effective January 2, 1900, consolidating and extending the old grants until December 31, 1934. The "Amortization Reserve" at the end of 1900 amounted to \$360,000

considered by any means sufficient for the purpose, but it constitutes the nucleus of a fund which it is expected will become ample as the earnings of the company increase and permit a larger percentage to be devoted to the reserve.

Mr. Beggs has said that were he to build and equip a brand-new, up-to-date electric railway under a limited franchise, he would, with the first turn of the wheels, at once provide not only for a depreciation reserve that would insure the preservation of the physical property at the highest efficiency possible, but also for an amortization reserve that would insure the integrity of the capital invested. The situation of the Milwaukee company in 1897 and of the St. Louis company two years ago was, however, very different from that of a brand-new property. Therefore, since neither had the earning capacity to provide the depreciation and amortization funds necessary to compensate for actual wear of physical property and for the diminution in length of the franchise term, the policy has been to set aside for reserves at first such amounts as it was considered the property could bear, with the intention of increasing, both absolutely and relatively, the amounts so reserved as the earning power became greater.

In this connection may be noted what has been done by two other companies of which Mr. Beggs is president. The Milwaukee Light Heat & Traction Company, which is a subsidiary of The Milwaukee Electric Railway & Light Company, began to provide for depreciation by setting aside 5 per cent of gross earnings in 1903; in 1904, the amount was 6 per cent; in 1905, it was 7 per cent; in 1906, it was 8 per cent, and for the current year will be 9 per cent of the gross earnings. Similarly the Wisconsin Traction Light Heat & Power Company, of Appleton, Wis., a reorganization and consolidation of a number of properties effected in 1900, began

with the current year to set aside 5 per cent of gross earnings for depreciation.

NEW ENGLAND STREET RAILWAY CLUB.

The February meeting of the New England Street Railway Club was held at the American House, Boston, on the evening of February 28, 1907, Vice-President Reynolds being in the chair. The speaker of the evening was Professor A. S. Richey of the Worcester Polytechnic Institute, his subject being "Electric Car Testing." An abstract of his paper follows:

Car equipment tests ordinarily are divisible into tests of the apparatus before assembly on a car and tests under complete or partial service conditions. The manufacturers' tests usually are for the purpose of determining the efficiency and relative data, and in the case of motors also may include tests of equipment under constant load for the determination of the heating rate and consequently the capacity of the motor. These stationary indoor or floor tests cannot of themselves give a true knowledge of the later performance of the same motor in actual service unless made with the proper allowance for the difference in fixed conditions compared with variable service conditions. The main differences arise from the variations in the load and voltage on the motors and the better ventilation secured in actual service. Flywheels have been used in manufacturers' stand tests to imitate the inertia of the car, the brakes furnishing an imitation of the train resistance, including curve and grade resistance. The value of these tests depends upon the proper assuming of train resistances and ventilating conditions; these assumptions should have, therefore, for their bases, tests that have been made on cars under actual operating conditions, or "car tests" in place of "motor tests." It is to such tests, made under actual operating conditions, that these notes mainly will be confined.

Such car tests may be made to determine the proper constants for use in applying motor-test results, or to determine certain data pertaining to the particular stretch of track, shape, size and weight of the car or train under consideration. They may be to determine the relative value of locomotive train, multiple-unit train or single-car operation, of double or quadruple motor equipments for the particular service in question, and to determine rates of acceleration, coasting or braking, heating values or train resistance.

The temperature rise of the motors and the train resistance at the speed under consideration are the values of greatest importance in considering the adoption of a motor equipment for any given line. Professor Richey next discussed the usefulness of speed-time-current-distance curves and indicated the methods of plotting them. They enable the engineer to predict the speed and current consumption at any point on the line, to determine the service capacity of motor equipments for given schedules and the corresponding power consumption. Motor tractive effort is usually obtained from the characteristic curves of the manufacturers.

The resistance of the track bears a pretty well-defined relation to the grade and curvature. Though the grade-resistance factor has been found constant and repeated tests have shown consistent results for the curve-resistance factor, train resistance is a more or less uncertain matter unless backed by experience or tests with the particular class of equipment under consideration. It varies with the size, shape, weight and number of cars comprising the train as well as the speed. It varies, not directly as the speed, but as some power of the speed, the exponent of this quantity being not greater than 2 and probably varying with the size, weight and shape of the train and perhaps with the speed. A formula has not been definitely deduced which can be applied to all cases as yet, and therein lies one of the uses of car testing—to determine the values of train resistance for a particular class of equipment under consideration, that they may be used in plotting speed-time-distance curves, so useful in solving many if not most of the problems of electric railway design.

The current time curves, giving the variations in the input to the motors, may be used to determine the service capacity of the latter if the heating characteristic of the motor under like conditions be known; otherwise, it also may be necessary to resort to the car test in order to determine this. Car tests also are made to determine the relative efficiency or operating costs of various parts of the car equipment, such as controlling or braking apparatus, brakeshoes, wheels of various materials, trolley apparatus, different designs of trucks, springs, etc.

Reference was made to the test tracks maintained by

the large manufacturing companies, the Berlin-Zossen tests and the extensive tests of the electric railway test commission in connection with the St. Louis exposition.

In tests where motor performances and train resistance are to be studied, it is usual to provide instruments showing values of voltage, current and speed. Speed values generally are obtained by measuring the voltage of a small magneto-generator, belted or geared to the car axle, its voltage, of course, varying with the speed. All these values are read or recorded simultaneously at short intervals of time, plotting these values against time, as ordinates; or autographic or semi-autographic instruments are provided which plot curves showing the desired values on a strip of paper moved under the instrument pens at a constant rate of speed. Recording wattmeters also are generally provided; the rise in temperature of the motors is measured by both thermometer and resistance methods, and the time of passing certain landmarks and the beginning and end of grades and curves, where possible, also is recorded.

Professor Richey referred to the extensive tests made in 1902 on the interurban lines of the Union Traction Company of Indiana by the Westinghouse company and the electrical engineering department of Purdue University. The tests were made by the electric company in order to secure general data on the performance and requirements of motors for such service; by the Purdue men as thesis work and by the railway company to secure information on train resistance and motor performance for use in specifying motors for a 100-mile extension then contemplated, and also to aid in a decision as to the adoption of two or four-motor equipments for that extension. Professor Richey emphasized the importance of using autographic instruments but stated that a perfectly satisfactory recording instrument capable of working accurately on a moving car has not yet been attained although approaches are being made to it from several directions.

A description of the semi-autographic apparatus devised by Mr. John D. Keiley and as used by the Interborough Rapid Transit Company of New York, the Brooklyn Rapid Transit Company, the Boston Elevated Railway Company and others, was then given. The striking feature of this apparatus is the arrangement made to follow the various instrument needles' motions and record the movements on paper. This is done by a centralized disc over each instrument, which is connected with a pen bearing on the moving strip of record paper, the disc being moved by a handle as the observer follows the variations in the needle. Typical records and lantern slides of its equipment were shown with reference to the wattmeters for integrating the total power consumption of the car, the square root of the mean square of the current per motor, energy consumption of multiple-unit control apparatus, air compressor, motor, etc. The use of the location marker pencil, operated by a magnet and push-button system also was described. Special tests made by the students of the Worcester Polytechnic Institute were described and the methods of checking speed and distance records by calculating the area underneath speed-time curves, the comparison of total current curves and current per motor curves, were taken up. The calculation of train resistance was briefly touched upon.

One of the most interesting features of the paper was a description of the development of the plans for testing electric car equipment in the new electrical engineering laboratory of the Worcester Polytechnic Institute, now nearly completed. A special car for tests will be a part of this equipment. The car body, which is being built by the Cincinnati Car Company, is 40 feet in length and externally closely resembles the interurban cars of the day with baggage compartment, although the interior will be devoid of the usual car furniture, leaving all space clear for the apparatus and observers. The car will be carried by Baldwin M. C. B. trucks and equipped with four G. E.-80 motors, K-28 control and General Electric straight airbrakes. All of the car wiring will be done from a slate panel-board inside the car so

that the instruments may be included in any portion of the circuit desired. The car is being equipped for the purpose of offering the greatest facilities for instruction, experiments and tests of all kinds in electric car equipment.

The laboratory also will be equipped with a car-testing stand. A concrete foundation at the bottom of the pit, having I-beams embedded in it, serves as a bedplate for the apparatus. Four bearing stands are provided which may be moved along the I-beams and fastened to them at any point suiting the wheel and truck-base of any car. Each bearing stand carries a shaft upon which is mounted a pair of supporting wheels, the periphery of which is the shape of a standard T-rail, the two wheels being mounted on the shaft just track-gauge distances apart. The shafts also carry flywheels built up of various thicknesses of boiler plate, so that the weight easily may be changed over a wide range. There also is mounted on each shaft a G. E.-57 motor arranged as a separately excited generator. A traveling crane serves the testing stand and the balance of the laboratory.

A car may be run over the stand and let down upon the supporting wheels, each pair of carwheels resting upon a corresponding pair of supporting wheels. The car is kept from moving endwise by being fastened at one end to an anchor post. If the car is started it will, as a whole and relative to the building, stand still, but its motors and wheels will revolve, and with them the supporting wheels. This motion will be retarded by the inertia of the steel-plate flywheels, which can be built up to imitate correctly the inertia of the car itself if it were moving on a stationary track. The train and grade resistance are imitated by loading the G. E.-57 motors acting as generators and these can be varied at will. As the four generator armatures are in parallel and their fields separately excited in series with one another, they also act to keep the speed of the four supporting shafts uniform with each other at all times. Any car on the stand thus can be operated with the same energy consumption as in regular service conditions, and the drawbar pull at any speed and current can be measured with a traction dynamometer. This test stand, upon which either the institute's car or one from any outside road may be operated, will afford opportunity for instruction and tests not available anywhere else. Two complete systems of multiple-unit control, General Electric and Westinghouse, will be mounted in operative conditions at the side of the testing stand, and either they or the K-28 control of the car itself can be connected to the panel-board of the institute car. Westinghouse, General Electric and National airbrakes can also be operated upon the test stand.

E. H. Gary on Steel Situation.

E. H. Gary, chairman of the board of directors of the United States Steel Corporation, when asked for his opinion as to the state of the steel trade, said:

"The steel situation is sound from every standpoint. The United States Steel Corporation is booking more new business than at this time last year. New orders, in fact, are running about 6,000 tons a day in excess of what they were a year ago. Unfilled business shows little change as compared with the tonnage reported on December 31, 1906. There has been a slight falling off in orders, as compared with the unusually heavy bookings in the last quarter of last year, but new business is equal to the capacity of our mills. At this time of the year there is generally a falling off in the demand from railroad companies. We only wish we had more capacity in order to meet the requirements of consumers more promptly."

A franchise has been applied for at Geneva, Switzerland, to build a railway from Zermatt to the summit of the Matterhorn. The project includes a cog and ratchet road from the Viege-Zermatt station to the Lac Noir, 2,508 meters. The entire system is to be operated by electricity. It is estimated that it will require four years to complete the road and that it will cost \$2,000,000.

SINGLE-PHASE, 11,000-VOLT LINE IN COLORADO.

As announced in the Electric Railway Review for February 16, page 221, construction work is now in progress on the new lines of the Denver & Interurban Railway Company. It will be remembered that this company will build 16 miles of new track on the right of way of the Colorado & Southern from Globeville, a suburb of Denver, to Louisville Junction. From the latter point to Boulder the two existing tracks of the Colorado & Southern will be equipped for electrical operation.

A large quantity of earthwork will be necessary in grading for the new track, but it is expected to construct a track over which trains of three multiple-unit cars each may be run at 60 miles per hour. The rails for the new track weigh 85 pounds per yard and slag will be used for ballast.

Power for the operation of the new line will be purchased from the Northern Colorado Power Company, which is now completing a 10,000-kilowatt capacity turbine station at Lafayette, Colo., about four miles distant from the midpoint of the new line. Single-phase current at 11,000 volts pressure will be fed direct to the No. 0000 grooved trolley wires at Louisville Junction. At this pressure no transmission lines other than the trolley wires will be necessary, neither will there be required any transformer stations. The trolley wire will be hung from a catenary messenger supported by brackets and wooden poles. The height of the wire above the track will be 22 feet and the poles will be set 8 feet from the nearest rail. This location of the poles and the use of a comparatively short bracket arm will place the trolley wire at one side of the track, and over a line between the rail and the end of the ties nearest the poles.

Current will be taken from the wire with two bow or pantagraph collectors mounted on opposite sides of the car so that one will be available for operation in each direction.

The company is now making preliminary designs for new high-speed interurban cars. The new equipments will weigh about 46 tons each and will be operated by four 125-horsepower single-phase motors. The car bodies will be of the steam-coach type, both straight passenger and combination, 55 feet long over all and 10 feet wide over all. The combination cars will have baggage compartments 8 feet long and both types will have forward cabs 5 feet long. The straight passenger cars will seat 64 passengers.

The Denver & Interurban Railway Company is also building a street car system in Ft. Collins, Colo. The new work here includes the construction of six miles of city track, the erection of the necessary shops and operating buildings and the erection and installation of a 600-kilowatt rotary current substation. The local system will be operated by 550-volt current from this substation, power being purchased from the Northern Colorado Power Company.

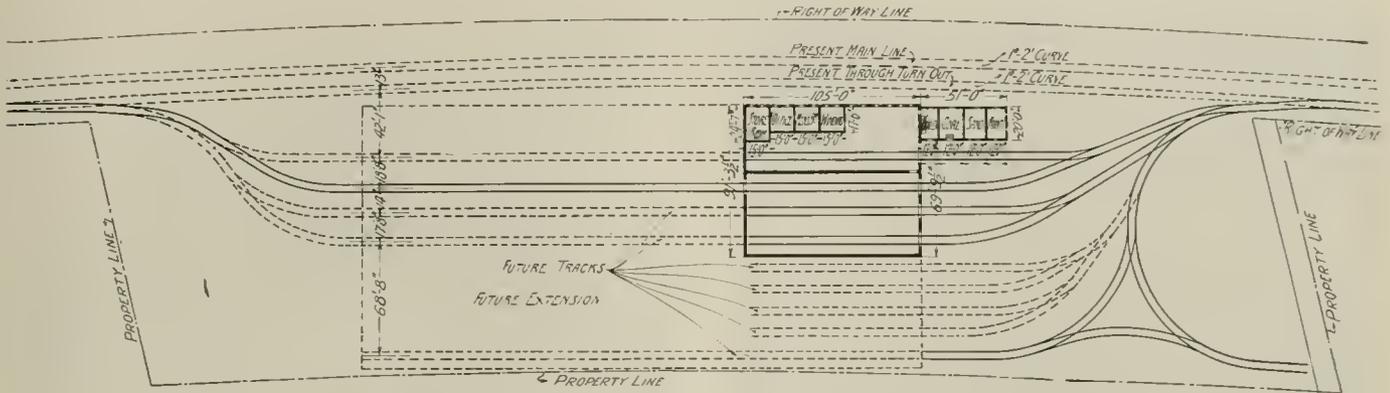
For use on the Ft. Collins lines the company has placed an order for eight semi-convertible cars with the Woepper Brothers Carriage Works, Denver. These cars are to be 40 feet long over all, equipped with four 40-horsepower motors, have vestibuled platforms, seating capacity of 40 passengers.

The Indiana Columbus & Eastern Traction Company is preparing to let contracts for the building of the London cutoff and other improvements on the Columbus and Springfield division. The cutoff will be a single track five miles long between Lafayette and Summerford in Madison county, O., and will shorten the line between Columbus and Springfield about seven miles. Other improvements that are to be made include the increasing of the capacity of the substation at Brighton near Springfield, the installation of a portable substation on the Columbus end of the division, and the renewing of the track by ballasting and replacing about 20,000 ties. Passenger stations will also be erected at Lafayette and Summerford.

Marks, Huntley, Coyne, Marengo, Garden Prairie and Camp Epworth.

The Stromberg-Carlson telephone system is used for dispatching trains. The main switchboard is located in the ticket office at Marengo and telephone booths are maintained at each of the agency stations. Jack-boxes are conveniently located on poles every 2,000 feet along the line and as each car is equipped with a portable box telephone, the trainmen can, in case of trouble, quickly get into com-

nel is 43 feet long and has a width of 14 feet and a clear height above the top of the track rails of 20 feet. The sides of the tunnel spread out into wing walls at the ends. The trolley is supported from mine hangers fastened to the under side of a wooden trough. The telephone lines and trolley feeders are carried through the subway on brackets set into the side walls near the roof, while the high-tension lines are taken over the track and telegraph lines of the railroad company. The transmission line wires are mounted on 60-



Elgin & Belvidere Electric Company—Plan of Car House and Yards.

munication with the dispatcher. The standard interurban train order system, as recommended by the committee of the American Street and Interurban Railway Association, has been adopted.

Track and Overhead Construction.

The railway is built on private right of way except through the towns. Excessive grades and short radius curves have been avoided. The longest tangent, 7 miles long, is just west of Marengo. There are also many shorter stretches

foot poles set 50 feet center to center. Protection is afforded by a guard net placed 25 feet above the railroad tracks. Standard overhead equipment furnished by Porter & Berg and the Ohio Brass Company has been used throughout. The copper wire was furnished by the American Steel & Wire Company.

A bridge over the Kishwaukee river is one of the interesting points in the roadbed construction. It is of the ribbed concrete-steel type, having four arches each 87½ feet in



Elgin & Belvidere Electric Company—Kishwaukee Bridge.

of straight track that will figure prominently in running trains on a fast schedule. There are no grade crossings with railroads and the number of highway and farm crossings is not large. The line passes under the Chicago & Northwestern and the Chicago Milwaukee & St. Paul railroads.

The subway under the Chicago Milwaukee & St. Paul Railway near Almore is of concrete construction. The tun-

length, and a solid concrete floor with 12-inch concrete stringers for retaining the ballast under the track. The approaches are built up on pile bents filled in with earth. Details of the methods employed in building this bridge were given in an article in the Electric Railway Review of August, 1906, in which many details of the track and overhead construction were described.

Power is purchased from the Aurora Elgin & Chicago Railway and is transmitted from its Clintonville substation, across the country and around Elgin to the right of way of the Elgin-Belvidere line. The current is three-phase, 25-cycle at 26,400 volts, which is stepped down and distributed from rotary-converter substations at Gilberts, Union, and Garden Prairie, approximately 10 miles apart. The three buildings are practically alike in construction and were described in the article previously mentioned, in which a ver-



Elgin & Belvidere Electric Company—Interior View of Passenger Car.

tical section illustrates numerous features. A foundation plan of the substations at Union and Garden Prairie is presented herewith and illustrates some features not shown in the vertical section.

The main portion of each substation is 29 feet 3 inches by 30 feet 5 inches and in the rear is an extension 11 feet 8 inches by 25 feet 7 inches, extending 16 feet above the ceiling of the main portion of the building. This tower receives the incoming high-tension lines on a rack fastened



Elgin & Belvidere Electric Company—Typical Cut.

outside the front wall of the building, the wires being carried over a parapet wall on two 45-foot poles located opposite the front of the building. All wires are supported by Locke No. 606 high-tension strain insulators. The wires enter the building through porcelain tubes mounted inside of three concentric fiber insulator tubes and pass through lightning arresters and oil disconnecting switches. Beyond these the

line conductors are separated by brick barriers. The main high-tension lines pass out of the building in a manner similar to the incoming lines, the arrangement virtually making a loop of the high-tension lines into the building.

The local lines, which are tapped off from the main conductors in the barriers, pass through lightning arresters, choke coils and oil disconnecting switches.

The lightning arresters are of General Electric 26,400-volt, three-phase, multiplex type and the oil-cooled choke



Elgin & Belvidere Electric Company—Substation at Union, Ill.

coils are also of General Electric manufacture. The three transformers, which are delta connected on both the primary and secondary sides, are each of 110 kilowatts capacity and step down the voltage from 26,400 to 370 volts. The three transformers feed into an alternating-current rotary panel of the switchboard which is thoroughly equipped to control the rotary.

The three-phase, 25-cycle, rotary converters are of 300 kilowatts capacity, designed for 370 volts on the alternating-current end. The direct-current voltage is 600, the cur-



Elgin & Belvidere Electric Company—7-Mile Tangent West of Marenco, Ill.

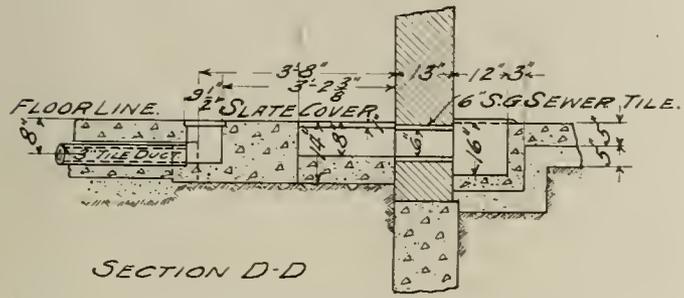
rent being fed into a direct-current switchboard containing two feeder panels of 1,200 amperes capacity serving the trolley line. The feeder panels are equipped with a 1,200-ampere General Electric C. P. circuit breaker, a 1,500-ampere T. F. T. ammeter with shunt, and a 1,500-ampere single-pole single-throw quick-break main switch. All of the electrical

equipment, including the rotary converters, switchboards, transformers, oil switches, choke coils and instruments, was furnished by the General Electric Company and consists of their standard type of apparatus designed for this work. At present one rotary converter only is installed in each station. The space left for additional equipment is shown in the accompanying ground plan of the substations. The location of the conductors connecting the various pieces of apparatus may also be seen.

All wiring is done in 3-inch tile ducts imbedded in the concrete floor as shown by the section along BB.

Rolling Stock.

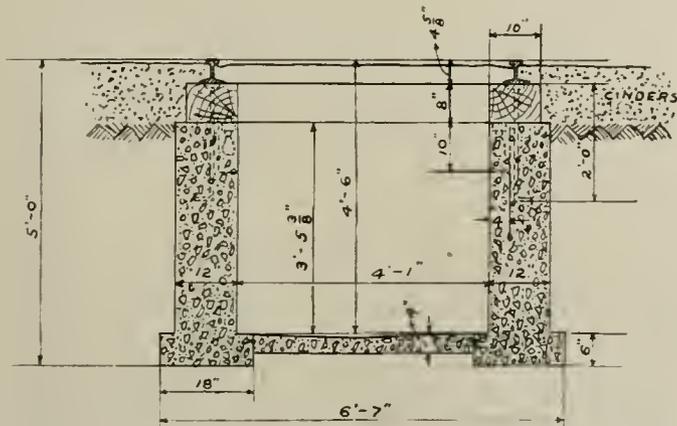
The passenger cars used on the line are of the Pullman double-truck single-ended vestibule type manufactured by



Elgin & Belvidere Electric Company—Section Through High-Tension Ducts.

the St. Louis Car Company. An exterior view is shown in the illustration of the Belvidere terminal. The cars have an overall length of 47 feet 1 inch, a width over sheathing of 3 feet 6 inches and a height of 9 feet 4 inches from the under side of the sills to the top of the roof, which is of the monitor deck construction over the entire body.

The interior of the car is divided into two compartments, the main portion being in accordance with standard interurban practice, having transverse rattan seats of the walkover pattern. The interior finish is of dark mahogany with a ceiling decorated in green and gold and finished with bronze metal fittings. The arrangement of the smoking



Elgin & Belvidere Electric Company—Section Through Concrete Track Pits.

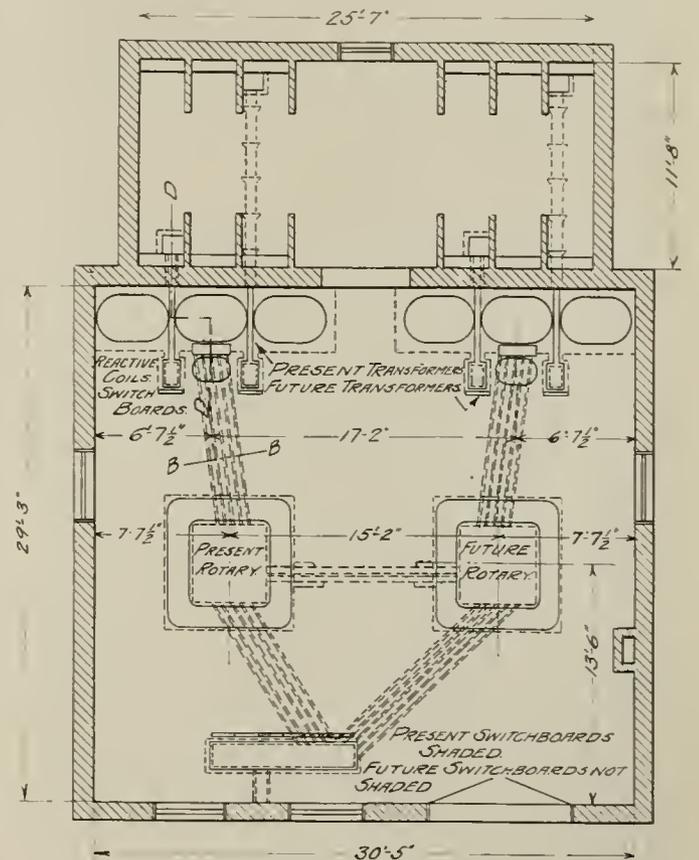
compartment is somewhat out of the ordinary. The motorman's cab is located at the forward end on the right side, as shown in the detail plan. This allows the left side for the use of passengers, affording an unobstructed view from the transverse seats. Back of the motorman's cab is a sliding baggage door. By dropping the three longitudinal folding slat seats, ample space for baggage is provided when necessary. Heating is secured by a Peter Smith No. 2 magazine coil heater, located in the smoking compartment. A

speaking tube is provided to afford communication between the motorman's cab and the rear vestibule.

While the car is intended to run forward under normal conditions, a controller and air equipment has been provided in the rear vestibule to allow backward running if necessary. Two trolley poles are also provided to facilitate running under such conditions. The trolley harps and wheels were supplied by the General Electric Company. The motor equipment, furnished by the same company, consists of four 74-horsepower motors, with parallel controllers, and all necessary auxiliary devices. The total weight of these motors is about 15,000 pounds.

The interior lighting is furnished by 25 incandescent lamps and an arc headlight is fitted at the forward end. All the wiring is placed in concealed iron conduit.

The car is equipped with a truck pilot on the forward end which is so arranged as to permit of two cars being



Elgin & Belvidere Electric Company—Plan of Rotary-Converter Station.

coupled head on. The total weight of the car with its equipment is 32 tons.

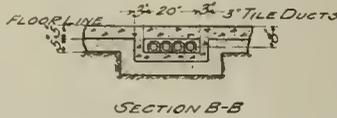
The baggage and express cars used on the line have double trucks and are 45 feet long over all and 8 feet 6 inches wide. These cars are made to conform in general exterior appearance to the passenger cars. They are equipped with four G. E. 65-horsepower motors and straight airbrake equipment, being intended to run at a maximum speed of 30 miles per hour.

Car House and Shops.

The car house and repair shops are located just outside of Marengo. The main building, 91 feet by 105 feet in area, is of brick, concrete and steel and is divided longitudinally into two equal bays, one of which is designed for the car repair work and the other for car storage purposes. The machine shop, which is equipped with a lathe, drill press and other tools essential in repairing cars, occupies the north-

east corner of the bay set aside for the car-repair work. The structure is lighted by four saw-tooth skylights which extend the length of the building. An addition 21 by 50 feet in floor area has been constructed at the northeast corner of the main building. In this portion are located a boiler room, and a coal and oil storage room. The superstructure of the building is of brick and the roof of frame construction.

The Arnold Company of Chicago had charge of the entire engineering and construction work, which was supervised by George A. Damon, managing engineer, George Wes-



SECTION B-B

Elgin & Belvidere Electric Company—Section Through Low-Tension Ducts.

ton, civil engineer, E. N. Lake, electrical engineer, and W. H. Rosecrans, superintendent of construction. The general offices of the Elgin & Belvidere Electric Company are at 181 La Salle street, Chicago, and the operating offices are at Marengo, Ill., as before stated.

UNUSUAL OPERATING CONDITIONS AT BIRMINGHAM, ALA.

The city of Birmingham, Ala., with a population of 100,000, and a suburban population of nearly as many more, is located in an iron and coal mining district which is well served by steam and electric railways radiating from the center of the city. The Birmingham Railway Light & Power Company operates 116 regularly scheduled cars over its lines. Under average conditions the tracks of the steam railways are crossed by an electric car approximately 40,000 times daily. This is an unusual condition and yet it has been met so successfully by the operating department that during the year 1906, when the total number of crossings made exceeded 14,500,000, there were but seven railroad crossing accidents. Six of this number were so trivial that no one was injured and the cars were repaired at a small expense.

In the operation of cars within the city a schedule speed of about 11 miles per hour is maintained. All railway crossings are flagged either by the conductor or a regular flagman, and the cars are required to come to a stop before a crossing is reached. During the rush hours of the morning and evening a number of extra flagmen are stationed at the crossings on the main lines. Aside from these provisions for the safety of cars the remarkably good year's record is due to the careful instructions of motormen and conductors and to the thorough working of a closely organized operating department.

The organization of the railway department consists of a superintendent, assistant superintendent, superintendent of transportation, dispatcher and 12 division superintendents.

The street railway traffic of Birmingham varies somewhat from that of other cities inasmuch as the burden of the patronage is drawn from the suburban districts. Less than 40 per cent of the business done by this railway is drawn from inside the corporate limits. This condition is partially due to the many large steel mills and iron and coal mines located outside of the city. The residence district is far removed from the business center.

Though no suburban line is more than 13 miles in length practically one-half of the company's 125 miles of track has been built to serve the suburban towns. The suburban lines are: a north line and a south line to Bessemer, each 13 miles long; a north line and a south line to Ensley, each 7 miles long, and lines to Gates City, 6½ miles; East Lake, 6½ miles; North Birmingham, 4 miles; Avondale, 5 miles; Bessemer to Jonesboro, 3 miles; Tuxedo to Wylan, 2 miles, and from Ensley to Wylan, 3 miles.

ELECTRIC RAILWAY AFFAIRS IN GREAT BRITAIN.

(FROM OUR LONDON CORRESPONDENT.)

One of the results of the introduction of electric traction on the underground railways in London has been a somewhat serious increase in the wear and tear of the rails. Some statements of an alarming and random nature have been made on this subject, and these have led to inquiries as to the effect the extra maintenance of the permanent way is likely to have on the companies' expenses. The state of things is by no means so bad as has been represented; but that the wear of the rails is greater under the altered conditions admits of no doubt, and the matter is one that is engaging the attention of the companies concerned. The rails on the lines in question have always shown an abnormally short life, owing to the frequency of the trains passing over them and to the constant starting and stopping due to the short distances between the stations. This was the case in the days of steam traction, and there are various reasons to account for the still greater wear that takes place under electrical conditions. In the first place the new rolling stock is differently constructed, and there is a greater dead weight on the axles, the wheel-base is shorter, and the diameter of the wheels is less. Then the electric trains, having a motor at each end, are subject in working to both a pull and a push, and this has the effect, especially on curves, of causing the wheels to grind on the side of the rails. Again, the greater acceleration of the trains in starting and the application of the quick-acting brakes in stopping tend in the direction of more wear and tear on the permanent way. To counteract this wear and tear various experiments are being tried, the most important being the adoption of a harder steel for the rails and the more liberal use of check-rails at curves. By the application of these and other means it is fully expected that after a short experience it will be found that the cost of maintenance of the permanent way of the electrified lines will not be materially greater than it was under the old conditions. On certain of the continental electric railways, notably in Berlin, serious damage has been caused to the rails by the so-called "wave-like wear," under which, at intervals, varying from a few inches to a foot or more in length, the surface of the rail becomes undulated, or worn into a series of ridges and depressions. The cause of this singular phenomenon has been the subject of much controversy among experts, and while in some cases it has been ascribed to inequalities in the hardness of the rail metal, due to imperfections in the rolling process, it has in other instances been attributed to the oscillations caused by the motor and to the absence of suitable springs. Observations made in the vicinity of stations and in parts of the line where the speed is normal have given contradictory results.

* * *

In connection with the electrification of the London, Brighton & South Coast Railway, which has now been in hand for some months, and which it is expected will shortly be in operation between Victoria and London bridge via Battersea park and Brixton, a new type of passenger coach has been designed by the company's consulting electrical engineer, which has now been definitely adopted for the new service. In the new type of carriage the side doors now in use on the suburban lines will be retained, but communication with the different compartments will be afforded in that the divisions between the compartments will not be built completely from one side of the coach to the other, but will allow of a space of 18 inches between the division and one side.

This means of communication will not be in the form of a corridor, as there will be no inner doors to the compartments such as are in vogue on many of the main lines. It will, therefore, be possible for a passenger, once inside the carriage, to enter any of its compartments. The coach will be divided by a door in its center in order to separate

smoking compartments from the non-smoking ones. For a half of the coach the communication will be on one side, and on the other side for the other half, so as to equalize the convenience of the new departure irrespective of which side of the coach the platform should happen to be. The new electric rolling stock on the Metropolitan and District railways contains but three doors to a coach, two of which are intended for entry and one for exit, but as most people who use these railways are aware the doors are generally used indiscriminately, frequently with inconvenience to the passengers. The same objection applies to the carriages in use on the various "tube" railways, where there are but two doors to a coach. The new type of carriage adopted by the London, Brighton & South Coast Railway will, it is confidently anticipated, greatly obviate these disadvantages, as there will be seven doors on either side of the coach, and the expenditure in space will be less than in the instances cited, as a coach of seven compartments will have seating accommodations for 70 passengers. With this system a passenger will be enabled to search for a seat after he is in the carriage, instead of having to do so before he enters it, as is at present the case on the suburban lines; this, in addition to the increased convenience afforded to the passengers, will render possible a great saving of time in the train's stoppages. It is intended to furnish these new coaches with four 10-candle power lamps in each compartment, which should result in an additional improvement. It is worthy of note that this railway is the first of the existing London railways to undertake the electrification of its suburban lines. Should the portion now being converted prove to be financially successful it is contemplated to extend the system, which is high tension overhead, to the Crystal Palace, to Croydon, and to Sutton, and in that event the electrification of the whole line to Brighton may ultimately be undertaken.

* * *

A system that is not much known in the south of England is the Wirral Railway, a line, however, of great importance in the Liverpool district. The railway connects Liverpool and the Birkenhead docks with seaside and residential resorts, such as New Brighton, Hoylake and West Kirby, and two new stations are to be erected immediately on the New Brighton branch. New coaches, to be run as single-car trains at such times of the day when a frequent service of heavy trains would be unremunerative, have been built for this service. The Wirral Railway has several claims to particular interest. One is that it was incorporated under its present title by a certificate from the Board of Trade under the powers given by the Railway Construction Facilities Acts, and another is that sections of the railway are now owned by the Great Central. This is one of the few instances where portions of a railway still enjoying separate ownership have been absorbed by another company. Of wider interest is the fact that the company has powers to electrify the line, although advantage has not yet been taken of them. The remarkable development of railway electrification in the Liverpool district seems to render the conversion of such local lines as are still steam-operated a matter of course. In this connection it is worthy of note that the route mileage of electric lines in the district is already over 35 miles, whilst the through running arrangements in force materially increase the value of the converted systems.

* * *

With the beginning of the new year the District Railway put in operation a further instalment of the increases in its train service made possible by electrification. With the old steam service the maximum capacity of the line was 18 trains an hour, and this was given only during the rush hours. By the increased service now inaugurated the maximum capacity has been raised to 24, equal to a train each way every 2½ minutes, and during the slack periods of the day a 3-minute service, or 20 trains an hour, is maintained. The

increases that have been introduced are certain to be popular, as they very greatly improve the facilities of such important residential districts as Richmond, Ealing and Wimbledon. The simplicity with which increases of this nature can be adopted on a busy system is one of the most striking object lessons afforded until now of the flexibility and adaptability of an automatic-signaled electric railway. It is generally recognized that automatic signaling is more than a perfected mechanical device and a safety factor. It forms one of the most effective means of increasing receipts. This is accomplished by its vast possibilities in increasing the possible train service without additional capital expenditure.

FINDING OF THE CORONER'S JURY ON THE NEW YORK CENTRAL WRECK.

The examination of witnesses before the coroner's jury and the state railroad commission to determine the cause of the wreck on the electrified lines of the New York Central at Woodlawn on February 16, was continued on February 27 and 28 and on March 1, 2 and 4. Vice-President W. J. Wilgus, who had supervision of all the construction work in the electric zone, testified before the state railroad commission as to the organization of the expert commission appointed to supervise and direct the installation of the new electric system and as to the tests of the new locomotives. The witness said the maximum speed attempted during the trial tests was 57 miles an hour while 75 miles an hour was the speed for which the locomotives were designed. During the tests there was a slight spreading of the gauge of the track at one point, but the rails were not displaced. Subsequent to the official test the witness drove a locomotive over the line at the rate of 83 miles an hour. Mr. Wilgus stated that safety was the first aim of the committee in the installation of the system and that the line had been turned over by him in good condition for operation. The actual running of trains came under the direction of the operating department.

Mr. Wilgus followed Mr. Newman before the coroner's jury with somewhat similar testimony. After hearing Mr. Wilgus the state railroad commission called to the stand A. H. Smith, general manager. Mr. Smith told the condition of the track at the curve just prior to the accident and of the daily inspection of the track on the Harlem division. Mr. Smith said that only in special instances was he in charge of laying original tracks; that the roadway was in safe condition for the operating of steam trains and that when the new locomotives were received his men were instructed to take them out and handle them roughly with a view to testing both engines and other equipment. He did not think the operating department should be held responsible for a failure to reconstruct the roadbed if that was necessary. The testimony of Mr. Smith had the effect of appearing to place the responsibility upon the electrical commission. Mr. Smith stated that since the wreck the rails on the curve had been double-spiked, to make assurance doubly sure.

The final hearing before the coroner was held on March 4 and the witnesses were Professor Lovell of Columbia University, Prof. George F. Swain of the Massachusetts Institute of Technology, Vice-President Wilgus, General Manager Smith and General Superintendent McCormack. After a deliberation of 40 minutes the jury returned its verdict. After reciting the death of 23 persons and the circumstances of the wreck, the verdict said:

We find that the derailment was caused by a portion of the track consisting of one of its easterly rails being forced out of its proper position.

That said rail was forced out of its proper position by the impact upon it of the above mentioned Brewster express train.

That said train, made up as it was shown to have been, was running at a speed in excess of what has proven to be safe for such a train on a track laid at the existing curvature at this point, the rails of which were fastened on in the way they have proven to have been fastened, and the super-elevation, such as it was proven to have been, of four and one-half inches.

That the running of said train at an unsafe speed over said track exerted sufficient lateral pressure on the outer or easterly

rall to cut off or shear the heads of the spikes holding said rails to the ties, thus permitting the displacement and the resultant accident.

Our conclusion is that the New York Central & Hudson River Railroad Company did not take safe and proper precautions to guard its passengers at this point, and consequently were culpably negligent, and that the responsibility for the existing conditions seems to be divided between the construction and the operating departments.

We recommend that the New York Central & Hudson River Railroad Company be compelled to reinforce the fastenings of the outer rails on all curves of their lines constructed as the one in question was proved to have been constructed by the addition of spikes, rail braces or increased superelevation, as from the testimony given we feel that unless such precautions are taken other accidents may be expected.

We further recommend that until the above strengthening is completed over the curves not so reinforced the New York Central and other lines be required to lower their speed on such curves to so-called equilibrium speed, or one that is absolutely safe to protect the lives of the passengers and employes, and that instructions to this effect be given to those in charge of trains.

Owing to the lack of information of the employes and the representatives of the New York Central to determine with exactness the speed of the electric train, we recommend that the company be compelled to install such instruments or make such tests to determine the speed under varying conditions as will enable the motorman to know with reasonable exactness the speed at which trains are traveling. This information is to cover speed at the three different positions of the controller lever, should be properly tabulated and hung in a conspicuous place in the cab.

After the foreman of the jury had reported the verdict the coroner asked if the jury found any one person responsible, to which the foreman replied that the verdict was as he had given it. The coroner then said that under the circumstances he would hold the directors of the New York Central and President Newman to the action of the grand jury. They were paroled in custody of counsel. On the following day the assistant district attorney asked that the court, in lieu of issuing warrants for the arrest of the president and directors of the company, certify to the grand jury that there is sufficient cause to believe that the New York Central is guilty of the crime of manslaughter in the second degree. This motion was granted.

An order has been issued limiting the speed of all trains in the electric zone to 45 miles an hour on straight track and 35 miles on curves.

AUTOMOBILE EMERGENCY STATION.

Several years ago the Birmingham (Ala.) Railway Light & Power Company established an emergency station near the center of the city of Birmingham, where supplies for all emergency repairs for the railway, electric and gas properties are stored. Experienced workmen are also kept at the station in readiness to respond to alarms of fire or emergencies of any nature. A description of this unique system appeared in the Street Railway Review of April, 1903, page 211.

At the time the description referred to was published horses were used exclusively in hauling emergency wagons, but since that time the company has purchased six Pope-Waverly electric trucks and two gasoline runabout automobiles for the use of the emergency department. These automobiles are kept in readiness night and day to respond at a moment's notice to any alarm that may be sent in. In addition to these there are provided at the station two line cars, three emergency trolley wagons and 22 light draft wagons. The latter are used in hauling stores from one department to another and in delivering supplies to points about the city where new work is in progress or where repairs are being made. A stable for the horses used in hauling the wagon is maintained near the station.

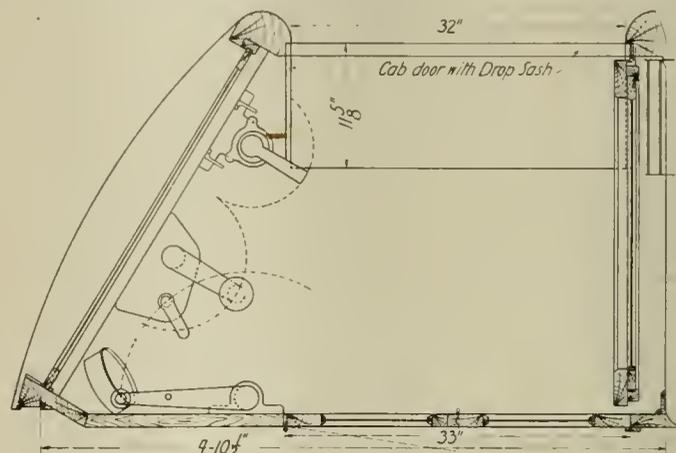
When trouble arises on any of the company's properties one of the emergency wagons and a crew of reserve workmen are hastened to the scene. So successful has the emergency station proven it is now planned to build a new and more commodious station to replace the one now in use.

The number of freight cars in service in the United States in 1905 was 1,692,194, having a combined capacity of 50,765,820 tons.

SPECIAL CABS FOR CHICAGO & MILWAUKEE CARS.

BY D. C. HINSTORFF.

Some interesting changes are being made by the Chicago & Milwaukee Electric Railway Company in the reconstruction of the vestibules on 10 cars which were received from the shops of the Jewett Car Company last



Special Cabs for Chicago & Milwaukee Cars—Plan View.

spring. The reason for making these changes is partly to have all the cars of uniform construction and partly to gain the advantages of the peculiar arrangement of the cabs which has been adopted by this road.

Among the principal advantages offered by the arrangement are that the motorman is enclosed, thus preventing conversation with passengers which would increase the lia-



Special Cabs for Chicago & Milwaukee Cars—Exterior View.

bility of accident as the result of his attention being detracted from the proper operation of his car; and it further enables the motorman to watch the rear steps without changing his position at the controller, which often saves considerable time as the motorman can proceed without having to wait for the usual signal from the conductor. The removal of the control apparatus from below the center window also gives the conductor free access to the trolley rope

when leading the trolley through special overhead work or in replacing it on the wire.

The accompanying plan view shows the partition of the cab in three sections which are hinged together. One of the sections is anchored to the end of the vestibule and floor and the other two sections, which are hinged to the first, serve as a door. When not in use the door folds against the stationary section, thus taking very little room and giving the vestibule a neat and finished appearance.

Single-sash windows are substituted in the vestibule in place of the double-sash windows on each side of the center drop windows. This eliminates the cross strip and gives the motorman a clear and unobstructed view ahead. Another interesting feature is the single door on the cab side of the vestibule which is fitted with a drop window allowing the motorman to look out without opening the door.

The illustrations clearly show the new doors which are made to resemble the folding doors which have been retained on the opposite side and end of the car to give the car body a more symmetrical and uniform appearance.

TRACTION ORDINANCES APPROVED BY CHICAGO REPUBLICANS.

The platform adopted by the republican convention, which nominated city officials in Chicago on March 2, urges unequivocally the approval by voters of the Chicago City Railway and the Chicago Railways Company ordinances at the election on April 2. Fred A. Busse, now postmaster of Chicago, was nominated for mayor. The attitude of the republican convention is squarely opposed to that of the democratic convention, which, as related in last week's issue of the Electric Railway Review, renominated Mayor Dunne on a municipal ownership, anti-traction platform.

The republican platform says that immediate and radical improvement in and extension of street railway facilities are the paramount need of Chicago. The platform says:

With growing indignation, but patient firmness, the people have endured totally inadequate transportation service and submitted to flagrant disregard of their convenience and comfort on the part of the traction companies. For 10 years street car patrons have risked health and life in overcrowded, insanitary cars, and suffered injury to their business and property through lack of sufficient and continuous service, awaiting the time when a settlement could be made with the companies that would properly safeguard the interests of the city.

Such a settlement is at last possible through the adoption of ordinances in support of which all disinterested and intelligent citizens who have the interests of Chicago at heart can unite without regard to differences of honest opinion as to the public or private ownership or operation of municipal utilities.

On February 4, 1907, the city council passed two ordinances, subject to referendum, which have for their purpose the immediate reconstruction and practical unification of the street railway systems. They reserve to the city the right to purchase the lines at an ascertained price at any time on six months' notice, and provide a direct and speedy method of bringing about municipal ownership. These ordinances received the votes of 57 out of 69 aldermen of both parties, representing every section of the city. The ordinances make practical and effective provision for the immediate and comprehensive improvement of street railway facilities throughout the entire city, for much-needed extensions of lines, especially in the outlying wards, and for a single fare over all the lines of the four great systems within the present or future limits of the city. They give the city control of construction, equipment and extensions, and of the service itself. They make the city a controlling partner in the enterprise, not only during the period of reconstruction but of subsequent operation. The city becomes a participating partner through provisions which limit the annual profits of the companies to a 5 per cent interest return and give the city 55 per cent of the net receipts, available for the purchase of the properties or for an equivalent reduction of fares. The ordinances provide for immediate construction of a central subway, and its future extension, and for the immediate establishment of 21 through routes, by means of which the central business district will be extended and new business centers established.

We believe these ordinances represent a great advance in municipal legislation, and, if ratified by the people, will settle in an equitable and satisfactory manner the question which has done so much to retard the city's growth and prosperity. We commend these ordinances to the support of the voters of Chicago, and pledge the republican party, if they are adopted by the people, to enforce all their terms and conditions, to the end that the street railways of Chicago shall be operated for the benefit of the people.

The Chicago Real Estate Board and the Chicago Com-

mercial Association have appropriated \$1,000 each to aid the work of the Citizens' Non-Partisan Traction Settlement Association. That association has passed a resolution stating that its membership is composed of men favoring municipal ownership as well as those who are opposed to it, but who are united in favor of the adoption of the ordinances, believing that they solve the traction question in a prompt and efficacious way; and further emphasizing that the association is non-partisan in character and will not enter into debates or discussions with organizations or individuals taking a partisan position on the traction question.

Headquarters have been secured by the association on the seventeenth floor of the Heyworth building, Madison street and Wabash avenue, and plans have been made to form subcommittees in each ward which will act under the direction of the executive committee.

In an address before the City Club on March 2, Walter L. Fisher, who drafted the traction ordinances while he was Mayor Dunne's special traction counsel, explained the ordinances and advocated their passage. Mr. Fisher said:

The advocate of immediate municipal ownership says: "Proceed at once to have the city acquire and operate the street railways." But to this the answer is two-fold: First, the city has not yet established its legal ability to do so, and it has not even made a faint beginning to establish its ability to finance the measures by which this must be brought about.

I know the validity of the Mueller law and of the \$75,000,000 ordinance is directly involved in the test case now pending in the supreme court of Illinois, upon which a decision can fairly be expected during the next few months. I know, also, that it is extremely probable the court will sustain the validity both of the statute and of the ordinance.

The city has won its main contention in the 99-year cases, but there are a multiplicity of other questions which were not decided in that case and upon which, in fact, the supreme court expressly reserved its decision. The Chicago City Railway Company was not even a party to the case, and will present new questions to the court.

If the supreme court of Illinois should sustain the Mueller law and the case should not be further carried to the supreme court of the United States, it would be possible for the city to institute condemnation proceedings to acquire the tangible and intangible property of the present companies.

But it may safely be asserted, first, that the price which the city would have to pay under such proceedings would in no event be substantially lower than that fixed under the present ordinances, and that the success of the companies upon any one of a large number of issues raised by them would easily increase the price many millions of dollars, and, second, that by no possibility could the property be acquired as speedily by means of condemnation proceedings as under the present ordinances.

This leaves entirely to one side the important question as to the ability of the city to finance such an enterprise under the present municipal ownership ordinance, even if it should be sustained by the supreme court of the state. It will be conceded, I think, that I have been and am in a position to know what assurances can be given in this connection, and that it is violating no confidence to state that there has been and there is now no arrangement, either definitely or tentatively, under consideration for the raising of \$1,000,000 toward the purchase of these properties by the city, and that the present city administration knows no more to what source it could turn to secure \$75,000,000 for this purpose than does any gentleman in this room.

There has been no plan and there is now no plan which has back of it any real assurance whatever that can be given to the people of this community that the city authorities can raise \$75,000,000 or any sufficient portion of that sum under the ordinance now pending in the supreme court of this state or any similar ordinance under the Mueller law.

I do not mean to state that this money could not be raised under certain circumstances and conditions and with such modifications in the ordinance as would give to the investors adequate security for their money. I merely state that no arrangements have been made or seriously undertaken to raise this money or any part of it, and that, in my judgment, there exists the most serious doubt as to the ability of the city to raise it under the present ordinance and under the political conditions which are likely to exist in this city during the next few years. Any assurances or expressions of opinion to the contrary must be placed in the same category with the assurances given by Mayor Dunne in the last mayoralty campaign.

Alderman M. J. Foreman criticized sharply the suggestion of Mayor Dunne that the ordinances should provide for lower fares. He said:

Any step looking to lower fares must mean either that the employes will suffer salary reductions or that the operation must be at a greatly reduced cost. In either case you are bound to have inferior service, and service which will be as unsatisfactory as it ever has been before. Under the new ordinance through routes and rides are provided for. There will be the south and north lines and south and west lines. It will be impossible to make

operating expenses on those routes on a 3-cent basis. Take the proposed Grand Crossing-Bowmanville route as an example. There a ride of 14 or 15 miles will be given the passenger for 5 cents. The same distance on a railroad would mean a fare of 40 or 50 cents. There will be many other through routes nearly as long, and if the companies were forced to a 3-cent rate the only way they would be able to run their cars would be by cutting expenses to a 3-cent basis. If it is taken out of the men's salaries, there will be more labor trouble than could be straightened out in many years; and if it is taken out of the operating expenses, the service will be abominable.

COMMUNICATIONS.

Correct Controller Connections.

To the Editors:

Having experienced nearly every difficulty in connecting up G. E. K-28 controllers, I think that I can answer the question put by "Seventy-Six" in the Electric Railway Review, February 16. The trouble was not in the motors in this instance but was simply due to the A-2 and A-4 connections in the No. 2 controller being crossed. I believe that if "Seventy-Six" will make these changes his car will cause him no further trouble.

R. G. STEWART.

Memphis, Tenn., February 25, 1906.

Two-Stage Feedwater Heater.

To the Editors:

As is now well known, besides the fuel economy which results directly from the heat units saved in heating feedwater with exhaust steam, there also results an indirect saving by increasing the life of the boiler. If this is true, why would not a greater saving and a longer life of the boiler result if the water always entered the boiler at the temperature of the steam?

It is true that certain of the scale-forming salts are thrown down in an open feedwater heater using exhaust steam, but there are also some which require a temperature of over 300 degrees F., and these will enter the boiler and form scale when the exhaust feedwater heater is employed. The formation of scale, of course, not only reduces the economy of the boiler but reduces the life of the tubes and shell as well, owing to the increased expansion and contraction and the liability of the surfaces exposed to the fire being burned and overheated.

Now, to utilize the advantages of having water enter the boiler at the temperature of the steam and still get the benefit of the heat in the exhaust steam, why wouldn't it be a good plan to pump the water from the exhaust feedwater heater to a second heater of the tray type having a live-steam connection to the boilers, thus giving the full steam pressure and temperature in the boiler? This heater could be located 15 or 20 feet above the boilers and the water then would flow into the boilers by gravity. The water level in the live steam heater could be regulated by a ball float.

By this arrangement all the economy of the ordinary feedwater heater would be realized, and the additional advantage of having all the scale deposited where it could easily be removed and an increased steaming capacity, efficiency and longer life of the boilers would result.

I hope you may find space to publish this in your valuable journal, so that I may get the opinion of your readers.

H. F. WATERS.

Chicago, Ill., February 23, 1907.

The Consolidated Railway Company of New Haven, Conn., has completed arrangements for installing a trolley express service between New Haven, Meriden and Wallingford, Conn., a distance of about 30 miles. This district is very thickly populated and an express service will prove a great convenience to the people along the route as well as being a profitable enterprise for the company.

BOOK TABLE.

Chicago Traction. By Samuel Wilbur Norton, Ph. D. Chicago, 1907. Cloth. 240 pp., 5½ by 8 inches. Price, \$1.00.

In a prefatory note the author states that the purpose in preparing this volume was to present facts pertaining to traction affairs in Chicago from a legislative and political standpoint. In the main the chronological order has been followed, the central theme being the controversy over the streets between the street railways and Chicago. While the avowed intention of the author has been to discuss his subject impartially, the dedication of his work indicates that his sympathy has been with those who have opposed the traction companies during the past ten years when the question has been made an issue in local politics. This dedication is "To the resolute men who withstood the aggressions of the street railway companies and preserved the streets of Chicago for the people." It might be asked pertinently whether any agency could better assist the people in securing the use of the streets than an efficient street railway system. In reviewing the ordinance of 1883 the author follows the language of the Harlan report, made in 1898, and describes the late Julius S. Grinnell as city attorney "afterwards general counsel for the Chicago City Railway Company," without mention of the fact that Mr. Grinnell did not become associated with the Chicago City Railway Company until a good many years after his opinion as to the validity of the "99-year act" was prepared for the city, and that Mr. Grinnell, after leaving the city attorney's office, was elected judge and served a term in the office. The text of this book will be very useful to one desiring to get quickly a general history of the controversy between the street railways of Chicago and the city. The adoption of the pending ordinances is discussed, but in a way that leaves the reader in doubt as to whether the author himself favors them.

DIRECTORY OF ELECTRIC RAILWAY ASSOCIATIONS.

American Street and Interurban Railway Association. Secretary, Bernard V. Swenson, 60 Wall street, New York.

American Street and Interurban Railway Accountants' Association. Secretary, Elmer M. White, assistant treasurer Birmingham Railway Light & Power Company, Birmingham, Ala.

American Street and Interurban Railway Engineering Association. Secretary, S. Walter Mower, general manager Southwestern Traction Company, London, Ont.

American Street and Interurban Railway Claim Agents' Association. Secretary, B. B. Davis, claim agent Columbus Railway & Light Company, Columbus, O.

American Street and Interurban Railway Manufacturers' Association. Secretary, George B. Keegan, 2321 Park Row building, New York, N. Y.

Canadian Street Railway Association. Secretary, Allan H. Royce, president Toronto Suburban Railway, Toronto, Ont.

Central Electric Railway Association. Secretary W. F. Millholland, secretary and treasurer Indianapolis Traction & Terminal Company, Indianapolis, Ind.

Colorado Electric Light Power & Railway Association. Secretary, John F. Dostal, Denver Gas & Electric Company, Denver, Colo.

Iowa Street and Interurban Railway Association. Secretary, L. D. Mathes, general manager Union Electric Company, Dubuque, Ia. Next meeting, Clinton, Ia., April 19 and 20.

Massachusetts Street Railway Association. Secretary, Charles S. Clark, 70 Kilby street, Boston, Mass. Meetings held in Boston on second Wednesday of each month, except July and August.

Northwestern Electrical Association. Secretary, R. N. Kimball, Kenosha, Wis. Annual meeting, Milwaukee, Wis., January, 1908.

New England Street Railway Club. Secretary, John J. Lane, 12 Pearl street, Boston, Mass. Meetings held on fourth Thursday of every month.

Pennsylvania Street Railway Association. Secretary, Charles H. Smith, superintendent Lebanon Valley Street Railway, Lebanon, Pa.

Southwestern Electrical & Gas Association. Secretary, R. B. Stichter. Annual meeting, San Antonio, Tex., May 14, 15 and 16.

Street Railway Association of the State of New York. Secretary, J. H. Pardee, general manager Rochester & Eastern Rapid Railway, Canandaigua, N. Y.

Wisconsin Electric and Interurban Railway Association. Secretary, Clement C. Smith, president Columbia Construction Company, Milwaukee, Wis.

PIPING AND POWER STATION SYSTEMS—XXXII.

BY W. L. MORRIS, M. E.

As shown in Figure 257 (I2-2), the bottom of the discharge waterway should be slightly lower at the point where the thawing-out pipe is run into the intake. The mouth of the discharge should be slightly higher than the intersection marked "low-point" to insure water flowing through the line at times of low water. The discharge of the thawing pipe should be a sufficient distance below the water to protect it against freezing. The entire thawing line should

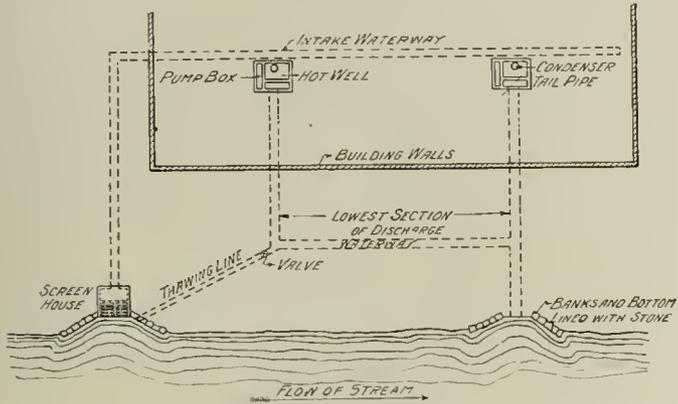


Figure 257-(I2-2).

have not less than five feet of earth over it. In case the water is taken from the cooling pond it would be unnecessary to provide a thawing line to the mouth of the intake.

The mouth of the discharge into the cooling pond should be provided with an oil or grease catcher to prevent grease from getting into the pond. This is necessary not only to prevent the disfigurement of the banks and surface of the pond, but also to prevent the liability of oil reaching the boilers. A simple grease catcher is shown in Figure 258 (I2-3). This may be constructed of wood, concrete, brick, or other desirable material. The discharge from this compartment is through an opening located as far as possible below the surface of the water. The opening from the grease-catching compartment is provided with a valve and handle for operating it. Inside of the grease-collecting compartment is an overflow into a trough which discharges into a sewer or grease-catching cistern. The grease is allowed to

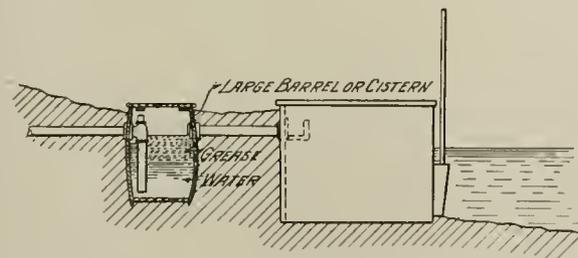


Figure 258-(I2-3).

accumulate in this compartment until the operator desires to draw it off, the latter process being accomplished by opening the trap, the latter process being accomplished by opening the trap to observe the overflow, and by closing the valve sufficiently to cause the water level in the compartment to rise to the skimmer edge and overflow into the sewer. An objection to this skimming device is that the sewer will become clogged with the gum and grease discharged into it. To avoid this difficulty and at the same time save the grease it would be profitable to place the grease tank between the overflow and the sewer, as shown in Figure 259 (I2-4). It may seem at first thought that the arrangements proposed are rather elaborate for the pur-

pose of removing grease, but if some such provision is not made the condition of the pond at the end of five years or so would be unbearable. It should be remembered that all the cylinder oil leaving the engine remains in the pond and it is very probable that 30 or 40 barrels of cylinder oil would be scattered along the banks, intake, etc., in this period of time.

In reference to the elevated jet condenser discharge, a modification of that shown in Figures 253 and 254 can be made by placing the condenser bowl at the power house and instead of running the tail-pipe vertically it can be run down the bank in a covered trench, allowing ample means for expansion and contraction as shown in Figure 260 (I2-5). The hotwell in this case would be made considerably larger. The

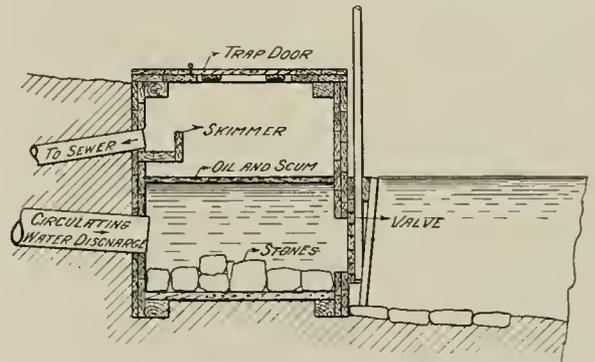


Figure 259-(I2-4).

volume of the hotwell measured from the discharge opening in the tail-pipe to the water level must be greater than the contents of the entire tail-pipe up to the condenser bowl. With this arrangement it would be necessary to run three pipes in the trench—the injection line, tail-pipe and heater supply.

To provide for the low-pressure water service in the plant it would be advisable to have two small low-pressure pumps in addition to the motor-driven circulating pump. It would further be advisable to have two centrifugal pumps attached to the motor shaft, one of which should take water from the hotwell and the other from the intake. This arrangement would require four pipe lines from the screen-house to the basement. This condenser system is suitable only where the proper elevations can be secured, the distance from the base of the condenser to the water level being ap-

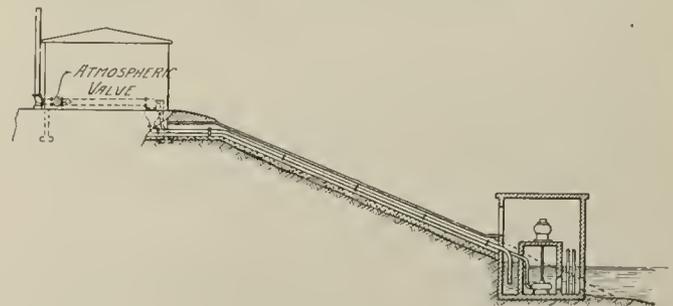


Figure 260-(I2-5).

proximately 34 feet. In determining the details of the intake and discharge waterway and the location of the condensers, pumps, etc., the water requirements should also be duly considered. These requirements are for boiler feed, general cold water service and fire protection.

If the power house is to furnish fire protection for other buildings as well, it would be necessary to provide steam pumps for this service, if for no other reason than to comply with the requirements of the board of fire underwriters. It will be observed that the plants shown in Figures 253, 254 and 260 fail to provide suitable equipment for this service. It also will be noted that these different services require elec-

trically-driven pumps as shown, leaving only the exhaust from the feed pumps for heating the feedwater, and a loss of economy follows as previously stated under this class heading, "1-2." To make possible the use of steam-driven pumps it would be necessary to locate the floor of the pump room so low that the pump could lift the water. This can be accomplished as shown in Figure 261 (12-6).

The following pumps should be placed in the pump room: The condenser, circulating water and underwriter's fire pump, hotwell pump to the heater and low-pressure pump from the intake. The air pump, if employed, may be located in the room directly over the pump room. The circulating and boiler-feed pumps should be of the compound type with high and low pressure steam cylinders to reduce the steam consumption and permit the use of as many steam-driven auxiliaries as possible. The fire pump if used regularly on the low-pressure service also should be compounded with provision for using high-pressure steam in both cylinders for the fire service, or boiler feed, tube-drilling, etc. If there are two feed pumps one may be used for tube-drilling, etc., and the other pump may then be operated continuously for the low-pressure service, which is very desirable if other buildings are supplied with water. The portion of the low-pressure system which must be always operated at low pressure may be fed from elevated tanks. A valve then should be placed close to the pump so that in case of fire the pressure can immediately

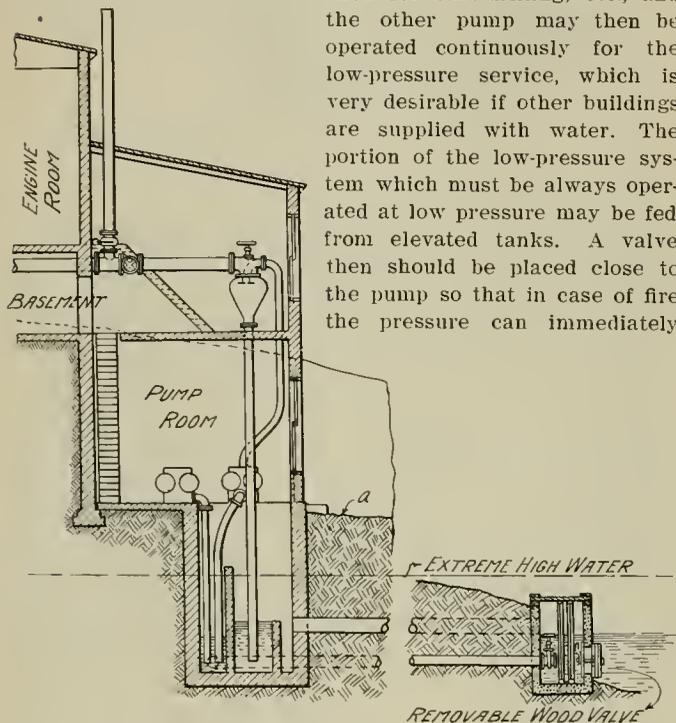


Figure 261-(12-6).

be raised on the remaining pipes by closing this valve, thus permitting the change from low to high pressure without stopping the pump. The tank will then supply the low-pressure system while the pump is being used for the high-pressure service.

(To Be Continued.)

The number of cases prosecuted in the police and justice courts of Columbus, O., by traction lines entering the city against persons accused of improper conduct on cars outside of the city are becoming much fewer. This is due to the vigorous campaign against persons of this character who took advantage of the lack of city police jurisdiction while on cars running through the country. Rowdiness became so annoying to other passengers on the cars that radical measures had to be taken to stop it. The conductors were informed that they had police power and were authorized to use it in all cases of improper conduct. This for a while kept traction officials busy in the courts, but it soon manifested a wholesome effect on the disorderly element. The Columbus New Albany & Johnstown Traction Company went farther than to instruct its conductors to make arrests and kept private detectives on the cars for several months.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B., OF THE CHICAGO BAR.

JUROR IN POSSESSION OF BOOK OF FREE TICKETS.

Shepard v. Lewiston Brunswick & Bath Street Railway, 65 Atl. Rep. 20.

The supreme judicial court of Maine says, in the personal injury case of Shepard v. Lewiston Brunswick & Bath Street Railway, 65 Atlantic Reporter, 20, that it cannot persuade itself that the gift of a "blue book" of free tickets on an electric railroad, of trivial value, as a favor, not particularly to the recipient, but rather to the society of which he was a trustee, months before the donee was, or could have been expected to be, drawn as a juror, should of itself be regarded as evidence of bias or prejudice on the part of the juror, or as raising a presumption that his verdict was affected by improper influences, or that it might have been otherwise tainted. It is true, in human experience, that almost all things are possible, but the possibility of bias under such circumstances as these seems so remote as not to be worthy of consideration.

RIGHT TO CROSS STEAM RAILROAD ON STREET WITHOUT APPROPRIATION PROCEEDINGS—THAT ROAD UNDER CONSTRUCTION IS A STREET RAILROAD AS AUTHORIZED CANNOT BE QUESTIONED—NATURE OF "RIGHT OF WAY" ACROSS STREET—NO RIGHT TO CHANGE GRADE OF RAILROAD.

Pennsylvania Co. v. Lake Erie, B. G. & N. Ry. (U. S. C. C., Ohio), 146 Fed. Rep., 446.

It appearing from the proof that the defendant company, which was authorized to construct a railroad operated by electricity or other motive power, had received from the council of the village of Woodville, Ohio, authority to construct a street railroad along Water street, which included the point where the tracks of the complainant crossed that street, the United States circuit court, in Ohio, thinks that there could be no doubt that the defendant, without resorting to appropriation proceedings, possessed the right to put in crossing frogs of the kind required by section 2503 of the revised statutes of Ohio of 1906. More than that, it thinks that one would look in vain for any authority in the defendant to prosecute any proceeding looking to the appropriation of a right to cross the tracks of a steam railroad in a municipality, in Ohio.

With regard to the contention that the defendant was not a street railroad company, and that the railroad which it was constructing in the village of Woodville was not a street railroad, the court says that it does not think this question was open to discussion, the council of the village of Woodville, in the manner provided by law, having authorized the construction by the defendant company of a street railroad along Water street and over a point where the complainant's railroad crossed that street. This, it seems to the court, was conclusive upon the question as to what kind of a railroad the defendant proposed to construct.

Furthermore, the court says that the complainant's bill assumed the possession by the complainant of a right in the street which in law it could not possess. The bill alleged that the defendant was about to enter upon the complainant's "right of way." In the sense in which this term is used in the bill, the complainant has no right of way in the street; that is, it has no tangible property therein. True, it has in strictness a right of way across the street; but this right is of an intangible nature. It has no more substance than the right of way over a street possessed by a pedestrian. So that to say that the defendant is about to enter upon complainant's "right of way," meaning the right of way it possesses across the street, is to say that the defendant is about to do what any and everybody has a right to do at all times, subject only to the movement of complainant's trains. What the defendant proposes to do is to introduce

in the public highway, at the point where complainant's tracks cross it, another public use thereof, under authority of the municipal legislation necessary in such cases. The complainant has no property in the street, and none on it except a few ties and rails. The disturbance of these for the purpose of suiting them to the new use to be made of the public highway is necessary, and results in no invasion of complainant's rights. But the right to put in crossing frogs does not carry with it the right to change the grade of the railroad.

VALIDITY OF ORDINANCE RELATING TO TEMPERATURE AND OVERCROWDING OF CARS, ETC.—NO INJUNCTION AGAINST PROSECUTIONS THEREUNDER—COMPANIES NOT DEEMED TO REPRESENT A CLASS.

City of Chicago v. Chicago City Railway Co. et al. (Ill.), 78 N. E. Rep. 890. Oct. 23, 1906.

Section 1958 of the Revised Municipal Code of the city of Chicago, as amended by a city ordinance in 1905, makes it unlawful to permit any car to be in use on the public streets unless an average temperature be maintained therein at not lower than 50 degrees Fahrenheit, a thermometer and copy of this section with invitation to report violations to the commissioner of public works are put up in the car, the car is reasonably clean, disinfected, and ventilated to be as free as practicable from foul or vitiated air, nor unless the track and car are in such condition as to insure the reasonably safe, convenient and comfortable transportation of passengers, nor unless there shall be furnished a sufficient number of cars, on each separate line, to carry passengers comfortably and without overcrowding, the same to be run on a proper and reasonable time schedule; nor unless each car, on each separate line, except in case of blockade or other unavoidable interruption of traffic, when it once starts on its trip, shall be run to such terminus of said line as is designated on said car without switching back before reaching said terminus, if there are any passengers on said car who desire to be carried to such terminus, etc. Section 1959 provides that any person or company violating any of said provisions shall be fined not less than \$25 nor more than \$100 for each car operated in violation of this law, and each day of the operation of such car shall be considered a separate offense.

The supreme court of Illinois says that this ordinance is within the power conferred upon the city by the clause of the cities and villages act giving cities power to regulate the occupation of the complainants. The provision is also within the police power, but it is of a nature to directly affect the business of the defendants. In such a case rights are involved which may authorize interference by a court of equity, although the mere invalidity of the ordinance affords no ground for such interference. Litigation commenced in a court of competent jurisdiction should be allowed to proceed to a final conclusion in that court, and for a court of equity to take jurisdiction to decide a suit upon a ground equally available in a court of law would be obvious error. That is especially true of cases like this.

The ordinance in this case is within the powers conferred upon the city, and it has for its object the laudable purpose of protecting the traveling public against discomfort, annoyance and danger. It is designed to promote the public comfort, safety and health by preventing the overcrowding of cars, and it should be sustained if it is legally possible to do so. To grant an injunction and prevent the prosecution of offenses against the ordinance during the progress of a chancery cause would be to render the municipal authorities helpless in the discharge of their public duties and suspend their legislature functions, contrary to public policy and public interest. If a court could take jurisdiction of a bill to declare an ordinance void because of the numerous prosecutions under it, a complainant would be able to confer juris-

dition by repeating his offense, and of course that could not be so.

Nor does the court think that two companies operating in different parts of the city and furnishing practically all of the railway service for the city, with a population of upwards of 2,000,000, could be said to represent a class and on that ground entitled to maintain a suit in equity to settle the question of the validity of the ordinance, there being besides them twelve other lines, which operated in outlying districts and did not own downtown terminals, the difficulty there being perhaps not so much to prevent overcrowding cars as to fill them with passengers.

ACTS GIVING PRIORITY OF RIGHT TO USE OLD ROADBED—THAT CAPITAL STOCK HAS NOT BEEN ISSUED, MONEY PAID THEREON, OR ANY PART OF ROAD IN TOWN CONSTRUCTED IS IMMATERIAL—NO CONDEMNATION BY ANOTHER COMPANY—RIGHT TO INJUNCTION.

Fayetteville Street Railway Co. v. Aberdeen & Rockfish Railroad Co. (N. C.), 55 S. E. Rep. 345. Oct. 30, 1906.

The principal question presented to the supreme court of North Carolina in this case was as to which of these two companies had the better right to appropriate and use the old and abandoned roadbed from Fayetteville to Hope Mills, seven miles distant, as its right of way. It appeared that the plaintiff, on August 23, 1906, after securing a franchise from the city of Fayetteville to build a street railway, obtained a street railway charter for that purpose from the secretary of state under the general corporation law, which, among other things, authorizes the construction of branch lines to towns within a radius of 50 miles. On the same day, after organization under the charter by electing directors and officers, a directors' meeting was held, and by resolution the roadbed in question was formally adopted as the plaintiff's permanent location between Fayetteville and Hope Mills, and direction given to mark and stake the line. On August 24th this was done by the agent of the company appointed for the purpose, report was duly made to the company, and on August 27th this action was likewise, by resolution of the directors, approved and confirmed. Moreover, the plaintiff avowed its good faith and intention and ability to go on and condemn the right of way and construct its road pursuant to law.

The court holds that the plaintiff obtained the prior right to the use of the roadbed as a part of its right of way.

The court says, too, that it was contended that the capital stock had not been issued and that no money had been paid thereon, and that the plaintiff, incorporated as a street railway, had built no part of the road as yet in Fayetteville or any other town, but was only proceeding in the country, and on a branch road, before the main road was constructed. These and all such objections, however, even if valid, could only be made available by direct proceedings instituted by some member of the company for unwarranted or irregular procedure on the part of the officers, or by the state, for abuse or non-use of its franchise, and were not open to collateral investigation in a case of the character of this one, which was brought to enjoin the defendant from interfering with the right of way claimed by the plaintiff, nor at the instance of the defendant. But these objections were not valid.

Furthermore, the court holds that the plaintiff's right to the exclusive use of this roadbed, as against the defendant's claim to appropriate it for its own right of way by condemnation, was clear, and that the plaintiff was entitled to be protected by injunction, there being no express grant to the defendant to condemn the plaintiff's right of way and no necessity for such action being shown, while this roadbed was only sufficient to permit the laying of one track.

A party of engineers will inspect the new turbine generating station at Fort Wayne, Ind., on March 9, 1907.

News of the Week

Second Tube of the New York Rapid Transit Tunnel Pierced.

The south tube of the New York Rapid Transit Commission's double-tube tunnel being built under the East river from the Battery on Manhattan Island to Brooklyn, was pierced on February 28. The north tube was put through about December 10. Much of the work was rock excavation but at the point where the tubes met the New York Tunnel Company, which had charge of the work, found it necessary to use the shield method in connection with the freezing process, the latter being used to prevent deviations in the alignment in the tunnel shields in the quicksand and very soft material.

Legislation Affecting Electric Railways.

Illinois.—Bills have been introduced in the legislature providing for the equipment of street cars with safety appliances and heating apparatus and regulating the hours of employment.

Minnesota.—A bill has been introduced in the legislature to authorize villages of 3,000 population or over to grant franchises to electric railways to carry freight.

Nebraska.—A bill is now before the state house of representatives which permits municipal street railways to own and control the stocks, bonds and securities of interurban railways. Another bill proposes to repeal the law which permits precincts to vote bonds to aid interurban railways.

Texas.—A bill prohibiting steam or electric railways, express or other transportation companies from giving free passes or accepting anything but money for transportation has passed the house of representatives.

Des Moines, Ia., Franchise Case.

The attorneys for the city of Des Moines, Ia., have filed objections to the form of decree submitted by the attorneys for the Des Moines City Railway Company for the signature of Judge McPherson in the injunction case. The objections to the decree submitted by the corporations are summed up in the statement that the attorneys for the street railway company attempt to secure an adjudication on only the Turner franchise, while the city's counsel claims that the adjudication extends over all of the franchises. The decree is also declared as ambiguous and not specific.

The decree filed by the corporation for Judge McPherson's signature states that the perpetual feature of the Turner franchise shall run without end and that the terms within the Turner franchise and the privileges therein stated are alone adjudicated, but the questions of the other franchises under which the company operates are still unadjudicated.

This, the city claims, is unfair because the terms of the other franchises were pleaded by the corporation in arriving at the adjudication which ended in the declaration of the perpetuity of the Turner franchise and the securing of an injunction to keep the city solicitor from interfering with the rights of the company through the medium of further litigation.

Mr. Shonts on New York Rapid Transit.

Mr. Theodore P. Shonts, who on March 4 assumed his duties as president of the Interborough-Metropolitan Company, controlling the elevated, subway and surface lines of Manhattan, has made the following suggestions in regard to the improvement of service conditions:

"As far as the surface roads are concerned, my observations lead me to believe that little can be done to better conditions without the intelligent co-operation of the city authorities. In my opinion it is not that we do not run enough cars on the surface lines to relieve as far as it can be relieved in certain hours the congestion that confronts us, but rather that we do not get a reasonable use of the facilities that we have furnished for trolley transportation. What I mean is that we do not get a reasonable use of the tracks we have laid in some highways when it is important that we should have almost exclusive right of way for our cars in certain hours of the day. In many of these thoroughfares trucks and other slow-moving vehicles are allowed to take their way along the trolley tracks, thus holding up an immense amount of traffic and making it impossible to give anything like a satisfactory service. Much of this heavy traffic could, I am sure, be diverted to other streets in the hours of congestion without any great inconvenience to the drivers, but this cannot be done without the co-operation of the city authorities.

"In view of the city's rapid growth in population I do not think it would be wise to build any more new lines of elevated railroads. I feel that we must look to subways, not piecemeal subways here and there, but a comprehensive system of subways that will provide for all future increases in traffic."

Trolley Express in Massachusetts.

The Boston & Worcester Street Railway has finally secured the necessary authority to carry freight and express matter over its line from Boston to Worcester, Mass., although it has not yet made arrangements for terminal facilities. Every city and town on the line has granted the local permits, Newton, Marlboro, Wellesley, Natick, Framingham, Westboro, Shrewsbury, Northboro, Southboro and Hudson, and the Massachusetts railroad commission has given its approval. Special cars are all ready to handle the traffic but the service has not yet been started for lack of terminal arrangements. President James F. Shaw says:

"People all along our line are anxious for us to take up this kind of business at once. But it is practically useless for us to

attempt to do anything without some agreement with the Boston Elevated and the Worcester Consolidated for getting our express cars in and out of the two cities, between the points where our own line ends and the center of the business sections, where we could have the stations necessary for receiving and delivering freight and express matter. There is not business enough along the line outside to warrant us in beginning a freight and express service before we get an entrance to the terminal cities."

However that there is reason to believe that the difficulties may be obviated is shown in the following statement by Gen. W. A. Bancroft, president of the Boston Elevated Railway:

"Any representation that the Boston Elevated Railway Company looks with disfavor on a plan for carrying freight over certain of its lines is unwarranted. On the contrary, the company looks with favor on the general plan, and undoubtedly a scheme can be arranged by which freight can be handled and terminal facilities provided without undue interference with the transportation of passengers."

Reorganization of Brooklyn Rapid Transit Companies.

President E. W. Winter of the Brooklyn Rapid Transit Company on March 1 issued the following statement:

"In order that the supply of electrical power and the maintenance of track, overhead work and structures of the railroads embraced in the Brooklyn Rapid Transit system should be under a concentrated management, and therefore more economically administered for each of the railroad companies, those companies have contracted with the Transit Development Company (which already owns some of the principal power houses of the system) to furnish power and to take charge of the maintenance and repair of the railway properties, including their equipment.

"The Transit Development Company is incorporated under the business corporations law and is authorized to manufacture and sell power and to do general contracting work. All the stock of this company is owned by the Brooklyn Rapid Transit Company.

"Inasmuch as the court of appeals in its recent opinion sustaining the right of the Brooklyn Heights Railroad Company to charge a fare of 10 cents to Coney Island has decided that Article IV of the railroad law relates only to street surface railroad corporations and that different provisions of the railroad law govern elevated railroad corporations and steam surface railroad corporations, it has been decided to hereafter limit the functions of each railroad corporation embraced in the system to the operation of its own character of railroad. Under this plan hereafter the Brooklyn Union Elevated Railroad Company (an elevated railroad corporation) will operate the elevated railroad, the steam surface railroad corporations will operate railroads of that character and the street surface railroad corporation will operate street surface railroads only. In order to accomplish this reclassification the leases of the Brooklyn Union Elevated Railroad Company, the Sea Beach Railway Company and the South Brooklyn Railway Company to the Brooklyn Heights Railroad Company have been terminated and the lease of the Prospect Park & Coney Island Railway Company has been assigned to the South Brooklyn Railway Company. This arrangement will in no way interfere with the through operation of trains and cars as heretofore wherever thereby the convenience of the public will be subserved."

Three-Cent Fare Bill Fails to Pass Congress.—The bill providing for a 3-cent fare on all street railway lines in the District of Columbia was passed by the house of representatives on March 2, but was not considered in the senate.

Speed Limit Ordinance in Louisville.—An ordinance has been introduced into the Louisville, Ky., city council which makes it unlawful to operate street cars in the city at a speed greater than nine miles per hour. The penalty is from \$5 to \$100.

Street Railway Investigation in Toronto.—The Ontario Railway & Municipal Board is now conducting an investigation of the operating conditions of the Toronto Railway Company with a view to determining how the service may be improved and overcrowding prevented.

Block Signal System for Chautauqua Traction Company.—The Chautauqua Traction Company of Jamestown, N. Y., has recently completed the installation of an electric block system on its entire line from Jamestown to Chautauqua, N. Y. The first part of the line was so equipped several months ago.

Interurban Line Cannot Enter Over City Tracks Without Franchise.—The supreme court of Illinois has given a decision that the Aurora Elgin & Chicago Railway cannot permit the cars of the Joliet Plainfield & Aurora Railroad to enter the city of Aurora over its tracks, because the latter has no franchise from the city.

Ogden Rapid Transit Company Increases Wages.—The Ogden Rapid Transit Company has announced an increase in the wages of its employes. Apprentices and beginners will receive 20 cents an hour for the first six months and 22½ cents for the succeeding eighteen months. Regular conductors and motormen who have been in the service of the company for two years will receive 25 cents an hour.

Four-Cent Fares Discontinued.—General Manager J. H. Van Brunt of the St. Joseph (Mo.) Railway Light Heat & Power Company has announced that the company will discontinue the sale of 4-cent tickets. The company has for years been selling books of 100 tickets for \$4.00. The officials of the company state that the tickets were withdrawn because of a bill which has been favorably reported by both houses of the state legislature which would materially reduce the fare to be charged on the line to Lake Conroy, a resort owned by the company. Citizens of St.

Joseph are now circulating a petition to the legislature urging that the bill be defeated, as being unfavorable to the best interests of St. Joseph.

Demurrer by Metropolitan Company. The Metropolitan Street Railway Company of New York City has interposed a demurrer in the United States circuit court to the bill of complaint filed by Daniel W. Burrows of Chicago asking that the Interborough-Metropolitan merger be declared illegal and invalid.

Willow Grove Park.—George Wyncoop, Jr., superintendent of Willow Grove park, located on the lines of the Philadelphia Rapid Transit Company and owned by that company, announces that the park will be opened on May 25. Engagements have been made with Damrosch and the New York Symphony Orchestra, Arthur Pryor's Band, Victor Herbert's Orchestra and Sousa's Band to furnish the musical entertainments at the park for the coming season.

Guard Rail for New York Subway.—A new suggestion has been made by W. T. Lawrence for minimizing the disastrous effects of derailment on curves in the New York subway. The plan proposed is identical with that proposed by Mr. Martin some months ago. It consists of a metal band running along and attached to the supporting columns at about the height of the car windows, and rollers or wheels placed on the side of the car above the windows, which would engage with the band or rail, in case of derailment, and prevent the car from striking the posts and becoming seriously damaged.

Ordinance for Increased Service in St. Paul.—The board of aldermen of St. Paul, Minn., on March 5 passed an ordinance requiring the Twin City Rapid Transit Company to increase its service on the principal lines of the city by reducing the headway in several cases and by making changes in routes. The ordinance is the result of a report submitted by a joint committee of the two branches of the council, appointed to investigate the street railway service. The report of the committee stated that, after a thorough investigation of the subject, it had been found that the cars used by the Twin City Rapid Transit Company were excellent, well ventilated, well cared for and of the highest type of efficiency, but that the increase of service had not kept pace with the growth of the city. The committee reported that it had deemed it best not to enter at the present time into the question of reduced fares, transfers or extensions.

Ordinance to Prevent Overcrowding of Cars.—Mayor Thompson of Detroit, Mich., has submitted to the city council an ordinance limiting the number of passengers to be carried in a street car and making it obligatory on the street railway company to provide sufficient cars. Section 1 provides that: "Every person, firm or corporation operating cars upon the streets of the city of Detroit shall, between the hours of 5 o'clock a. m. and 8:30 o'clock a. m., and between the hours of 11:30 a. m. and 2:00 o'clock p. m., and between the hours of 4:30 o'clock p. m. and 6:30 o'clock p. m., Sundays excepted, provide a sufficient number of cars of sufficient capacity to accommodate and provide for the transportation of passengers, so that no car, in consequence of the failure to so provide, shall carry a greater number of passengers than the seating capacity of said car and one-half as many more: Provided, That it shall not be lawful for any car, when it is filled with passengers to or in excess of the number herein specified, to pass by without stopping for additional passengers, or decline to receive passengers, whenever so signaled, unless another car on said line and following in its rear is within a distance of 200 feet: and Provided further, That this section shall not apply on any line that is maintaining, continuously, during the time herein named, a service where the cars are 20 seconds apart." The ordinance further requires that in each car shall be posted a notice giving the seating capacity of the car. A penalty of \$100 is fixed for each violation.

Ordinance to Reduce Noise and Accidents.—Corporation Counsel T. E. Tarsney of Detroit, Mich., has drafted an ordinance to be submitted to the city council requiring that "all street cars in the city shall be equipped with fenders and wheel guards and that the running gear of cars shall be kept in a reasonably good condition of repair," the object being to reduce the noise of the cars and to prevent accidents. The combination fender and wheel guard is described in the ordinance, which reads as follows:

"That all persons, associations or corporations now or hereafter owning or operating street railways in the city of Detroit shall equip each and every car so operated with wheel guards, so constructed that the entire space between the body of said car, except the space across the rear of said car, and a distance of not more than 2½ inches from the level of the rail, shall be enclosed in a shield constructed of wood with proper fastenings of iron to attach said shield to said car. The forward end of said shield shall be so constructed that the sides thereof shall converge to a point not to exceed 45 degrees, said point to be covered with rubber or other substance to operate as a cushion thereon.

"At least 30 of the cars operated upon said street railway shall be equipped with wheel guards on or before the first of May, 1907, and all cars operated thereon shall be so equipped on or before January 1, 1908.

"Each and every street railway company so operating cars in the city of Detroit shall keep and maintain its tracks and the running gear of its cars in a reasonably good condition of repair and adjustment, and prevent, as far as practicable, noise and sound from the operation of said cars."

A fine of \$100 is prescribed for each violation. Mr. Tarsney states that the fender is one that is used by the Liverpool Corporation Tramways with excellent results, and that the device is not patented.

Construction News

FRANCHISES.

Asheville, N. C.—The Asheville Rapid Transit Company, recently incorporated, has secured a franchise to build an electric railway to Overlook Park on Sunset mountain, with an extension later to Weaverville, about 8 miles from Asheville. It is stated that the company contemplates extensive improvements at the park involving about \$25,000. Charles E. Van Bibber of Holden, Mass., and Thomas E. Rollins and John P. Arthur of Asheville are interested.

Buffalo, N. Y.—The International Railway Company has secured an additional grant of 25 years to its present franchise to build an extension of its Elmwood avenue line and to construct new lines in Franklin, Chippewa and other streets.

Chicago, Ill.—The Metropolitan West Side Elevated Railway has applied to the Cicero town board for a franchise to extend its road 2½ or 3 miles west from its present terminus at Fortieth avenue to Forty-ninth avenue, south in Forty-ninth avenue to Ogden avenue and west to the town limits. The grant is for 42 years in order that its expiration date may correspond with the existing franchises of the company.

Everett, Wash.—The Puget Sound Skyhomish & Eastern Railway, recently organized, has applied for a franchise to build an electric railway between Galena and Index, Wash., about 10 miles, and for telephone, telegraph, electric light and power lines in Snohomish county.

Johnstown, Pa.—Franchises have been granted to the Johnstown Terminal Street Railway and the Southern Cambria Railroad for a line in that city. A \$10,000 bond has been filed as a guarantee of the construction of the road.

Lincoln, Neb.—The Citizens' Railway Company has secured permission to construct a line from Twenty-Sixth and N streets east on N to Twenty-ninth street and north to Q street with a turnout switch between P and Q streets.

Natchez, Miss.—A ¾-mile extension of the Southern Light & Traction Company's line to the city and national cemetery over the cemetery road, which is under government control, has been authorized by congress.

Paris, Ill.—The Terre Haute & Western Railway of Paris is applying for a 20-year franchise.

Philadelphia, Pa.—The Philadelphia Rapid Transit Company has secured permission to build and operate an overhead trolley line along Second street from Erie to Tioga and along Amber street from Lehigh avenue to Huntingdon street. It will also lay a double track on Lehigh avenue from Second street to Richmond. The Wissahickon Electric Railway also has obtained permission to extend its tracks on Dupont, Baker and Gay streets.

Portland, Ore.—A 25-year franchise has been secured by the promoters of Rose City park for the construction of an electric line along the Sandy road from East Sixteenth street toward Columbia river, a distance of 2 miles. Track-laying is to begin at once in order that cars may be in operation to Rose City park by the middle of June. It is stated that \$500,000 will be expended on developing the park. Hartman & Thompson, Title Guarantee & Trust Company, Jacobs & Stein, T. B. Wilcox, W. F. Burrell, S. G. Reed, O. W. Taylor, F. I. Fuller, R. B. Miller, T. Richardson and A. B. Slausson of Portland and Dr. J. W. Harris of Eugene are interested in the project.

St. Louis, Mo.—A special committee of the city council which has under consideration the bill granting a franchise to the St. Louis Electric Terminal Railway, a corporation organized to secure terminal facilities in St. Louis for the Illinois Traction Company, on March 5 reported the bill adversely. The bill has been before the council in different committees for eight months and a few days ago the council instructed the committee to report at once. The reason given for the adverse report was that sufficient signatures of property-holders has not been obtained. It is believed that this difficulty can be remedied in time to pass the bill at the present session, as a majority of the council have expressed themselves favorably.

San Diego, Cal.—H. A. Howard has been granted a franchise for an electric railway in Pueblo avenue, Fillmore street, Wash and Scott avenue, Steiner street and Fairmount avenue. It is stated that construction work will commence immediately and be completed within four months.

San Jose, Cal.—The San Jose & Santa Clara Interurban Railway has been granted franchises for a comprehensive system of city lines in San Jose. C. C. Bluson, general manager.

Spokane, Wash.—A franchise granting the Spokane & Inland Empire Railroad the right to build its lines in certain streets and alleys of Spokane is under consideration by the city council. The franchise calls for a single-track freight and express electric line and it is stated that an arrangement has been made with the Spokane Traction Company to operate over its line a part of the way.

Tacoma, Wash.—The Tacoma Railway & Power Company has been granted a franchise for an electric line to Bismarck, Wash.

Youngstown, O.—The Mahoning & Shenango Railway & Light Company has applied for an extension of its present franchises

in Youngstown for a period of 11 years, agreeing to build several extensions and give 25 tickets for \$1.00 with universal transfers.

York, Pa.—The city council has granted to the York Street Railway franchises for about 6½ miles of city lines, taking the place of franchises previously granted with changes in routes.

RECENT INCORPORATIONS.

Bluffton Geneva & Celina Traction Company.—Incorporated in Indiana to build an electric railway from Bluffton, Ind., to Celina, O., capital stock \$100,000. Incorporators, R. F. Cummings, L. C. Justies, Samuel Bender and A. W. Brown, all of Bluffton, where the office of the company is located.

Burlington & Davenport Interurban Company.—Incorporated in Iowa to build an electric interurban line from Davenport to Burlington. Capital stock, \$250,000. The C. G. Hipwell Construction Company, which also has filed articles of incorporation, will conduct the construction work of the road and the interurban company will operate the line after its completion. C. G. Hipwell, Davenport, Ia., is interested in both companies.

Capital Traction Company.—Incorporated in California with \$100,000 capital stock. Incorporators: E. A. Phillips, J. J. Scriver, D. B. Edwards, J. W. Scott and G. E. Phillips of San Francisco.

Cleveland Southwestern & Columbus Railway.—Incorporated in Ohio as a consolidation of the Cleveland & Southwestern, the Cleveland Ashland & Mansfield and the Ohio Central Traction companies, with a capital of \$10,000,000. This gives the Pomeroy-Mandelbaum interests a direct route from Cleveland to Bucyrus by way of Wooster and Mansfield. From Bucyrus it is possible to reach Columbus over the Columbus Delaware & Marion line.

Columbia River Outlook & Northwestern Railway.—Incorporated in Washington to build from Vancouver to a point in or near Spokane, Wash. Capital stock \$3,000,000. Incorporators: W. McF. Stewart and M. C. Stewart, Outlook, Wash.

Derry & Goffs Falls Electric Railway.—Incorporated in New Hampshire to build an electric railway 8 miles long from Derry to Goffs Falls, where it will connect with the Goffs Falls Litchfield & Hudson Street Railway. Incorporators: Roswell Annis, James F. Cavanaugh and others of Manchester.

Frederick Interurban Railroad.—Incorporated in Maryland with a capital stock of \$1,000,000, to construct an electric railway connecting the towns of Frederick, Middletown and Jefferson. Incorporators: Emery L. Cobientz, Thomas H. Halley, Richard P. Ross, James E. Ingram, Jr., and Robert P. Graham.

Ocean Shore & Eastern Railway.—Incorporated in California to build a line from Santa Cruz to Watsonville, 20 miles. The line will be an extension of the Ocean Shore Railway and will pass through Soquel, Aptos and other towns in the Pajara fruit valley. It is said that surveys have been completed and that construction is to begin at once. Capital stock, \$3,000,000. Incorporators: J. Downey Harvey, president and general manager of the Ocean Shore Railway, San Francisco; J. A. Folger, Woodside; Charles Carpy, Charles C. Moore and B. Corbet.

Seashore Municipal Railroad.—Incorporated in New York to build and operate an electric railway from Hempstead, Nassau county, to East Rockaway, 5 miles. Capital, \$150,000. Incorporators: G. A. Green and M. H. Day, Brooklyn; R. M. Lamb, H. M. Olmstead, Jr., Freeport; H. M. Pratt, Julien Leadbeater, M. J. White of New York; H. D. Bristol, Rockville Center, N. Y.

Springfield, Ill.—Incorporation papers for a new electric interurban line from St. Elmo, Fayette county, to Springfield have been filed. The capital stock is \$5,000 and the headquarters will be at St. Elmo, Ill. The line will extend through Fayette, Shelby, Montgomery, Christian, Macoupin and Sangamon counties to Springfield. Incorporators: Presley M. Johnston, Heraldson L. Hunt, John W. Griswold, George W. Bledsoe and George T. Turner.

Susquehanna Railway Light & Power Company.—Incorporated in Connecticut with a capital of \$20,000,000. Incorporators: Lucius F. Robinson and John T. Robinson of Hartford and Albion B. Wilson.

Syracuse & Milford Railroad.—C. J. Reilly, superintendent of the Sandusky Portland Cement Company, Syracuse, Ind., writes that the above is the correct name of the road reported last week as the Wabab & Wawasee Railway, incorporated to build from Syracuse to Milford, Ind.

Terre Haute Indianapolis & Eastern Traction Company.—Incorporated as a holding company for all the traction lines between Indianapolis and Terre Haute, by the Indiana syndicate represented by Hugh J. McGowan of Indianapolis. The roads which are to be merged are the Indianapolis & Western, which runs to Brazil and Terre Haute; the Indianapolis Danville & Western, and the Indianapolis & Plainfield. It is stated that it is the intention of the company to connect with the interurban lines of Illinois at some future time. The company is capitalized at \$100,000. Robert I. Todd, president; Thomas B. McMath, vice-president; William S. Milholland, secretary and treasurer; Fletcher M. Durbin and R. E. A. Foley, directors.

Washington Spa Springs & Greta Railroad.—Incorporated in Maryland to construct a railroad commencing at the Maryland line and the District of Columbia at a point on the Baltimore and Washington turnpike near Bladensburg to Greta, which is near the junction of the Riverdale and Edmondston roads, motive power to be decided later. Capital stock, \$20,000. Incorporators:

James C. Rogers, Benjamin D. Stephens, Fillmore Beall, J. Enos Ray, Jr., and Marion Duckett, all of Prince Georges county.

Wisconsin Valley Electric Railway.—Incorporated in Wisconsin to build an interurban railway from Grand Rapids to Stevens Point, Wis., with an extension later to Wausau and Merrill. It is stated that the plans call for an expenditure of \$1,000,000. Capital stock, \$25,000, to be increased later. Incorporators: George A. Whiting, Neenah, Wis.; F. F. Whitecomb and George Lines, Milwaukee.

TRACK AND ROADWAY.

Benton Harbor-St. Joseph Railway & Light Company.—H. C. Mason, manager, Benton Harbor, Mich., writes that contracts are to be let April 1 for the construction of an extension from Benton Harbor to Paw Paw, Mich., 12 miles. Contracts are to be let for a steel bridge 400 feet long. Contractors are requested to correspond with the company. Seventy-pound rails have been purchased. C. K. Minary of Benton Harbor is president.

Boston Lowell & Lawrence Electric Railroad.—This company, which proposes to build an electric road from Boston to Lowell, Mass., is seeking legislation which will permit the construction of about 900 feet of elevated structure for the entrance into Lowell and about 1,300 feet more for the entrance into the Sullivan Square terminal in Boston.

Consolidated Railway (New Haven, Conn.)—It is reported that a line will be built this spring from Dayville through Attawaugan and Ballouville to Pineville, Conn.

Dallas Electric Interurban Railway.—The American Engineering Company of Indianapolis has nearly completed the surveys for the belt line around the city of Dallas, and it is expected that the surveyors will begin locating the line to Greenville early next week. It is the intention to put grading crews to work as fast as the route is located and to push the construction as rapidly as possible.

Defiance, O.—It is reported that A. L. Irish of Toledo and eastern capitalists are interested in a project for building an electric road from Defiance to Toledo via Napoleon, Liberty, Whitehouse, Waterville and Maumee. Surveys have been made and it is stated that prospects are bright for making the necessary financial arrangements.

Detroit Jackson & Chicago Railway.—Superintendent J. L. Millsbaugh, Ypsilanti, Mich., has announced that the Saline branch will be extended from Saline to Adrian, Mich., via Clinton and Tecumseh. The tracks of the Saline branch are to be relaid with heavier rails.

Detroit, Mich.—It is reported that the Westinghouse Electric & Manufacturing Company is making plans, specifications and estimates for the complete electrical construction and equipment of a road from Ft. Wayne, Ind., to Detroit, Mich., via Bryan, O., for C. M. Pierce of New York and others.

Georgia Railway & Electric Company.—The directors have approved the plans for the rebuilding and extension of several miles of city lines in Atlanta, Ga., and the construction of the line to Hapeville. Rails for this line have already been laid in Hapeville. The line will be built on a private right of way.

Grand Rapids & Kalamazoo Valley Traction Company.—President W. H. Patterson of Kalamazoo, Mich., has announced that the rails have been purchased for building the road from Kalamazoo to Otsego and that the work of tracklaying will begin as soon as the weather will permit. It is the intention to build the first part of the road before June 1 and to build on to Grand Rapids during the summer.

Idaho & Nevada Railroad.—W. D. Kenyon of Burley, Idaho, is one of the organizers of the above company, which proposes to build an electric railway from Burleigh to Oakley, 25 miles.

Illinois Traction Company.—Work is progressing rapidly on the Champaign-Decatur line. The first section, from Champaign to Monticello, was opened for operation about two weeks ago. Track has been laid into Sangamon from the east and poles are being distributed. From the Decatur end of the line track has been laid from the junction at Jasper street to the Swartz farm and poles are distributed. At present the contractors are putting in the timbers for the overhead crossing of the Wabash. Soon the only gap in the line will be at the Sangamon east of Decatur, where work on the bridge and the grading must be finished before cars can run into Decatur.

Indianapolis Coal Traction Company.—Work is now in progress on a large arch bridge over White Lick, west of Plainfield, Ind., on the extension to Amo.

Indianapolis Huntington Columbia City & Northwestern Railway.—M. V. Ryan of Syracuse, Ind., has the contract for building this line from Huntington to Goshen, Ind., 60 miles, which it is proposed to extend ultimately to connect Indianapolis and Goshen. Grading is completed from Wawasee Lake to Goshen, and tracklaying is to begin in a few days. D. L. Homer, Syracuse, Ind., chief engineer.

Iowa City-Davenport Traction Company.—Surveys have been completed and nearly all of the right of way has been secured for this proposed line from Iowa City to Davenport, Ia., via Springdale, Rochester, Sunbury, Maysville and Tipton.

Lafayette & Logansport Traction Company.—The work is progressing rapidly on this extension of the Ft. Wayne & Wabash

Valley Traction Company from Lafayette to Logansport, Ind. From a point half way between Delphi and Rockfield, the steel is laid to Logansport, and the road is being ballasted. The bridge over Rock creek will soon be completed. Painters are putting the finishing touches to the two bridges at Logansport. Rails are laid from one mile east of Colburn to Wild Cat creek and the roadbed is graveled. H. L. Weber, Ft. Wayne, Ind., chief engineer.

Lake View Traction Company.—H. E. Craft, vice-president, Memphis, Tenn., writes that construction will begin in about 60 days on this proposed line from Memphis, Tenn., to Clarksdale, Miss., a distance of 77 miles, of which 15 are in Tennessee and 62 in Mississippi. The entire route has been surveyed. R. F. Tate, 552 Randolph Building, Memphis, Tenn., is president.

Lewiston & Southeastern Electric Railway.—Judson Spofford, Lewiston, Idaho, vice-president and general manager, writes that this road will extend from Lewiston to Grangeville and Nez Perce, Idaho, 135 miles. The entire route has been surveyed and grading has been completed from Lewiston to Tameny, 6 miles. Grading is now in progress from Nez Perce to Dublin, 6 miles. There will be no large bridges and no tunnels on the line and no heavy grades. The road will handle a general freight, passenger, mail and express traffic, and 80-pound steel rails will be used. G. W. Thompson, president, and W. P. Wood, chief engineer, both of Lewiston, Idaho.

Lima, O.—It is reported that the Schoepf-McGowan syndicate, which owns the Indiana Columbus & Eastern Traction Company, has let a contract for building the line from Lima to Bellefontaine, O.

Louisville (Ky.) Railway.—Preparations have begun for the construction of an extension of the West Broadway line about ½ mile long.

Milwaukee Northern Railway.—The grading and bridge work is now completed from Port Washington to within a mile of the city limits of Milwaukee and steel is on the ground ready to be laid at once. As soon as this section is completed it is intended to build the line from Port Washington to Sheboygan. The Comstock-Heigh-Walker Company of Detroit has the contract. F. W. Walker, Port Washington, vice-president.

Nashville & Columbia Interurban Railway.—H. H. Mayberry of Franklin, Tenn., is president of this company, that proposes to build an electric railway from Nashville to Mt. Pleasant, Tenn., via Franklin and Columbia. It is stated that financial arrangements have been completed and that construction is to begin at once.

Nashville & Huntsville Railroad.—It is reported that a contract has been let to the American Construction Company for building this road from Nashville, Tenn., to Huntsville, Ala. Thomas M. Steger of Nashville is president.

Nashville Railway & Light Company.—Percy Warner, president and manager, Nashville, Tenn., has announced that the company proposes to expend \$1,000,000 in improvements, extending several lines and double-tracking others and building new transfer station. New rails are to be laid on many of the present lines.

New York Auburn & Lansing Railroad.—H. A. Clarke, chief engineer, Auburn, N. Y., writes that grading has been completed on this line from Auburn to Ithaca, N. Y., 37 miles. The road is chartered as a steam road but will be operated by electricity, using the third-rail system and three-phase transmission. Twenty miles of the road, from Auburn to Genoa, is now completed and freight and construction trains are operated. The Auburn Construction Company, Auburn, N. Y., has the contract. The power house, which is now under construction, will be equipped with two 800-kilowatt steam turbines. Two substations are also under construction. Connection for interchange of freight is made at Auburn with the New York Central & Hudson River and the Lehigh Valley Railroads. A. H. Flint, New York, president; B. M. Wilcox, Auburn, vice-president; B. Halladay, New York, secretary and treasurer.

Schuylkill Valley Traction Company.—This company has prepared plans for the extension from Ringing Rocks to Boyertown, Pa.

Scioto Valley Traction Company.—It is reported that the directors have decided upon the construction of an extension from Lancaster to Logan, O., and that work is to begin as soon as the weather is favorable.

Southern Pacific Company.—Orders have been placed for the electrical equipment of the present steam lines constituting the Alameda mole system in Alameda, Cal. The lines will diverge into three terminals, one at High street in Alameda, another at Fruitvale and a third at Fourteenth street in Oakland. A site for the power house has been purchased.

Sparta-Melrose Electric Railway & Power Company.—Mr. H. Teasdale, secretary, Sparta, Wis., writes that this company, recently incorporated, proposes to build an electric railway from Sparta to Melrose, Wis., 28 miles, passing through Angelo, Trout Falls, Cataract and Melrose; 18 miles of the line has been surveyed; grading is to begin this spring. The company is now securing the right of way and contracts will be let about April 1. George Cromwell, Sparta, Wis., is president.

Terre Haute, Ind.—C. M. Shedd of Indianapolis is reported to be interested in a project to build an electric line from Terre Haute to Charleston, Ind., via Marshall and Westfield.

Tacoma Railway & Power Company.—The South Tacoma line

between Hosmer Junction and Pine street is being double-tracked. This work will complete the double-tracking of the entire South Tacoma line, which will be used in connection with the new line to American Lake.

Toledo & Chicago Interurban Railway.—It is stated that this company is making preparations for the proposed extension from Kendallville west to Goshen, Ind. Surveys have been made and it is stated that work will begin early this spring. F. B. Perkins, general manager, Kendallville.

United Cities Traction Company.—This company is now building an electric railway for both freight and passenger service from Ft. Smith, Ark., to Ft. Smith, Okla., 4½ miles. The principal traffic of the road will be derived from handling freight from the Missouri Pacific, St. Louis & San Francisco, Kansas City Southern, Fort Smith & Western and Midland Valley railroads, which center in Ft. Smith, Ark. One mile out of Ft. Smith, Ark., has been graded and work will be pushed as soon as the right of way is secured. Contracts have been let; overhead construction will be of the span type; the rails will be of 80-pound steel for the first mile and a half and 60 pounds for the remainder; standard ties with 2-foot centers; maximum grade, 3 per cent. Ira L. Reeves, of Muskogee, I. T., is president.

Winona (Ind.) Interurban Railway.—This company has distributed along the right of way the ties, rails and poles necessary for the construction of the Peru extension. The work of building this line will be resumed as soon as weather conditions will permit. A Bullock 300-kilowatt rotary converter, which is to be used in furnishing current for this division, has recently been installed at the company's power house at Winona Lake.

Youngstown & Southern Railroad.—Grading has been completed on the extension from Columbiana to Leetonia, O., and the work of setting poles, stringing the wire and laying the track has been started.

POWER HOUSES AND SUBSTATIONS.

Alabama Railway & Power Company.—It is reported that this company is making a location survey for the construction of its power plant at Birmingham, Ala. C. L. Young of Dawson, Ala., is chief engineer.

Boston Elevated Railway.—It is reported that this company has just closed a contract with Allis-Chalmers Company, Milwaukee, Wis., through the Stone & Webster Engineering Corporation of Boston, for the largest engine type alternators ever constructed. These machines will be installed in the new extension of the Boston Elevated Railroad.

Huntsville (Ala.) Railway Light & Power Company.—It is reported that this company will spend between \$30,000 and \$40,000 for improvements to its power house. Some extensions amounting to 2 or 3 miles will also be made to the tracks of the company. Francis M. Lawton, Huntsville, Ala., is manager and purchasing agent.

Indianapolis Columbus & Southern Traction Company.—The breaking of a piston rod in the Edinburg power plant of the Indianapolis Columbus & Southern Traction Company at about nine o'clock March 3, 1907, caused considerable delay to its patrons, as five cars were stalled on the line some distance out of Taylorsville, and the company had to hire carriages to bring in the delayed passengers. The reason for the long shut down, which lasted all day, was that part of the auxiliary generating unit had been sent away for repairs, so that this was not available.

Indianapolis Newcastle & Toledo Electric Railway.—It is reported that work on the power house of this company is progressing favorably in spite of the unfavorable weather so far this season. This, it is said, will be one of the largest power houses in that part of the country.

Joplin (Mo.) & Pittsburg Electric Railroad.—It is reported that this company has been negotiating for the purchase of the power plant of the Consolidated Light Power & Ice Company of Joplin, Mo., with the intention of using the power from this plant for the operation of its new line. It is also reported that this company will purchase land for park purposes, which will probably be located at Grand Falls park on Shoal creek, which is said to be one of the most beautiful park locations in southwestern Missouri.

Little Rock Railway & Light Company.—This company announces that it will soon let a contract for a surface condenser, air pumps, etc., which will be used in connection with the 1,500-kw. Curtis turbine which is being installed in its power plant.

Mt. Vernon (Ohio) Electric Light & Railway Company.—The power plant of this company was partly destroyed by fire on the morning of March 2, 1907. The extent of the damage is said to be several thousand dollars. The indications are that the fire started from spontaneous combustion in the store room over the dynamo room.

Savannah Electric Company.—This company has found it necessary to increase the speed of its cars to prevent the congestion of traffic which has resulted from an unusually rapid increase in business. The increase in speed will be obtained by replacing all the old 30-inch wheels by new wheels 33 inches in diameter.

Southern Pacific Company.—This company has purchased an entire block lying west of Fruitvale avenue, Oakland, Cal., to be used for the erection of a large power house and car barns, in connection with the proposed electric lines which will supersede the local steam lines in Oakland and Alameda.

Personal Mention

Mr. H. C. Roome has been appointed manager of the Miami (Fla.) Electric Railway, succeeding Mr. T. H. Tatum, resigned.

Mr. Frank Eckerson, Pittsfield, Mass., has been appointed chief engineer of the Pittsfield Electric Street Railway, effective February 18.

Mr. E. R. McDowell, superintendent of the Ashtabula, O., Rapid Transit Company, has been promoted to general manager of that company.

Mr. W. T. Durfee of Decatur, Ill., has been appointed to the newly created position of traveling express auditor of the Illinois Traction System.

Mr. Harry Nye, of Dayton, O., has been appointed park manager of the Indiana Union Traction Company, in charge of the company's various amusement resorts.

Mr. James A. Robertson, who, for the past 25 years has served in various capacities with the Georgia Railway & Electric Company, has been appointed division superintendent of its south side lines.

Mr. A. A. Hoehn, formerly superintendent of the San Jose & Santa Clara (Cal.) Railway Company, has resigned to engage in other business. Mr. Hoehn will have no successor, the office having been abolished with his resignation.

Mr. J. White Sprong, purchasing agent of the Delaware & Hudson Company, Albany, N. Y., has had his jurisdiction extended over the recently consolidated United Traction and Hudson Valley lines and will assume his new duties at once.

Mr. James McCabe has been appointed division superintendent in charge of the Elizabeth lines of the Public Service Corporation of New Jersey, succeeding Mr. F. C. Southard. Mr. McCabe formerly was in charge of the turnpike line between Newark and Jersey City.

Mr. Charles Kline has been appointed general manager of the Enid (Okla.) and the Tulsa (Ind. Ter.) Street Railway companies. Mr. Kline goes to his present position from Piqua, O., where he has been train dispatcher for the Dayton Covington & Piqua Traction Company since it first began operations.

Mr. Joseph S. Wells, acting general manager of the Utah Light & Railway Company, Salt Lake City, Utah, has been appointed general manager. The office of assistant to the president, heretofore filled by Mr. F. L. Morse, whose resignation, as previously reported, took effect on March 1, has been abolished.

Mr. Axel Eckstrom, consulting electrical engineer for the Delaware & Hudson Company, assumed charge, on March 1, of all mechanical and electrical work of this company and will hereafter be known as general electrical and mechanical superintendent of the traction department. The extension of Mr. Eckstrom's jurisdiction is a step toward the more efficient organization of the steam and traction properties of this company.

Mr. W. H. Zimmerman has resigned as general manager of the DaKalb-Sycamore Electric Company to accept a similar position with the Michigan Power Company, at Lansing, Mich., in charge of a large amount of reconstruction work, which the Michigan Power Company expects to undertake in the near future in the way of constructing a new auxiliary steam plant and making further developments of the water power on the Grand river.

Mr. H. C. Prather of Newark, N. J., has been appointed superintendent of transportation of the Roanoke (Va.) Railway & Electric Company, a position recently created by the company on account of its rapid growth within the last two years, and will assume his duties at once. Mr. Prather's street railway experience extends over several years, including similar positions with the Springfield (Ill.), St. Louis (Mo.) and Paterson (N. J.) systems.

Mr. Bion J. Arnold, president of the Arnold Company of Chicago, has been retained by the city of Toronto, to interpret the conditions of the agreement between the municipality and the street railway company with regard to the operation of its lines. A difference of opinion as to the legality of certain regulations imposed by the city in connection with the existing franchise of the company has led to a misunderstanding and Mr. Arnold's advice on the subject has been sought by the city.

Mr. R. E. Hunt, formerly associated with the Williams traction interests at Augusta, Ga., and more recently superintendent of railways for the Norfolk & Portsmouth (Va.) Traction Company, has resigned his position, effective March 15, to become superintendent of railway service for the Utah Light & Railway Company, Salt Lake City. Mr. Hunt will occupy the position recently made vacant by the resignation of Mr. Walter P. Read, noted in the Electric Railway Review of January 12.

Mr. F. D. Hoffman, heretofore assistant secretary and treasurer of the Chicago City Railway, has been elected treasurer of that company, succeeding Mr. J. P. Burke, who has been elected assistant treasurer. Mr. Hoffman was born in Milwaukee on December 25, 1880, and began his street railway career in 1898 as messenger for the Milwaukee Electric Railway & Light Company. He was later secretary to Mr. T. E. Mitten, now president of the Chicago City Railway, and accompanied Mr. Mitten to Buffalo in 1901 when he was in charge of the Buffalo street railways during the Pan-American Exposition. In 1905 he became secretary to President H. J. Pierce of the International Railway of Buffalo and in

February, 1906, was made assistant secretary and treasurer of the Chicago City Railway.

Mr. W. T. McCaskey, formerly special agent of the Allis-Chalmers Company of Milwaukee, Wis., has been appointed general manager of the Indianapolis Newcastle & Toledo Electric Railway, which is building a new line from Indianapolis to Newcastle, Ind.

Mr. William J. Mullin, who recently was appointed general traffic manager of the Delaware & Hudson Company, on March 1 had his jurisdiction extended over the associated traction properties of this company, including the United Traction Company of Albany, and the Hudson Valley Railway of Glens Falls. It is stated that beginning on March 1 the officials of the passenger and freight traffic department will, in addition to their present duties, have entire supervision of the associated electric railway properties controlled by the company. This will extend the jurisdiction of Mr. Paul Wadsworth and Mr. J. W. Burdick, assistants to Mr. Mullin.

In the reorganization of the Brooklyn Rapid Transit Company, by which the leases of several of the subsidiary companies to the Brooklyn Heights Railroad Company have been terminated, effective on February 28, Mr. Henry Heibert has been elected president of the Brooklyn Union Elevated Railroad; Mr. J. G. Jenkins president of the Sea Beach Railroad; Mr. John E. Borne president of the Nassau Electric Company, and Mr. H. C. Duval president of the Brooklyn Queens County & Suburban Railroad and the Coney Island & Gravesend Railroad. Mr. Howard Abel has been appointed comptroller and Mr. G. D. Youmans general counsel of the South Brooklyn Railroad.

Mr. A. A. Anderson, whose appointment as general manager of the Indianapolis & Louisville Traction Company in addition to his present duties as general manager of the Indianapolis Columbus & Southern Traction Company was noted in last week's issue of the Electric Railway Review, brings to his new position the training born of long experience in street railway work. From 1878 to 1893, during its several changes in ownership, he served in various capacities with the City Railway Company of Indianapolis. In 1893 he accepted a position with the City Railway properties of Youngstown, O., where he remained nine years, during which time the Mahoning Valley interurban system was built. During a portion of 1903 he was connected with the Union Traction Company of Indiana. In 1904, at the solicitation of Mr. Charles L. Henry, he became connected with the Indianapolis & Cincinnati Traction Company, where he remained until his appointment as general manager of the Indianapolis Columbus & Southern in October of last year.

An official circular issued by the Utah Light & Railway Company, Salt Lake City, Utah, states that the office of chief engineer, heretofore held by Mr. O. A. Honnold, has been abolished. Mr. William Ashton, chief engineer of the Oregon Short Line, has been appointed consulting engineer. Mr. L. L. Dagrón, who has been connected with the engineering department of the Oregon Short Line, has been appointed engineer. He will have direct charge of all surveys, real estate, rights of way and records of same; construction, additions, betterments and maintenance of railway lines; dams, reservoirs, canals, pipe lines and buildings, and such other work as may be assigned to him by the general manager from time to time. Mr. O. A. Honnold has been appointed electrical engineer. He will have general charge of construction, maintenance and operation of electrical power plants; transmission lines and distributing systems pertaining thereto; also general charge of electric lighting and power distribution, and such other work as the general manager may assign to him from time to time.

Obituary.

Robert Edwin Jenkins, formerly president of the Metropolitan West Side Elevated Railway of Chicago, and a well-known lawyer, died at the Hahnemann hospital in Chicago on March 5, aged 61 years. He was born at Alexandria, Clark county, Mo., in 1846 and came to Chicago in 1866, where he received his legal education. He has held several important public positions. For a number of years he was chairman of the Chicago Bar Association; he also was vice-president of the Chicago Citizens' Association, was one of the organizers of the Union League Club and was the author of the present jury commission system in Cook county.

David Plume, formerly first vice-president of the Connecticut Railway & Lighting Company, Waterbury, Conn., died recently. Mr. Plume was well known in street railway circles through his connection for many years with the railway interests of Waterbury. He was one of the original owners of the old horse-car system of that city and later, before its consolidation with the Connecticut Railway & Lighting Company, was president of the Waterbury Traction Company. He has been identified in various capacities with a number of manufacturing and commercial enterprises in Connecticut and at the time of his death was president of the Colonial Trust Company and the Thomaston National Bank, and treasurer of the Plume & Atwood Manufacturing Company and the American Ring Company. He also was a director in a number of corporations.

The Scioto Valley Traction Company has taken a case to the Ohio supreme court in which it will test the constitutionality of an ordinance passed by the council of Circleville, O., which creates police jurisdiction in compelling the traction company to stop its cars at all street crossings in the town. Alvin Townsend, a conductor on the Scioto Valley, was arrested under the ordinance for not stopping his car at all street intersections and was fined. The common pleas court of the county decided against the traction company.

Financial News

Amherst & Sunderland Street Railway, Amherst, Mass.—An offer has been made for the \$120,000 capital stock of this company and it is announced that the directors and principal stockholders will recommend that the offer be accepted by all shareholders.

Buffalo & Lake Erie Traction Company.—This company has applied to the railroad commissioners of New York for authority to increase the capital stock from \$6,750,000 to \$7,500,000. The proceeds will be used to acquire the stock of the Jamestown Chautauqua & Lake Erie Railway Company, which is now a steam road. The Jamestown Chautauqua & Lake Erie lines run from Jamestown to Westfield, Mayville to Chautauqua, and Clifton to Falconer, N. Y., a total of 37.39 miles.

Chicago & Milwaukee Electric Railroad.—A. C. Frost, the president of the company, in a letter to the Western Trust and Savings Bank of Chicago regarding \$2,000,000 notes, which were mentioned in last week's issue of the Electric Railway Review, gives the following information regarding the company:

"The Chicago & Milwaukee electric railroad is double-tracked throughout. The route is practically an air line between Chicago and Milwaukee, having a maximum of 0.4 per cent grade and a maximum of 1 degree curve. All abutments and culverts are of concrete, built for four tracks. The company has no railroad grade crossings except two, which are provided with modern interlockers. All other railroad crossings have been separated by going over or under them and many of the important highways and streets are crossed by means of subways. All bridges are of steel on concrete abutments and have a carrying capacity of 100,000-pound cars. Eighty-pound rails are laid on first quality white oak ties, 2-foot centers. The company has built 37 stations costing from \$1,000 to \$30,000 each, besides many shelters. The roadbed, power plant, substations and equipment are of the highest standard of electrical railroad construction, permitting, with safety, a speed of 60 to 70 miles per hour.

"The railroad is incorporated under the general railroad act of the state of Illinois and under the general railroad act of the state of Wisconsin. The company holds most satisfactory franchises, all but four being in perpetuity; all the franchises of the Wisconsin division are perpetual except for the entrance into Milwaukee, which is for 30 years. The entire right of way is owned in fee simple and is from 100 to 150 feet in width, allowing for the construction of additional tracks. The company has expended over \$2,000,000 for right of way, depot grounds and terminals.

"The property consists of two divisions—the Illinois division and the Wisconsin division, incorporated as separate corporations under the laws of Illinois and Wisconsin. The Wisconsin division, however, is leased to the Chicago & Milwaukee Electric Railroad Company (Illinois corporation) for a period of 50 years, and the Illinois corporation guarantees the principal and interest of the Wisconsin division bonds.

"The Illinois corporation owns that portion of the road from Evanston to Waukegan, which has been completed and in operation since 1900, and the branch from Lake Bluff to Rockfeller, which was completed and placed in operation in 1903—a total of 76 miles of main track. It connects at Evanston with the Chicago Union Traction system and the Evanston branch of the Chicago Milwaukee & St. Paul railway. Arrangements have been made for a connection with the Northwestern Elevated, which will give us a direct entrance into the business center of Chicago. The Illinois corporation has a total bond issue of \$5,000,000 first-mortgage 5 per cent bonds.

"The Wisconsin division begins at the junction of the main line of the Illinois division and its Libertyville branch and extends north through Waukegan, Kenosha and Racine, and a number of small towns between these cities, to Milwaukee, a distance of 55 miles. The road is now completed to a point within 15 miles of Milwaukee and will be completed and in operation into Milwaukee by September 1, 1907. The Wisconsin corporation has an authorized bond issue of \$10,000,000, of which \$7,000,000 will have been issued when the road is completed into Milwaukee. The remaining \$3,000,000 are reserved for building branches from the main line west from Waukegan to Fox Lake, and from Kenosha west to Lake Geneva. These extensions will develop an enormous passenger business in the summer and a large ice traffic in the winter.

"We have freight connections with the Elgin Joliet & Eastern (outer belt line of Chicago), which is a medium of connection with every trunk line radiating from Chicago, and with the Wisconsin Central. Although freight has only been handled by the company during the last two years, the freight business has already assumed considered proportions and there is every prospect of a very large increase in our freight business during the next few years.

"On December 1, 1906, the company entered into a contract with the United States Express Company for operating its express business over this company's lines, from which we are assured a profit of at least \$25,000 for this year.

"The company has made a contract with the Racine Stone Company, whose quarries and plant are located three miles north of Racine, for hauling its entire product of about 1,000 cubic yards of crushed stone per day. This contract assures us a profit of \$75,000 this year.

"The company owns extensive gravel beds at Libertyville and near Kenosha. This gravel is used in large quantities for road making. The company can deliver this gravel on its cars anywhere along its line for 30 cents per cubic yard, including the cost of loading, and receives \$1.00 per cubic yard for it.

Cleveland Southwestern & Columbus Railway.—This company

has been formed to acquire the properties of the Cleveland & Southwestern Traction Company, the Cleveland Ashland & Mansfield Traction Company and the Ohio Central Traction Company. Stockholders of these three companies have approved the plan for combination, and the shareholders in the new company will meet on April 21 to organize. The new company will have \$7,500,000 common stock and \$2,500,000 preferred stock. A bond issue of \$10,000,000 is authorized. Of this amount \$3,110,000 will be held to retire Cleveland & Southwestern bonds, and \$400,000 to retire Ohio Central bonds. In exchange for Cleveland & Southwestern preferred stock the new company will offer \$200,000 bonds, \$2,000,000 preferred and \$200,000 common stock; and for Cleveland & Southwestern common stock \$3,000,000 of the new common stock will be given. For Cleveland Ashland & Mansfield bonds the new company will give \$1,000,000 bonds and \$1,000,000 common stock. Holders of Ohio Central preferred stock will receive \$400,000 new preferred; and the holders of the common will receive \$500,000 new common. For the immediate needs of the combined property \$290,000 in bonds will be used. The proceeds from \$5,000,000 in bonds, \$100,000 preferred stock and \$2,300,000 common stock will be used from time to time in acquiring or building other lines and in the making of improvements.

Connecticut Railway & Lighting Company.—The Commercial & Financial Chronicle publishes the following authoritative statement: "The company's property has been leased to the Consolidated Railway Company for 999 years from August 1, 1906. The payment of the rental has been guaranteed by the New York New Haven & Hartford Railroad Company. The lessee pay taxes and a cash rental amounting to \$975,000 for the year 1906-07, increasing gradually to \$1,400,000 for the year 1914-15 and for every year thereafter. Out of this amount must be paid fixed charges, consisting of bond interest and sinking fund amounting to \$673,882 annually. Under the lease no further bonds are to be issued by the Connecticut Railway & Lighting Company. The holders of the stock of the company have ratified the execution of this lease. The common shareholders have agreed to pay to the Colonial Trust Company, trustee, \$10 per share on either stock; while the preferred shareholders have agreed hereafter, and during the term of the lease, to accept 4 per cent dividends per annum in place of 5 per cent. The above payment of \$10 per share on common stock, added to the surplus rentals received under the lease, will provide a fund sufficient to pay dividends at the rate of 4 per cent on the preferred stock from August 1, 1906, and dividends at the rate of 4 per cent on the common stock from August 1, 1907, which the agreement provides shall be so applied. The present certificates are to be exchanged for new certificates on which will be endorsed the above stipulations."

Havana (Cuba) Electric Railway.—At a meeting of stockholders in Jersey City on March 6, a reorganization of this company was effected whereby the following were elected directors: Warren Bicknell of Cleveland; David T. Davis; Robert Mather, vice-president of the Rock Island Company; Walter G. Oakman of the Guaranty Trust Company of New York; James Rattray, Samuel San Miguel, Henry Runken, Carlos Zaldo and Frank Steinhart. The last four are of Havana.

Indiana Union Traction Company, Anderson, Ind.—At the annual meeting of stockholders on March 5, the following directors were elected: Randall Morgan, J. Levering Jones and I. H. Kingston of Philadelphia, Pa.; W. Kelsey and Jacob Schoepf, Cincinnati, O.; Hugh McGowan, Indianapolis; George F. McCulloch, Muncie, and Arthur Brady, Anderson. Officers were elected as follows: President, Phillip Matter, Marion; vice-president, E. C. Carpenter, Anderson; secretary and treasurer, W. C. Sampson, Anderson.

Louisville (Ky.) Traction Company.—A meeting of stockholders will be held on April 13 to vote on a proposition to authorize an increase in the common stock from \$12,000,000 to \$15,000,000. The new stock will be issued as capital for improvements is required.

Metropolitan West Side Elevated Railway, Chicago.—During the fiscal year ended February 28 gross earnings, according to an officer of the company, were about \$2,546,000. The total number of fares collected was 50,935,060, as compared with 46,186,753 in the previous year. The daily average number of passengers carried was 139,548, an increase of 13,008, equal to 10.28 per cent, over the preceding year.

St. Louis & Suburban.—The number of directors of this company, which is controlled by the United Railways Company of St. Louis, was reduced at the annual meeting of stockholders on February 26, from fifteen to five. The following were elected: John I. Beggs, C. H. Huttig, Robert McCulloch, Richard McCulloch and Frank R. Henry. Most of the stock of the St. Louis & Interurban is held in a voting trust and it was voted by the trustees, who are: Julius S. Walsh, Breckinridge Jones, C. Marquard Forster, Benjamin Altheimer and Samuel Kennard.

Union Railway Company of New York City.—In the year ended December 31, 1906 the gross earnings were \$1,566,871, as compared with \$1,420,990, an increase of \$145,881. The earnings compare as follows:

	1906	1905	1904
Gross	\$1,566,871	\$1,420,990	\$1,367,633
Expenses	1,049,129	1,067,825	977,328
Net	\$517,742	\$353,165	\$390,305
Other income	76,120	49,683	30,888
Total income	\$593,862	\$402,848	\$421,193
Charges	351,440	302,573	300,131
Surplus	\$242,422	\$100,275	\$121,062

Manufactures and Supplies

ROLLING STOCK.

Charleston & Summerville Electric Railway, Charleston, S. C., is figuring on 8 cars.

Erie Cambridge Union & Corry Railway, Erie, Pa., has purchased 8 interurban cars.

San Jose & Los Gatos Interurban Railway, San Jose, Cal., has ordered 3 interurban cars.

Columbus Newark & Zanesville Electric Railway, Newark, O., is figuring on five 28-foot cars.

Columbus Delaware & Marion Railway, Columbus, O., is about to place an order for a special funeral car.

Grand Rapids Railway, Grand Rapids, Mich., has ordered 10 cars from the G. C. Kuhlman Car Company.

Columbus Magnetic Springs & Northern Railway, Delaware, O., is considering the purchase of a number of new cars.

Nashville Railway & Light Company, Nashville, Tenn., has placed an order for 30 new double-truck cars for August delivery.

Ft. Dodge Des Moines & Southern Electric Railway, Boone, Ia., has purchased 11 interurban cars from the Niles Car & Manufacturing Company.

Northern Electric Company, Chico, Cal., has just placed an order for 50 standard box cars of 80,000 pounds capacity with the American Car & Foundry Company.

Elmira Water Light & Railroad, Elmira, N. Y., has purchased 6 cars from the G. C. Kuhlman Car Company, 4 of which are closed cars for city service and two 15-bench open cars for interurban service.

Austin Electric Railway, Austin, Tex., has placed an order with the Southern Car Company for four 10-bench open cars to be equipped with GE-54 motors. The company expects to have these cars in service in April.

Brooklyn Rapid Transit Company, Brooklyn, N. Y., recently reported in the market for 200 cars, has placed an order for 100 surface cars with the J. G. Brill Company and is reported to have ordered the 100 elevated cars from the St. Louis Car Company.

Manchester Street Railway, Manchester, N. H., has placed an order with the Laconia Car Company for 6 new cars to be used on the new Manchester and Nashua line. The cars will be 46 feet in length and of the same type as those now in operation on that line.

American Railways Company, Philadelphia, placed an order some time ago with the Jewett Car Company for 10 double-truck cars for the Peoples Railway Company, Dayton, O., and 4 of the same type for the Springfield Street Railway, Springfield, O., to be used for city service.

Oregon Electric Railway, Portland, Ore., as reported in our issue of February 23, has placed an order for 8 motor cars with the Jewett Car Company and 2 electric locomotives with the General Electric Company. The order was placed through W. S. Barstow & Co., New York and Portland.

Winona Interurban Railway, Winona Lake, Ind., has placed an order for 6 interurban cars which will be duplicates of the cars described and illustrated in the Electric Railway Review for November, 1906. Four cars of the same type which were ordered last year will be delivered within the next 10 days.

Ferrocarril Electrico de Lerdo a Torreon, Gomez Palacio, Mex., has just placed an order with the J. G. Brill Company for 11 cars as follows: Two 35-foot 12-bench open motor cars, two 30-foot closed motor cars, all to be equipped with GE-80 motors; also four 30-foot 8-bench trailers and three 21-foot trailer gondola cars, delivery on all to be made before May 20, 1907.

Denver & Interurban Railway, Denver, Colo., on February 25, placed an order for 8 semi-convertible cars, with the Woeber Brothers Carriage Works, Denver. These cars are to be 40 feet long over all, equipped with four 40-horsepower motors, have vestibuled platforms, seating capacity of 40 passengers and will be operated on the new Ft. Collins city lines which this company is now building.

York Street Railway, York, Pa., has recently purchased 5 cars, 2 of which are of the Pullman type, 47 feet in length over all, and 3 single-truck cars for city service, 20 feet long over corner posts. These cars will be mounted on Standard Motor trucks of the 0-50 type city and suburban high speed double-trucks and of the C-35 type single trucks and will be equipped with Westinghouse 101-B motors. The company is also about to order 5 cars for its new Hanover and York line.

Denver & Interurban Railway, Denver, Colo., is making preliminary designs for new high-speed interurban cars. The new equipments will weigh about 46 tons each and will be operated by four 125-horsepower single-phase motors. The car bodies will be of the steam-coach type, both straight passenger and combination, 55 feet long over all and 10 feet wide over all. The combination cars will have baggage compartments 8 feet long and

both types will have forward cabs 5 feet long. The straight passenger cars will seat 64 passengers.

Chicago South Bend & Northern Indiana Railway, South Bend, Ind., has placed an order for 10 interurban cars. They will be 62 feet in length, equipped with four 75-horsepower motors, and will have baggage compartment, smoking compartment and lavatories.

Washington Baltimore & Annapolis Electric Railway, Washington, D. C., has just placed an order with the Niles Car & Manufacturing Company for 25 cars. Nineteen of the cars are 60 feet in length of the passenger type; four are combination passenger and baggage cars, 54 feet in length and two are of the express and locomotive switching type cars and 54 feet long. The cars will be geared to 75 m.p.h. and will be equipped with GE A-603-A motors and Baldwin trucks of the 90-40 class.

Texarkana Gas & Electric Company, Texarkana, Ark.-Tex., placed an order about the first of January with the J. G. Brill Company for 3 semi-convertible cars, 2 of which have 20-foot bodies, equipped with Brill 21-E trucks, 2 GE-54 motors and 1 double truck car equipped with 4 GE-54 motors and National Brake & Electric brakes. This car is 41 feet in length over all. The company has also purchased 5 National Brake & Electric Company's equipments and one 2 GE-54 motor equipment.

Omaha & Council Bluffs Street Railway, Omaha, Neb., as reported in the Electric Railway Review of March 2, has placed an order with the American Car Company for 30 closed all-wood passenger cars with a seating capacity of 34 persons and 5 closed cars with a seating capacity of 44 persons. They will have the following dimensions:

Five Cars.

Length of body.....	34 ft.	Width, inside.....	7 ft. 6 in.
Over vestibule.....	45 ft.	Over all.....	8 ft. 3 in.
Over all.....	46 ft. 6 in.	Height, inside.....	8 ft. 2 1/4 in.
		Sill to trolley base	9 ft. 1 in.

Thirty Cars.

Length of body.....	28 ft.	Width, inside.....	7 ft. 6 in.
Over vestibule.....	39 ft.	Over all.....	8 ft. 4 in.
Over all.....	40 ft. 6 in.	Height, inside.....	8 ft. 2 1/4 in.
		Sill to trolley base	9 ft. 1 in.
		Body and underframe	Wood

Consolidated Railway Company, New Haven, Conn., has placed the following orders for new equipment with the Wason Manufacturing Company to be distributed among its several lines as follows: For the New Haven Line, twenty 15-bench open cars to be equipped with Taylor trucks, 2 GE-87 motors, Christensen air brakes and Sterling-Meaker No. 5 registers; also three cars, 36 feet in length and 44 feet over all, for trolley express purposes to be equipped with heavy Taylor trucks, 4 GE-87 motors and Christensen air brakes; for the Hartford Street Railway, 20 15-bench open cars to be equipped with Taylor trucks, 2 GE-87 motors, Christensen air brakes and New Haven Recording registers; for the New London Street Railway, four 15-bench open cars to be equipped with Taylor trucks, 4 GE-80 motors, Sterling-Meaker No. 5 registers, and Christensen air brakes; for the New England Investment & Security Company's lines as follows: Berkshire Street Railway, ten 14-bench vestibule open cars to be equipped with Standard Motor trucks, 4 GE-87 motors, Christensen air brakes and New Haven-Philadelphia type registers; for the Springfield Street Railway, ten 14-bench vestibule open cars, equipped with Standard Motor trucks, 4 GE-80 motors, Christensen air brakes and Sterling-Meaker No. 5 registers; for the New York & Stamford Street Railway, eleven 15-bench open cars equipped with Taylor trucks, 2 GE-87 motors, Christensen air brakes and Sterling-Meaker No. 5 registers. All of these cars will be equipped with the Crouse-Hinds arc headlights. The company also expects to order a lot of closed cars within the next few days.

SHOPS AND BUILDINGS.

Exeter Hampton & Amesbury Street Railway.—One of the car barns at Hampton, Mass., was burned the night of March 1, destroying a considerable amount of rolling stock. The estimated loss is \$50,000.

Ft. Dodge Des Moines & Southern Electric Railway.—The work on the car barn at Boone, Ia., is said to be progressing rapidly. J. F. Ivis has the contract.

Georgia Railway & Electric Company.—The directors have authorized the construction of new car barns and repair shops at Atlanta, Ga. Both buildings will be fireproof, of brick and steel construction. The barns will have a capacity of 60 cars. The shops will include blacksmith, machine and carpenter shops and a planing mill.

Hannibal Street Railway & Electric Company.—It is reported that this company has decided to build a concrete car house at Hannibal, Mo.

Illinois Traction Company.—It is reported that a large tract of land has been purchased in the suburbs of Decatur, Ill., on which to erect a large car house and shops.

Indianapolis Coal Traction Company.—Work has been begun on the construction of a new station in Plainfield, Ind. It will be of brick and stone, of artistic design and equipped with all modern conveniences.

Meridian Light & Railway Company.—The directors at a recent meeting decided to build new car barns at Meridian, Miss., with a capacity of 80 cars. A. B. Paterson, manager.

Roanoke Railway & Electric Company.—This company will

close contracts within the next few days for four 500-horsepower water tube boilers for its new power plant. Most of the equipment has been purchased, including one 1,500-kilowatt and two 500-kilowatt Curtis generators, two 500-kilowatt rotary converters and other machinery.

Toledo Railways & Light Company.—This company is reported to be negotiating for the purchase of land in the vicinity of Riverside Park, Toledo, O., on which to erect a car house with accommodations for 100 cars. The company now has four car houses in the city, but their capacity is being outgrown and it is expected that they will be enlarged or abandoned and new ones built with a capacity for 400 or 500 cars.

United Railway & Electric Company.—This company has acquired land on North avenue east of Patterson Park avenue, Baltimore, on which to erect a car barn. The company has plans for building nine car barns, three of which are now under construction.

United Traction Company.—It is reported that this company will soon begin the erection of a car barn at Rensselaer, N. Y. E. S. Fassett, general manager, Albany, N. Y.

Washington Baltimore & Annapolis Electric Railway.—Bids are being requested for the construction of a one-story car-repair shop, 84 by 257 feet, at Academy Junction, Md., after plans prepared by the Roberts & Abbott Company of Cleveland. It is reported that the Engineering Contracting Company, Baltimore, Md., is estimating on the construction. The office of the Washington Baltimore & Annapolis is at 801 Maryland Trust building, Baltimore.

Winona (Ind.) Interurban Railway.—This company will soon begin the construction of a new building 56 by 60 feet in floor area for a carpenter and a paint shop. The building is to be located immediately back of the present shops at Winona Lake and is to be equipped with all tools necessary for use in car building. The excavation has been started and part of the building material is now on the ground.

TRADE NOTES.

W. S. Barstow & Co., New York, have recently opened a branch office at Montreal, Que., in the Bank of Ottawa building, which will be in charge of Robert S. Strangland.

Col. Homer J. Lindsay, assistant to the president of the Carnegie Steel Company died at his home in East Pittsburg on March 5 of Bright's disease. He was 47 years of age.

Columbia Brake Shoe & Foundry Company, Cincinnati, O., is the new name of the Columbia Foundry Company. The company manufactures brake shoes for steam and electric cars.

American Conduit Company, manufacturer of bituminized fiber conduit, has moved its New York office to 140 Nassau street, where it will be more centrally located and will have larger office facilities.

R. L. Rand, who has recently resigned as manager of the Ft. Smith (Ark.) Light & Traction Company, has accepted a position with H. M. Bylesby & Co., Chicago, owners of the Ft. Smith plant.

Nathan Shute, formerly salesman for the Crouse-Hinds Company, has accepted a similar position with the Ohio Brass Company of Mansfield, O., and will be connected with the New York office of that company.

Stuart-Howland Company of Boston has been appointed the New England representative of the Kalamazoo Railway Supply Company of Kalamazoo, Mich., and will carry a stock of Moore track drills, track tools and jacks.

Sherwin-Williams Company is having plans prepared by Eames & Young, Lincoln Trust building, St. Louis, for a 3-story warehouse, 64 by 110 feet, to be located at Second and Clinton streets, in that city. It is estimated to cost \$30,000.

W. J. Martin has been appointed manager of the Clark Electric Company of Detroit, Mich., recently organized to handle electrical supplies. Mr. Martin was formerly connected with the People's Telephone Company in that city.

Buffalo Railway Supply Company, Buffalo, N. Y., has been incorporated with an authorized capital stock of \$50,000 for the purpose of manufacturing railway equipment and supplies. The incorporators are: Henry D. Miles, Michael Sullivan, Harris T. Dunbar, all of Buffalo.

Hisey-Wolf Machine Company, Cincinnati, O., has increased its capital stock from \$20,000 to \$100,000. Plans are being considered for the erection of a new plant in Cincinnati that will provide for a large output of electric drills, grinders, etc., which are products of the company.

Arthur J. Arwine is one of the late additions to the sales force of the Ohio Brass Company of Mansfield, O. Mr. Arwine is connected with the company's new branch office recently established at 10 North Fourth street, St. Louis. He was previously connected with the sales department of the Dearborn Drug & Chemical Works of Chicago.

Cortright Metal Roofing Company, 50 North Twenty-third street, Philadelphia, is calling attention to an item in the Cortright Metal Shingle Advocate, a publication issued monthly in the interest of its product, which in turn calls attention to another publication issued by the company which it is believed will be of sufficient interest to every architect, builder, contractor, roofer, carpenter and home builder to warrant the trouble of a request

for a copy. The book contains illustrations of many of the finest buildings in America and will be sent free to anyone writing the Cortright company for it.

Charles I. Earll, Bowling Green building, New York, manufacturer of the Earll trolley retriever, reports an order from the San Paulo Light & Power Co., Limited, of Brazil, S. A., for 100 of its retrievers. These machines are now used on many of the largest electric railways in the United States and they are guaranteed unconditionally for one year.

New York Electric Controller Company, 21-27 New Chambers street, New York, manufacturer of motor starters and controllers, owing to its greatly increasing business will during the early part of April move its plant to 35-37 Rose street, where new and modern machinery will be installed which will increase the capacity of the plant and insure prompt delivery.

Rail Joint Company of Canada, Limited, has been organized and has taken over the patents and business of the Continuous Rail Joint Company of Canada, Limited. The headquarters of the company are at 216 Board of Trade building, Montreal, Can. The manufacture of its products in Canada has been commenced and the company is prepared to make prompt deliveries.

George Moses, for the past several years associated with the mechanical department of the Southern Railway, has accepted a position as traveling representative with J. B. Sipe & Co., Allegheny, Pa. For the present Mr. Moses will make his headquarters in Washington, D. C., and handle the sale of Japan oils manufactured by this company in the eastern southern states.

Independent Pneumatic Tool Company, Chicago, has received a large order for its "Thor" piston air drills and pneumatic hammers from the Wisconsin Engine Company of Corliss, Wis. It is stated that this company, after testing and experimenting with many different makes of pneumatic tools, decided to place its order for "Thor" air tools, on account of their great efficiency and durability.

Carbolineum Wood Preserving Company, New York, has secured the services of Henry Grinnell, late forest inspector of the United States Department of Agriculture, who has taken charge of the wood preserving experiments carried on by the department under Mr. Crawford. Mr. Grinnell will give special attention to the preservation of poles and mining timbers and will have his headquarters at Washington, D. C.

General Purchasing Company is a recently incorporated organization with offices at 525 The Rookery, Chicago. The business of the company consists mainly in cashing the daily sales of manufacturers and jobbers whose active capital would otherwise be tied up in accounts due some time in the future. The purpose of this arrangement is to enable a company with a growing business to realize daily on the output at no greater expense than would be incurred by allowing the customer the usual discount for payment on shipment. This plan is in use more or less extensively in the east and the General Purchasing Company is now introducing it in the west.

Curtis Motor Truck Company has been incorporated in Illinois with an authorized capital stock of \$250,000 by Edmond A. Curtis, John P. Drennan, Arthur O. Bolen, James D. Johnson and Charles C. Leforge. The company is organized for the purpose of manufacturing and selling the patented motor trucks which have been invented by Edmond A. Curtis and proposes to acquire by purchases all of the patents covering his designs in the United States, Canada and Great Britain. The officers of the company will be as follows: J. P. Drennan, president; A. O. Bolen, vice-president; James D. Johnson, secretary and treasurer; E. A. Curtis, general superintendent. The incorporators are most of them citizens of Decatur, Ill., and it is proposed to establish at that point a plant which will have a capacity of about 15 trucks per day, with a total value per annum of about \$750,000.

ADVERTISING LITERATURE.

Western Electrical Instrument Company, Waverly Park, Newark, N. J.—A new instrument, the Western electroplaters' voltmeter, Model 131, is the subject of bulletin No. 7 issued by this company.

Allis-Chalmers Company, Milwaukee, Wis.—Bulletin No. 1050 is a 20-page publication describing alternating-current generators of the water-wheel type. The generators are described in the usual manner as to general construction, armature, field or rotor, excitation, rating, voltage, etc., with divisions under the various heads for the consideration of particular features.

United States Engineering Company, Philadelphia, Pa.—A catalogue describing and illustrating the Nachod automatic signal for electric railways has been issued. This system is intended for use on single-track roads, wherever it is necessary to converge them for a distance into single-track, as may be occasioned by tunnels, bridges or narrow streets, where cars run in both directions.

Electric Service Supplies Company, Philadelphia, Pa.—"Garton-Daniels Lightning Arresters" is the title of a substantial catalogue issued in the interests of the Garton-Daniels Department of the Electric Service Supplies Company. The publication covers in an unusually complete manner the matter of lightning arresters, detailed descriptions being presented of the various types and prices being quoted.

Kinnear Manufacturing Company, Columbus, Ohio.—The problem of a suitable door for car barns is one deserving the attention of all those interested in the proper protection and mainte-

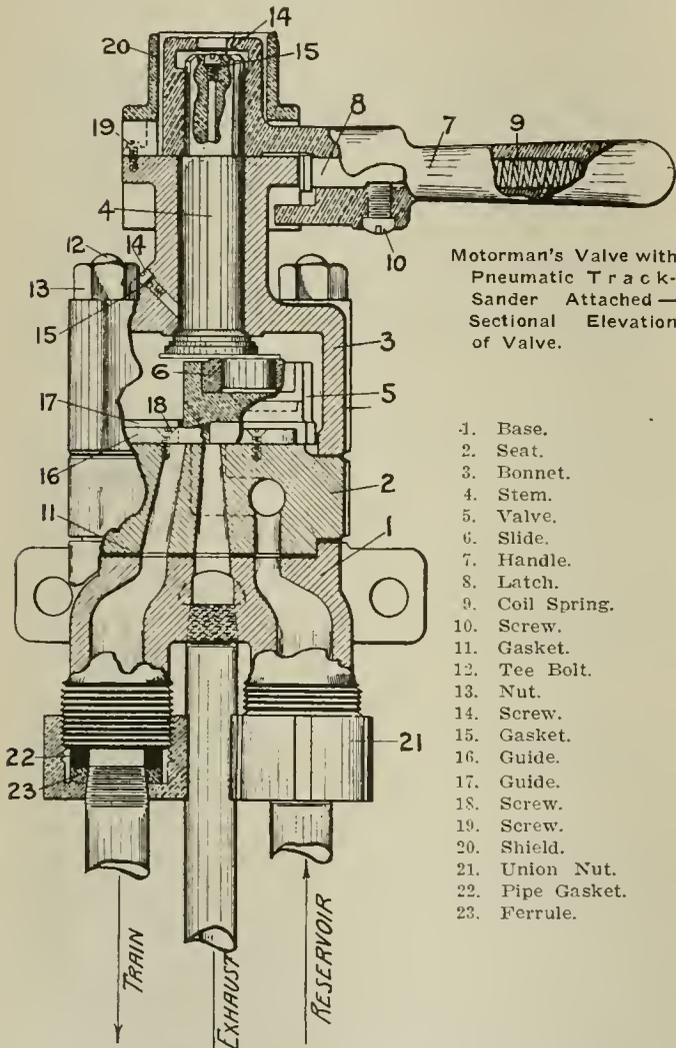
nance of equipment and property, particularly in climates where there is a wide range of temperature during different seasons of the year. The Kinneer Manufacturing Company has published a pamphlet giving exclusive consideration to this subject and calling attention to the efficacy of its steel rolling doors for this service.

Charles I. Earll, 11 Broadway, New York.—A very complete catalogue describes and illustrates the Earll trolley retrievers and catchers which prevent damage, accidents and delays when the trolley jumps from the wire, and relieve conductors of the necessity of watching the trolley. The instant the trolley jumps a wire the retriever automatically pulls it down from two to four feet and holds it until the conductor replaces it. In addition to giving a general description of the retriever the catalogue describes in detail the various parts.

National Association of Manufacturers of the United States of America, 170 Broadway, New York, N. Y.—This association is organized for the purpose of affording its members facilities for procuring personal service in the nature of news service, advice in legal matters, and advertising, trade marks, reports on various matters such as foreign matters and foreign credit, customs tariff, etc. The organization is a mutual one for the promotion of the industrial interests and commerce of the United States, the betterment of relations between employers and employes and the encouragement of the business and financial interests of its members at home and abroad.

A MOTORMAN'S VALVE WITH PNEUMATIC TRACK-SANDER ATTACHED.

There is probably no other invention of modern times that has contributed so largely to the safe operation of high-speed cars as the modern airbrake. The airbrake of the present day, which is suit-



able for the highest speeds, has been developed by gradual improvements extending over many years. The handbrake and the mechanical friction brake have been superseded by it entirely for high-speed work as such devices are entirely inadequate. The requirements of a perfect high-speed airbrake are not only that it will be able to bring the car to a stop in case of danger but that it shall accomplish that act without undue inconvenience to the passengers or excessive wear and tear on the mechanical equipment of the car, such for instance as is caused by the wheels skidding. Further, the valve which controls the air supply to the brake must be so constructed that even the motorman of only medium in-

telligence will be able to accomplish these results and still feel confident that the stops will be made in the required distance. A feature which is of the greatest importance in securing the proper operation of the brake, assuring the greatest possible negative acceleration of the car and at the same time preventing the wheels from skidding, which results in those much dreaded flats, is the proper sanding of the track. This can be accomplished in the most economical way by an air track-sanding valve which is fitted to the motorman's valve such as is manufactured by the National Brake & Electric Company of Milwaukee, Wis.

The arrangement of the track-sanding valve directly above the motorman's brake valve, as shown in one of the accompanying



Motorman's Valve with Pneumatic Track-sander Attached—
Elevation.

illustrations, permits the motorman to apply sand to the track exactly when it is needed, and thus it will be evident that besides assuring a positive smooth stop, it also prevents the extravagance and wasteful use of sand which it is impossible to avoid with the older form of track-sanding devices. Though this feature may at first appear of little importance, the element of cost is the least important to be considered, for many times a most serious accident may be avoided if sand is available to assist the brakes, and it is well known to all railroad men that many serious accidents in the past have resulted from a lack of sand at the critical moment.

A sectional view of the National Brake & Electric Company's motorman's valve is also shown herewith. The essential parts of the brake may be followed in order by the numbers upon the diagram and in the accompanying table.

The base, valve seat and bonnet are made of cast iron, and the remainder of the valve with the exception of the tee bolts, is made of a high-class bronze. All the parts have been so designed and constructed as to withstand the maximum of wear and tear and the rough handling to which they are inevitably subjected. For the same reason a common flat slide valve was decided upon to control the various port openings. This valve, which is constructed of bronze, working on a scraped cast-iron seat, it is stated, will work satisfactorily with but one oiling and without any perceptible wear for more than 150,000 applications of the brake. Further, the pressure on the valve is so adjusted that as the valve and seat wear they will always form a perfectly air-tight seat, so that planing and scraping are very seldom necessary. Occasionally, depending upon the severity of the service, it will, however, be necessary to take the valve apart, clean it thoroughly with gasoline and oil it before reassembling to assure satisfactory operation.

A quiet, easy stop, even in the hands of medium class motormen, is obtained by the construction of the train service force, part of which is formed in the shape of a V so that a graduated application and release of the brakes is easily obtained. The lap position of the motorman's handle and the other positions of application are located the same as on most airbrakes. In many of them important and desirable features will be noted by careful examination of the illustrations presented herewith.

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The municipal ownership fad takes on curious phases under the peculiar conditions of various efforts at local application.

Philadelphia, which once had a municipal gas plant of which even Professor Bemis wrote that the city officers "mismanaged the works and used the offices under it as rewards for party services," is now offered

by Mayor Weaver a scheme for the resumption of the works. His idea is to raise capital by "popular subscription" and to divide profits between the city and the subscribers until the capital-cost is made up. The idea of getting users to advance the purchase money and then to reimburse themselves out of the profits on their own gas bills is certainly unique. If the citizens of Philadelphia have forgotten their experience with this same gas works they ought to turn to the report of the Committee of One Hundred, which, in referring to the investigation of the works, says: "At the outset (of the investigation) difficulties were encountered which only yielded to the persistent efforts of counsel. Little was known of this trust. (The gas works was managed by a board known as the City Gas Trust.) Its meetings for years had been held in secret, while its published annual report to the councils was confused and unintelligible, and, as now appears by the evidence, actually falsified. The visible results of the management of the trustees had been the sale of gas at a high price to Philadelphia consumers without realizing an adequate profit to the city. The vast purchases of supplies, made at excessive prices from favored parties, without competition or advertisement (in some instances from the trustees themselves, in violation of the ordinance), the disbursement of enormous sums annually for these purchases in checks drawn to bearer, the frequent failure to produce any record of the supplies having been received or the work performed, the admission that, not content with paying bills rendered, the employes in some cases habitually made out the bills themselves, make some of the general features of the management of this municipal trust as appearing in the very voluminous testimony." Before Philadelphians decide that their former experience was ex-

ceptionally unfortunate and that they might do better with the next experiment, they might reflect upon the recent report of Allen W. Thurman on the Columbus, O., municipal electric lighting plant. In this report Mr. Thurman says: "So far as we have gone in the investigation of the municipal light plant, we are convinced that the manner of conducting the plant, from the highest to the lowest officials, verges on criminal negligence." If municipal ownership is desirable, or can be made desirable, some one should produce at least one American instance in which it has proved, on a large scale, at least a moderate success.

The 10-years' struggle between the city administration of Chicago and the traction companies has at last reached a crisis. The present campaign for the election of city officers, unlike its predecessors for 10 years, is not based on an elusive hope of traction settlement, but is founded on a definite issue, which is the approval or rejection by voters of ordinances which will be accepted by the companies. Those who have lived in Chicago or who have followed its history closely in the last decade have seen the city ruled by mayors who, in pre-election promises, have agreed to settle the problem. Carter H. Harrison secured office on a traction settlement platform in four successive elections. After he had been mayor for eight years he was followed in 1905 by E. F. Dunne, who is the unwilling instrument through which the question has been brought to the present important point. Now, for the first time in 10 years the traction portion of the campaign is something besides a politician's mere catch-word. Although the republican candidate approves the ordinances without qualification and the democratic nominee stands for their rejection and for municipal ownership, public-spirited citizens have taken steps to emphasize strongly that the approval of the ordinances is a vital, non-partisan question. Thus, while the candidates are diametrically opposed on the only real issue of the election, an independent campaign has been undertaken for the ordi-

nances. In the history of the struggle which is now fast approaching culmination, there are interwoven broken promises of city executives, losses of investors, the revelation of a municipal ownership craze, and eventual public indifference. The city is now aroused to the need of action. Thoughtful people will recognize that the companies, made desperate by long years of contest and negotiation, have made most liberal concessions in a final effort to secure a settlement. But if the ordinances were less favorable to the city, even then a settlement would be better for the public than the perpetual retention of the traction question for the uses of politicians.

The tendency toward higher speeds in both interurban and suburban service calls for high-class mechanical work in the erection of trolley wire and rather close inspection of the wire in service if annoying breakages are to be avoided. In fact, the original wire must be of good quality to begin with, free from scales and flaws.

Permanent Trolley Construction. and of high conductivity. The practice of putting up trolley wire under the stress of emergency construction without even a superficial examination of its quality is responsible for a good many troublesome subsequent interruptions of the schedules, and often these occur at times when the traffic is heaviest. Whether round or grooved trolley wire is the better for high speed and even moderate speed service is a question upon which opinions differ. On a prominent interurban line in the east operating about 75 miles of track recent experience is unfavorable to the use of grooved copper, and round wire is being substituted in every break. The grooved trolley in this case shows nicks and flaws on careful examination, and all the recent breakages have been at those weak spots or else near the ends of the suspension ears. The question is raised whether grooved wire can be drawn with the same perfection of texture as round copper, and it is undoubtedly true that the strain on the thinner section of the wire near its center is liable to be serious if the alignment and sag of the line are not just right for the conditions. In the above case it is probable that the whole line will be restrung with round copper inside of a year or two. The maximum speed of the cars is about 45 miles per hour on this line, and practically all the wear of the trolley is in one direction, as the road is double tracked. Experience has shown in general trolley practice that a flexible suspension of the hanger and ear, the use of long tapering ears and overhead switches and frogs with gradual approaches and recessions from the center are more favorable to continuous service and more reasonable wear than short ears and frogs with relatively stiff ends. The point is to avoid sudden changes in the direction of the wire as the trolley wheel runs over it; otherwise wear and possibly heavy arching develop or aggravate weak spots in the wire at the points of defective suspension. Undue wear also comes from excessive sag. Constant watchfulness of the way the wheels take suspected spots is essential, and in some cases the use of frequent expansion ears and the occasional taking up of slack in the trolley itself will be found helpful.

The practicability of an electric railway company building its own cars is well illustrated at Colorado Springs, Colo.

Practicability of Home-Built Rolling Stock. After continued experimenting with several makes of rolling stock built in different sections of the east, the Colorado Springs & Interurban Railway Company has, during the past two or three years, undertaken the construction of all of its own cars. There are several reasons given for adopting this course. It has been found in practically all the Rocky mountain cities that woods that may have been ever so thoroughly seasoned in localities having lower altitudes and higher percentages of humidity, will shrink

and warp after a few months' service in the Rocky mountain climate. Also, like other progressive properties, the Colorado Springs company has its own methods for installing control and lighting wiring and for placing the various other "fixtures" of a car. It is thought that better economy can be had in the long run when this work is done locally, since inspection may then be more thorough, and the men who equip a car are the ones who are also responsible for its maintenance. Familiarity with detail car construction is considered a factor tending greatly to reduce repair costs. Probably the most important reason for the Colorado Springs company building its own cars is because it can thus get a good, serviceable car, suited to local weather and traffic conditions for less money than such a car could be purchased in the east and shipped west. The excessively heavy tourist traffic of the electric road, lasting about five months each year, demands a more complete working organization than would ordinarily be required and for this reason a well-organized shop force is available for car building during seven months of the year, thus making the labor item, when all other things are considered, an extraordinarily small one.

SWITCHBOARD MAINTENANCE.

The increasing relative cost of switchboard apparatus in power plants justifies more thorough inspection on the part of attendants than at present obtains in many installations. There is a feeling in some quarters that if a switchboard is blown out every day with compressed air and the instruments wiped with a dust cloth, nothing further in the way of inspection need be done until something goes wrong.

There are more moving parts on a modern switchboard than one would at first suppose, and a certain amount of attention is an essential of continuous reliable service. In addition to the indicating and recording instruments there are time limit relays, circuit breaker controls, oil switch mechanisms and other contacts to look after, while the possibility of overheated parts of switches and coils is always present. Oil switches in operation should be inspected for overheating at least three times a day during the heaviest part of the load, and the binding posts of potential transformers, regulators and instruments should be looked after every two or three weeks with an eye to their becoming loose.

The oil tanks on oil switches ought to be dropped certainly once in three months and the contacts carefully examined to locate any broken or bent springs, burned contacts or loose connections. When these contacts are cleaned with a file or in any way where there is a chance of personal connection with the wiring system, the utmost care is essential that current should be cut off and high-potential contacts avoided. Knife switches for simple disconnecting work are worth many times their cost.

The solenoid equipment of time-limit relays are often neglected for long periods. The adjustment of these devices should be tested every two or three months and the contacts cleaned with the finest sandpaper or emery cloth. There is a tendency sometimes to forget that these relays are delicate apparatus. The adjustment of spring tension to hold contact pieces in place and the varnishing of solenoid plungers need to be carefully done. No little trouble can arise by careless varnishing of plungers so that they stick in one position and do not respond to the load variations above normal. Another point likely to be neglected is the care of the leather diaphragm on the relay bellows. This should be dressed with neatsfoot oil every two or three months to prevent it from becoming stiff and hard. Lightning arresters should always be examined and placed in condition after a storm; rheostat contact points, fixed and movable, carbon brakes and copper feeder and switch jaws all need regular inspection just as much as commutators, brushes and bearings.

Instrument calibration is of less importance on a rail-

way switchboard than in a central station selling current to individual consumers, but it would seem wise to check up the voltmeters and recording wattmeters at least once a year, and if possible to make an annual calibration check of the other instruments. The cost of power cannot be properly determined with recording wattmeters of inferior accuracy.

All these little details of operation are important factors in securing reliable service, and in some plants it will pay to reduce them to the compass of printed and framed rules.

AN ECONOMICAL SHOP LAYOUT.

The new Nashville shops which were described in the *Electric Railway Review* of March 2, 1907, illustrate in a marked degree the tendency of the times toward economical administration in the maintenance department of street railways. Breadth of outlook in repair work is one of the most essential factors in successful railway operation, for the increasing weight, power and ornamental attractiveness of modern rolling stock demand highly organized treatment in the preservation of regular service and prevention of breakdowns. The central location of the shops with respect to the business district tends to reduce dead mileage at night and morning and to shorten the time during which cars with minor defects remain out of service.

The Nashville shops are unique in their adoption of the direct-connected motor drive in both machine and wood-working departments. Group driving from one or two motors has been such a common practice heretofore that the advantages of subdividing the shop motive power have generally been overlooked. The character of work done in the street railway repair shop is so varied in its scope, so entirely different from the regular and uniform production of the ordinary manufacturing plant, that the individual drive should be exceptionally valuable on account of its elasticity. In repair shop practice the different machines are seldom operated continuously for any great length of time, so that there ought to be a considerable saving in power; if any part of the shop has to be run overtime, it can be done without the least difficulty, and the elimination of belts and shafting counts strongly in favor of increased compactness of installation and enlarged facilities of natural lighting. The tool can be brought to the work when necessary and the increased amount of head-room should afford the utmost facility in handling armatures, wheels, axles and other parts. In many repair shops the arrangement of tools has developed along circumstantial lines, without much regard to the sequence of operations, and in some cases the belts and shafting prohibit the mechanical handling of heavy work by an overhead crane or traveling hoist. With the direct electric drive the expansion of the shop work can be as easily handled as the production of the first installation; and if experience proves that the location of any special tool is not the best, the electric wiring problem is so simple that matters can be rectified at very slight expense. This is frequently impossible with the group system of driving.

The amount of power used in the machine shop, 51.5 horsepower in total rating, taken in conjunction with the size of the machine tools, shows that the shops should be able to undertake even heavier work than the simple maintenance jobs if necessary. In striking boldly into the field of individual driving the company has done well to avoid using too small sizes of 600-volt motors for single machines. It is as yet difficult to build very small motors for reliable service at this potential, and it was undoubtedly a wise step to group the smaller tools, such as emery wheels, grinders, backsaws, etc., for operation by a 5-horsepower motor. The first cost of motors specially designed for shop driving with individual speed control is naturally a considerable item, but when the reduced expense of operation, the lessened amount of shafting and the possibility of more rapid production by speed

adjustment are taken into account, the installation expense shrinks in importance. The use of induction motors in the carpenter shop reduces the fire hazard so materially that there ought to be a distinct reduction in insurance rates on account of their installation. The relatively large amount of power consumed by the wood-working tools is of interest, judging by the total rating of 110 horsepower, and the benefits of the individual drive in this department ought to be even greater than in the machine shop.

Other features of the Nashville installation which make for economy and which can readily be availed of in other situations are the provision for manufacturing spare parts when desirable, the use of a traveling crane over the shop pits, the saving of waste oil in the pumping room, plans for electrically hoisting the armatures to the winding room, drainage of pits and unification of car equipment. Reduction of idle movement of stock, the loading of machines with work against times of emergency material consumption, the storage of cars over pits to facilitate right inspection and the protection of expensive rolling stock by fireproof housing all commend themselves to the close observer of car house and shop design.

DOUBLE-SECONDARY TRANSFORMERS.

A relatively new departure in transformer design will be found on another page of this issue in the description of the Litchfield substation of the new Manchester and Nashua electric line. The use of multiple-voltage primary and secondary stops has been common practice for some years in the design and operation of large power transformers, but the construction of transformers with double secondary windings for the separate operation of independent rotary converters on the low-tension alternating-current side of the substation is something of a novelty.

The frequency of the system in point was necessarily 60 cycles on account of the supply of the power from long-established plants carrying a heavy lighting service. The parallel operation of 60-cycle rotary converters in sizes of 300-kilowatt is, of course, perfectly practicable at the present time, but from some points of view there is greater assurance of reliable service if the alternating-current sides of such machines can be operated separately. The use of a separate secondary for each of the two rotaries in the station permits applied voltage adjustments upon either or both machines with practically no reflex action, and enables a wide range of service conditions to be met by simple double-throw switches on the main board.

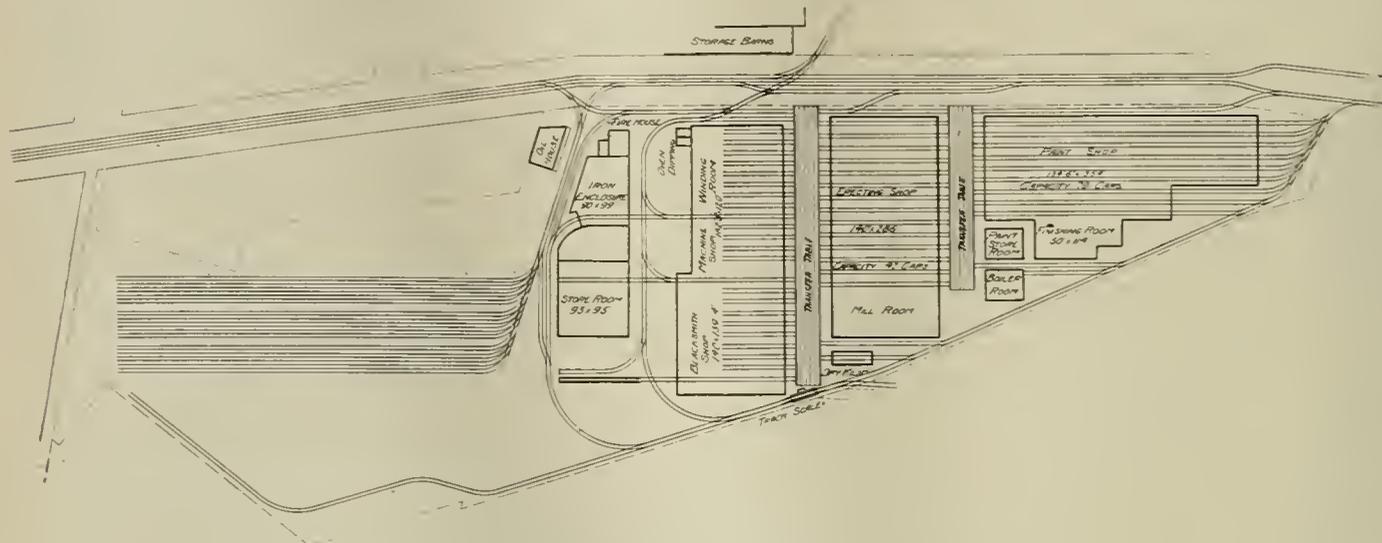
Off-hand it would seem as though a slight sacrifice in transformer efficiency would be the price of double-secondary isolation, but this is probably too small to carry much weight. In a substation likely to be extended by the addition of considerable new equipment, there is some question if the attempt to segregate machines in the above way would not defeat its own ends by reducing the general flexibility of the plant. There is undoubtedly a practical limit to the amount of independent winding which is permissible on a transformer, for the requirements of moderate first cost and high efficiency are difficult to meet in proportion to the multiplication of separate coils. In a small substation, however, flexibility of operation on a common set of busbars is an important factor in the reliability of service, and the actual convenience of being able to adjust the voltage independently on the alternating-current sides of two rotaries running smoothly in parallel on the direct-current busbars may work out to be a valuable insurance against operating troubles. The experience of plants equipped in this way will be worth watching. It is certainly a great convenience to be able to set the circuits for an alternating-current potential of 396, 376 or 360 volts without the laborious task of unbolting terminals and trying to manipulate stiff and unwieldy cables in the narrow space beneath the transformer case.

SHOPS OF THE NORTH JERSEY DIVISION OF THE PUBLIC SERVICE CORPORATION.

The North Jersey Division of the Public Service Corporation of New Jersey has a total mileage of 550 miles and includes the following street railway properties: The North Jersey Street Railway Company, the Jersey City Hoboken & Paterson Street Railway Company, the Elizabeth Plain-

overhauling of the entire division are done at the Plank Road shops.

The company has auxiliary or light overhauling shops on the North Jersey Division at five points, as follows: The Montgomery Street shop at Jersey City, the Market and Jersey Street shop at Paterson, the Angelque and Clinton Street shop at West Hoboken, the Milltown shop at Milltown and the Dunellen shop at Lincoln. Each of these auxil-



North Jersey Shops—General Layout.

field & Central Jersey Street Railway Company, the Elizabeth & Raritan River Street Railway Company, the Orange and Passaic Valley Street Railway Company, the South Orange & Maplewood Traction Company and the Bergen Turnpike Company.

The mechanical department of these lines is in charge of Charles Remelius, general superintendent of rolling equipment, with headquarters at the Plank Road shops, the main shops of the system. These shops, which constitute one of

ary shops is available for light repairs needed by cars operating in its vicinity. The only work performed outside of the Plank Road shops and the auxiliary shops is the inspection, oiling and trivial repairs performed at terminals. We present herewith a diagram showing the relative sizes and location of the main repair shops and auxiliary overhauling shops, and also a diagram showing the organization of the mechanical department of the North Jersey division.

The total number of cars operated by the foregoing prop-



North Jersey Shops—General Exterior View of Shop Buildings.

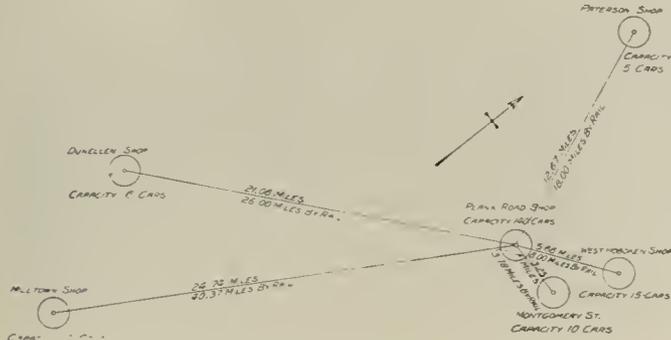
the largest and best equipped plants for shop work and car house storage to be found on any street railway system in the country, are located on the eastern outskirts of Newark. The shops formerly consisted of a machine shop 190 by 120 feet. This has been remodeled and greatly enlarged and a large erecting shop, paint shop, auxiliary buildings and car storage barns have been added. The plant has been in service since June of last year. All the heavy repairs and

erties and subject to the supervision of the mechanical department in the shops mentioned is approximately 2,000 cars. Since the amalgamation of the properties 600 new double-truck cars have been purchased and 150 are under construction. The equipment represents almost every imaginable variety on account of the corporation having been made up of so many different companies, but the aim of the department is to standardize equipment as rapidly as practicable

and this has been effected in a remarkable degree in the time the organization has been in existence, that is, since June, 1903. The standard car which the company has adopted for general use is the city and interurban car of the 1600 type. The principal dimensions of this car are as follows: Length over all, 42 feet 8 inches; length of body, 30 feet; width, 8 feet 4 inches. The car has seats for 42 passengers. Among the standard devices adopted are the center bell-ringing device, the Detroit fender and platform, etc.

Plank Road Shops.

The general layout of the Plank Road Shops and car houses presented herewith shows the convenient relation of



North Jersey Shops—Diagram Showing Location of Shops.

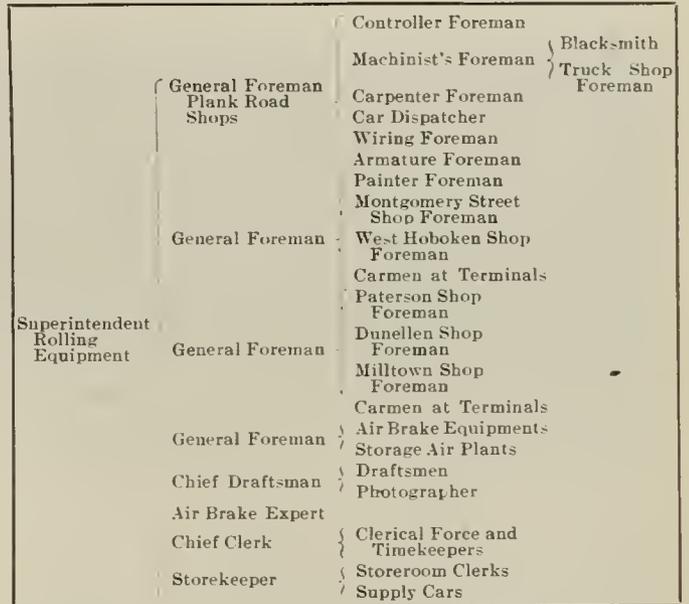
the three main buildings—the machine shop and blacksmith shop building, the erecting shop with a capacity of 42 cars and the paint shop with a capacity of 70 cars, which buildings are served by two transfer tables. The front elevation of the shops is on Ferry street and on the other side of this street is located the car house, built in five bays with a capacity of 150 cars.

The entire property devoted to shop purposes is fenced in. On the front, along Ferry street, is an iron fence seven feet high, with three-quarter inch pickets set diagonally and supported by three rails, having posts set in concrete every seven feet. There are four track entrances which necessitate

ings is equipped with a time clock and a careful record is kept of the hours of service of all employees.

Machine Shop.

The machine shop is reached from the outside through a front entrance and a stairway leading to the balcony, in the forward portion of which are located the offices of the superintendent of rolling equipment. Here is also the drafting



North Jersey Shops—Diagram Showing Organization of Mechanical Department.

room and the office of the chief clerk of the department. There is a private inter-communicating telephone system so that the superintendent can call up from his office the foreman of any particular department and issue orders, or go into detail with regard to any particular situation. There is also a dining room and kitchen on the balcony of the ma-



North Jersey Shops—General View Interior of Machine Shop.

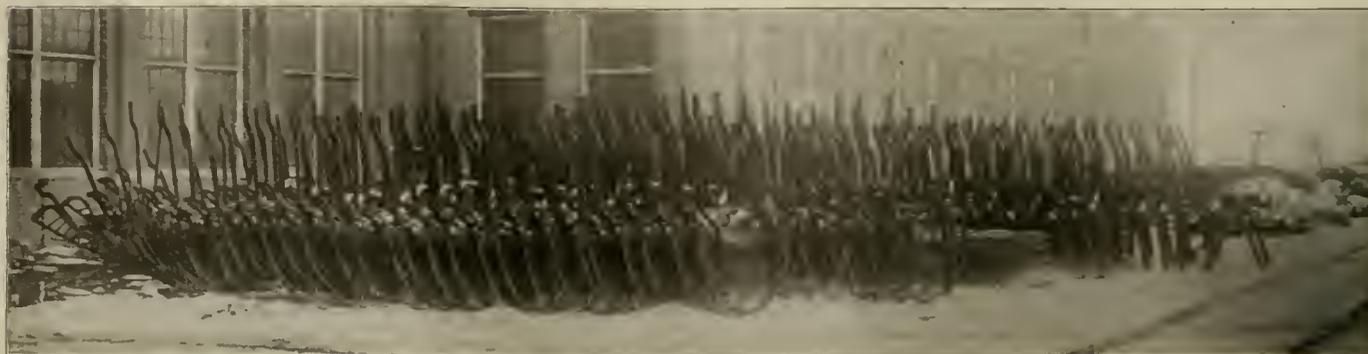
openings as wide as 50 feet and these have sliding gates. These gates are among the largest of the type that have been erected. Care is taken that no one is allowed to enter or leave the property, except through the small gate at the watchman's house, and through this entrance the workmen pass to and from their duties in the various buildings. These fences complete with the gates were built by the E. T. Barnum Iron Company, Detroit. Each one of these build-

ings is equipped with a time clock and a careful record is kept of the hours of service of all employees. The machine shop is reached from the outside through a front entrance and a stairway leading to the balcony, in the forward portion of which are located the offices of the superintendent of rolling equipment. Here is also the drafting

lighting effect in the machine shop attracts attention at once. A skylight 25 feet wide runs the entire length of the room, and this, in addition to the windows on the side under and above the balcony, makes the place almost as light as if it were in the open. We present herewith a general view of one side of the interior of the shop taken from the balcony and looking toward the armature-banding and field-winding machines.

The first floor of the shop is reached from the balcony

that they may be served by self-supporting cranes that are placed between each pair of pits. The cranes were especially designed by the company. The cranes consist of an 8-inch pipe, that serves as a revolving mast, held in place by a base casting. The mast revolves on ball bearings placed in a casting bolted to the floor. The jib of the crane is made up of two 6-inch channel irons and trussed with $\frac{7}{8}$ -inch rods. The channel irons are placed 15 inches apart, allowing a movement of the carriage that supports a 6 inch by 5 foot



North Jersey Shops—Fenders Piled Adjacent to Blacksmith Shop.

by means of an elevator in the front of the building. The east side of the building on the first floor is taken up with the overhauling pits. Each pit is equipped with a special car hoist, of which a view is presented herewith. This hoist is made up principally of four jackscrews driven by a motor in the forward end of the pit. This motor has an extended shaft with two miter gears on each end to mesh into miter gears that attach to two longitudinal shafts that run parallel with the pit and under the floor. The longitudinal shaft is arranged with worms that drive the worm gears, which operate the jackscrews. The motors used in these pits are old ones, taken from discarded cars, and are of the Westinghouse 12A type. When the pit is clear the jackscrews are always down so that the I-beams that are placed on top and

air cylinder and piston. The crane revolves very easily and operates on loads readily with the air. The pressure used on all of the shop tools is maintained at about 90 pounds by the compressor plant, which consists of a twin electrically-driven set. The compressors were installed by the National Electric Company and have a capacity of 100 cubic feet.

No traveling crane system is used in the shop, the latter having been laid out so that the cranes at the head of the pits handle the heavy work on and off from the trucks. The heavy parts are taken through the shop by small especially designed trucks, that are pulled along the floor. It is believed that this is the more economical practice for the reason that when a traveling crane is in service for one purpose, other work is compelled to wait, whereas by the sys-



North Jersey Shops—Car Repair Pit with Body Hoist.

which are intended to support the car bodies rest directly on the cement floor. About two minutes are required to raise a car body from its trucks and the hoists are very reliable and definite in their action. They appear to have considerable advantage over the overhead hoist on account of being out of the way and taking up little room. In the bottom of each pit is a track of 3-foot gauge, upon which an air-operated pit jack is placed. This pit jack may be moved the length of the pit on its trucks and is so built that it may be shifted transversely.

When the car body is raised the trucks are run out so



North Jersey Shops—Drop Pit with Wheel Grinding Apparatus.

tem adopted no delay whatever is experienced and in view of the disposition of the self-contained cranes herein described, and those placed at the machines, an efficient economical service is obtained.

One of the pits is fitted up with a wheel grinder, which was designed by the superintendent of rolling equipment, and is shown in one of the accompanying cuts. Cars are run over the pit and jacked up and the wheels made to revolve by running the current through the motors, after a water rheostat has been connected in series with them. A movable section in each rail permits work upon the car

wheels, and the latter are ground down by coming in contact with the emery wheels of the grinder. This operation is very effective, as it is not necessary to dismantle the car, and an ordinary flat spot is taken out in a few minutes. The operation of this grinder has proved it to be much superior to the old lathe method and so effective and satisfactory that six other machines have been installed at various terminals on the system. The machine work in the shops is done on the ground floor on the west side of the old building. It

chine and a Ferguson oil furnace for the bulldozer. Oil furnaces are also arranged for the Ajax forging machine and two power forging hammers. The oil furnace is found to be superior to the ordinary forge for making the heats as large areas of iron are quickly brought up to the welding temperature. The bulldozer is equipped with forms for forging break hangers, bumper irons, etc. Each piece is forged with a few blows of the machine and a great deal of work and time are saved by reason of using these machines in place of the



North Jersey Shops—Blacksmith Shop.



North Jersey Shops—Wheel Repair Department.

was noted that the tools are run in gangs instead of being separately driven. It is claimed by the management that the running of tools in gangs with line shafting is much preferable to a practice of driving them independently. Especially when it is imperative to use 500 volt direct current. Of course this does not apply to the large insulated machine tools, as these are independently driven.

hand forges. Six Buffalo down-draft forges are in service. These forges get their blast through underground ducts from air generated by fans and the smoke and gases are taken away through exhaust ducts by the same method. One of the accompanying cuts shows a group of the new standard fenders piled outside, convenient to the forge shop, which is equipped for their manufacture.

One of the accompanying cuts shows a view of the tool room and shop foreman's office, the tool room being below and the office above. In providing this office the spot best suited to ready supervision was selected. From the superintendent's office one is able to see about the entire shop

Wheel Room.

The wheel room, shown in one of the accompanying cuts, takes up the rear end of the building and is convenient to the wheel platform outside. The machines in the wheel room are driven by separate motor and line shafting and there



North Jersey Shops—Tool Room and Office of Shop Foreman.



North Jersey Shops—Electric Yard Crane at Work In Wheel Storage Yard.

and have an eye on all that is going on. The new portion of the machine shop building is single floor, similar to the remaining new construction, the west side being a continuation of the overhauling shop and the east side being reserved for the smith work in the blacksmith shop. In the forging department are some heavy tools not usually met with in street railway shops. The accompanying photograph shows a heavy Williams & White bulldozer and Ajax forging ma-

are two improved 200-ton wheel presses, two boring mills and a lathe. Axle racks are arranged between the columns, convenient to the work. All the new axles are 4½ inches and the gear wheels are pressed on the axles instead of being of the split type. We understand that the gear wheels placed on the axle give much better satisfaction and last longer than the split gear. The wheel and axle storage tracks

are near at hand. One of the accompanying views shows the method of storing the standard wheels and axles that are ready to be repaired in the wheel room or those that are finished and waiting for distribution about the system by the wheel car. This car is used solely for handling wheels and is equipped with a crane having a revolving mast and chainfall, so that the wheels can be handled readily.

One of the cuts herewith, presenting the general view of the blacksmith shop, shows a Bradley power hammer and an air hammer. The Buffalo down-draft forges are shown on the left, opposite them on the right are cast-iron forms, which are used by the blacksmith for bending special shapes. In connection with the forging department there is also a large double fire. Buffalo forge that is used for babbitting. The babbitt is melted in pots and taken with a ladle and poured into the special babbitting molds which are manufactured by the Columbia Machine Works & Malleable Iron Company of Brooklyn. This form of mold was first used and



North Jersey Shops—Bulldozer and Oil Furnace in Blacksmith Shop.

originally designed at the Plank Road shops, and is said to be more rapid than the old core method, by which the complete bearing was made, instead of in halves as by this mold. It is stated that by the new method a much more perfect bearing is obtained and one that needs very little dressing down or finishing.

(To be continued.)

ELECTRIC RAILWAY OPERATIONS IN ILLINOIS.

The preliminary report of the Illinois Railroad and Warehouse Commission, covering the operations of surface and elevated electric railways during the fiscal year ended June 30, 1906, states that the daily business of the commission demonstrates "that all of the provisions of the statutes governing railways operated by steam should be extended over the electric railways." and that electric railways "are getting to be a very important factor in the transportation problem of the state." An abstract of the report follows:

The total mileage, main line and branches of surface and elevated electric railways for the year was 935.76 miles, an increase of 173.07 miles. The total mileage of second, third and additional main track was 190.7 miles, an increase of 12.55 miles. The mileage of yard tracks and sidings was 56.84 miles, an increase of 19.01 miles. The total mileage of all kinds of track was 1,187.43 miles, an increase of 204.63 miles.

The capital stock and funded debt of this class of roads for the year was \$160,587,228, an increase of \$7,664,609, which is accounted for by the increased mileage put in operation. The average capitalization (stock and bonds) per mile of road of surface and elevated electric railways for the year was \$171,782. The average capitalization (stock and bonds) per mile of surface roads was \$75,868. The average capitalization (stock and bonds) per mile for elevated roads was \$2,035,289.

The total dividends paid were \$742,969, an increase of \$112,595. The total assets were \$173,724,598, an increase of \$7,258,189. Liabilities were \$169,726,314, an increase of \$6,-

113,907. The net surplus of assets over liabilities was \$3,998,284.

The total income from passengers, mail, express and advertising was \$11,016,920, an increase of \$1,587,790. The total income from freight service was \$446,320, an increase of \$82,732. The total earnings from all sources were \$12,805,420, an increase of \$2,050,539.

Passenger earnings per mile of road were \$11.771, as compared with \$12.030. Freight receipts per ton per mile were 4.8 cents. The average amount received from each ton of freight was 35 cents, as compared with 54 cents in the previous year. Freight earnings were \$751 per mile of road, as compared with \$1.144.

The expenditures for the year for maintenance of way and structures, maintenance of equipment, conducting transportation and general and unclassified expenses and fixed charges, were \$10,900,208, as follows:

	1905.	1906.
Maintenance—		
Way and structures.....	\$ 498,588	\$ 564,470
Equipment	749,801	921,332
Transportation—		
Operation of power plant.....	1,231,870	1,359,872
Operation of cars.....	2,217,876	2,377,785
General expenses	994,991	1,255,219
Unclassified expenses	15,091	29,752
Total operating expenses.....	\$5,708,217	\$6,508,930
Total fixed charges.....	4,080,142	4,391,278

Total oper. exp. and fixed charges.....\$ 9,788,359 \$10,900,208

The number of revenue passengers carried was 183,650,979, an increase of 21,001,944. The revenue freight carried amounted to 1,277,566 tons, an increase of 641,823 tons. While gross passenger and freight earnings per mile of road were less than in the preceding year, the operating expenses were lower and the net earnings per mile of road were \$74 larger than in the previous year.

The number of officers and employes was 6,726, an increase of 1,603. There was paid in salaries \$3,965,761.53, an increase of \$622,399.39. The daily average compensation for all classes was \$2.12, an increase of \$0.04 per day.

During the year 4,117 tons of steel rails and 80,755 new ties were laid. There are 351 stations on these roads, an increase of 34. The number of highways crossed at grade is 2,146, an increase of 96. The number of under highway crossings is 458 and the number of overhead highway crossings is 7. The number of electric railways crossed at grade is 54, an increase of 11. The number of crossing frogs is 167, an increase of 9. The number of steam-railway crossings at grade is 123, an increase of 5. The number of crossing frogs is 403, an increase of 61. The number of overhead crossings of steam railways is 40. The number of overhead electric railway crossings is 12.

The increase of mileage of ballast, such as gravel, stone, cinders, etc., shows a disposition on the part of the management of these roads to place their properties in the best physical condition for the careful handling of business.

These lines have 10 bridges of masonry, 15 of iron, 97 of steel, 4 of wood and 2 combination, with an aggregate length of 15,499 feet. There are 104 pile and frame trestles, with an aggregate length of 12,127 feet.

The number of passengers killed was 7, an increase of 4. Ten employes were killed, an increase of 3. The number of other persons killed was 31, an increase of 12. The total number of passengers injured was 306, a decrease of 29; 97 employes were injured, an increase of 20, and 65 other persons were injured, a decrease of 14.

The accident reports for steam railways show that 1 passenger was killed for every 1,659,314 passengers carried and that 1 passenger was injured for every 96,744 passengers carried. The accident reports for steam railways also show that 1 employe was killed in every 359 employed and 1 employe was injured in every 29 employed. The accident reports for surface and elevated electric railways show that 1 passenger was killed for every 26,235,854 passengers carried, and 1 passenger was injured in each 600,166 passengers carried. The accident reports for surface and elevated electric railways also show that 1 employe was killed in every 672 employed and 1 employe was injured in every 69 employed.

The amount of taxes paid shows an increase of \$89,673.95 over the previous year, and an increase of \$537,362.18 over the amount paid ten years previous.

The income account, with a comparison, is as follows:

	1905.	1906.
Gross earnings from operation.....	\$10,354,559	\$12,280,192
Operating expenses	5,758,623	6,573,261
Income from operation.....	\$ 4,595,936	\$ 5,706,931
Income from property and other sources....	472,883	682,845
Total income	\$ 5,068,819	\$ 6,389,776
Expenses assignable to fixed charges.....	4,097,925	4,423,277
Net income	970,894	1,966,499

CONCRETE TIES—RAIL CORRUGATION.

The committee on way matters of the American Street and Interurban Railway Engineering Association has issued the following circular relating to "Concrete Railway Ties":

It is a well-known fact that the available supply of wood for railway ties is becoming less year by year, and that the cost thereof is increasing in proportion. The question of the future means to be employed in providing substitutes therefor is rapidly becoming an acute one. Numbers of experiments are being made and various materials used. The possibility of using concrete has appealed to many, and experiments with concrete ties are now undoubtedly under way. The committee of the American Street and Interurban Railway Engineering Association having charge of way matters desires to assist all who may require information upon this subject, and is to this end sending out this circular letter with the request that all roads which have been or now are engaged in experiments with concrete ties, kindly notify the committee that they have been or are so doing, with information as to the method of construction used in the manufacture of the tie and the cost thereof, and forward a statement of results obtained and conclusions arrived at on account of these experiments.

If no result has yet been obtained, the committee suggests that a careful record of all phases of the experiments

Please state what remedies have been applied, if any, and what result has been obtained therefrom; also, the cost of applying such remedies, if possible.

Please give your general conclusions in the matter and such other information as you may think pertinent.

Fred G. Simmons, Thomas K. Bell, C. A. Alderman, Committee.

FORTY-TON SWITCHING LOCOMOTIVE, ILLINOIS TRACTION SYSTEM.

Two electric locomotives have been built recently for the Illinois Traction System by the General Electric Company and the American Locomotive Company. The locomotive is a swivel truck switching type, weighing 40 tons on drivers, and equipped with 4-GE-55-H.P.-motors; in other words, is classified as a 4-0-4-E-80—4-GE-55-H.P. type, in accordance with the standard system of classification recently adopted by the General Electric and the American Locomotive companies for the rating of electric locomotives.

The truck is of the M. C. B. equalized type with plate bolster. The wheel base is 6 feet 6 inches, the wheels 36



Forty-Ton Switching Locomotive for the Illinois Traction System.

be kept so that the result may be used later for the benefit of all concerned.

The same committee has issued the following circular of inquiry on "Rail Corrugation":

If you have had any experience with the phenomenon commonly called rail corrugations, will you please furnish the following information:

Type of rail affected.

Are different types of rail affected where conditions are similar?

Length of section affected.

Length of time rail was in service before corrugations appeared.

Length from center to center of corrugations.

Depth of corrugations.

Please describe rails most affected, giving the type, weight, manufacturer, date rolled, date laid and composition of rail, if possible.

Please describe the track construction, giving the rigidity, drainage, condition of paving and general method of construction, and specify as between track in paved streets and track laid on earth and loose stone or gravel ballast.

Please describe location of corrugations, both on straight tracks and as to inner or outer rails on curves, with degrees of curvature; as to grades and their percentage; as to points where brakes are applied and all other locations tending to indicate a cause. Are opposite rails always corrugated?

Please describe the traffic conditions at points of corrugation, giving frequency of car service, weight, type and speed of cars, type of brake used, type of truck employed, etc.

inches in diameter with fused steel tires and the journals are 5½ inches by 10 inches, the construction being particularly heavy in order to meet the demands of locomotive service. The weight of the truck is carried upon equalizers, each of which is made of two 5½-inch by 1½-inch bars held apart by suitable distance pieces and carrying the truck frame on spiral springs. The top frame is a 2 by 3½ inches rolled bar, and end frames of the same section are bolted to it. The truck transoms are built up of 13-inch channels riveted to ½ inch by 18 inch gusset plates and securely bolted to the truck frame. The plate bolster carrying the center pin and side bearings is built up of 9-inch channels and plates riveted together.

The motors are designed especially for the slow speeds and heavy tractive effort required in locomotive service. At the rated load of the motors the locomotive will give a tractive effort at the rail head of 16,800 pounds, and at the slipping point of the wheels will develop 20,000 pounds tractive effort with a load on the motors slightly in excess of their rated load.

Some of the particular dimensions of the locomotive are:

Length over all	.....31 feet 1 inch
Height over cab	.....11 feet 9 inches
Width over all	.....9 feet 6 inches
Rigid wheel base	.....6 feet 6 inches
Weight of electrical equipment	.....27,500 pounds
Weight without electrical equipment	.....52,500 pounds

INSPECTION TRIP TO SPY RUN GENERATING STATION
OF THE FT. WAYNE & WABASH VALLEY
TRACTION CO., FT. WAYNE, IND.

A party of engineers and railway officials left Cincinnati on a special Pullman train at 8 o'clock March 9, 1907, for Ft. Wayne, Ind., to inspect the new turbine generating station of the Ft. Wayne & Wabash Valley Traction Company, on Spy Run avenue, Ft. Wayne, as the guests of the Westinghouse Machine Company, Westinghouse Electric & Manufacturing Company and the Babcock & Wilcox Company. The party was joined at Ft. Wayne by representatives of the press and Ft. Wayne Electric Company, and after breakfast a special car furnished by the Ft. Wayne & Wabash Valley Traction Company conveyed the party to the power house,

ably commented upon by everyone present was the absence of vibration. This illustrates in a very clear manner the perfect balance which is obtained in the spindles and rotating fields of these units, as in this particular case the machines are practically without a foundation other than the 18-inch concrete floor of the generating room. Another point which was generally commented upon was the absence of noise, as, in spite of the high speed at which these turbines run and the hollow sounding-board effect of the light generating room floor, the noise made by the turbines was considerably less than would be made by reciprocating engines of the same capacity. This result is obtained by the system of forced ventilation of the generators, which are totally enclosed except for two openings into the air ducts located under the engine room floor. Besides the great reduction



Spy Run Generating Station, Ft. Wayne & Wabash Valley Traction Company.—Inspection Party.

which is located about one and a half miles from the center of the city.

Mr. C. D. Enmons, manager of the Ft. Wayne & Wabash Valley Traction Company; Mr. J. A. Brett, manager of the Westinghouse Electric & Manufacturing Company; Mr. G. H. Gibbs, manager of the Cincinnati office of the Westinghouse Machine Company, and Mr. E. K. Gillett, manager of the Cincinnati office of the Babcock & Wilcox Company, acted as guides for the party and explained the many interesting features of the installation and the apparatus and its operation.

As will be seen by referring to the complete description of this plant, which was published in the October, 1906, issue of the Electric Railway Review, the arrangement of this power house is rather unique in that the generators are located in the second story of the power house, directly above the boilers. This arrangement was made possible by the use of steam turbines in place of reciprocating engines. One of the remarkable operating features which was very favor-

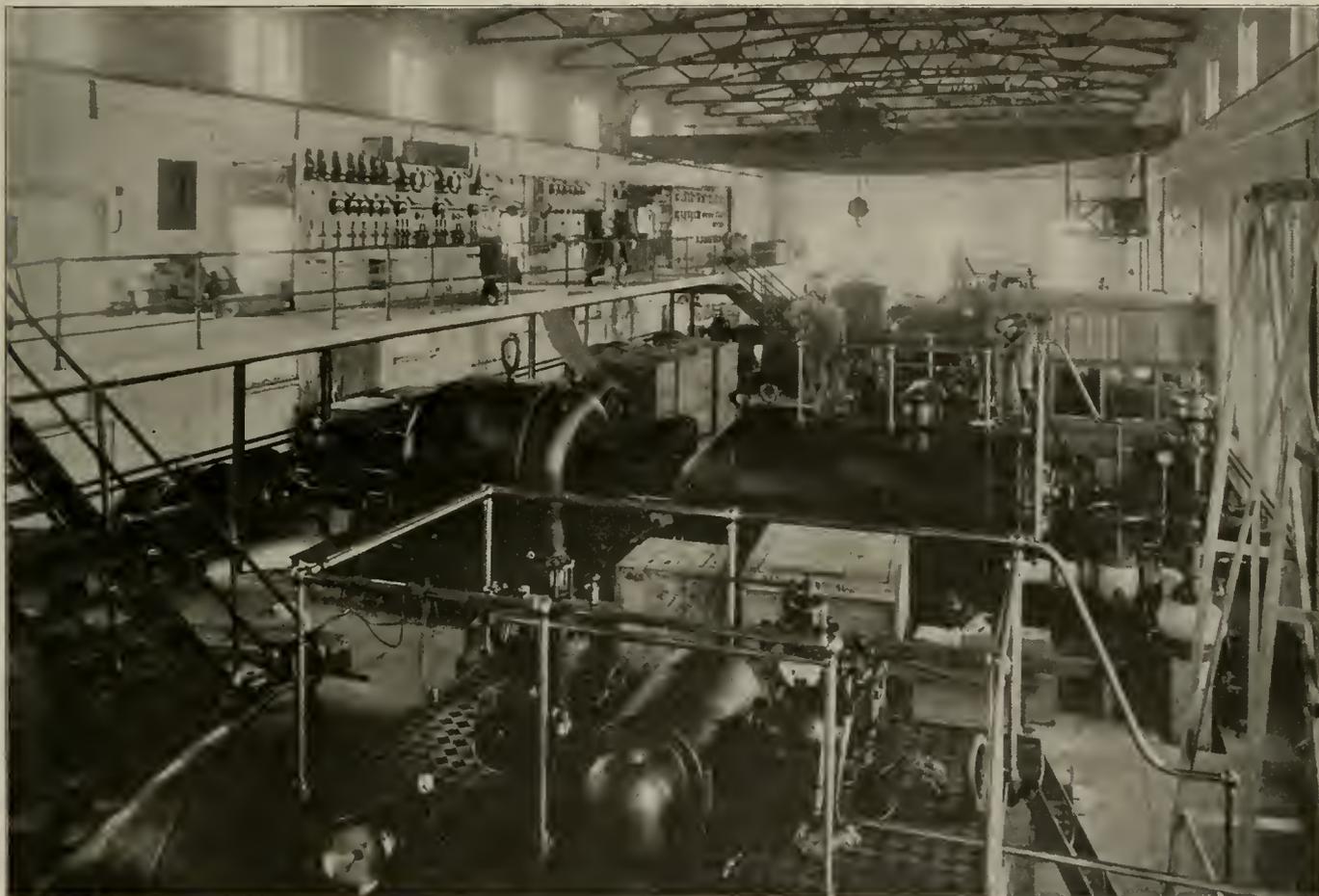
ably commented upon by everyone present was the absence of vibration. This illustrates in a very clear manner the perfect balance which is obtained in the spindles and rotating fields of these units, as in this particular case the machines are practically without a foundation other than the 18-inch concrete floor of the generating room. Another point which was generally commented upon was the absence of noise, as, in spite of the high speed at which these turbines run and the hollow sounding-board effect of the light generating room floor, the noise made by the turbines was considerably less than would be made by reciprocating engines of the same capacity. This result is obtained by the system of forced ventilation of the generators, which are totally enclosed except for two openings into the air ducts located under the engine room floor. Besides the great reduction

in the amount of noise, the system of forced ventilation here employed also greatly reduces the temperature rise of the generators, which were very cool considering the load they were carrying. The first enclosed turbo-generator supplied with forced ventilation was the 400-kilowatt turbine which was installed in the old generating station of Ft. Wayne & Wabash Valley Traction Company, and which is now doing duty in the new station. The 400-kilowatt turbine and generator were dismantled for the inspection of the guests. This was one of the most interesting parts of the exhibit in that the turbine had been running under a heavy overload nearly 18 months, during which period it had never been opened or adjusted and was only shut down two or three times for an hour at a time, during the entire period. An examination of the blades of the stator and spindle showed that there was no appreciable wear on the blades which could be observed by the closest scrutiny. A further condition which speaks very highly for the operation of the turbines, is the fact that owing to a very large amount of scale-forming material in

the water, which was used in the packing glands, a heavy incrustation had formed inside of the turbine shell, and on the end of the low pressure dummy, which at times must have come in contact with the shell, but in spite of this the machine ran very quietly and no ill effects were visible upon the closest inspection. Some of the scale had chipped off and fallen into the equalizer pipe, but it had not completely filled up, so there was sufficient passage for steam. The very large axial clearances between the stationary and moving blades were a surprise to many who have heard of the small clearances in the Westinghouse-Parsons turbine. An examination of the bearings of the turbine and generator showed that no noticeable wear had occurred, and, as has been stated at times, some of the original tool marks on the bearings were still visible, which speaks well for the lubri-

by the general manager, who acted as a guide through the works. The principal points of interest here were the new type of revolving field belted alternator, and a 75-kilowatt Curtis turbo-generator of the horizontal type. The turbine and generator operated very quietly, with practically no vibration.

The party consisted of the following: Louis Arnold, George Weidemann Company; F. C. Armstead; J. A. Brett, manager Cincinnati office, Westinghouse Electric & Manufacturing Company; A. A. Brown, Westinghouse Machine Company; A. C. Beattie, Beattie Electric Company; F. C. Bittgood; Walter A. Black; Robert Bowman; Thomas Cookson, Cookson Steam Specialty Company; George W. Cleveland, manager Cincinnati Inspection and Report Bureau; Daniel Delaney, Dearborn Drug & Chemical Company; C. D. Emmons, manager Ft. Wayne & Wabash Valley Traction Company; Thomas Elliott, consulting engineer Cincinnati



Spy Run Generating Station, Ft. Wayne & Wabash Valley Traction Company—Interior of Turbine Room.

cation. The switchboards and controlling apparatus were next inspected, after which the party descended to the boiler room floor. Here, some of the boilers and stokers had been taken down for inspection and general satisfaction was expressed about the operation of the stokers and the fine condition of the boilers and furnaces. Behind the boilers the condensers, which are the jet type, are located directly under the engine room floor, making a very compact arrangement with short exhaust, injection and tail pipes, which is made possible only by the use of turbines, which require no foundations and can therefore be located above the boilers. The boiler feed pump and circulating water pump, which are of the Worthington manufacture, and were specially designed, facilitating easy access to the valves, are located in the boiler room and were one of the features which received the special attention of the party.

Having had their photographs taken, the party was conveyed to the Ft. Wayne Electric Works, where it was met

Traction Company; M. H. Folger, Westinghouse Machine Company, Chicago; W. G. Franz, Droth Syndicate; W. C. Green, American Engineering & Specialty Company; Cale Gough, Street Railway Journal, Chicago; G. H. Gibbs, manager Westinghouse Machine Company; E. K. Gillett, manager Cincinnati office, Babcock & Wilcox Company; C. R. Gilliland, manager Louisville office, Westinghouse Electric & Manufacturing Company; George W. Galbraith, manager Laidlaw-Dunn-Gordon Company; C. P. Hughes, manager the Ideal Engine Company; W. B. Hubbell, Cincinnati Inspection and Report Bureau; R. Hallam; W. A. Heisel; H. C. Houck; W. C. Honhorst; A. B. Jacobs, Cincinnati; George Knopp, Post-Glover Electric Company; B. Kauffmann, western manager the Evans-Almstead Company; Charles Kilgour, vice-president Toledo Urban & Interurban Railway; E. H. Lostetter, manager Stoker & Foundry Company; R. W. Leach, Westinghouse Machine Company, Chicago; W. G. Leary; Charles Murray; Norman G. Meade, Westinghouse Companies, publicity department; H. C. Marsh, Arthur P. Taylor, Charles Taylor & Sons Company; Robert Morrow, Murphy Automatic Feed Regulator Company; E. McClintock, chief engineer Union Gas & Electric Company; J. H. McCabe, manager Cin-

cincinnati office, Murphy Iron Works; C. R. McKay; H. McNulty, chief engineer Cincinnati Traction Company; John Neil, John H. McDonald Company; R. W. Palmer; V. T. Price, manager Buckeye Engine Company; J. B. Pevoar, manager Cincinnati office General Electric Company; L. F. Ralley, General Electric Company; E. H. Sniffen, Westinghouse Machine Company; E. J. Schroder, Philip-Cary Manufacturing Company; Newton L. Schloss; Henry F. Schmidt, Electric Railway Review, Chicago; F. L. Swanberg; B. W. Seawell; Edward H. Spring; Frank Strievy, railway department, General Electric Company; Arthur P. Taylor; Howell Van Blarcom, manager Westinghouse Machine Company, Pittsburg; Ralph P. Willis, the R. P. Willis Company.

APPLICATION OF THE INTERSTATE COMMERCE LAW TO ELECTRIC RAILWAYS.

Since the passage of the Hephurn interstate commerce law last June there has been considerable speculation in regard to the status of electric interurban railways under that law and in regard to the jurisdiction of the interstate commerce commission over such companies. The matter has not yet been brought before the commission in any general way, and consequently no general ruling has been issued. In reply to a recent inquiry on the subject, however, from the East St. Louis & Suburban Railway, Commissioner James S. Harlan responded for the commission, expressing his views unofficially on the particular facts set forth in that communication. In view of the widespread interest in the subject and as the points touched upon affect other companies similarly situated, we publish Mr. Harlan's letter in full:

March 12, 1907.

The East St. Louis & Suburban Railway Company, East St. Louis, Ill.

Dear Sirs:—I have the honor to acknowledge the receipt of the letter of your assistant treasurer of February 26, in which he inquires whether the electric street car lines operated by your company are subject to the act to regulate commerce, as amended June 29, 1906.

In a communication from Messrs. Schaefer and Farmer, attorneys at law, of Belleville, Ill., dated September 4, 1905, and written by them apparently as your legal advisers, it was stated that your company operates electric street car lines in the cities of East St. Louis and Belleville, and interurban lines between East St. Louis and other points in St. Clair and Madison counties. These lines are all in the state of Illinois within a radius of 20 miles from East St. Louis, which is in that state. The interurban lines, as stated in that letter, have a terminus at East St. Louis, at which point passengers for St. Louis, in the state of Missouri, may take what is referred to in the correspondence as an ordinary street car line over the Eads bridge. This line across the bridge is said to carry passengers only. Whether it belongs to and is operated by your company or by a separate company does not appear on the correspondence. Nor is the fact material to this inquiry; for tickets are sold on your line that entitle the holder to transportation from points on your line in the state of Illinois to the corner of Third street and Washington avenue in the city of St. Louis in the state of Missouri. Tickets are also sold in St. Louis for passage over the same route to points in Illinois. So that, even if there be no common ownership or management, or any definite contract between the two lines, the tickets sold by your line in Illinois and by the other line in Missouri would seem to constitute a contract with the holder and an arrangement between the two lines for continuous transportation from a point in one state to a point in another state. Under such conditions the transportation, whether carried on under a common ownership or management or by two connecting lines, would seem to be subject to the provisions of the act to regulate commerce. But a further statement of the details of the actual arrangement between the two lines and of the form and wording of the through tickets might possibly lead to a different conclusion.

Under that act—to respond to your further inquiries—there is no distinction made between the transportation of passengers and the transportation of property. Either kind of transportation constitutes interstate commerce if it originates at a point in one state and is destined to a point in another state. Moreover, if such transportation be carried on for the general public and for hire, it is interstate commerce whatever may be the vehicle or the motive power used. It would be interstate commerce in every legal sense if carried on by means of omnibuses or automobiles, or by a ferry or otherwise, if it is done for the public and for hire and is carried on between points in different states.

You will understand, however, that interstate traffic, as

here defined, whether of passengers or other property, comes under the jurisdiction of this commission and is subject to the provisions of the act, only when carried on by means of one of the several classes of common carriers that are enumerated in the act; that is to say, by a pipe line or a railroad (or by a water line in connection with a railroad). But we think it clear that the word "railroad," as used in the act, includes all kinds of rail carriers that transport either passengers or property, whatever may be the form of motive power used by them. In other words, we hold that any form of transportation on rails, whether the motive power be electricity or steam or gasoline, compressed air, horse-power, or otherwise, is a railroad within the meaning of the act and to the jurisdiction of this commission, if it transports either passengers or property for hire from a point in one state to a point in another state.

For your further information it may be well to add that the law makes no distinction between electric lines that connect urban communities and are engaged in the transportation of passengers and property, and are commonly known as "interurban lines," and the shorter lines that are operated chiefly for the carriage of passengers within, or for short distances beyond, the limits of urban communities, and are commonly called "street car" or "traction" lines. Any such line that transports passengers or property from a point in one state to a point in another state, either on its own rails or in connection, under some arrangement for through transportation, with the rails of another carrier, is itself an interstate carrier engaged in interstate commerce, and is subject to the jurisdiction of this commission and to all the provisions of the act to regulate commerce.

You will understand, of course, that what I have said in this letter is simply the expression of my personal views. The commission does not ordinarily respond formally to such inquiries.

Very respectfully,

JAMES S. HARLAN,
Commissioner.

CHICAGO TRACTION SITUATION.

Fred A. Busse, postmaster of the city of Chicago, in accepting the republican nomination for mayor, made the following statement regarding the traction situation:

For several years we have had too much traction for the politicians and too little for the public. Traction has been used to carry various people into office, but there has not been enough of it to carry people to and from their homes rapidly and in comfort.

This traction question is the people's question, and it is proper that they should have the last word as to whether the ordinances now before them for their decision should become laws. We are all interested. The present surface transportation is utterly inadequate. Elevated and suburban trains are overtaxed because the surface lines are inadequate. The consequence is wasted time and discomfort of all who ride.

Improved transportation, as our platform well says, would lessen congestion in the downtown business center, develop new business centers, give people a chance to live out where they can get better air, more room and more healthful surroundings, and at the same time benefit thousands of small taxpayers.

Street car employees are injuriously affected by present conditions. Overcrowded and out-of-date cars and equipment make their work much harder and more hazardous than it should be.

The ordinances now before the people for their decision are the results of years of investigation and study, and the successive steps in formulating them were apparently approved by all of those active in the work until just before they were completed. No good reason has yet been given, so far as I can discover, for reverting again to talk instead of proceeding to action.

The proposal to acquire the street railway properties by condemnation is one that does not commend itself to me. It will mean years of litigation, the result of which no man can prophesy, during which time the companies will reap the harvest of fares without being under any obligation to divide profits with the city or to install new equipment or to maintain through routes or to do any of the other things which are immediately provided for by the pending ordinances.

Everybody is agreed that we want better service at once. The pending ordinances provide for that. They provide for extensions, for through routes and for transfers that will enable us to ride from any part of the city to any other part of the city reached by the lines of any one or all of the four great systems—namely, the Chicago City, the Union Traction, the Chicago Consolidated and the Chicago General Railway companies.

These ordinances safeguard the city's interests. They

make the city a participating partner in the profits of the street railway companies, and permit this revenue to be applied either to purchase of the lines or to reduction of fares. They also provide ample opportunity for the city to acquire the lines whenever the people desire to embark in the enterprise. Therefore, I cannot see why any person who wants better car service, whether he does or does not believe in municipal ownership, should be against the ordinances.

CHICAGO & MILWAUKEE ELECTRIC RAILWAY SEEKS JOINT RATES WITH STEAM RAILWAYS.

A petition that the Illinois Central Railroad Company be compelled to establish joint traffic arrangements with the Chicago & Milwaukee Electric Railroad Company has been filed by the latter corporation with the interstate commerce commission. This is the second case of this character to be brought to the notice of the commission. Evidence in the petition of the Cedar Rapids & Iowa City Railway & Light Company for joint rates with steam railways was heard in Cedar Rapids on January 29 and 30.

The Chicago & Milwaukee Electric represents in its petition that it is a railroad corporation and that it has the right to operate from the city of Chicago in a northerly direction to some point on the state line between Illinois and Wisconsin, with power to appropriate such land as may be necessary for the transaction of its business and to contract with railway corporations in other states for leasing and running their roads. It has secured by contract the right to operate its trains upon the tracks of the Chicago & Milwaukee Electric Railroad of the state of Wisconsin, which has laid its tracks from a connection on the state line with the Illinois corporation to Racine, Wis.

The petitioning company operates the lines of railway in Illinois and Wisconsin as one system, using as motive power both electricity and steam. It states that it is fully equipped with locomotives, passenger and freight cars for the operation of its business; that its roadbed is constructed under the most modern and improved systems; that its rails are 80-pound rails and its bridges of concrete and steel; that its grade at no point exceeds 1.5 per cent; that in every way it is thoroughly equipped to handle successfully the freight and passenger business in the territory which it serves; and that its freight and passenger business is successfully conducted.

The petition says the Chicago & Milwaukee Electric connects with the Wisconsin Central Railway Company at Rockefeller, Ill., and with the Elgin Joliet & Eastern Railway at Rondout, Ill. The Elgin Joliet & Eastern operates a railway extending from Waukegan, Ill., to Porter, Ind., known as the "outer belt line." The Elgin Joliet & Eastern interchanges freight between all railways entering the city of Chicago and, the petition recites, must be a party to joint traffic arrangements for freight shipments beyond Chicago between the various roads which enter Chicago. A general tariff and division sheet has been established by the Chicago & Milwaukee Electric with the Elgin Joliet & Eastern covering all freight interchanged between the two roads.

The Chicago & Milwaukee Electric represents that the territory it serves in the counties of Kenosha and Racine, Wis., is exceedingly fertile and produces a large tonnage of farm products, one of which is cabbage; that there was shipped during the year 1906 from Racine county over 2,000 carloads of cabbage, all of which came from the territory served by the Chicago & Milwaukee Electric, and which was hauled by wagon to the Chicago & Northwestern Railway at Berryville, Racine and Kenosha, Wis. The Chicago & Milwaukee Electric secured from the Illinois Central, the Yazoo & Mississippi Valley and the Elgin Joliet & Eastern a joint freight tariff on cabbage in carload lots from Racine, Hansche Siding and Piper Siding, Wis., to Vicksburg, Miss., New Orleans, La., Natchez, Miss., and Memphis, Tenn.

This tariff was filed with the interstate commerce com-

mission on November 1, 1906, and thereafter the Illinois Central and the Chicago & Milwaukee Electric shipped freight under its terms. At the time the tariff was put into effect, the petition says, the traffic manager of the Chicago & Milwaukee Electric and the assistant general freight agent of the Illinois Central had many conferences concerning the extent of the business and the promulgation of tariffs; and in conformity with the tariff in existence the Chicago & Milwaukee Electric secured a shipment of 15 carloads of cabbages for lower Mississippi valley points reached by the Illinois Central and the Yazoo & Mississippi Valley, and requested of the Illinois Central the delivery of sufficient cars at Rondout to carry the cabbages.

The petition states that the Chicago & Milwaukee Electric, through its traffic manager, was definitely promised these cars, but they were never delivered, and on November 19 the Illinois Central, without notice, filed with the interstate commerce commission a notice of cancellation of the joint tariff.

The Chicago & Milwaukee Electric charges that "said cancellation notice operated as a great hardship" and prevented it from "conducting its legitimate business and deprived the shippers of cabbage of a competition in freight rates to which they were justly entitled."

In conclusion, the Chicago & Milwaukee Electric prays that the Illinois Central and the Yazoo & Mississippi Valley may be required to answer the charges, and that after due investigation they may be compelled to enter into joint traffic arrangements with the Chicago & Milwaukee Electric for the transportation of cabbage and other commodities originating at or destined to points in the territory of the Chicago & Milwaukee Electric in Wisconsin; that through rates and joint rates be established covering articles of merchandise from all points along the petitioner's railway in Illinois and Wisconsin to points on the defendant's railways outside of Illinois, and from points on the line of the defendant's railways lying outside of Illinois to points on the Chicago & Milwaukee Electric in Illinois and Wisconsin; that through rates and joint rates be established from points upon the petitioner's railway in Wisconsin to all points upon the defendant's railways in other states, except in Wisconsin; and that the commission may prescribe a division of such rate or rates and the terms and conditions thereof. The interstate commerce commission will hear the evidence in April.

Movement in Brooklyn for Free Ferries.

A conference of representatives of various civic organizations in Greater New York was held in Brooklyn on the evening of March 7 to discuss the subject of free municipal ferries, to relieve the crush on the Brooklyn bridge. The agitation for free ferries will be carried on by means of enrollment cards and circulated petitions as well as by further meetings. It is said that some 500 signatures have been obtained on the cards, which read as follows: "Believing that free ferries will give immediate relief to the bridge crush, and will help Brooklyn generally, I hereby request that my name be placed on the membership list of the 'League for the Promotion of Free Ferries.'"

The petitions, to which some 600 or more signatures are already known to be appended, read as follows:

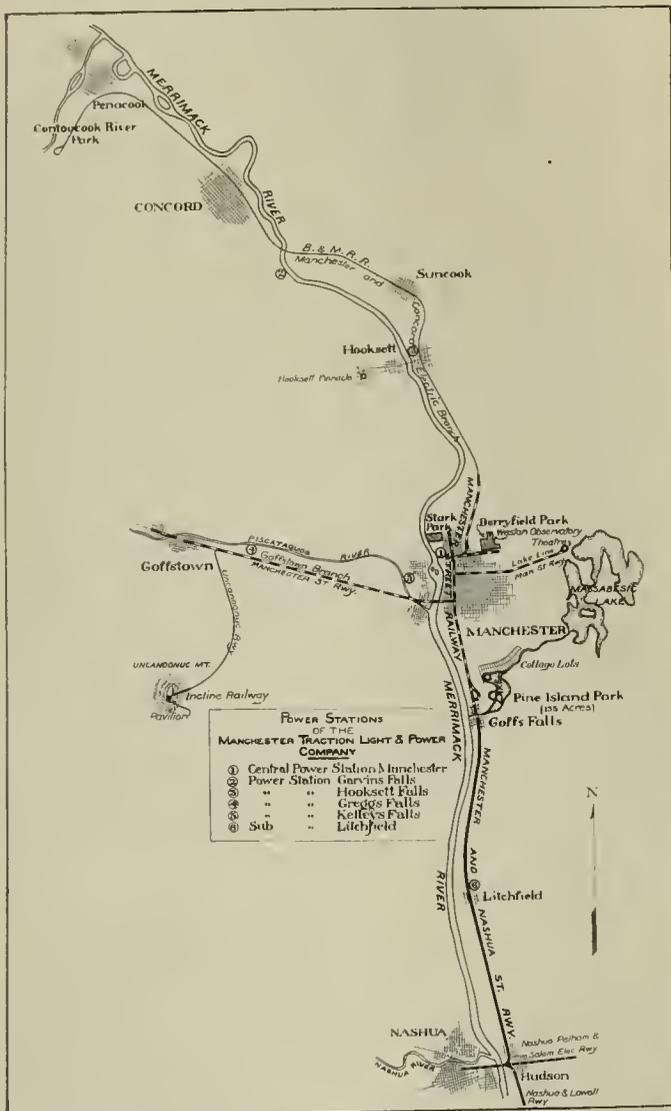
"It is the firm belief of the undersigned residents of Brooklyn that the municipal ownership and operation of the East river ferries free of charge to the public will at once very greatly diminish, if not entirely do away with, the bridge crush horror until a permanent remedy can be had by the building of more bridges, tunnels or subways, and that making the ferries free to all users would greatly help to give new life to the deserted ferry localities, stimulate business, encourage manufacturers to settle there, improve property and be a great convenience to the residents of these neglected districts of this neglected borough."

THE MANCHESTER & NASHUA STREET RAILWAY.

The Manchester & Nashua Street Railway, an important new electric interurban line in southern New Hampshire, connects the lines of the Boston & Northern Street Railway Company in the outskirts of Nashua with the system of the Manchester Traction Light & Power Company, and forms the final link in the continuous trolley route between Boston, Lowell, Nashua, Manchester and Concord. The new line began operation on January 1, 1907. It is owned by the Manchester Traction Light & Power Company, whose officers are:

sufficiently substantial to permit speeds of 40 miles per hour and upwards.

The length of the new line in Goff's Falls, Litchfield and Hudson is 12.5 miles, the total distance between Manchester city hall and the Tremont house, Nashua, being 18.25 miles. The running time from terminal to terminal is 55 minutes; from Goff's Falls to Hudson it is about 28 minutes, making



Manchester-Nashua Street Railway—Map of Route and Connections.

President, William A. Tucker; vice-president and general manager, J. Brodie Smith; treasurer, S. Reed Anthony.

Route.

In physical features the new road is somewhat unique, at least in comparison with other electric lines in New England. It is built entirely upon a private right of way; the heaviest grade is about 1.5 per cent and the sharpest curve has a radius of 1,042 feet. Long tangents are frequent, and in several localities the track is straight for upwards of two miles. Most of the electric railways in New England have a certain percentage of their lines located in the public high-ways, and severe grades or sharp curves are frequent characteristics of the profile and alignment. Fast running is therefore out of the question, except where the character of road-bed and track construction on the private right of way is



Manchester-Nashua Street Railway—Exterior Litchfield Substation.

a schedule speed of about 27 miles per hour on the private right of way with a maximum of approximately 40 miles per hour. The population of Manchester is now about 70,000; Nashua, 30,000; Litchfield, 500; Merrimack, 2,000; and Hudson, 2,000. About 69 per cent of the through run is via the new line.

Cars leave Manchester city hall hourly between 5:30 a. m. and 9:30 p. m., the last southbound car leaving at 11:00 p. m. Northbound, cars leave Nashua at 6:30 a. m. and thence hourly until 9:30 p. m., the two later cars being 11:00

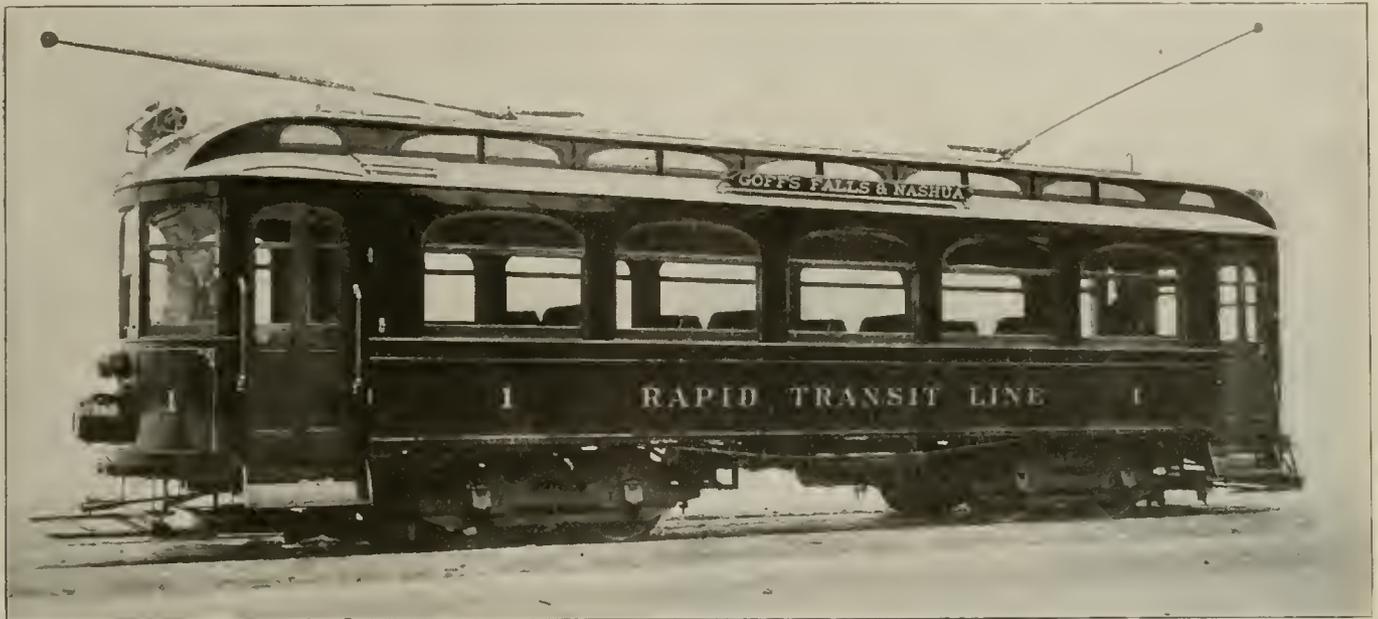


Manchester-Nashua Street Railway—Emergency Car with Trolley Repair Platform.

and 11:50 p. m. During the night the cars are held in the car house of the Manchester company, and the repair work is also carried on at the latter point, with the exception of tire turning and wheel renewals, which are usually performed by contract with the Manchester works of the American Locomotive Company. It will, of course, be a simple matter to decrease the present headway when traffic warrants it.

The new line proper begins at Goff's Falls, a southern suburb of Manchester, and in a general way follows the east bank of the Merrimack river through level farming lands through Litchfield to Hudson, which is on the east side of the Merrimack opposite Nashua. The roadbed is all single track on the private right of way, but turnouts one mile long

the trolley being grooved, size No. 00 B. and S. gauge. But one trolley was installed. With the exception of one-half mile north of Hudson the entire line is fed with 600-volt direct current by a 500,000-circular mil copper feeder which parallels the trolley. Power for the operation of the road is transmitted from the generating plants of the Manchester Trac-



Manchester-Nashua Street Railway—Standard Passenger Car.

are shortly to be in service. The rails were laid in 33-foot lengths, T-section, each joint being bonded with the No. 0000 soldered bond of the Lord Electric Company. Chestnut ties of standard steam railroad specification were used, spaced 2 feet apart on centers. Gravel ballast was used throughout, and the right of way is about 50 feet in width. There are four grade crossings with highways, and five steel trestles

tion, Light & Power Company to a substation located in Litchfield, just half way from each end of the private right of way. The 500,000 circular mil feeder is divided into two sections at the Litchfield substation, one section feeding north and the other south. The poles used are of chestnut, 35 feet in average length, with 7 and 8-inch tops, and spaced 100 feet apart. The contractor for the grading, track and overhead



Manchester-Nashua Street Railway—Garvins Falls Hydro-Electric Plant.

built upon concrete foundations. At the crossings danger signs have been installed, and the trestles are equipped with inside guard rails and outside guard timbers. The construction of the roadbed was carried out under the direction of Mr. A. R. McReel.

Bracket suspension was used throughout the new line,

work was the Hub Construction Company of Boston. The material for the overhead construction was furnished by the H. W. Johns-Manville Company. The chief engineer was Mr. John E. Egan of Windsor Locks, Conn.

The power generating system of the Manchester Traction Light & Power Company consists of five plants, including

the central substation and auxiliary steam equipment at Manchester. At Garvin's Falls, on the Merrimack river, is a water-power station rated at 3,900 k.w.; at Hooksett, on the Merrimack, is a 600-kw. water-power plant, with the prospect of an early increase in capacity; at Gregg's Falls, on the Piscataquog river, is a 1,200-kw. water-power station; and at Kelley's Falls, on the Piscataquog, is an 830-kw. plant, both

transformers to enable the rotaries to be operated on high, normal or low voltage, e. g., with 11,000 volts primary, 396, 376 or 360 volts. The alternating current sides of the rotaries in this substation are not operated in multiple, though the transformer primaries are permanently connected in delta, there being but one set of these. One secondary winding in each transformer is devoted to the exclusive use of a corresponding rotary. The direct current sides of the rotaries are operated in multiple, as usual.

An accompanying sketch shows the general transformer arrangement, with the single primary winding and double secondaries of each transformer. P_1 , P_2 and P_3 are the primaries of transformers 1, 2 and 3; S_1 , S_2 and S_3 are the secondary windings of the three transformers devoted to one rotary R; and S_1' , S_2' and S_3' are the windings connected with the other rotary R'. The taps H_1 , N_1 , L_1 , t_1 , t_2 and H_3 , N_3 , L_3 , t_3 give the high, normal and low voltage combinations for rotary R, while the corresponding taps of the other windings do the same for rotary R'.

Another sketch shows the secondary connections to impress high, normal or low voltage upon the terminals of rotary R. T_1 , T_2 and T_3 are the secondaries of the three transformers and the taps are shown as in the other figure. On the high and low positives the second transformer is not needed. When rotary R₁ is shut down the corresponding secondary windings are idle. The connections shown in the diagram are made easily on the switchboard by manipulating the double-pole, double-throw switches for each rotary.

Switchboard.

The switchboard in the Litchfield substation consists of six 24-inch panels. One panel carries a bracketed synchro-



Manchester-Nashua Street Railway—Standard Track and Overhead Construction.

steam and hydro-electric. At the Brook street station in Manchester is a capacity of 1,450-kw. alternating current power, with 2,160-kw. in direct-current, 550-volt machinery. Steam power is rarely used on the system.

All these generating plants are connected radially with the Manchester substation by transmission lines, and are operated in multiple at the latter point as far as is desirable. Between Garvin's Falls and Manchester, 14 miles; Gregg's Falls and Manchester 6 miles, and Hooksett and Manchester, 10 miles, 11,000-volt circuits are run. The Kelley's Falls plant is a 6,600-volt installation, and it feeds Manchester over a 3-mile line. The Litchfield substation, 6.25 miles south of Goff's Falls, is supplied with power from the high tension net work by an 11,000-volt 3-phase circuit of No. 4 wire branching southward from the Gregg's Falls line.

On account of the lighting and power business of the Manchester company, the frequency of the alternating system is 60 cycles, and the rotaries in the Litchfield substation are therefore wound for that periodicity. The Litchfield substation is a neat brick building, 23 by 30 feet, with an equipment of two 12-pole, 300-kw., 600-volt Westinghouse rotaries, normal speed 720 revolutions per minute, and three 250-kw. 11,000-396-volt transformers of the same make, oil-cooled type. Each rotary is equipped with a direct-connected induction motor on the end of its shaft for starting purposes. Toilet facilities are provided in the substation, together with a storage room and small workshop.

Double-Secondary Windings.

A special and novel feature of the transformer equipment is the provision of a double set of secondary windings in each transformer, with special taps in the windings of two of the



Manchester-Nashua Street Railway—Standard Trestle.

scope and a high-tension automatic oil switch; the next two are duplicate alternating-current rotary panels and each contains a power factor meter, an 800-ampere ammeter, synchronizing and starting-motor switches, a main three-pole rotary switch, rheostat and the transformer switches mentioned in the preceding paragraph; the next two panels are direct-cur-

rent generator slabs, with the usual switches, ammeters and recording wattmeter; and the last panel is a direct-current feeder panel with recording totalizing wattmeter, two switches, two 800-ampere ammeters and two circuit-breakers. Busbar and direct-current machine voltmeters are bracketed at the end of the board.

The substation roof is of concrete, supported on steel I-beams. Two of those beams support rolling hoists which facilitate the handling of heavy machine parts.

Rolling Stock.

Six new cars have been purchased for the service between Manchester and Nashua. These were made by the Laconia Car Company, and each is 41 feet long over all, 8 feet 4 7/8 inches wide, and mounted upon double trucks of the Laconia 8 B2 type. The motor equipment is four G. E. 80 motors, with K28 control. The brakes are straight air, General Electric system, and each car has two trolleys and a seating capacity of 40 passengers. The interior finish is red oak. These cars are among the handsomest ever operated in New Hampshire.

The trucks are equipped with 33-inch wheels, having 2 1/2-inch treads, 7/8-inch flanges, steel tires and a 4-foot 4-inch wheelbase. Imperial headlights of the arc type with an incandescent lamp in the headlight for use in city streets; Pfingst fenders, International registers, consolidated heaters and twenty 16-candlepower interior lamps make up the car fittings. The seats are reversible with the exception of four at each vestibule corner. The aisles are 18 inches wide, and each of the eight cross seats on each side of the aisle is 32 inches long by 15 inches wide. The longitudinal end seats also carry two persons each.

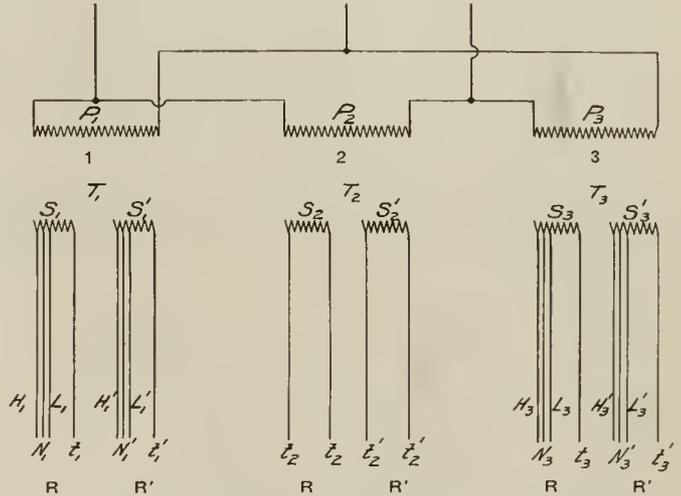
The interior lighting of the cars is unusually good. Four 16-candlepower lamps are spaced at even distances apart under the roof; six lamps are installed on each side of the car at the monitor bottom, and four others are installed on each side over the adjacent pairs of seats. On each side of the car are five plate glass windows 21 inches high and 50 inches long, surmounted by semi-oval windows. Each window covers two seats, and is balanced with weights to enable it to be pushed down between the side panels to convert the car into an open car for summer use. In each vestibule a vertical brass switch-stick holder is provided, together with the usual lighting and heater switches, and a small shielded incandescent lamp to illuminate the air gauge dial.

Operation Details.

The fare from any point in Manchester to any point in Nashua via the new line is 25 cents, three of these fares be-

The repair shops in Manchester are unusually compact for a system covering as much territory. The Manchester company has one of the most complete equipments of snow-fighting apparatus in the state. Armature and field coils are made by the company.

A special arrangement for drying sand has been tried successfully in these shops. An ordinary pit 15 or 20 feet long has been equipped with steam pipes and the sand is dumped into this pit and shoveled out as it is needed. The



Manchester-Nashua Street Railway—Transformer Connections for Single Primary and Double Secondary Windings.

car house has to be heated, in any case, and it was thought unnecessary to go to elaborate lengths when steam was easily available for the purpose.

Another convenience is an emergency trolley car which takes the place of the frequently slow-moving tower wagon. This car will shortly be equipped with high-powered motors to enable it to make fast time over the lines. Its most interesting feature is a platform which can be raised or lowered by a single man through the agency of a special tackle inside, swung around radially and locked in position to permit work on either side of the trolley. An iron ladder is provided on each side of the car to facilitate quick mounting or dismounting from its top.

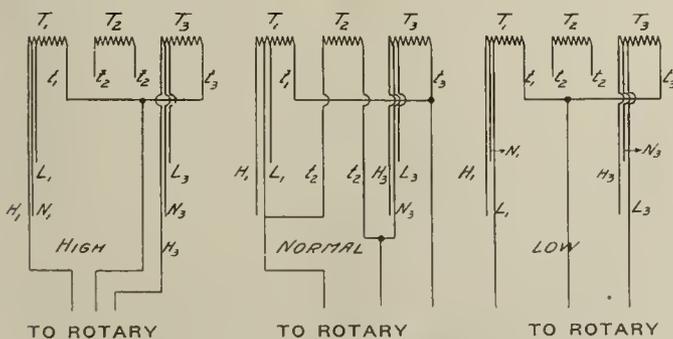
Form for Recording Car Equipments.

Mr. F. A. Bundy, master mechanic of the Lima & Toledo Traction Company, Lima, O., has developed a form to be used in compiling statements of cars and car equipments, which, because of its thoroughness, does away with the necessity of keeping book records of equipments. The form, which is 18 inches wide and may be made any desired length, contains columns for the respective heads and subheads under which the various car parts are grouped as follows:

Car, number, open or closed; motors, make, kind, number, horsepower; controller, type, number; trucks, make, single or double, wheel base; wheels, diameter, tread, flange, bore, kind; axles, length, diameter, gear section, size of journals; brake, hand or air, resistance, number of tanks, kind of gird; body, length over bumpers; width out to out, extreme height above rail, height of floor above rail, length of passenger compartment, length of smoking compartment, length of baggage compartment; gear, ratio; seats; remarks.

Blue prints of the form containing complete records of all the cars owned by the Lima & Toledo Traction Company are furnished the heads of all departments.

The pig iron produced in Canada in 1906 was 541,957 long tons, of which 525,716 tons were made with coke, 16,021 with charcoal and 220 tons by electricity.



Manchester-Nashua Street Railway—Secondary Connections for High, Normal and Low Voltages.

ing charged for the run over the Goff's Falls, Litchfield and Hudson line. The company is equipped with Couch & Seeley telephone apparatus, stations being placed at important points along the line. Portable telephones are also supplied for car use. Near the Goff's Falls end of the line is a pleasure resort known as Pine Island park, and it is anticipated that in the coming summer there will be a large travel to this point from the vicinity of Nashua.

FREIGHT TERMINAL STATION AT FT. WAYNE, IND.

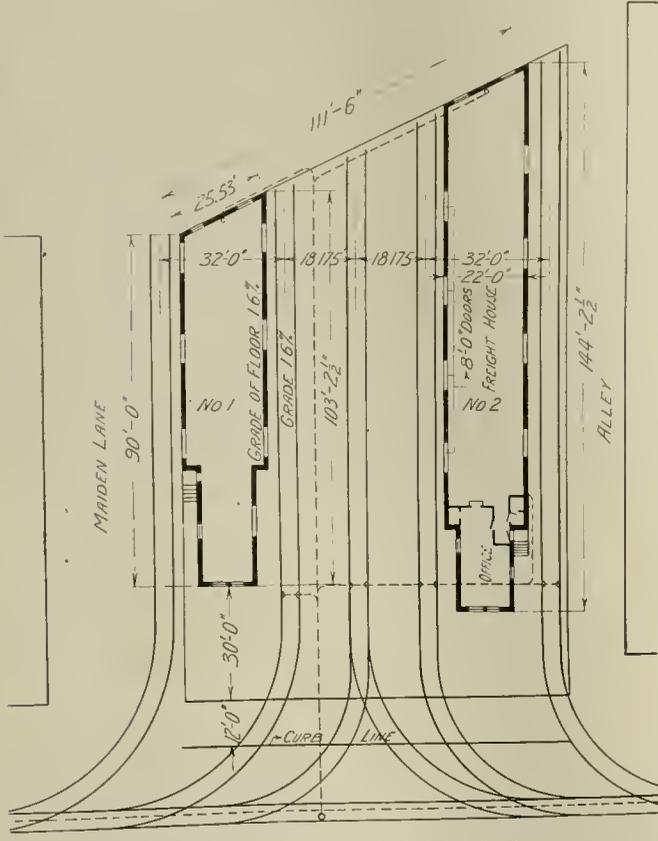
The Ft. Wayne & Wabash Valley Traction Company is perfecting plans at Ft. Wayne, Ind., to handle the extensive freight traffic that is being developed by the five interurban railways radiating from that city. This company controls the city lines and the terminal facilities at Ft. Wayne, and in a way is the dominating spirit in the interchange of traffic between the interurban lines.

The waiting station from which all interurban passenger cars are started on their outward journey is located at the corner of Pearl and Harrison streets, about two blocks from the center of the city. Immediately at the rear of this station a freight terminal has been laid out that is intended, when completed, to furnish facilities for speedily handling the incoming and out-going freight for all electric railways entering the city. The space set aside for the development of the terminal station—in the form of a trapezoid—is 100 feet wide and 160 feet long on the longest side. Along the

charge freight at the same time. Five tracks enter the terminal. Two are designed to serve the building for incoming and two to serve the building for out-going freight. The fifth track is to be used for car-storage purposes. The center lines of the tracks adjoining the buildings are located 4 feet 11 inches away from the foundations, which brings the sides of the average interurban freight car while standing at the station, about four inches from the door sills. This feature was designed to do away with gang planks in loading and unloading freight.

All freight trains entering Ft. Wayne over the Ft. Wayne & Wabash Valley, the Lima & Toledo, the Toledo & Chicago, the Ft. Wayne Bluffton & Marion, and the Ft. Wayne & Springfield railroads are accommodated at this station. Freight interchange arrangements have been made between the several interested companies so that the country surrounding Ft. Wayne is very thoroughly served. The arriving and departing time of freight trains over the various divisions are:

- For Bluffton and points south to Muncie, leaving time 9 a. m. and 3 p. m.; arriving time 2 p. m. and 7 p. m.
 - Local freight for Huntington, Wabash, Peru, Logansport and intermediate points, leaving time 10 a. m., arriving time 8:30 a. m.
 - Through freight for Indianapolis by way of Peru, leaving time 5 a. m., arriving time 1 p. m. The Southbound car on this run arrives at Indianapolis at 1 p. m. and leaves again for the north at 2 a. m.
 - For Auburn, Kendallville and way stations on the Toledo & Chicago, leaving time 12 o'clock, noon, arriving time 10:30 a. m.
 - For Van Wert and Lima, Ohio, and way stations, leaving time 8:20 a. m. and 2:20 p. m.; arriving time 7 a. m. and 1 p. m.
 - For Decatur, Ind., by way of the Ft. Wayne & Springfield railroad, leaving time 1 p. m.; arriving time 10:30 a. m.
- In addition to the above extra cars are frequently operated over the several divisions. Freight is received at the Ft. Wayne freight office between the hours of 7 and 12 a. m. and 1:00 and 5:30 p. m.



Plan of Ft. Wayne Freight Terminal.

east and the west sides of this plat of ground the general plan calls for the construction of two freight buildings, one of which is to serve for receiving and the other for dispatching freight commodities.

The first unit of the general scheme has been erected and the second structure, in which the freight agent's office will be located, will be built at an early date. The completed building which is intended for out-going freight is 22 feet wide, 103 feet long, on the long side, 90 feet long on the short side and 22 feet high from the foundation to the coping. It is intended later to make this building two stories high.

The superstructure of the building is of brick and the floor and roof are of concrete-steel construction. The window and door lintels are also of concrete, moulded in sections 13 by 13 inches by 10 feet in size. The floor is 3.85 feet above the freight tracks, which brings it to a level with the floors of the average freight car that enters the station.

The track layout for the terminal has been developed so that the largest possible number of cars can load or dis-

NEW CAR HOUSES OF THE INTERNATIONAL RAILWAY COMPANY AT BUFFALO, N. Y.

Owing to the rapidly increasing traffic of the International Railway Company, the old storage and repair facilities which, with the completion of the car houses at Cold Spring in 1906, were thought would be sufficient to accommodate the increase in traffic for a number of years to come; the growth of the business, however, has been so rapid that it has been again necessary to increase the storage and repair accommodations. With this object in view, the company has erected a new car house and an open storage yard on Broadway, east of Bailey avenue, Buffalo.

The new car house will accommodate one hundred and eight 46-foot cars and the storage yard along the south side of the building will accommodate one hundred and thirty-five 46-foot cars. It is expected in the near future to build an extension of the car house, which will cover the storage tracks which are now in the open. The general dimensions of the new car house are, length 561 feet, fronting on Broadway, and a uniform depth of 148 feet, extending back to Stone street. The property on which the barn and storage yard are situated has a total length of 698 feet 4 inches, and is 270 feet 8 inches wide.

The general arrangement of the car house has been so planned that it can be divided into four fireproof compartments by means of rolling steel fire doors, thus making it possible to confine the fire to only a portion of the building, should such an emergency arise.

Concrete and steel only have been used in the construction of the barn, with the exception of the roof, which is constructed of 6 by 12 inch and 4 by 12 inch yellow pine purlins and 2-inch matched hemlock roof plank, with a covering of 5-ply felt and 1/4 inch of actinolite.

In the building are provided recreation rooms for the conductors and offices for the clerical force. Bowling alleys, card tables and pool and billiard tables, as well as a library, are provided for the motormen and conductors, and the general arrangement and fittings throughout show the attitude

of the company in trying to make the men as comfortable as possible when off duty.

A full description of the new improvement, with detail plans, will be published in a subsequent issue of the Electric Railway Review.

REPORTING ACCIDENTS AT NASHVILLE.

It is generally conceded that a large percentage of damage suits growing out of accidents on street railways are results of the diligent solicitation of shyster lawyers. Few people are injured through their own carelessness without being ready to admit, at the time the injuries are received, that the fault was their own.

After making a careful study of this subject the claim department of the Nashville (Tenn.) Railway & Light Company has devised a means of obtaining a complete account of an accident within a few minutes after it occurs. It is a duty of the conductor to telephone the details, as soon as possible, to the dispatcher, giving the name and address of the injured, advice as to whether medical or surgical aid has been obtained, if the injured has been removed (and to where), location and time of accident.

The conductor is always supplied with blank forms which enable him to get a concise statement from the injured per-

FORM 257 SM-10-00

FOR THE PROTECTION OF CAR MEN.

Date. _____

NASHVILLE RAILWAY AND LIGHT CO.

GENTLEMEN—I hereby state that the CAR MEN WERE NOT IN ANY WAY TO BLAME for this accident in which I was injured or damaged. I was myself to blame, and make this memorandum at the time in full knowledge of the facts of the accident.

Signature. _____

Address. _____

Reporting Accidents at Nashville—Car Men's Release as Signed by Injured Passenger.

son and thereby to furnish to the claim department accurate information on the subject.

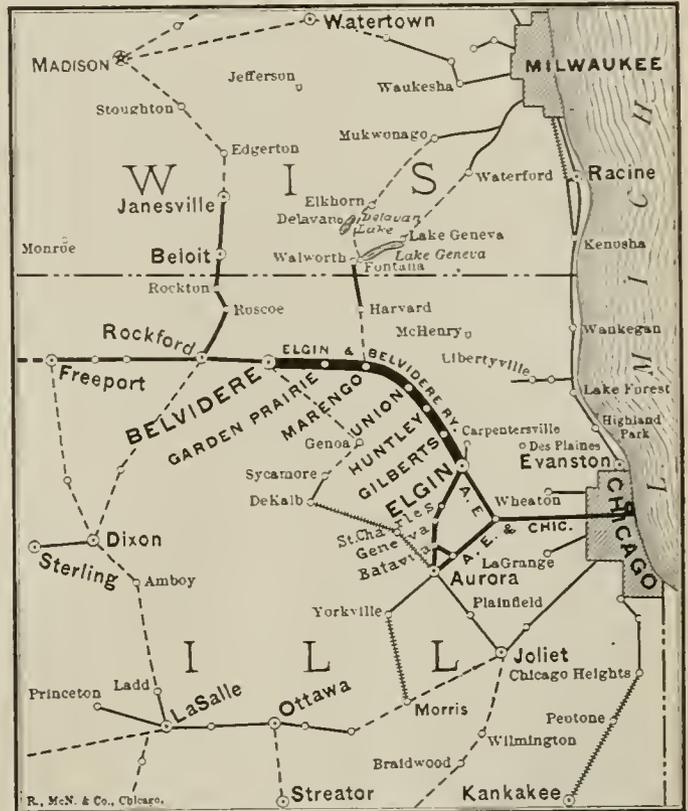
In case of any accident to persons or property, however slight, in connection with or near a car the car-men are required to obtain the names and residences of persons injured, a clearance from blame, if possible, and a list of witnesses of the accident. All disputes and troubles which occur on a car are reported as accidents. Failure or neglect in reporting accidents is punishable by discharge.

As soon as an accident occurs the conductor of the car tries to obtain the signatures of the persons injured to printed blank forms, which exonerates him from all blame. After this is done a memorandum of the accident is made out on a card-board form, printed in blank, four by eight inches in size. From this memorandum a formal report is made to the superintendent of transportation. This report is very complete and contains, in addition to the usual information required for a comprehensive understanding of the conditions, a diagram of intersecting streets which enables the car-men to fill in the names of the streets and to give a rough sketch of the exact location of the car at the time the accident occurred.

When this report is received at the office the division superintendent conducts a thorough investigation, after which he sends to the general manager a report on his decision as to whether or not the trainmen were to blame for the accident.

NEW ROADS PLANNED NEAR ILLINOIS-WISCONSIN STATE LINE.

Important developments in electric railway operations will take place this year in the territory tributary to that served by the Elgin & Belvidere Electric Company. This line, which was constructed by The Arnold Company of Chicago, was described in last week's issue of the Electric Railway Review. The accompanying map shows the route of the road, its immediate connections, and other lines in operation and proposed in the territory. Announcement is made of the organization of the Marengo Harvard & Geneva Lake Railway Company, which will build during the present year an electric line from Marengo to Harvard, Ill., where connection will be made with the Chicago Harvard & Geneva Lake



ELECTRIC RAILWAYS
 ——— IN OPERATION
 - - - - UNDER CONSTRUCTION
 PROPOSED

Elgin & Belvidere Electric Railway—Map Showing Roads in Operation and Proposed Near State Line.

Railway, which is already in operation between Harvard, Ill., and Fontana, Wis., a point on the southwest shore of Lake Geneva. It is proposed to combine these two lines and to build an extension of the Chicago Harvard & Geneva Lake Railway from Fontana to a point on the east shore of Lake Delavan. A further extension will be made to Elkhorn, Wis., where the line will connect with the electric road which is to be constructed from Mukwanago to Elkhorn. Hamilton Browne of Chicago is president of the new Marengo Harvard & Geneva Lake Railway Company.

General Manager H. C. Page of the Springfield, Mass., Street Railway, has announced a new schedule of wages for conductors and motormen, effective on March 16, as follows: For the first six months, \$2 per day; second six months, \$2.10 per day; second, third and fourth years, \$2.20 per day; fifth, sixth and seventh years, \$2.30 per day; eighth and ninth years, \$2.40 per day; tenth and subsequent years, \$2.50 per day.

PIPING AND POWER STATION SYSTEMS.—XXXIII.

BY W. L. MORRIS, M. E.

To overcome the difficulty of opening up a trench as deep as shown for the waterway it may be found more economical to use scrapers and lower the section of ground between the condenser and screen-house so that the ground over the waterway lies just below the pump-room floor as shown by the grade lines, a. This would make a trench about 16 feet deep for the intake instead of possibly 30 to 35 feet deep. By lowering the ground in this manner there could be a door from the pump room and a walk leading down to the screen-house and this would also provide more room for windows in the pump room, which is very desirable. If a surface condenser is employed practically the same arrangement would be adopted for a circulating pump and fire pump in the pump room, but the condenser and wet-vacuum pump would be located as close to the engines as possible. The pump room and the well to the waterway can be made considerably smaller, in fact the waterways may be run directly under the pump and be fitted with a manhole opening and ladder leading down to the water. The floor of the pump room shown in Figure 261 may also be run over the intake and hotwell, there being no serious objection to this arrangement, as there is no machinery located in the well, as would be the case in Figures 253 and 254. Figure 261 unquestionably is the most practical system for plants located at a considerable distance above the water supply, as it is possible to start the pump and obtain the full vacuum before the engines are started, and thus avoid interruption caused by the opening of circuit-breakers and the stopping of the pump motors.

The system is more economical from an operating standpoint and it would be in most cases as economical to construct as any of the other systems described, due to the fact that only standard apparatus is employed. It would be necessary in such a system to have an elevated water tank and priming lines connected to all the pumps in the pump room so that they can be started with a 14 or 16-foot suction.

Class 13, 4 and 5.—Circulating Water, Main and Branches.

If the plant is fitted with more than one condenser or more than one pump, a main should be provided into which all the pumps discharge and one from which all the condensers receive their water. This arrangement enables the operation of any of the pumps with any of the different condensers. Such an arrangement is particularly essential in the case of motor-driven pumps, as it permits the use of as many pumps as may be required. The pressure on these

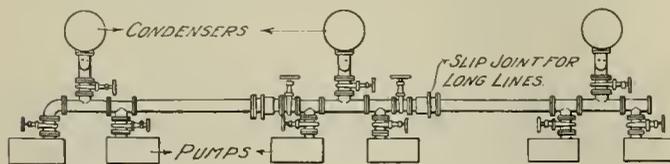


Figure 262-(13-1).

lines would be very slight, in fact they may be under vacuum, this being determined by the style of the condensers and the relative elevations of the line with respect to the condensers. Light cast-iron pipe is very suitable for this service, but special provision must be made for the expansion and contraction with changes of temperature. Valves should be placed in each branch and should also be located along the main so that each condenser unit may be isolated, together with its pumps, as shown in Fig. 262-(13-1).

By arranging lines in this manner, it is possible to shut down any portion of the main to make repairs and permit the remaining portion to operate without interruption. The size of the main required is only that required for one con-

denser or two pumps, and for three condensers would simply be the size of the branch pipe to the condenser. This main is also desirable if the pumps are steam driven as it makes the injection water more easy to control. A pressure gauge should be placed on the main to indicate whether the pumps are delivering more water than required, which would cause the pressure to increase, or whether the supply is insufficient, which would result in a decrease. The injection valves (or admission valves to a surface condenser) are generally controlled by hand, and as they are opened or closed to meet the demand of the condensers, the capacity of the pumps is also changed, due to the increased or decreased pressure against which they are delivering. It is therefore quite impossible to keep the quantity of cooling water properly regulated, as the conditions constantly change, so that if the water supply is adjusted at a sufficiently large amount to insure the maximum vacuum obtainable, then the tail water is for the greater portion of the time at a very low temperature. If the quantity of water is reduced to raise the temperature of the discharge water, then the vacuum will be less than that which is obtainable, except when the load may be temporarily light.

The ideal method of controlling the circulating or cooling water would be by means of a thermostatic regulator operated by the temperature of the tail water, opening or closing the inlet valve as quickly and as often as the temperature of the discharge changes. Controlling the quantity of injection by the vacuum is very uncertain and undesirable, as it is evident that if leaks should occur or for any other reason, such as the condenser becoming air-bound, the vacuum drop, the quantity of injection would be abnormally increased, resulting in too low a temperature of the tail water and a waste of power in the circulating pump, as the extra supply of injection is useless. A thermostatic regulator for controlling the quantity of the injection water is shown in Fig. 263-(13-2). The regulator, as will be seen, consists of an expansion tube which is permanently attached to a point near the lower end of the tail pipe and attached to the injection valve by an adjusting screw which permits the regulator to be adjusted.

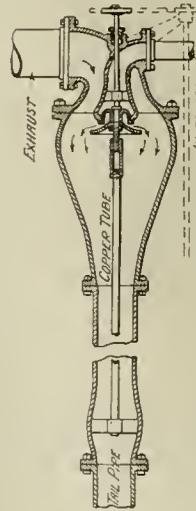


Figure 263-(13-2).

The length of the tube is so chosen that it will give the desired travel to the valve. As copper has a higher coefficient of expansion than cast iron, as the temperature of the injection water becomes too high, the lengthening of the copper tube increases the opening through the injection valve, which admits more water and constantly lowers the temperature of the injection. Should the temperature of the tail water become too low, it is evident that the reverse process occurs. The shaft, sprocket, etc., shown by dotted lines on the diagram, is for a valve extension so that the valve can be operated from the floor if desired. A thermometer placed in the tail pipe and a vacuum gauge connected to the exhaust pipe should be placed near the operating handle of the injection valve so that the attendant may observe the vacuum and temperature of the discharge when adjusting the amount of injection water supplied to the condenser.

In reading the vacuum gauge a correction must be made to allow for the column of water in the pipe if there is a long drop or rise in the gauge connection. Each foot of pipe filled with condensation is equal to about an inch on the vacuum gauge. It is seldom that two or more vacuum gauges will read the same, due to the difference in the length of their water columns. The pointer on a gauge is set to show the pressure at the gauge connection, and if the pipe runs from either above or below the gauge and water collects in

the pipe, the gauge will read incorrectly. To determine the extent of this inaccuracy, the gauge should be read and the line then quickly blown out and the gauge re-read, at the same time noting the pressure on some other gauge to ascertain whether the pressure remained constant while the gauge connection was being blown out.

Class 1, 6, 7 and 8—Waterway Connections for Other Service than Condensing.

In regular operation, the feed pump would draw water directly from the hot well or from the hot-well pump which would deliver the warm water to an open heater, from which the feed pump would deliver it to the boiler. The fire pump would draw its water from the intake line only, regardless of whether it is supplying the low-pressure main or the high-pressure lines in case of a fire. The pump that is used for tube-drilling should have an intake connection and the feed pump should also have a connection to the intake for use when the condenser is not in operation. To facilitate the arrangement of these different connections with the circulating water lines it is generally found that the best arrangement is to run both the intake and discharge waterways under the building in such a way that all the pumps can take their suction directly from the waterways without the necessity of using a long suction main to which the different pumps are attached, with their numerous pipe joints, valves, etc.

When laying out waterways for condensing machinery it should be remembered that there are other uses for the water which if not properly provided for at the start will lead into complicated and troublesome pump suction. If the intake is laid out as a part of the building construction and the portion under the building is completed before making a connection to the water supply there should be no particularly difficult features met in its construction. The location of the waterways that is best adapted for all the various connections is parallel with the dividing wall between the engine and the boiler room, the various pumping machinery being set along the wall and over or just to one side of the waterway. To avoid the possibility of loosening the soil alongside of the waterway and provide a safe footing for the division wall, crane columns, etc., it would be found both a safer and more economical construction to support the walls on the masonry of the waterway as shown in Fig. 264-(16-1). The top and bottom of the waterway may be reinforced as shown. Sleeves should be placed in the concrete for the suction pipe to pass through, and manholes provided with ladders built into the concrete should be placed in the waterway to facilitate entrance for cleaning or inspection.

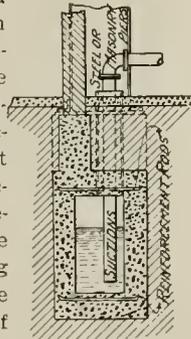


Figure 264-(16-1).

(To Be Continued.)

Submersion of Wood in Water.

In an article on "Kiln Drying Hardwood Lumber," published by the Forest Service, Frederick Dunlap says:

"Prolonged submersion of wood in water is believed to prepare it well for drying. The probable reason for this is the leaching out of the sap constituents so that the cell cavities finally contain approximately pure water; for the organic sap, as we have already seen, appears to hamper the extraction of water in drying. In rafting, logs frequently remain a long time in water before they are sawed, and the lumber cut from such logs is held to dry more readily and thoroughly. For the past two years the Forest Service has been conducting experiments on the influence of submersion upon subsequent air-seasoning. These experiments are not yet concluded, but present results add weight to these views. The effect of submersion upon subsequent drying varies with species and climate.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B.

Passing Teams Left Unguarded.

If among the many teams left unguarded some may be negligently so left, the supreme court of New Jersey says, *Brower v. Public Service Corporation of New Jersey*, 64 Atlantic Reporter, 1052, that a street railway company cannot have imposed upon it the burden of assuming that all unguarded teams are sources of danger and be made negligent for passing any unguarded team.

Not One Continuous Trip, But Two Trips.

A man left his office intending to go to his home, and, being invited by a friend, took a car, and, visiting with his friend, rode beyond the point where he would have transferred by the usual route to reach his home, and kept on riding away from his ultimate destination. Having finished his visit, he sought to reach his home by transferring from line to line, but was finally refused a transfer, and accounted himself aggrieved by what he alleged was the company's violation of the provisions of section 104 of the New York railroad law, requiring the company "to carry between any two points * * * any passenger desiring to make one continuous trip between such points for one single fare." But the second appellate division of the supreme court of New York holds, *Hunt v. Brooklyn Heights Railroad Company*, 101 New York Supplement, 209, that his trip was not continuous as the term is used in this section, and that he was not entitled to recover a penalty for being refused a transfer. It says that he was making two trips—the first to last as long as his visit with his friend was incomplete; the second to reach home from the point where his visit ended.

Walking on Track to Avoid Snow—Duty of Motormen.

Discussing rights in streets, the supreme court of Indiana says, on the appeal of the Indianapolis Traction & Terminal Company v. Kidd, 79 Northeastern Reporter, 347, that pedestrians have a right to use any part of such highways, but the question whether a particular use is such as a reasonably prudent person would make must depend upon the attendant circumstances. When a certain portion of the highway has been paved as a sidewalk or otherwise reserved for the exclusive use of foot passengers, and the same is unobstructed and in suitable condition for such use, it may not be prudent to walk in the roadway set apart for the use of vehicles.

In this case it appeared that the street along which the plaintiff was passing was covered with melting snow and ice to a depth of from six to fourteen inches, except the space between the rails of the company's tracks, which was paved with brick and was practically free from all obstructions. This condition of the street explained the plaintiff's use of the track. She was required to use ordinary care for her safety, and the duty which she owed to the company was to vacate the track when apprised that the same was required for the passage of a car. She had a right to assume that the company's cars would not be run at an excessive rate of speed, and that she was not required to anticipate that a car upon a straight track in broad daylight would run her down from the rear without any warning. In considering the question of her alleged contributory negligence, due regard for the reciprocal rights, duties and obligations of the company must be observed. It had no right to exclude her from its track upon the street, but had the right merely to require her to remove therefrom when she ascertained or was notified that the same was needed for the passage of one of its cars.

Its servants in charge of the operation of its cars were required to exercise diligent and constant watchfulness for persons who might be upon or approaching the track. Such servants were required to take notice of obvious obstructions

to the ordinary and free use of the street. The drivers of such cars were chargeable only with the exercise of ordinary care for the safety of other users of the street, but ordinary care in law implies a high degree of watchfulness and vigilance when propelling a car at a speed of 20 to 25 miles per hour through the streets of a populous city, where persons on foot and in vehicles are constantly passing and repassing, including the aged, infirm and crippled, as well as children thoughtless and wanting in prudence and discretion.

Regard to Be Had for Disabilities of Passengers.

The correct principle, which is deducible from all the better-reasoned cases, the supreme court of Washington says, *Plattor v. Seattle Electric Company*, 87 Pacific Reporter, 489, is that the conductor, having supervision and control of the car and of the passengers on the car, must exercise that supervision in a reasonable way, taking into consideration the appearance of the passengers and the circumstances surrounding them. It is the infirmity of the passenger and his incapacity to protect himself that he must take notice of, no matter whether that infirmity is produced by age or from being crippled, or from ravages of disease, or from excessive obesity. Or it might be that a passenger, who was young, agile and alert, would be incapacitated from protecting himself from the sudden lurch of a car for the reason that his hands were occupied by holding a child or some other burden. In all such cases the conductor should see that the passenger has time to obtain his seat before the car is started with such suddenness as to imperil his safety. This doubtless is more or less burdensome upon the conductor, but it is a burden imposed in the interest of common humanity and for the welfare of the public.

Conductors' Transfer Statements—Ordinance v. Orders.

A statement by a conductor when issuing a transfer that it was good on a certain line the supreme court of Illinois holds admissible in evidence in an action by the holder for alleged wrongful ejection from a car on said line. It says, *Chicago Union Traction Company v. Brethauer*, 79 Northwestern Reporter, 287, that in the view which it takes of this question the conductor of a street car line who is placed in charge of a car, supplied with blank transfers and authorized to punch and deliver them to passengers upon request, in consideration of cash fare previously paid, stands in the relation to the street car company and its passengers very much like a ticket seller who has been chosen for the purpose of supplying the public, for a consideration, with tickets entitling the holder to certain rights and privileges. In such case the ticket seller, for the purpose of that transaction, is the direct representative of the company for which the tickets are sold, and what such agent says in connection with the sale of tickets and as to the extent of the privileges thereby secured has often been held admissible as part of the *res gestæ* (things done) and as characterizing the subsequent conduct of the purchaser of such ticket. Such evidence having been held admissible with respect to ticket agents by the courts of many other states of the Union, this court sees no reason why a conductor of a street car, in delivering transfers to passengers when it is his legal duty to do so, should not be governed by the same rules.

The court also holds that an ordinance requiring certain transfers having been held valid, the ordinance was as valid before the rendition of its decision as it was afterwards, and if the company chose to regard it as invalid, and instructed its employes accordingly, it did so at the risk of having its contention set at naught and its acts in violation of the ordinance pronounced illegal. A violation of the law cannot be excused on the ground that the violator believed the law unconstitutional. The validity of the ordinance having been established, the duty of the company and its servants, and their relations to the plaintiff, must be determined by the ordinance

rather than by the instructions of the company to its servants based on the assumption that the ordinance was invalid. It was the duty of the conductor issuing the transfer referred to as a servant of the company, to issue transfers regardless of any instructions he might have had to the contrary from his superiors, and in carrying out this duty he must be held to have been acting for and on behalf of the company.

Occupation of Street and Inquiry Into It by State.

The occupation of a public street for railway purposes, the supreme court of Iowa says, *State v. Des Moines City Railway Company*, 109 Northwestern Reporter, 867, is not a matter of common right, and without a legislative grant therefor the construction or maintenance of such a railway would expose the party responsible therefor to punishment as for a nuisance. The municipality to which is given authority to grant such a privilege exercises a delegated power only, and it cannot grant to any person or corporation a privilege which is confessedly in derogation of the common right, in a manner which shall exclude the power of the state to inquire into its abuse, or to prevent the subversion of the public interests which the legislative grant was intended to protect.

To say that the state has surrendered to the city all its power and authority to protect public interests against usurpation, neglect or abuse by a corporation of its own making, and that so long as the city authorities are content to remain quiescent the state is powerless in the premises, is to say that the state may surrender its sovereignty and the legislature estop itself by an abdication of its legislative power. Even the state itself cannot constitutionally authorize the occupation of the streets for anything but a public purpose, and if a city government by its indifference to public interests or by a mistaken estimate of its own power in the premises permits a corporation to occupy its streets without legal right to such franchise or to assume without authority other rights which are not common to the people generally, the state has the inherent and reserved right to call upon such corporation to show by what warrant it assumes to hold or exercise such franchise.

Number and Kind of Fenders—Leaving Rear One Down.

A fender, the supreme court of New Jersey says, *Whilt v. Public Service Corporation of New Jersey*, 64 Atlantic Reporter, 972, is a usual appendage of a street car, intended to promote the safety of travelers upon the highway. In some states it is required by statute. Whether the street railway company shall have a fender at one end only or at both is a matter of detail in the construction of its cars, which ought to be left to the reasonable judgment of the managers. It may reasonably be thought advisable to have fenders at each end rather than a movable fender, to be transferred from one end to the other, as necessity requires. Whether a rigid and immovable fender is likely to serve the public safety better than a movable fender is also a matter upon which men may reasonably differ. It may well be that a rigid fender will better serve the purpose intended than a movable one. So, too, the company may fairly think that the danger of a fender becoming loose and falling, in case it is fastened up, is greater than the danger to be apprehended from a fender that is always down. It is bound to the exercise of a reasonable judgment and of due care and skill, but it is not to be condemned as negligent merely because the event that happened would have been avoided if its judgment had been different.

In this case the plaintiff, a passenger on a street car, alighted for the purpose of taking another car, and in passing to the rear of the first car came in contact with the chain running down from the rear dash to the end of the fender, and was injured. The fender, contrary to the usual custom as to rear fenders, was down. The court holds that the facts did not justify an inference of negligence on the part of the street railway company.

News of the Week

Louisville Strike Is Settled.

By a unanimous vote on the evening of March 14, the striking employes of the Louisville (Ky.) Railway Company resolved to accept the terms agreed upon by their executive committee and the officers of the company. The strike became effective at 5 o'clock on the morning of March 10, and 800 employes participated in it. The terms of settlement provide for an increase in wages from 18 to 20 cents an hour for new men and wages of 22 cents an hour for all employes after the first year, 25 cents an hour for overtime, 30 minutes for lunch, the men to be restored to their positions, and, for the company, an open-shop policy in the hiring of new men. The executive committee which represented the strikers did not secure the establishment of a closed-shop policy or recognition for the union. It was agreed that if future differences arise they will be settled by arbitration. The strikers created riots, and the settlement was due partly to the efforts of commercial organizations in the city and representatives of the Greater Louisville Exposition.

Plans for a Municipal Street Railway in Detroit.

Mayor Thompson of Detroit is said to be forming plans for a semi-municipal three-cent fare street railway company to be organized on the plan of the Municipal Traction Company of Cleveland, to gain a foothold in the streets of Detroit and to take over the lines now operated by the Detroit United Railway as fast as that company's franchises expire. He has made no definite announcement of the details of his plans, but he has been in conference with Mayor Johnson of Cleveland in regard to the matter and on March 11 stated to the city council that a syndicate was ready to guarantee to pay the Detroit United Railway a 10 per cent advance on the cost of any track extensions made by the company without a city franchise. When questioned recently as to his plans Mr. Thompson refused to show his hand but quoted the following paragraph from his inaugural speech: "If an equitable adjustment is not possible, capital is ready and willing to build all lines in the city of Detroit, and take over and occupy existing grants as they may expire and upon terms far more favorable than any heretofore offered. The strongest position for the city to occupy and the one most likely to lead to a reasonable and right settlement of this question will arise when there exists a rival company to test the claims of the existing company by the law of competition."

Single Fares on Connecting Systems.

A broad decision on the question of allowing a single fare within the limits of a city traversed by two separate but connecting street railways was rendered recently by the railroad commission of Massachusetts. Citizens of Walden petitioned for a 5-cent fare for rides within the city limits, although these rides involve parts of two distinct systems, the Boston & Northern Street Railway and the Boston Elevated Railway.

The board states that the serving of one of the important thoroughfares of the city in part by one system and in part by the other has been a barrier to the enjoyment of a single five-cent fare between all sections, but that the same conditions exist at nearly all other points where interurban railways connect with the system of the Boston Elevated Railway Company. The peculiar privileges granted to that company under the acts of 1897 include the right to insist upon a five-cent fare from every passenger, a right that stands in the way of any arrangement for a joint fare to be shared with other companies. The board states that it has no authority to suggest that the Boston Elevated relinquish a part of the fare to which it is entitled by law; that it cannot rightfully ask the Boston & Northern to render services without compensation, and that it has no jurisdiction over the extensions of railway lines or changes in the control or ownership of such lines. Under these circumstances no action is open upon the complaint which will afford the complainants the facilities which they desire.

Henry Loomis Nelson on Municipal Ownership.

"Should Municipalities Both Own and Operate All Public Utilities?" was the subject of a debate held on March 10 at the New Rochelle, N. Y., under the auspices of the People's Forum of that city. Martin W. Littleton, ex-borough president of Brooklyn, said that they should, while Henry Loomis Nelson, who is now filling the chair of political economy at Williams College, contended that municipal ownership had been a failure wherever tried, in this country or abroad. Mr. Nelson asserted in his argument that the world had prospered and grown to what it was by individual effort, and that the great incentive to thoughtful men was the profit that they might reap as the fruit of their genius or industry. The question that everyone must put to himself, he said, was whether "we are prepared as yet to drive out the individual from business by taking away his incentive." He continued:

"Are you going to take the management from him and are you going to begrudge him a fair profit and pass it over to the average man of the community? Are you going to go very far if you give it to the average man? In your railroad service, your street railway transportation and transportation by water, your telephone service and all other such important public necessities—is the average man going to take those enormous chances which the exceptional man has ever taken in this country? It is the exceptional man who has built up large communities long before they could have otherwise been built up. It is the exceptional man who makes homes for the workingman better than they

could otherwise have had. What is the real outcome of municipal ownership? Mayor Johnson recently put it right when he said 'free rides.' The majority of the voters of all large cities are non-taxpayers, and if the municipal ownership idea is adopted they will always have the power to compel the taxpayers to give them free rides, free lights, free telephones, etc. Such a condition will be the ultimate outcome of municipal ownership. If the public utilities operated by the municipalities fail to make their running expenses and meet interest on bonds, the deficit will always have to come from the pockets of the taxpayers."

Cleveland Traction Situation.

The negotiations between Presidents Andrews and Du Pont of the Cleveland Electric and Municipal Traction companies are so near a conclusion that it is believed an agreement or disagreement will be arrived at within a few days.

It is now nearly two months since the temporary peace agreement was made and all of this time has been consumed in making up a detailed inventory of Cleveland Electric physical and franchise values. Since the negotiations were commenced both sides have made important concessions and have completely reversed their respective attitudes toward important points involved. These changes in front have been largely due to revelations made in the inventory of physical values. During the past few days there has been a great deal of work done on the valuation figures at the city hall. It is stated that the figures of the Cleveland Electric experts are being minutely checked up under the supervision of the mayor.

Mayor Johnson has declared that a number of reports as to physical valuation and unexpired franchise values circulated within the past week emanated from persons whose efforts have been in the direction of bulging the stock of the Cleveland Electric Railway. He said the reports came from speculators and added that constant spreading of these rumors would tend to delay a settlement of the street railway question.

"This rumor business and stock manipulation is not sanctioned by the principal officers of the Cleveland Electric Railway," said he. "Such stories certainly are not helping progress toward a settlement. Instead they are really serious obstacles to an agreement."

"The men who are doing the negotiating are patiently and painstakingly working out their problem, which is a most complex one. There is a deliberate attempt on the part of somebody to unload stock on innocent people, who are lead to believe that there will be a settlement within a few days on prices much higher than the market one week ago. Such belief is based on groundless rumors. There is not the slightest chance of a settlement on anything like the market prices today."

It is now stated that besides determining on the valuation of the property the conferees are arranging the terms of the lease to the Municipal Traction Company and that City Solicitor Baker is preparing the security franchise under which the street railway lines will revert to the Cleveland Electric Company if the holding plan should prove a failure.

Legislation Affecting Electric Railways.

California.—The assembly has passed a bill authorizing boards of supervisors, city councils and other governing bodies of municipalities to grant franchises to interurban and street railways for carrying freight on their lines.

Illinois.—A bill has been introduced in the house to require all electric railways to do away with the third rail or overhead trolley systems and substitute the underground contact system.—The committee on municipal corporations has taken favorable action on a bill limiting the service of street railway employes to ten hours a day and providing that the ten hours employment must be had within a period of twelve consecutive hours.

Iowa.—A bill is now before the house that provides that city railways shall allow interurban railways the use of their tracks, power and terminal facilities to enter the city, the amount of compensation to be fixed by the state railroad commission in case of a disagreement between the companies.

Massachusetts.—Several bills have been introduced to amend the so-called "interurban" law of 1906, requiring electric railway promoters to secure location consents from local communities before applying to the railroad commission, and fixing the obligations for damages to property caused by elevated structures.

Minnesota.—The house committee on express, telegraph and electric lines has recommended for passage a bill giving the state railroad and warehouse commission power to make reasonable rules and regulations for the operation of electric railways in any village, city, town or county in the state of Minnesota. An amendment has been added to the original bill, at the suggestion of the city attorneys of Minneapolis, St. Paul and Duluth, to the effect that the railway and warehouse commission shall not take away any of the power at present vested in any municipality for the regulation of street cars, or that may be vested in home rule or special charters.

Nebraska.—The bill permitting the city railway companies to own and operate interurban lines has been passed by the senate and approved by the railroad commission of the house. Several amendments have been added.

New Jersey.—A bill in the house fixes electric railway rates as follows: Not more than five cents for every ten miles; transportation coupons or tickets to be sold as follows: 25 tickets, \$1; 50 tickets, \$1.75; 100 tickets, \$2.50; larger amounts at the rate of the 100-ticket book. Each coupon thus sold to entitle the holder thereof to one ride not exceeding 10 miles. Each cash fare or coupon shall entitle the bearer to transfer to any other line owned, leased or operated by the same company, and shall be good for one hour at the junction point.—Another bill amends the corporation act so that two of the three incorporators shall be residents

of New Jersey; limits the period of duration to thirty years; authorizes all absent stockholders to vote at all meetings by proxy in writing; that all property in payment for stock must be clearly described and, if real property, must be located; if any part of stock is issued for services or expenses such services or expenses must be described in detail; provides a new method of changing corporation's business or its name, or increasing or decreasing capital stock, etc.

New York.—Attorney-General Jackson has introduced a bill providing that no more than a 5-cent fare shall be charged within the corporate limits of a city or town for a continuous ride on any railroad, on branches, or leased lines, or connections of such road.—The so-called "public utilities bill" championed by Governor Hughes was introduced in both houses of the legislature last week. The act creates one public utilities commission for New York city and another for the remainder of the state. Each is to be composed of five members, who are to receive \$10,000 each per year. The New York city commission is given all the powers of the present rapid transit commission and many additional ones, including control of all common carriers operating exclusively within its jurisdiction and of those portions of other railways within the limits of the city, and also of all gas and electric corporations. Both passenger fares and freight rates may be regulated by the two commissions in their respective jurisdictions, and they have power to compel adequate service to be given. All mergers are prohibited unless consented to by the commissions. Present holdings of stocks of public service corporations by stock companies are not interfered with, but no new holding companies are permitted to be formed. The fines for disobeying the orders of the commissions range from \$1,000 to \$50,000, and officers and employes of quasi-public corporations, as well as shippers and others who violate the law, may be held guilty of a misdemeanor. The governor is empowered to appoint both commissions.

Ontario, Canada.—A bill has been introduced in the legislature to permit the Port Arthur Electric Street Railway Company, which is owned by the municipality of Port Arthur, to operate its cars on Sunday, within the limits of the city and as far as the limits of Ft. William.

Pennsylvania.—Forty-eight different bills affecting electric and steam railroads have been introduced in the senate and house. The house committee on electric railways has reported favorably on bills giving electric railways the right of eminent domain and the right to carry freight, also bills permitting cities and traction companies to enter into contracts and requiring the consent of local authorities before charters are granted to passenger railways.—The Hall bill, prohibiting steam railroad companies or their officers or directors to own a part or controlling interest in the stock of a parallel street railway line was reported out with a heavy penalty clause attached.—The Dunsmore bill creating a state railroad commission was reported with several changes, providing for five members with salaries of from \$5,000 to \$6,000 annually.—A bill introduced by Representative Edward H. Fahey of Philadelphia permits municipalities, boroughs and townships to have representation in the directorates of electric railways. This is to provide for the reorganization of the Philadelphia Rapid Transit Committee, according to the plan of the retail merchants' association.—Other bills include the following: Providing for the construction of bridges over or under street railroads where a public highway is about to be opened which intersects or will intersect a railroad and the township in which it is reasonably unable to bear the expense to be erected as county bridges.—Requiring that all street cars be provided with vestibules in cold weather.—Requiring street railway companies to furnish seats for every passenger or to collect only half fare.—Requiring suburban trolley cars to be equipped with toilets and water closets.—Requiring steam and electric railways to report the number of statute miles operated by them.—Requiring township assessors to assess all traction engines, motor cars, automobiles, trucks and vehicles propelled by steam, electricity or other motive power.—Authorizing municipal authorities to compel railroads to erect safety gates.—Forbidding railway companies to lease or purchase the franchises of or own stock or in any way control a parallel or competing street railway line.—Forbidding officers of any transportation company from holding stock in any competing lines or from being officers thereof.

Texas.—Governor Campbell has signed the bill granting to interurban railroads the right of eminent domain. The bill was intended to facilitate the building of the line from Houston to Galveston, in which Stone & Webster of Boston are interested.

Washington.—Both houses have passed a bill authorizing the city of West Seattle to sell its municipal street railway to the Seattle Electric Company.

Progress of Subway Plans in New York.

The rapid transit commission will begin advertising on March 15 for bids for the construction of the first section of the subway to connect the Manhattan terminals of the Williamsburg and Brooklyn bridges. Sealed bids will be received until noon of April 11. The time for opening bids will be fixed at a meeting of the board on that day. The board will bind itself to make the award to the successful bidder within 10 days after the opening of the proposals.

The bridge loop is to be built by the city and to be controlled by the city. This is to enable the municipal authorities to give access to the tunnel to the Brooklyn Rapid Transit Company as well as to a Manhattan railroad system. The contracts for the operation of the tunnel will not be let until after it has been finished. The section for which bids will be asked on Saturday will extend under Centre street from Pearl to Canal. As this will be more difficult to build than the second section from Canal

street to Williamsburg Bridge, there will be no hurry on the part of the commission to ask for bids for the second stretch.

The bidder to whom the contract is awarded will have to deposit \$300,000 security and must complete the section within 21 months. If the work is completed in 18 months a bonus of one per cent of the unexpended balance due to the contractor from the city will be paid. It is estimated that this will be about \$15,000. The plans call for a four-track subway in Centre street and two tracks under Walker and Canal streets when the turn to the east is made. There is to be a station between Leonard and White streets.

Pipe galleries are to be laid, but for this work separate bids will be asked for. The advertisement will state that the manner of construction shall be by the "cut and cover" method, so far as Centre street is concerned, but in Walker and Canal streets the opening excavation process is to be permitted.

The commission awarded on March 11 the contract for the printing and engraving of 500 copies of each of more than 350 detailed drawings of plans for the Lexington and Seventh and Eighth avenue subways and the loop line connecting the Manhattan terminals of the East river bridges. Bids for the construction of all these routes will be advertised for simultaneously. Final action on the Seventh and Eighth avenue lines cannot be taken until after a statutory public hearing on the form of contract. This hearing has been fixed for March 25. The contract will then be passed upon by the board of estimate at its meeting on March 28 and it is expected that about a week later the advertising for bids will begin. The advertisements must appear for six weeks and by about the middle of May the commission will be able to award the contracts.

Street Railway Association of the State of New York.—The next regular meeting of the New York association will be held the latter part of June at Bluff Point, N. Y.

Annual Meeting New England Street Railway Club.—John J. Lane, secretary, Boston, Mass., announces that the annual reception and dinner of the New England Street Railway Club will be held on the evening of March 28 at the Hotel Somerset, Boston.

Oklahoma Electric Light Railway & Gas Association.—The first meeting of the newly organized Oklahoma Electric Light Railway & Gas Association will be held on April 22 and 23 at Oklahoma City. Charles W. Ford, of Oklahoma City, is secretary. The programme has not yet been announced.

Electric Road Gets Mail Contract.—The Houghton County Street Railway of Hancock, Mich., has taken a contract to carry United States mail between the Houghton and Hancock postoffices and Franklin Mine and Demmon. The service will begin on March 18 and will include a delivery of mail each way twice daily.

Physical Examination for Trainmen.—The Fort Wayne & Wabash Valley Traction Company has adopted the system of physical tests which is in vogue on all the principal railroad systems of the country. Dr. M. H. Thomas of Huntington has been employed to make the tests and all of the trainmen of the company will be required to submit to the examination.

Proceedings of Iowa Association Issued.—The proceedings of the third annual convention of the Iowa Street and Interurban Railway Association, held at Des Moines, Ia., on April 19 and 20, 1906, have been issued. The principal paper is that by Mr. F. W. Hild of Chicago on "The Gasoline Car for Interurban Service," which contains exhausting and interesting data as to the cost of operation and maintenance of different types.

Freight Interchange Agreement in Massachusetts.—The Old Colony Street Railway of Boston, Mass., and the Brockton & Plymouth Street Railway of Plymouth, Mass., have effected an agreement for the interchange of freight and express, which went into effect on March 4. By this arrangement shippers along the lines of the extensive system of the Old Colony company will have easy access to the towns between Brockton and Plymouth.

The Question of Municipal Ownership.—Mr. R. W. Hutchinson, Jr., whose technical work, "Long-Distance Electric Power Transmission," has just been published by the D. Van Nostrand Company of New York, has an article in the March issue of Public Service on "The Question of Municipal Ownership," in which publicly owned utilities are heavily scored. Mr. Hutchinson is on the staff of the National Brake & Electric Company of Milwaukee.

Value of Creosotes.—The forest service of the department of agriculture announces that it has investigated by chemical analysis the qualities of different creosotes used for preserving timber and a detailed account of the methods employed and the results obtained are now published. Those who desire the publication should ask for "Circular No. 80—Fractional Distillation of Coal Tar Creosote," and requests should be made to The Forester, Forest Service, Washington, D. C.

Ten Fares for a Quarter for School Children.—The Citizens' Railway Company of Lincoln, Neb., has recently put on sale a new form of tickets for school children, at the rate of 10 rides for 25 cents. The tickets are not transferable and are good only on school days and at stated hours. In order to secure the tickets, the pupil and parent sign a statement that the ticket is to be used exclusively by the pupil and the principal of the school attended certifies to the correctness of the statement.

Service Ordinances in St. Paul.—The St. Paul, Minn., assembly has passed the three ordinances passed by the board of aldermen on March 5 providing for increased service by the St. Paul City Railway, which is controlled by the Twin City Rapid Transit Company. One of the ordinances directs what service shall be main-

tained during rush hours on ten of the principal car lines of the city. The others order the building of a new line and the operation of a loop line at the terminus of the Maria street line.

Paper Car Wheels for Detroit.—It is reported that the management of the Detroit United Railway will equip several of its cars with a patented car wheel, of which the axle collar and tire are of cast steel and the space between of many thicknesses of paper, held by bolts and iron side pieces. The principal object of the test is to ascertain whether these wheels possess the qualities of noiselessness that have been claimed for them, as there has been considerable protest by the city authorities of Detroit recently against the noisy cars.

Shelters Under Boston Elevated Stations.—The Massachusetts railroad commission has recommended to the Boston Elevated Railway that it erect shelters under the elevated stations at City square and Thompson square, Charlestown, to protect passengers waiting to transfer onto the surface lines from rain and snow. The recommendation provides only for a temporary overhead covering because when the Washington street subway is completed it is contemplated lengthening the elevated station platforms because the length of the trains is to be increased from five cars to eight.

Car Stops at Street Crossings.—After a week of experimenting with a rule requiring motormen to stop all cars at both the near and far sides of street crossings the Philadelphia Rapid Transit Company on March 8 issued an order that the rule would be discontinued on March 11 and that cars would stop hereafter only on the near side to receive and discharge passengers. An exception is made at streets occupied by double-track railroads, where the cars will stop on both sides. The rule requiring stopping at both sides of the street seriously delayed the cars and caused many complaints on the part of both the public and the employees.

Employees' School at Youngstown.—M. E. McCaskey, second vice-president and general manager of the Mahoning & Shenango Railway & Light Company, which operates the city lines of Youngstown, O., and other towns in that vicinity, has instructed General Superintendent G. J. A. Paul to open a school for conductors and motormen at Youngstown. The public has been requested to report to the management full particulars of any cause for complaint in the conduct of the employees, and these cases will be taken up in the class-room, where the men are to receive instructions both in the handling of cars and in their relations to the public.

Massachusetts Merger Suit.—W. S. Slocum has been appointed master in equity to hear the suit brought by Attorney-General Malone of Massachusetts several months ago against the New York New Haven & Hartford Railroad Company for an injunction to restrain the company from further using the franchises or guaranteeing the bonds of street railway companies. It is charged that the company, in violation of the law passed by the 1906 legislature, owns and controls, directly or indirectly, the Worcester & Southbridge, the Worcester & Blackstone, the Worcester & Webster and the Springfield street railways, and that it guarantees the payment of bonds and dividends of those companies.

A New Engineering Course at the University of Illinois.—A railway engineering and administration course has been established at the University of Illinois, which no doubt will supply the long standing demand for instruction on railway subjects. The small bulletins which have just been sent out and which can be obtained by writing to the registrar of the university, explain the course briefly and show some interesting photographs of the test cars and test locomotives which are at the disposal of the students. These cars which have been built especially for test purposes are of standard design except for the interior, which has been equipped with all the instruments necessary for making tests of any description. W. L. Pillsbury is registrar, Urbana, Ill.

New Bi-Monthly Mining Journal.—The incorporation of the Canadian Mining Review with the Canadian Mining Journal has been announced by the publishers, the Mines Publishing Company, 171 St. James street, Montreal, Que., with branch offices at Halifax, Victoria, and London, England. The first issue of this paper has been received and contains a large number of excellent articles on mining, metallurgy and allied arts. Besides a staff of able editors, a large staff of special contributors has been secured, which contains the names of most of the prominent mining engineers and metallurgists of Canada. Among the many excellent contributions of the first issue are: "Mines and Mining at Cobalt," by Willet G. Miller; "Western Coal Resources," by J. C. Gwillim; "Recent Developments in Metallurgy," by S. F. Kirkpatrick; "Iron Mining in Northern Ontario," by H. B. Willmott."

New Type of Fender.—F. I. Fuller, manager of the Portland (Ore.) Railway Company, appeared recently before the special fender committee of the Portland city council and requested that no action be taken by the body until the company had time to experiment with a type of fender that is now being constructed. Mr. Fuller said that he believed the fender he had in mind would be practical and that it would be superior to the one now in use. The committee granted his request and adjourned to meet again at the call of the chairman. The new fender in which Mr. Fuller has faith is a double one, and if it works as is planned it will be almost impossible for a street car to run over a person lying on the track. If an object struck by a car is not caught by the first fender but instead passes beneath it, the second fender will fall to the ground to act as a scoop, the device acting automatically.

Construction News

FRANCHISES.

Atlantic Highlands, N. J.—The New Jersey Traction Company has applied for a franchise to build an electric railway in Atlantic Highlands from the pier to connect with the main line.

Augusta, Ga.—The Augusta Railway & Electric Company has made application for permission to lay a single-track line and operate freight and passenger cars on certain streets in Augusta. One object of the company is to connect the line on Reynolds street with the new freight and express warehouse which it proposes to erect at 757 Broad street.

Brazil, Ind.—The Indianapolis & Western Railway has applied to the board of commissioners to build its road from the eastern line of the county to Harmony, Ind., and from there to the eastern city limits of Brazil. It is stated that the commissioners will demand a rate of 1 cent a mile between Brazil and Greencastle and between Brazil and Terre Haute as one of the provisions of the grant. Final action will be taken next Tuesday. C. C. Reynolds, general manager, Indianapolis.

Burlington, Wis.—A franchise has been granted to the Milwaukee Light, Heat & Traction Company for an extension of its suburban line through Burlington.

Cheektowaga, N. Y.—The Cheektowaga Railway Company, recently incorporated in New York with a capital of \$75,000, has been granted a 50-year franchise to construct its line through this town. The line will run from Clinton street and the city line of Buffalo to the intersection of Lawson road and the Transit road by way of Cheektowaga, about 6 miles, and will be double-tracked part of the way. The proposed line will serve the New York Central's gravity yards which are to be built in Cheektowaga and will cross the yards on an overhead structure 2,000 feet long. A certificate of necessity soon will be applied for and it is stated that New York contractors have been asked for bids on the construction of the road. Charles L. Williams, William H. Kinch, Edmund L. Ryan and others are interested.

East Aurora, N. Y.—A franchise has been granted to the Buffalo Southern Railway for a line from Main street in Buffalo to East Aurora.

Fremont, O.—A franchise has been granted to the Fremont Belt Line Railway for a belt line in Fremont and a line from there to Port Clinton. It is stated that the owners of the Toledo Port Clinton & Lakeside Railway are back of the project. Col. Webb C. Hayes of Fremont, is interested.

Greenfield, Ia.—The American Electric Railroad Company, which will build an interurban line from Des Moines to other points in Iowa, has asked for a franchise to build and operate an electric line in Greenfield, reserving the right to use steam or gasoline for construction or wrecking trains only. The line must be completed by March 1, 1909, or the franchise will be void. A special election will be held on March 19 to vote on the question. C. W. Baker, Des Moines, Ia., president.

Lincoln, Ill.—The Springfield & Northeastern Traction Company has applied for a franchise to enter Lincoln on Chicago street and to build its line over certain other streets. This is part of the line that is contemplated to Peoria by way of Pekin or Mackinaw. It is stated that a large car barn will be located in Lincoln at the south end of Chicago street; also a freight house to care for the freight traffic will be erected. Final consideration of the franchise will be given at the meeting of the council next Monday. L. E. Fischer, Danville, Ill., general manager.

Menominee, Wis.—The Chippewa Valley Electric Railroad Company has accepted the franchise recently granted by the council for right to lay its line in that city. A light and power franchise also has been granted, acceptance of which the company has under consideration.

Nauvoo, Ill.—The Mississippi Valley Electric Railway will make application at the meeting of the city council on March 25 for a franchise to build its line through Nauvoo. It is stated that the company is ready to deposit \$25,000 with the city as guarantee of its intention to build the road.

Newark, N. J.—The Morris County Traction Company is seeking permission to lay a double-track line in Milburn avenue from the corner of Main street to the Maplewood line. It is stated that work will be started as soon as possible and the line probably in operation by summer.

Oshkosh, Wis.—The Winnebago Traction Company has applied for a franchise to operate interurban cars in Oshkosh and do a general passenger, freight, mail and express business. In return the company agrees to inaugurate a commutation system of transfers between the city and interurban lines, and, beginning in March, 1910, will pay the city \$300 a year for the grant, provided an extension of its line from Omro to Berlin is in operation by that date. Action has been referred to a special committee appointed to confer with the city attorney regarding the high-tension transmission lines.

Tampa, Fla.—The county commissioners have granted a franchise to J. Craig Phillips, former county attorney, James N. Holmes and C. B. Ware, for a line from Tampa to St. Petersburg and Clearwater. The road will begin in Armenia avenue, West

Tampa, and will run through the western portion of the county to Clearwater, about 30 miles. At some point near Seven Oaks it is proposed to build a spur of the road to St. Petersburg. Work must begin within 18 months and be completed inside of five years. It is stated that the question of whether it shall be an electric line or an automobile system has not yet been determined.

Tiffin, O.—The Cleveland & Indianapolis Interurban Railway is seeking permission to enter Tiffin on Market street and extend its line from the western to the eastern limits of the city. The franchise calls for a 25-year term and a general freight, passenger, mail and express business. Before commencing work \$10,000 must be deposited as a guarantee of good faith. The company has until March, 1910, in which to have the line in operation.

Vallejo, Cal.—The Vallejo & Northern Railway has secured permission from the board of trustees to cross certain streets in the northwestern part of the city and to lay tracks over the tidelands along the city front.

RECENT INCORPORATIONS.

Indiana Punxsutawney & Sagamore Street Railway.—Incorporated in Pennsylvania to build a 35-mile electric line in Indiana county. Capital stock, \$210,000.

Orrville Doylestown & Barberton Railway.—Incorporated in Ohio to build an interurban line between Barberton and Orrville, touching the towns of Doylestown, Easton, Marshallville, Hametown and Johnson's Corners. Right of way will be secured by a committee appointed for the purpose and it is stated that the franchise of the Barberton Wadsworth & Western and one granted to another proposed line between Barberton and Doylestown some time ago, will be purchased by this company. Capital, \$50,000. Incorporators: J. B. Meech, Dr. A. E. Stepfield, John W. Zimmerman of Orrville; John W. Hartel and George Landis, Doylestown.

Roanoke (Va.) Traction Company.—Incorporated in Virginia to build a street railway in Roanoke. Capital, \$40,000. Incorporators: C. Markley, president; C. G. Cannaday, vice-president; M. A. Riffe, J. T. Bandy, B. B. Dillard, R. C. Camp, G. R. Paris and J. A. Staff, all of Roanoke.

Salem Street Railway.—Incorporated in Ohio with a capital stock of \$10,000. Incorporators, W. M. Baldwin, George Lomitz, F. Williams, F. H. Fowler and F. P. Shellhorn. This is a subsidiary company of the Youngstown & Ohio River Railroad to which the latter's franchise to operate on Broadway may be transferred if the injunction suit now pending in the circuit court stands. The Youngstown & Ohio River Company has acquired an old street railway franchise on that street, and the suit was brought by the city to restrain operation under it because the company is chartered as a railroad.

Squirrel Hill Street Railway.—Incorporated in Pennsylvania to build an electric line in Pittsburg in Boundary and Joncaire streets, Woodlawn avenue, Northumberland street and Dennison avenue, 2½ miles. Capital stock, \$15,000. Incorporators: M. J. Hosack, president, Roger Knox, James M. Magee, Charles K. Robinson and W. D. McBryan.

Syracuse & South Bay Electric Railroad.—Incorporated in New York to build an electric line from Syracuse to South Bay, N. Y., on Oneida lake. Capital stock, \$1,500,000. Incorporators: A. K. Hiscock, William Nottingham and C. A. Lux, Syracuse, N. Y.

Toledo & Defiance Railway.—Incorporated in Ohio to build an electric line in Lucas, Fulton, Henry and Defiance counties. Preliminary surveys for the line were made several months ago by Riggs & Sherman of Toledo and soundings for a bridge over the Maumee river at Defiance also have been taken. This is one of three projected interurban lines between Toledo and Defiance, the other two being an extension of the Toledo & Indiana from Delta to Defiance and the other the Cincinnati Toledo & Detroit Short Line. It is said that grading for the latter line will commence as soon as the frost is out of the ground. Capital stock, \$10,000. Incorporators, Clem V. Wagner, M. I. Brown, M. O. Topuiff, H. C. Ehlert and C. V. Ferson, all of Toledo.

TRACK AND ROADWAY.

Asheville Rapid Transit Railway.—C. E. Van Bibber, vice-president and general manager, 60 Wall street, New York, writes that this company has purchased the Asheville Loop Line Railway, 3 miles long, and will build a line from Asheville to Overlook Park, 8 miles, to operate in connection with the loop line. Five miles have been graded. The overhead construction will be of the span type. The Railways Construction & Securities Company has the contract. Overlook Park, the objective point of the new line, is a large recreation park overlooking Asheville and the surrounding country at an altitude of nearly 3,000 feet, and is fitted up with a casino, dancing pavilion, and the usual amusement park features. J. K. Vochell, Baltimore, Md., is president. Headquarters, Asheville, N. C.

Aurora Elgin & Chicago Railway.—It is reported that the Yorkville line is to be extended to Plano and Sandwich, Ill., and that work will begin as soon as the right of way can be secured.

Bellingham, Wash.—Stone & Webster of Boston will soon begin the construction of an electric railway from Bellingham to Skagit county towns, for which surveys are now being made. S. L. Shuffleton will be the engineer in charge.

Boston, Mass.—The Boston Transit Commission has awarded

the contract for constructing the entrances and exits to the Washington street tunnel for \$20,592. A contract for furnishing 185 tons of steel and iron for section 6 of the tunnel has been awarded to the Eastern Bridge and Structural Company.

Boyetown & Pottstown Railway.—The contract for grading, concrete work and bridges on the line from Pottstown to Swamp, Pa., has been let to Fine & Harris, of Philadelphia. The contract for the bridges and steel work, including two 70-foot plate-girder bridges and one 460-foot plate-girder bridge, has been sublet to the McClintic-Marshall Construction Company. The rails will be 75-pound. All contracts for material have been let. Thomas K. Bell, of Philadelphia, chief engineer.

Buffalo & Lackawanna Traction Company.—This company, which some time ago secured a franchise for an electric railway from the Hamburg turnpike at the city limits of Buffalo to Lafayette square, has begun construction work in the city. J. C. Calisch of Buffalo, general manager.

Chicago South Bend & Northern Indiana Railway.—It was announced at a recent meeting of the board of directors that more than \$1,000,000 will be expended in improvements and extensions to the South Bend system, by this company which recently took over the Northern Indiana Railway. Plans were formulated for the improvement of Spring Brook park in South Bend and for the establishment of a new resort at Chain Lakes, about 6 miles west of the city. Arrangements were also made for forestalling the movements of the Chicago Lake Shore & South Bend Railway, which is building a competing line from South Bend to Chicago, by ordering the necessary material and equipment for the Murdock line at once.

Cincinnati Northern Traction Company.—A contract has been let to J. C. Carland of Toledo, O., for grading and bridge work on 9 miles of new line between Middletown and Hamilton, O. Contracts for 70-pound rails and tracklaying are to be let in a few days. C. A. Alderman, chief engineer, Hamilton, O.

Cincinnati Toledo & Detroit Short Line Railroad.—It is reported that this company has purchased all the right of way owned by the People's Rapid Transit Company between Cincinnati and Toledo, O., and that contracts have been let for the line between Toledo and Defiance. J. M. Morgan of Toledo is president.

Cleveland Alliance & Mahoning Valley Railway.—Work is to begin at once on the branch from Ravenna to Warren, O., 20 miles, and two steam locomotives have been ordered for construction purposes. The main line will extend from Cleveland to Ravenna and Alliance and the section from Ravenna to Bedford is to be completed this year. B. M. Frink, Salem, O., chief engineer.

Cleveland, O.—M. B. Excell, of this city, is interested with others in a project to build an elevated railway system approximately 5 miles long, from the Public Square. The plan contemplates making trackage arrangements with Interurban lines.

Coos Bay Gas & Electric Company.—It is reported that this company recently organized by Henry Hewit of Tacoma, Wash., Seymour H. Bell of Sumpter, Wash., and Louis Simpson of North Bend, Wash., will build an electric railway connecting North Bend, Marshfield and Empire City, Wash.

Corn Belt Traction Company.—Surveys are being made and right of way is being secured in the vicinity of Champaign for the proposed line from Champaign to Bloomington, Ill. H. C. Billingsley of Bloomington is interested.

Denver City Tramway.—At a meeting of the directors last week plans were adopted for the extensions to be undertaken by the company this spring and summer. Over a hundred men and teams have been put to work on the extension of the Eleventh avenue line on Madison street east of Congress park, and arrangements were made to begin work this week on the Sixth avenue line and the Eighteenth street line, which is a part of the line to Globeville to connect with the Colorado & Southern's new electric line now under construction. Construction work on the city line extensions is to be pushed this year as rapidly as possible and as much work is to be done as laborers can be found for. John A. Beeler, vice-president and general manager.

Elmira Corning & Waverly Railroad.—It is stated that construction work is progressing rapidly between Elmira and Waverly, N. Y., on this proposed line from Corning to Waverly, and that 1 mile has been graded out of Elmira toward Corning. The Powers & Mansfield Company of Troy, N. Y., has the contract.

Findlay-Marion Railway & Light Company.—Surveys have been made and right of way secured for this proposed line from Findlay to Marion, O., 47 miles, via Mt. Blanchard, Forest, Marselles and Cochranton. R. P. Hankey, president, Findlay, O.

Galion Mt. Gilead & Delaware Railway.—T. E. Buck of Mt. Gilead, O., states that the work of securing right of way for this proposed electric line from Galion to Delaware is progressing rapidly.

Grafton, W. Va.—Rails have arrived and surveys have been made for one mile of street railway in this city, and surveys are being made for an extension.

Hamilton Grimsby & Beamville Railway, Hamilton, Ont.—At the recent annual meeting the extension of the road to St. Catharines was authorized.

Henderson Traction Company.—K. R. Battin, superintendent, Henderson, Ky., writes that this company will build two miles of city extensions this year. H. P. Barrett of Henderson, president.

Highland Grove Traction Company, McKeesport, Pa.—It is re-

ported that this company is planning to extend its lines from McKeesport to East Pittsburg. The extension is to begin on the road leading from North McKeesport to the Greensburg pike, reaching East Pittsburg via Dixon's Hollow. It will also touch Wilmerding and Turtle Creek. The terminal will be directly opposite the Westinghouse works at East Pittsburg. The company expects to have the line in operation by next fall. John Christy, McKeesport, general manager.

Huron & Ontario Railway.—It is reported that contracts are to be let by April 1 for the proposed lines from Toronto to Windsor and to Owen Sound. Surveys have been made and part of the right of way has been secured. The third-rail system is to be used. S. F. Kilgore, president; H. W. Middlemest, chief engineer, both of Toronto.

Illinois Valley Railway.—This company is beginning the construction of a line between Streator and Ottawa, Ill., and surveys are being made for a connection with Chicago from the terminus of the line at Seneca either by way of Yorkville and the Aurora Elgin & Chicago Railway or by way of Morris and Joliet and the Chicago & Joliet Electric Railway. This line will form part of the Chicago-St. Louis line of the Illinois Traction Company. H. E. Chubbuck, general manager, Ottawa, Ill.

Indianapolis Huntington Columbia City & Northwestern Railway.—Several carloads of rails have arrived and a force of about 40 men is employed in laying the track between Syracuse and Vawter Park, Ind. When this section is completed track will be laid from Syracuse north toward Goshen. The road will extend from Huntington to Goshen, 60 miles. D. L. Homer, of Syracuse, chief engineer.

Indiana Columbus & Eastern Traction Company.—Contracts have been let to J. C. Carland of Toledo for 31 miles of grading and concrete and steel bridges between Leipsic and Toledo, O., to complete the Lima & Toledo Traction Company's line, and for 45 miles of grading and bridge work from Lima to Bellefontaine, O. Other contracts, including those for 70 pound rails and tracklaying are to be let in a few days. Thomas Elliott of Cincinnati, O., consulting engineer.

Joplin & Pittsburg Steel Railroad.—Mr. W. O. Hands, manager and engineer, Joplin, Mo., writes that this company has constructed about a mile and a half of track in the city of Joplin, and that it contemplates building about 17 miles of track this summer. Surveys have been completed for lines running from Joplin to Webb City, Carthage, Galena and Carl Junction, about 48 miles in all. An amusement park called Tiff Cave is now being developed. Joseph J. Heim of Kansas City is president.

Kalamazoo Elkhart & South Bend Railway.—It is stated that grading will begin between Kalamazoo, Mich., and Elkhart, Ind., within 30 days.

Kennett & Coatesville Railroad.—G. H. Dodge, secretary, Kennett Square, Pa., writes that grading is to begin April 1 on this single-phase electric railway from Kennett Square to Coatesville, Pa., 12 miles, via London Grove, Upland, Doe Run and Modena. Surveys have been completed from Kennett Square to London Grove, 4½ miles, and surveys are in progress from the latter point to Coatesville. Current will be generated for transmission at 6,600 volts. The overhead construction will be of the catenary type, No. 0000 trolley wire being used. Mr. Dodge has the general contract for building and equipping the line. Contracts for cars and equipment, bridges and all material are to be let within 30 days. J. Walter Taylor of Kennett Square is president.

Lederachville & Pennsburg Electric Railroad.—This company will build an electric railway from Lederachville to Pennsburg, Pa., 30 miles. Right of way has been secured and surveys have been completed. W. C. Riffert, Dauphin, Pa., chief engineer.

Lewiston Brunswick & Bath Street Railway.—An official report states that this company, which has recently acquired the Augusta Winthrop & Gardner Railway, proposes to build lines from Lewiston to Mechanic Falls, Me., 10 miles; from Lewiston to Augusta, 20 miles, and from Augusta to Oakland, 20 miles. Grading is to begin on April 1. The overhead construction will be of the bracket type and 70-pound T-rails of Pennsylvania standard section will be laid. John R. Graham, Bangor, Me., president.

Louisville New Albany & Corydon Railroad.—J. G. White & Co. have completed surveys for this company's proposed electric line from New Albany to Corydon, Ind. McKinley Boyle of Corydon, president.

Memphis Street Railway.—A large amount of improvement work has been planned for the coming summer, much of it in the nature of extension of work already planned and partially completed. Work is now in progress on the South Memphis extension of the suburban lines, some extensions of the East End lines will be rebuilt and a number of other lines are to be repaired and reballasted. E. W. Ford of Memphis, general superintendent.

Middlesboro, Ky.—It is reported that a number of prominent coal operators of the Middlesboro district are considering the building of an electric line from Middlesboro to Hartranft, Tenn., 9 miles, touching a number of large mining towns.

Milner, Idaho.—Grading is now in progress for an electric railway from Milner to Gooding, Idaho, and it is reported that orders have been placed for 9,000 poles and sufficient ties and rails for completing the line.

Mississippi Valley Electric Railway.—This company, recently incorporated, proposes to build an electric railway from Carthage to Nauvoo, Ill., connecting with Keokuk and Ft. Madison, Ia., a

total distance of about 45 miles. Surveys are now being made. W. A. Calhoun of Buffalo, consulting engineer.

Missouri & Kansas Interurban Railway.—Mr. Fred O'Flaherty, chief engineer, Lawrence, Kan., writes that this company proposes to build a branch from Kansas City to Lenexa, Kan., 11 miles, via Rosedale, South Park, Merriam and Shawnee. Surveys have been completed and grading is to begin about June 1. This company now has a line between Kansas City and Olathe, and operates Strang gasoline-electric cars. A. F. Hunt, Jr., 15 Wall street, New York, president.

Mt. McKay & Kakabeka Falls Railway.—This company has made surveys and is securing right of way for a line from Ft. William to Kakabeka Falls, Ont., 30 miles. W. F. Hogarth of Ft. William is president.

Nashville & Columbia Interurban Railway.—The survey has been completed for this proposed line from Nashville to Columbia, Tenn., 45 miles, and engineers are now staking out the grade lines. H. H. Mayberry of Franklin, Tenn., president of the company, announces that the contract for constructing the road has been awarded to Patrick Hirsch of New York, who is now in Nashville preparing to begin work. When this part of the road is completed President Mayberry states that it will be extended from Columbia to Mt. Pleasant, 11 miles.

Newark, N. J.—The board of public works has instructed the city engineer to investigate and report on the feasibility of a subway on Broad and Market streets.

New York Northern Railway.—This company has been organized to build an electric road from Watertown to Oswego, N. Y. Foster P. Shines of Watertown, president.

Oklahoma City, Okla.—W. R. Silsby of Saginaw, Mich., is interested in a project to build an electric railway connecting Oklahoma City, Shawnee and Norman.

Oakland (Cal.) Traction Company.—This company has begun building a line to Alameda via East Oakland. A double track is being laid on Thirteenth street between Oak and Washington streets in Oakland.

Palestine-Corsicana Interurban Railway.—The surveyors have finished locating the line from Corsicana to Palestine, Tex.

Paris, Ill., Traction Company.—A contract has been let for building this company's line in Paris to Ralph Baum. An extension to Christman, 13 miles north of Paris, is being considered.

Peoria, Ia.—Citizens of this and neighboring towns are interested in a project to build an electric railway from Oskaloosa to Newton, Ia., via Peoria and Galesburg, and C. B. Judd, a civil engineer of Pittsburg, Pa., has been engaged to make estimates and surveys.

Pensacola Electric Company.—The line from Pensacola to Ft. Barrancas, Fla., 9 miles long, which has been electrified since the property was acquired by Stone & Webster of Boston, Mass., was formally opened on March 10.

Portland & Mt. Hood Railway.—The engineers have started on the final surveys for this road from Portland, Ore., to Mt. Hood, 46 miles. It is stated that the project has been fully financed and that construction will begin at once. The Portland terminal will be in the blocks surrounded by East Washington, East Oak, East Water and East Second streets. Tracks will be laid from the terminal grounds east on East Washington and East Oak streets to Sixth street; south to East Taylor street, east to East Twelfth street, south to Hawthorne avenue, east to Ladd avenue, south-east to Division street, east to the city limits, and from thence east through the rich agricultural district to the Sandy river, where the road will follow the Sandy river until the side of Mt. Hood is reached. A cog road will reach the peak of Mt. Hood. It is proposed to build a large hotel on the side of the mountain. M. G. McCorkle of Portland is one of the promoters.

Portland, Ore., Railway Light & Power Company.—An appropriation of about \$2,000,000 has been made for improvements this year, not including the new terminal station. Nearly a mile of new 72-pound rails has been laid on Dawson street, 2½ miles of 70-pound rail will replace the 40-pound steel on Union avenue north of Welder street and 2 miles of new road will be built from East Twenty-eighth and East Burnside street to Rose City Park, as well as other extensions.

Puyallup Valley Northern Transit Company.—It is reported that contracts have been let to the Engineering Construction Company of New York for building this line, which is part of a proposed line from Puget Sound to Spokane, Wash.

Redlands, Cal.—It is reported that W. F. Whittier of San Francisco will build a road from Redlands to Hemet, Cal., which was surveyed several months ago.

Rochester Corning & Elmira Traction Company.—The appellate division of the supreme court of New York has directed the state railroad commission to issue this company a certificate of public convenience for the construction of its road from Rochester to Elmira, N. Y., and W. C. Gray, chief engineer, will begin making surveys at once.

Rockford Oregon & Southern Railway.—A company with the above name is being organized at Oregon, Ill., for the purpose of building an electric railway in the territory between Rockford and Dixon, Ill., via Oregon. F. G. Jones of Oregon is interested.

Saginaw Owosso & Lansing Railway.—J. A. Thick, chief engineer, Owosso, Mich., writes that this line from Saginaw to Lansing, Mich., 64½ miles, has been surveyed and that grading will be-

gin this spring. The road will be built on a private right of way, all of which has been purchased, and 70-pound rails will be used. Maximum curvature, 6 degrees. John L. King of Syracuse, N. Y., president; Charles W. Baird, vice-president. Headquarters, Detroit, Mich.

Santa Ana, Cal.—S. H. Finley, of Santa Ana, has completed surveys and is securing the right of way for an electric railway from Santa Ana to Huntington Beach, 10 miles.

Selma Street & Suburban Railway.—It is reported that this company will build several extensions to new suburban points. F. M. Abbott, Selma, Ala., president.

Shore Line Electric Railway.—An official report states that this line has been surveyed from Stony Creek to Ivorton, Conn., 35 miles, passing through Guilford, East River, Madison, Clinton, Grove Beach, Westbrook, Saybrook, Essex and Centerbrook. Grading is now in progress between Ivorton and Saybrook, 12 miles. C. W. McChesney, New York, president, and A. William Sperry, New Haven, Conn., chief engineer.

Sioux City & Ireton Interurban Railway.—This company, which proposes to build an electric railway from Sioux City to Doon, Ia., about 57 miles, has secured about half the right of way, has 50-year franchises in Ireton, Doon and Rock Valley and has had a large part of its stock subscribed for. A trackage arrangement has been made with the Sioux City Traction Company for an entrance to the city from Leeds. S. A. Mitchell of Rock Valley, Ia., is president.

Southern Kansas Railway Light & Power Company.—It is reported that 15,000 ties have been shipped for the proposed lines connecting Parsons, Independence, Cherryvale and Coffeyville, Kan. H. F. Smith of St. Louis, engineer of construction, is now making surveys and it is the intention to begin construction in a short time in three directions out of Cherryvale. R. C. Rawlings, president, Chanute, Kan.

South Carolina Public Service Corporation.—The surveyors have completed the surveys for this proposed line from Charleston, S. C., to Aiken, Ga., where connection is to be made with the Augusta & Aiken Electric Railway for Augusta.

Spokane & Inland Empire Railway.—It is reported that this company has purchased an old right of way of the Oregon Railroad & Navigation Company from Colfax to Penewawa, Wash., and will build to Dayton and Walla Walla.

Springfield Clear Lake & Rochester Electric Railway.—The first section of this line from Springfield to Clear Lake and Rochester, Ill., was formally opened on March 11 when a party of officers and guests made the first trip from the corner of Fifth and Monroe streets in Springfield to a point about four miles from the center of the city. Regular service over this section has since been instituted. The grading is now almost completed between Springfield and Rochester and construction is progressing rapidly. Large quantities of ties and rails are on the ground and some track has been laid. It is now expected to have the entire line in operation by June 1. Power is rented from the Springfield Consolidated Railway, over whose tracks the cars enter Springfield, and the same company will furnish the cars until those that have been ordered are delivered. J. H. Melick of Rochester, Ill., is president.

Stroudsburg & Wind Gap Electric Street Railway.—J. B. Williams, president, Stroudsburg, Pa., writes that this company proposes to build an electric railway from Stroudsburg to Wind Gap, Pa., 14 miles, via Snyder'sville, Kellersville, Sciota, Saylorsburg, Ross and Common. Surveys have been completed, but the date of beginning construction has not yet been determined.

Tacoma Railway & Power Company.—The final surveys are now being completed for the branch from the main Seattle-Tacoma line $\frac{3}{4}$ of a mile east of Brookville, near Tacoma, to Puyallup, Sumner and Orting. A bridge is to be built across the Puyallup river. W. S. Dimmock, manager, Tacoma, Wash.

Tidewater Development Company.—President J. M. Dewberry of Birmingham, Ala., has received the report of the engineers, containing the profiles and other details of the proposed road from Gadsden to Tuscaloosa, Ala., and states that contracts will be let in a month or two.

Toledo Uran & Interurban Railway.—It is reported that this company proposes to extend its line from Findlay south to Bellefontaine, via Arlington, Dunkirk and Kenton, O. Charles Kilgour, Findlay, O., chief engineer.

United Traction Company.—It is reported that this company will begin on April 1 on the extension of the Broadway line in Rensselaer, N. Y. E. S. Fassett, general manager, Albany, N. Y.

Union Traction Company of Kansas.—Tracklaying on the line from Coffeyville to Independence, Kan., 20 miles, has been completed for 6 miles south of Independence and for 5 miles north of Coffeyville, to Jefferson, and the poles have been set for most of the distance. The right of way for the branch from Coffeyville to Cherryvale is nearly all secured and it is stated that construction will begin this week. D. H. Siggins of Coffeyville, president.

Union Traction Company.—This company, which operates about 15 miles of electric railway in Santa Cruz, Cal., and vicinity, will change its system from narrow to standard gauge. S. W. Coleman, Santa Cruz, general manager.

Utica Southern Railroad.—It is stated that this company will award contracts in April for building its line, which will connect Clinton, Hamilton, Norwich and Waterville, N. Y., 26 miles. Right

of way has been obtained and surveys made. F. H. Baxter, Utica, N. Y., chief engineer.

Vallejo & Northern Railway.—Melville Dozier, Jr., president and chief engineer, Oakland, Cal., writes that this company will begin grading this summer on a line from Vallejo to Sacramento and Woodland, Cal., 105 miles, via Cordelia, Suisun, Fairfield, Cement, Vacaville and Winters. Surveys have been completed from Vallejo to Sacramento, 58 miles, and from Winters to Woodland, 18 miles. Both the third rail and trolley systems will be used. T. T. C. Gregory, secretary; George S. Lackie, treasurer, both of Vallejo, where the offices of the company are located.

Vincennes Washington & Eastern Traction Company.—A. J. Padgett, attorney for the company, states that contracts have been let for the construction material and equipment for this line from Vincennes to Loogootee, Ind., and that work will begin about May 1 on the first section, from Vincennes to Washington. W. H. Schott of Chicago, president.

West Penn Railways, Connellsville, Pa.—It is reported that this company is making surveys for an extension from McKeesport to Glassville, Pa.

West Shore Traction Company.—This company, incorporated last October, has been authorized by the New York railway commission to build an electric railway along the Hudson river in New York from Tompkins Cove to Cartaret, 25 miles. Searing & Co., bankers, of New York city, are interested in the project.

Wilksburg East Pittsburg & Turtle Creek Street Railway.—This company has been securing right of way for the past several months and has now begun construction work on its line from East Pittsburg through Turtle Creek, Falls Hollow, Coalville and Mucklerat to Wilksburg, Pa. About two miles of tracklaying and overhead work has been completed at the western end beyond Mucklerat.

Yazoo City, Miss.—The city council has awarded to the Saunders-Johnson Company of Vicksburg, Miss., a contract to build a municipal street railway, 3 miles long, costing \$50,000, for which city bonds have been issued. The contractors take bonds in payment. The road is to be completed by July 1.

POWER HOUSES AND SUBSTATIONS.

Bloomington & Normal Railway & Light Company.—This company has been doing considerable work on its lines, which will tend to increase the schedule speed of the cars. An eight-foot cut has been made north of Salt Creek Bridge, which will also reduce the demand for power materially. A new sub-station has been erected at Magill, a siding about a mile and a half south of Clinton, and the old sub-station located at Johnson's siding has been moved to the siding at the county line north of Wapella.

Chicago Lake Shore & South Bend Railway.—A contract has been let to James E. Southard & Co., for all the concrete work foundations, etc., for the power house at Michigan City. The Westinghouse Electric & Manufacturing Company has the contract for the equipment.

Cumberland & Westport Electric Railway.—This company has broken ground for the erection of a new power house 30 by 90 feet. A 550-kilowatt generating set and boilers of 650 horse power capacity will be installed. H. R. DeWarren is president.

Freeport Railway Light & Power Company.—Mr. A. B. Goddard, general manager of this company, states that the contracts for all the machinery and for the installation of the machinery in the new power plant have been let.

Henderson Traction Company.—K. R. Battin, superintendent, writes that this company will install one complete additional unit in its power house at Henderson, Ky., and contracts are to be let for a 250-hp. boiler and a 125-kw. direct-current engine and generator.

Indianapolis & Louisville Traction Company.—It is reported that work on the power house of this company is progressing rapidly. Four of the six 300-horsepower boilers have been installed and it is expected that the cars may be running some time between April 15 and May 1, 1907. It is stated that the cost of the new power house and the equipment will be about \$297,000.

Indianapolis Crawfordsville & Western Traction Company.—The power house at Crawfordsville, which is being built by this company, is rapidly approaching completion. It is expected that the overhead work of the lines and the feeders will be completed by March 15, and the track ready for the through operation of cars by June 1, 1907, which has been set for the opening of the line.

Union Traction Company of Kansas.—Rapid progress is being made on the power house at Independence, Kan., and it is expected to be ready for operation by May 1. The building is 60 by 80 feet in floor area, with an addition 15 by 50 feet.

Winchester & Washington City Railway Company.—President S. H. Hansbrough and a party of officials of the company visited the large water power electric plant of this company, located at Millville, Jefferson county, West Virginia, for the purpose of inspecting the dam, turbines and machinery and to start the turbines in operation for the first time. S. L. Hoover, manager of the company, stated after the trip that everything was satisfactory and that the plant would be put in regular operation as soon as the transformers are thoroughly dried out.

Personal Mention

Mr. W. Gillette has been appointed general manager of the Ft. Smith (Ark.) Light & Traction Company, succeeding Mr. R. S. Rand, resigned.

Mr. John Davey has resigned his position as master mechanic of the Trinidad (Colo.) Electric Railroad, effective on March 10, to accept a position with the Philadelphia & Western Railroad.

Mr. W. H. Hurlburt, formerly president of the Oregon Water Power & Railway Company, Portland, Ore., has been appointed general manager of the Jersey Central Traction Company, Keyport, N. J.

Mr. A. L. Ober, of Chatfield, Minn., has been elected president of the Minneapolis Rochester & Dubuque Traction Company, which proposes to build an electric railway from Minneapolis, Minn., to Dubuque, Ia.

Mr. H. G. Kruse has been appointed superintendent of the Peoria & Pekin Terminal Railway, with headquarters at Peoria, Ill. Mr. Kruse formerly was connected with the Baltimore & Ohio Southwestern.

Mr. C. Denny, formerly superintendent of construction work for the Tacoma Railway & Power Company, Tacoma, Wash., has been appointed master mechanic of this company succeeding Mr. William Glenn, resigned.

Mr. Frank Cooley, for the past 10 years associated with the Brooklyn Rapid Transit Company in various capacities, has been appointed superintendent of employment for the system, succeeding the late F. D. Valentine.

Mr. W. M. Kessler, formerly superintendent of transportation of the Dayton & Troy Electric Railway, has resigned to accept a similar position with the Pittsburg & Butler Street Railway at Butler, Pa. Mr. W. S. Coy, chief train dispatcher for the company, will succeed Mr. Kessler.

Mr. Theron A. Atwood has been appointed general manager of the Michigan United Railways, with headquarters at Lansing, Mich. The duties of this office heretofore have been incorporated with those of the vice-president. Mr. Atwood formerly was a member of the Michigan state railroad commission.

Mr. F. E. Fitzpatrick, formerly manager of the Sacramento (Cal.) Electric Gas & Railway Company, has resigned to become general manager of the Bay Counties Power Company with headquarters at San Francisco. Mr. C. W. McKillip, recently supervisor for the Sacramento system, will succeed Mr. Fitzpatrick as general manager.

Mr. E. E. Lillie has been appointed superintendent of the Spokane & Inland division of the Spokane & Inland Empire Railroad, with headquarters at Spokane, Wash. Mr. Lillie goes to his present position from St. Paul, Minn., where he was formerly chief dispatcher and more recently assistant in the general superintendent's office of the Great Northern Railway.

Mr. M. O. Chadbourne has been appointed general manager of the Albuquerque (N. M.) Traction Company. The duties of this office heretofore have been combined with those of the vice-president, Mr. H. A. Jastro. Prior to accepting his present appointment Mr. Chadbourne had been acting as superintendent of construction for the American Lumber Company.

Mr. William Glenn, master mechanic of the Tacoma Railway & Power Company and the Puget Sound Electric Company, and for the past 17 years associated with the street and interurban systems of Tacoma, Wash., has resigned to accept a more lucrative position with a large street railway system in the east. As a token of esteem the employes of the company on March 2 presented him with a gold watch. Mr. Glenn will be succeeded by Mr. C. Denny.

Mr. J. N. Akarman has resigned as superintendent of the South Jersey division of the Public Service Corporation of New Jersey. He has held his present position since last August, having been transferred at that time from the Newark division of the company. It is stated that with Mr. Akarman's resignation the office of superintendent will be abolished and its duties incorporated with those of the general manager in South Jersey. A portrait and biographical sketch of Mr. Akarman were published in the Electric Railway Review of October, 1906.

Mr. Warren S. Bicknell, until recently president of the Lake Shore Electric Railway, has been elected president of the Havana (Cuba) Electric Railway Company under its reorganization, which took place in New York on March 6. The road is financed by American capital and probably will become, under its present management, one of the most important of the enterprises in Cuba controlled by American interests. Mr. Bicknell severed his connection with the Lake Shore Electric Railway about a year ago and is at present in New York preparing to take up his new duties. Associated with Mr. Bicknell as directors under the new management are David T. Davis and Robert Mather of the Chicago Rock Island and Pacific Railway interests; Walter G. Oakman of the Guarantee Trust Company; James Rattray, San Miguel, editor of a newspaper in Havana; Carlos Zaldo, president of the Bank of Havana; Henry Runken of Upmann & Company, bankers, and Henry Steinhart, United States consul-general at Havana.

Financial News

Alton (Ill.) Granite & St. Louis Traction Company.—The income account for 1906 compares as follows:

	1906.	1905.	Increase.
Gross	\$468,262	\$376,768	\$91,494
Expenses	302,490	206,912	95,578
Net	\$165,772	\$169,856	*\$4,084
Charges and taxes.....	131,685	+104,166	27,519
Surplus	\$ 34,087	\$ 65,690	*\$31,603

*Decrease.
†This item includes twelve months' interest on the original bonded indebtedness and ten months' interest on additional bond issues to acquire properties and to build the interurban road, which began operation on March 1, 1905.

The increase in operating expenses for the year 1906 was due to unusual expenditures for the improvement of the physical condition of the properties and which were charged to operating expense.

Atlantic Shore Line Railway, Sanford, Me.—The \$1,900,000 refunding 4 per cent bonds of this company are offered by A. H. Bickmore & Co. of New York, at a price to net 5¼ per cent interest. The road has 79 miles of track in operation and 18 more under construction.

Auburn (N. Y.) & Northern Electric Railroad.—The state railroad commission of New York has granted authority to this company to increase its capital stock from \$250,000 to \$1,500,000. The company will operate an electric railway from Auburn to Port Byron and from Auburn to Cayuga and Seneca Falls.

Catskill (N. Y.) Electric Railway.—Arthur M. Murphy of Catskill was appointed receiver of this company on March 7 in foreclosure proceedings brought by the Hamilton Trust Company of Brooklyn as trustee under the mortgage made in 1899 to secure \$400,000 bonds.

East St. Louis (Ill.) & Suburban Company.—The report for the year ended December 31, 1906, compares as follows:

	1906.	1905.	*1904.
Gross earnings	\$1,551,737	\$1,351,579	\$1,363,552
Operating expenses	739,218	594,801	593,159
Net earnings	\$ 812,519	\$ 756,778	\$ 770,393
Fixed charges and taxes.....	377,539	363,514	358,198
Surplus	\$ 434,980	\$ 388,264	\$ 412,195

*World's Fair year.

Indianapolis Crawfordsville & Western Traction Company.—At the annual meeting of stockholders of this company on March 6 in Chicago, the following directors were elected: P. C. Summerville, Eli P. Baker, A. E. Reynolds, C. N. Van Cleave and E. C. Voris, Crawfordsville, Ind.; Edward Hawkins, O. P. Ensley, A. M. Glossbrenner, A. A. Barnes and H. A. Mansfield, Indianapolis, Ind.; George P. Haywood, Lafayette, Ind.; A. A. Swartz, Jeffersonville, Ind.; W. O. Ford, Madison, Ind., and A. M. Hewes, Chicago. The old officers were re-elected as follows: President, A. F. Ramsey, Crawfordsville, Ind.; vice-president, A. E. Reynolds, Crawfordsville, Ind.; secretary, Edward Hawkins, Indianapolis, Ind.; treasurer, Oliver P. Ensley, Indianapolis, Ind.

Minster Loramie & Southern Railway.—This company, recently incorporated, has organized by electing the following officers: president, J. H. Goeke, Wapakoneta, O.; vice-president, Wm. Schulenberg, New Bremen, O.; secretary, F. M. Horn, Wapakoneta; treasurer, R. B. Anderson, Wapakoneta; financial agent, R. J. Depenbrock, Wapakoneta. The above also constitute the board of directors. The company will proceed forthwith to make a survey over at least two different routes; one from Minster, Auglaize county, O., to Piqua in Miami county, O., and the other from Minster, via Versailles, Darke county, O., to Greenville. After the survey and estimates have been made and completed, steps will be taken to finance the road.

Mt. Vernon (O.) Electric Railway.—It is reported that control of this company has been acquired for the new Cleveland Southwestern & Columbus Railway Company.

Norfolk (Va.) & Ocean View Railroad.—This company has acquired the Bay Shore Terminal Company of Norfolk and has given a trust deed to the Baltimore Mortgage & Guarantee Company to secure an issue of \$1,500,000 bonds due in 30 years and bearing 5 per cent interest.

Northwestern Elevated Railroad, Chicago.—Plans for the purchase by this company of the property owned by the Chicago & Oak Park Elevated Railroad have progressed so that it is announced that a consolidation will be completed before May 1. This announcement has revived the talk of the general consolidation of all of the elevated roads of Chicago.

St. Louis Hillsboro & Southern Railroad, Hillsboro, Mo.—The stockholders have voted to authorize a new issue of \$1,200,000 bonds. The new bonds will replace an issue of an equal amount authorized in August, 1902. These bonds have been canceled.

Susquehanna Railway Light & Power Company.—This company has been formed to acquire and operate electric railway and gas properties. It will purchase the \$1,000,000 common stock of the Lancaster County Railway & Light Company, Lancaster, Pa., and the \$1,649,320 common stock of the United Gas & Electric Company.

The latter company controls 11 gas and electric companies in various cities. The Susquehanna Company will have authorized \$10,000,000 preferred stock and \$10,000,000 common stock.

Syracuse (N. Y.) Lake Shore & Northern Railroad.—An increase in the capital stock from \$2,250,000 to \$3,500,000 has been authorized by the state railroad commission.

Texas Traction Company, Sherman, Tex.—This company has given a trust deed to the Old Colony Trust Company of Boston, Mass., to secure an issue of \$3,000,000 bonds, bearing 5 per cent interest, and maturing January 1, 1937. Of this amount \$2,000,000 bonds are outstanding.

Twin City Rapid Transit Company, Minneapolis.—Earnings for January compare as follows:

	1907.	1906.	1905.
Gross earnings	\$456,837	\$407,865	\$351,121
Expenses	243,097	205,519	175,315
Net earnings	\$213,740	\$202,346	\$175,806
Charges and taxes	115,258	109,708	97,325
Surplus	\$ 98,482	\$ 92,638	\$ 78,481

Underground Electric Company, London.—A claim amounting to \$789,669.20 has been filed by this company against the estate of Charles T. Yerkes. Other claims which were filed at the same time are the following: Speyer & Co., New York, \$367,302.87; Speyer Brothers, London, \$632,698.65.

United Traction Company, Albany and Troy, N. Y.—The earnings for the quarter ended December 31, 1906, with a comparison, are as follows:

	Quarter Ending December 31.		
	1906.	1905.	1904.
Gross earnings	\$472,974	\$434,981	\$431,609
Operating expenses	302,640	283,975	250,418
Net earnings	\$170,334	\$151,186	\$181,191
Other income	1,939	2,118	1,833
Total	\$172,273	\$153,404	\$183,024
Charges	87,481	86,581	86,659
Surplus	\$ 84,792	\$ 66,823	\$ 96,365

Washington (D. C.) Railway & Electric Company.—The pamphlet report for the year 1906, with a comparison, shows earnings as follows:

	1906.	1905.	1904.
Gross earnings	\$3,133,240	\$2,905,907	\$2,644,360
Operating expenses	1,613,096	1,478,466	1,355,822
Net earnings	\$1,520,144	\$1,427,441	\$1,288,537
Other income	44,595	50,553	49,024
Total	\$1,564,739	\$1,477,994	\$1,337,562
Charges	1,041,118	999,455	981,039
Surplus	\$ 523,621	\$ 478,539	\$ 356,523

The increase in operating expenses is largely due to an increased expenditure for maintenance. While the total operating expenses increased \$134,630, or 9.10 per cent, the cost of maintenance increased \$64,612, or 20.59 per cent. This increase in cost of maintenance is partly due to the fact that the properties have been maintained in better condition than heretofore, but more to the large increase in the cost of materials of every nature entering into the construction and operation of such properties.

The surplus after the fixed charges for the year ending December 31, 1906, amounting to \$523,621, has been applied as follows:

To payment of 5 per cent dividend on \$8,500,000 preferred stock	\$425,000
Discount on \$250,000 consolidated mortgage 4 per cent bonds	35,102
Credited to depreciation reserve	50,000
Credited to profit and loss surplus	13,519
Total	\$523,621

There are in the treasury of the company its consolidated mortgage 4 per cent bonds of the par value of \$1,078,600. Of these bonds \$351,600 were, under the plan of reorganization, delivered to the company and have been credited to depreciation reserve; \$227,000 were issued to cover expenses of extensions and betterments paid for out of surplus earnings, and \$500,000 were purchased for investment in open market.

Washington Traction Company, Springfield, O.—Application for a receiver was made at Springfield on March 2 by William J. Ramsay on the ground that the \$800,000 authorized bonds cannot be disposed of and that the company has defaulted in interest on bonds issued to pay old claims.

Wellsburg (W. Va.) Bethany & Washington Railway.—This company has given a trust deed to the Wellsburg Banking & Trust Company to secure an issue of \$200,000 bonds bearing 5 per cent interest and due on December 1, 1936. Of this amount \$110,000 bonds have been subscribed for at par, \$50,000 have been taken by the contractors and the remaining \$40,000 are reserved to acquire 40 acres of coal at a cost of \$1,600, the Bethany Light & Water Company (cost \$7,000) and other property and equipment as it is required. The company has completed over 75 per cent of the roadway of the proposed line from Wellsburg to Bethany, a distance of 7½ miles.

West End Street Railway, Boston.—Application has been made by this company to the Massachusetts railroad commissioners for authority to issue \$500,000 additional common stock. The proceeds will reimburse the Boston Elevated railway for expenditures on the property from April, 1904, to March 31, 1906.

Manufactures and Supplies

ROLLING STOCK.

Kenosha Electric Railway, Kenosha, Wis., is reported as soon to order six single truck cars for city service.

Meridian Light & Railway Company, Meridian, Miss., has ordered five cars from the Southern Car Company.

Rockland Thomaston & Camden Street Railway, Rockland, Me., is building two freight cars of 40,000 pounds capacity.

Chattanooga Railways Company, Chattanooga, Tenn., has ordered 15 cars from the G. C. Kuhlman Car Company.

Rochester Railway, Rochester, N. Y., has placed an order with the G. C. Kuhlman Car Company for 15 cars to be 30 feet in length.

Utah Light & Railway Company, Salt Lake City, Utah, contemplates the purchase of 50 new double-truck cars for city service.

Niagara Gorge Railroad, Niagara Falls, N. Y., is having two cars 38 feet 8 inches in length built by the G. C. Kuhlman Car Company.

Memphis Street Railway, Memphis, Tenn., is reported to have placed an order for 25 high-speed semi-convertible cars for fall delivery.

Citizens' Railway & Light Company, Ft. Worth, Tex., has placed an order with the G. C. Kuhlman Car Company for five cars 30 feet in length.

Johnstown Passenger Railway, Johnstown, Pa., is having twelve 8-bench, 28-foot open cars built by the G. C. Kuhlman Car Company.

Indianapolis & Eastern Railway, Indianapolis, Ind., has placed an order with the Cincinnati Car Company for 10 interurban cars to be 62 feet in length.

Terre Haute Traction & Light Company, Terre Haute, Ind., has ordered 10 single-truck cars to be 22 feet in length from the Cincinnati Car Company.

Denver City Tramway, Denver, Colo., will consider the purchase of additional rolling stock as soon as its contemplated track extensions are well under way.

Columbus Magnetic Springs & Northern, Delaware, O., is having two cars built by The J. G. Brill Company. This road will purchase additional rolling stock late this year.

Public Service Corporation of New Jersey, Newark, N. J., has placed orders since the first of January, 1907, for 49 semi-convertible single-end double-truck four-motor cars with The J. G. Brill Company.

Butler Passenger Railway, Butler, Pa., was reported in our issue of February 2 as having purchased one closed car. This was purchased from The J. G. Brill Company, being mounted on Brill 21-E trucks, with a wheel base of 7 feet 6 inches, with body 20 feet long and for city service.

Illinois Valley Railway, La Salle, Ill., has purchased four new interurban cars from the American Car Company and has just had delivered one 50-foot express car built by the St. Louis Car Company. Negotiations are under way for two additional interurban cars for delivery about the middle of the summer.

Pittsfield Electric Street Railway, Pittsfield, Mass., is having two double-truck open cars built by the Wason Manufacturing Company in addition to the one double truck closed car built by the same company and one double truck snow plow being built by the Russell Car & Snow Plow Company reported in the Electric Railway Review on February 23. The snow plow is of a special design, being constructed along the same line as those now in use upon steam roads.

Roanoke Railway & Electric Company, Roanoke, Va., as reported in the Electric Railway Review of March 2, has ordered from The J. G. Brill Company two full-convertible cars mounted on Brill 27-G1 trucks. The car bodies will be 28 feet 4 inches in length and 39 feet over all; also two Brill semi-convertible cars 30 feet 8 inches in length. The equipment will include Westinghouse air brakes, 4 GE-80 motors and National Brake & Electric Company's brakes. The semi-convertible cars are for interurban use and the full-convertible cars for city use.

Lynchburg Traction & Light Company, Lynchburg, Va., has contracted with The J. G. Brill Company for four full-convertible Narragansett motor cars, mounted on Brill 27-G1 trucks. These cars will be 28 feet 4 inches in length with a length over all of 39 feet, will be equipped with 4 GE-80 motors each and Westinghouse air brakes. A special feature of the cars will be an automatic headlight, the lighting of which will be controlled by the reverse lever of the controller, going away with the three-way switches customary on the inside of the car.

Brooklyn Rapid Transit Company, Brooklyn, N. Y., as previously reported, has placed an order for 200 passenger cars. The 100 surface cars will be built by the John Stephenson Company at Elizabeth, N. J., and the 100 elevated cars will be built by the Laconia Car Company and the Jewett Car Company, each build-

ing 50 cars. The surface cars will cost \$6,000 each and the elevated cars \$14,000. Delivery on the surface cars will be made in July of the present year, while the elevated cars will come during the late fall, the first shipments being due to arrive in October. The elevated cars will be steel framed and of extremely high motive power. Both elevated and surface cars are to be equipped with air brakes, the latter with storm-proof vestibules of the latest design. Seating arrangements in the elevated cars will consist of longitudinal seats along the side except in the center of the car, where four transverse benches will be placed.

Colorado Springs & Interurban Railway, Colorado Springs, Colo., has ordered the building of 6 double-truck closed cars in its own shops. The details will be as follows:

Seating capacity.....36 persons	Width, inside.....7 ft. 3 in.
Weight.....33,000 lbs.	Over all.....8 ft.
Wheel base.....5 ft. 10 in.	Body.....Wood
Length, body.....25 ft. 5 1/2 in.	Underframe....I beam-side sills
Over vestibule.....36 ft. 5 1/2 in.	
Over all.....37 ft. 5 1/2 in.	

Special Equipment.

Air brakes.....Westinghouse	Sanders.....Co. standard
Axles.....Cambria	Seats.....Hale & Kilburn
Heating system.....Consolidated	Trolley poles and attachments
Headlights.....United States	.....Nuttall
Interior finish.....Oak	Varnish.....Valentine
Motors.....4 GE-67	Vestibule.....Both ends
Steps.....Stanwood	

SHOPS AND BUILDINGS.

Aurora Elgin & Chicago Railway.—This company is erecting a brick building which will be used for an employes' wash-room and for an oil storage house on property located near the present car house at Wheaton, Ill. The employes' room will be provided with shower baths, 75 lockers, etc. The tanks in the oil-house will be so located that barrels of oils may be rolled from the cars and emptied directly into the tanks at the same level. Plans are also being made for an addition to the south end of the car house for a paint and carpenter shop.

Boston & Worcester Street Railway.—This company has purchased 3 1/2 acres of land at South Framingham, Mass., for the erection of a new car house.

Denver (Colo.) City Tramway Company.—This company is making plans for two new carhouses and an entirely new layout of repair shops. A parcel of land, 61 acres in extent, has been purchased, well located on the Denver Northwestern & Pacific (Moffatt) Railroad and the Colorado & Southern Railroad.

Evansville & Southern Indiana Traction Company.—This company will erect a two-story brick building at Princeton, Ind., for a freight and passenger station and car house. The cost is estimated at \$20,000. R. R. Smith, Evansville, Ind., general manager.

Ft. Wayne & Wabash Valley Traction Company.—An option has been taken on some property on Main and Seventh streets, Lafayette, Ind., on which it is proposed to erect a passenger station.

Indianapolis & Louisville Traction Company.—The car house at Scottsburg, Ind., is now nearing completion. The building is of brick and steel construction, 179 by 76 feet in area, and will contain four tracks, with accommodation for 16 cars. The building will also contain offices for the general manager and engineers as well as a room for the trainmen. Plans have been prepared for a two-story brick station building.

Meridian Light & Railway Company.—This company proposes to build a car barn of brick and steel structure 175 by 225 feet in area at Meridian, Miss. The building will also contain a machine shop, carpenter shop and paint shop. A. B. Paterson, president and manager, Meridian, Miss.

Minneapolis Rochester & Dubuque Traction Company.—The citizens of Decorah, Ia., have donated 20 acres of land as a site for the shops of this company, which proposes to build a line from Minneapolis, Minn., to Dubuque, Ia. W. P. Mason of Minneapolis is the promoter.

Omaha & Council Bluffs Street Railway.—It is reported that this company will begin this spring or summer the construction of a large car barn in Omaha to replace the present one at Twentieth and Harney streets, at a cost of \$75,000.

Stuebenville & East Liverpool Railway & Light Company.—It is reported that this company has purchased a tract of land just west of East Liverpool, O., on which to build extensive car barns and repair shops. J. C. Rothery, East Liverpool, general manager.

Washington Baltimore & Annapolis Electric Railway.—It is reported that a contract is to be let this month for a car repair shop at Odenton, Md. Office 801 Maryland Trust building, Baltimore.

TRADE NOTES.

Jewett Car Company, Newark, O., is preparing plans for the erection of an additional erecting shop.

Railway Steel Spring Company, 71 Broadway, New York, has declared its regular semi-annual dividend of 2 per cent on its common stock, payable April 4.

Westinghouse Companies, Pittsburg, are reported to have made announcement that negotiations are under way with the Niagara Lockport & Ontario Power Company to supply the power for a large manufacturing plant which it is stated will be erected at

Lockport, N. Y., by the Westinghouse interests, giving employment to about 5,000 people.

Wason Manufacturing Company, Springfield, Mass., is reported to have confirmed the report that its car building plant has been sold to The J. G. Brill Company, Philadelphia.

American Car & Foundry Company, St Louis, has declared its regular quarterly dividend of 1 1/4 per cent on its preferred and one-half of 1 per cent on its common stock, payable April 1.

Howard M. Post, who recently was appointed advertising manager of the Quincy Manchester Sargent Company, Chicago, has accepted the position of advertising manager of the Western Electric Company.

Eugene H. Lewis, a prominent member of the legal department of the General Electric Company, died in New York on March 1. He was at one time attorney for the Schenectady (N. Y.) Railway Company.

Youngstown Car Manufacturing Company, Youngstown, O., will hereafter handle the industrial car business in the states of Ohio, West Virginia and Western Pennsylvania, formerly conducted under the supervision of the Ernst Wiener Company.

Allis-Chalmers Company, Milwaukee, has received an order from the Bristol Tramway Company, Limited, of Bristol, Eng., for a large vertical cross compound engine. This company has already in use one engine of this type at its Bristol plant.

Wolff Truck Manufacturing Company, Chicago, has been organized to manufacture and deal in rolling stock and motors. The company is capitalized at \$24,000. The incorporators are: George W. Manierre, 96 Clark street, Chicago; Frederick W. Lester and Alvin McElroy.

Humphrey Trolley Wheel Company, Monroe, Mich., has been organized to manufacture a newly patented trolley wheel for electric cars. The officers of the company are: President, Henry L. Humphrey, 371 Chene street, Detroit; vice-president, O. J. Leonard; secretary, A. B. Braydon, and treasurer, N. J. Leonard, all of Monroe, Mich.

Dossert & Co., 242 West Forty-first street, New York, announces that the Western Electric Company has adopted the Dossert solderless joint throughout in the electrical equipment of its new plant at Hawthorne, Ill. It is stated that this mechanical joint saves more than two feet of cable, the cost of which is equal to that of the joint itself.

Siliker Car Works, Limited, Halifax, N. S., reported in the Electric Railway Review of January 19 as having been incorporated with a capital stock of \$125,000 for the purpose of manufacturing street cars, has purchased 20 acres of land in Halifax as a site for its plant, and work will be commenced upon its construction as soon as the weather will permit.

Cleveland Pneumatic Tool Co., Cleveland, has established a new department for the manufacture of mining drills and will make a new pattern of air hammer rock drills. G. H. Hall, formerly with the Gardner Electric Drill & Machine Company, has been placed in charge of this department. A new office has recently been opened by the company at 6 East Sixth street, Chattanooga, Tenn., in charge of R. P. Decker.

Electric Service Supplies Company of Philadelphia and Chicago announces that in addition to the territory of Philadelphia and Chicago, which it already controls, it has been given the territory surrounding Pittsburg for the sale of the full line of Sterling insulating material. A full stock of Sterling insulating varnish, black plastic insulator, etc., will hereafter be carried in stock at its new Pittsburg warehouse.

Robert E. Carrick of Philadelphia, Pa., formerly general superintendent of the Unit Concrete Steel Frame Company of Philadelphia and more recently with Tucker & Vinton, New York, in the capacity of general engineer, has joined the engineering corps of the General Fireproofing Company of Youngstown, O. Mr. Carrick's experience has been extensive in laying out and superintending the construction of reinforced concrete work, and with the General Fireproofing Company, his interest will be centered in the sale and installation of pin-connected girder frames. The type of the girder reinforcement developed in this product is claimed by the General Fireproofing Company to possess an exclusive feature, in that it provides a complete mechanical tie by a link and pin connection over each column or beam intersection, a tie which does not in any way depend upon the adhesion of the concrete to the steel.

J. R. Lovejoy has been appointed general manager of the sales department of the General Electric Company, Schenectady, N. Y. Mr. Lovejoy has long been known to the electrical fraternity, and this title is a formal recognition of the responsibilities with which he has practically been charged for the last two or three years. Mr. Lovejoy was born at Columbus, O., in 1863. After a post-graduate course at the Ohio State University, from which he received the degree of bachelor of science, he entered the employ of the Thomson-Houston Electric Company, of Lynn, Mass., in August, 1886. Here he gained his practical experience and graduated from what was then known as the "expert course" to take up engineering work in the Boston office of the company. Later his time was devoted to executive duties at headquarters, and when the Thomson-Houston Company was merged into the General Electric Company in 1892, he became general manager of the supply department. In 1900 he was also made manager of the railway and lighting departments of the General Electric Company. He is an officer and a director in several subsidiary companies, and is a director and member of the executive committee of the Schenectady

Trust Company, being one of the organizers of that concern. He is a member of the American Institute of Electrical Engineers, the Franklin Institute and the American Society for the Advancement of Science, as well as several organizations pertaining to electrical science. In addition to his diversified business duties, Mr. Lovejoy finds time to take an active part in promoting the welfare of the Mohawk Golf Club of Schenectady, of which he is president. He is also a member of the Mohawk Club of Schenectady and the University Club of New York. For many years Mr. Lovejoy has been interested in the subject of archaeology so far as it is related to implements of the Stone Age, particularly Indian arrow heads, of which he has made a noted collection. Mr. Lovejoy's home and principal office is still situated, as for several years past, at Schenectady.

Baldwin & Rowland Switch & Signal Company of New Haven, Conn., reports a very satisfactory and progressive business for its multiple interlocking recording block signal. Among the recent orders are three sets for the International Railway Company of Buffalo, N. Y., three sets for the Bay Shore Terminal Company of Norfolk, Va., and four sets for the Norfolk & Portsmouth Traction Company of Norfolk, Va. The International Railway Company of Buffalo, N. Y., has been using this signal for two years and is evidently well pleased with it. Among other satisfied users are the following: Consolidated Railway Company, New Haven, Conn., Rochester Syracuse & Eastern Railway Company, Syracuse, N. Y., Auburn & Syracuse Electric Railroad Company, Syracuse, N. Y., Syracuse Rapid Transit Company, Syracuse, N. Y., Altoona & Logan Valley Electric Railway Company, Altoona, Pa., Central Pennsylvania Traction Company, Harrisburg, Pa., Farmington Street Railway Company, Hartford, Conn.

J. G. Brill Company, Philadelphia, as reported in the Electric Railway Review of February 23, has announced the reorganization of its company, the new name being The J. G. Brill Company. The capital stock has been increased from \$6,000,000 to \$10,000,000, one-half of which is preferred 7 per cent cumulative stock and the remaining one-half common stock. The new company owns all the stock of its subsidiary companies and each will be operated separately by the new company. A portion of the shares were reserved to provide for the purchase of another plant and additional working capital. No great change was made in the personnel of the company, the officials being as follows: President, James Rawle; vice-president, John A. Brill; second vice-president and general manager, Samuel M. Curwen; secretary, M. Herman Brill; treasurer, Edward Brill; assistant treasurer, Edward P. Rawle; assistant secretary and general manager sales department, W. H. Heulings, Jr., and secretary to president, J. W. Rawle.

W. S. Barstow & Co., New York and Portland, Ore., have materially enlarged their drafting force to meet the demands of their increasing business. Thomas Richardson, who has had a thorough experience in power plant design, is at the head of the department. During the time he was connected with Westinghouse, Church, Kerr & Co. he was identified with the design of the Kingsbridge power station of the Metropolitan Street Railway of New York and several other power plants. Harold S. Richmond, C. E., a graduate from the Norwich University of Vermont and a post-graduate at the Thayer School of Civil Engineering of Dartmouth College, is in charge of the steel structural designing. Mr. Thayer has been connected with the Boston Bridge Works and Riverside Bridge Company as assistant engineer in the bridge department of the Boston & Maine Railroad and later with the structural department of Westinghouse, Church, Kerr & Co. The drafting department of the company now numbers about 30 men, covering all branches of engineering.

ADVERTISING LITERATURE.

McClintock Manufacturing Company, St. Paul, Minn.—"The McClintock Crossing Signal for Electric Railways" is the title of an illustrated pamphlet recently issued by this company. The apparatus consists of a signal tower, time element, circuit breaker, bell, starting relays and insulated rail sections. A diagram is presented showing the combination for use on single-track lines and a similar diagram shows the arrangement for double-track lines. The apparatus is briefly described.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis.—"A Tale of Two Types" is the title of a pamphlet published for the purpose of placing before electric motor manufacturers and other purchasers of starting rheostats facts concerning the two types of starting boxes known as "ventilated" and "enclosed." The Cutler-Hammer Manufacturing Company is the producer of both types and should, therefore, be in a position to speak advisedly concerning the relative merits of the two types.

Goheen Manufacturing Company, Canton, O.—A very useful engineer's contract book has been published by this company, which will no doubt be found of the greatest value to engineers, managers, contractors, and, in fact, to anyone connected with the contracting business. This book has ruled and printed forms 13 by 23 inches, which have been especially arranged for keeping a complete record of contracts in a form adapted for a convenient reference. The minutest details relating to a contract are found on these sheets, also a blank space for general remarks. Perforations permit the sheet to be easily removed. The book contains contract blanks for street, paving, sewers, sidewalks, pumping machinery, pumping stations, standpipes and foundations, power station buildings, machinery and boilers, electric road overhead construction, electric road track construction, cars and

equipment, electric light and power equipment, underground tubing, underground conduit and contract blanks for the construction of buildings of any description. A particularly advantageous scheme carried out in this book is the placing of complete detailed specifications for the preservation of steel work and general painting with the Goheen Manufacturing Company's products. As many of these books as required may be had for the asking and should be found in every engineers' and contractors' office.

Railway Steel-Spring Company, 71 Broadway, New York.—A handsome catalogue has been issued by this company to show a few of the various types of its springs used throughout the United States and in many foreign countries for locomotive, passenger car and freight car equipment, as well as for street and interurban cars and machinery. Owing to the large number of styles manufactured, it has been impossible to show the entire product of the company, but distinctive types which are standard for various classes of service are shown by engravings from photographs.

Dielectric Manufacturing Company, St. Louis, Mo.—Bulletins Nos. 1 and 2 are the first of a series which are to be issued by this company in the interests of its line of insulating varnishes, paints and compounds. Bulletin No. 1, which is illustrated with engravings from photographs taken in the chemical and electrical laboratories of the company, discusses problems of modern coil impregnation. Bulletin No. 2 is arranged in tabular form and presents condensed data about the Dielectric standard insulating materials, indicating the insulation suitable for particular classes of work and the manner in which it may best be handled.

Ingersoll-Rand Company, 11 Broadway, New York, N. Y.—"Rand Rock Drills" is the subject of catalogue No. 46, which contains 84 pages and has a large number of illustrations. The catalogue matter is specially divided for the purpose of adequately treating the several lines of apparatus. Rand drills are fully described in their various details and full information is given as to sizes, capacities and other parts, together with further data, including prices. Some of the other products of the company are briefly mentioned and a list is presented of the various Ingersoll-Rand publications which may be obtained on application.

International Correspondence Schools, Scranton, Pa.—The fifteenth anniversary of the International Correspondence Schools which was celebrated at Scranton, October 16, 1906, has been recorded in a handsome memorial which contains the addresses of the various speakers and the program which was followed for the occasion. The publication is designed to set before educators, engineers, manufacturers, members of the press and others who might be interested and who were invited but were unable to attend the ceremonies, the methods in text-book preparation, in teaching by mail, and in securing the use of their courses of instruction by the public.

General Electric Company, Schenectady, N. Y.—Type CQ motors of from 1-6 to 20 horsepower are briefly described in Bulletin No. 4486 with respect to design, construction frame, pole pieces, bearing heads and bearings, field coils, armature and commutator and other features. Railway signals, top-mast, direct-connected two and three-position type are the subject of Bulletin No. 4484. A number of illustrations are presented showing this type of signal in use on the Baltimore & Ohio and its points of advantage are also stated. Bulletin No. 4482 issued in the interests of the lighting department is entitled "A Guide to the Design of Medium and Small Capacity Central Station Switchboards." Bulletin No. 4481 describes "Signal Relays" for use in connection with the railway signal apparatus which is a product of the General Electric Company.

WEAR WELL LEATHER PACKINGS.

It is interesting to note how the modern demand for high-class work has led to specialization in the manufacture of even the smallest details of a machine. It was at one time the custom for engineers to cut out their own packing for gaskets, glands, etc., but with the advancement in the designs of modern machinery a greater perfection and nicety of adjustment than could be secured by the older methods are demanded. This is particularly true of the many leather packings, gaskets and washers required by the ever-increasing use of pneumatic and hydraulic machinery, and to fulfill this growing demand for leather packings of superior quality, the Detroit Leather Specialty Company, Detroit, Mich., has taken up the manufacture of "Wear Well" leather packings for such purposes. The necessity of having packings of this nature manufactured by specialists in this particular field will be realized when it is considered that different classes of machinery will require leather of different thickness and flexibility as well as leather which has been treated in a scientific manner to meet the demands of the particular service which it is to fulfill. In order to make packings which will exactly meet the requirements of any service it is necessary that they shall be made to order rather than that the nearest stock size of packing shall be used, as was formerly the custom. It will be readily understood why the old-time home-made washers gave unsatisfactory results when it is taken into consideration that the dies which were used in making them were generally improperly formed. The Detroit Leather Specialty Company makes a study of each case and furnishes packings which in its expert judgment will most satisfactorily meet the stated conditions. These packings are made in all sizes, from the smallest to any size desired. Should, however, any one desire to make his own packings he can secure "Wear-Well" valve leather, which is the company's product, in backs of any thickness from 1/8 to 1/4 of an inch, tanned to meet the requirements of the service specified.

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Japanese oak is now being used for ties in California. It hardly seems credible that hardwood timber is so scarce and the transportation facilities so over-

Japanese Oak Ties for California. can be purchased in Japan, and shipped to California to be sold there, duty paid, at a lower price than ties made from local red-

wood. That this is practicable is evidenced by a recent purchase of 1,500,000 Japanese oak ties for the Southern Pacific Railway and about 50,000 for an extension of the Vallejo Benicia & Napa Valley electric road near San Francisco. These ties have now been delivered, and at a lower cost to the purchaser than soft redwood ties of smaller dimensions could have been purchased in the local market. The timber is said to be equal to our best white oak.

Report on Curve Mechanics. The Woodlawn wreck in the New York Central electric zone on February 16, last, has been the subject of an unusual amount of scientific investigation and discussion by engineers under the head of "Curve Mechanics." The object of these investigations has been to ascertain the initial cause of the derailment, but thus far no definite cause has been announced. A theoretical discussion by a board of engineers relating to the differences between the steam and the electric locomotives of the New York Central, the effect on track due to centrifugal force, and to the skewing of the wheel base, is published elsewhere in this issue. The calculations relating to centrifugal force were so simple that there was a general agreement as to the results, but in that portion of the investigation relating to the skewing of the wheel base various elements in the problem of necessity were assumed, and there was not a general agreement as to the results. The numerical results at first given out were subject to correction, and the incorrect figures or formulas were published by a number of technical journals last week. We are pleased to present the report of the board of experts as it has been finally revised; this will be found an interesting investigation of a subject which has received too little attention from

railway engineers and the professors in charge of the railway engineering in our technical schools.

Three-Cent Fares in Politics. Three-cent street railway fares, in the opinion of Mayor Johnson of Cleveland, supply the long-looked-for issue on which the democratic party is to regain the presidency. The following is his view of the situation: "Three-cent fares and universal transfers made me three times mayor of Cleveland, which was once a republican stronghold. The odds against the democratic party in the state and nation in proportion to the population are not any greater than the odds against the democratic party in Cleveland when I entered the political ring." Just what would become of this issue if someone should suggest 2-cent fares or take up his own panacea of free rides, "Ilke elevator service," Mayor Johnson does not say. He does prophesy, however, that "the world will have 3-cent street car fare and universal transfers soon. I want my state and nation to be the first. Japan has already made a start."

Tom Johnson and the municipal ownership enthusiasts have always asserted that Glasgow people were already enjoying 2-cent fares, although for the shortest distances and without any transfers. Although there are really no long hauls in Glasgow, the burghers would as readily think of giving free rides as of establishing 3-cent fares good over all the city

When the single-phase line of the Vallejo Benicia & Napa Valley Railway was first operated, some two years ago, current was distributed at 750 volts on the trolley wire. Later, the operating conditions warranted raising the operating potential to 3,300 volts. With this change some trouble-

Three-Wire Telephone Circuits. some effects made themselves known on the telephone system with which the cars are dispatched. Obviously these disturbances were caused by inductance, since the telephone wires were supported on the poles almost directly between the two sides of a single-phase circuit, the

overhead trolley and the track return. For part of the route the telephone wires were also paralleled by a high-tension transmission line. These conditions, while not uncommon with single-phase roads, were probably more troublesome in this instance because of the unusual design of the overhead construction. The single scheme by which the telephone system was practically freed from inductance disturbances, comprised the stringing of a third wire similar to those of the telephone circuit and about one-half mile long. This half-mile of wire was placed on the poles as close to the operating telephone wires as mechanical details would permit, about 6 inches. The auxiliary wire when well-grounded to the track so disturbed the field in which the telephone lines were that annoying effects from inductance practically disappeared. The simplicity of this method and its effectiveness commend it for trial elsewhere.

LONDON'S LESSON.

Prior to the election of March 2, the London County Council consisted of 83 socialists or progressives, as they have named themselves, 34 moderates and one independent. The result of the election is a distinct reversal of these figures. The new council will contain 79 moderates, 36 socialists and three representatives of organized labor. Thus, by a sudden culmination of long-lasting resentment at municipal extravagance and incompetence, the people have overthrown a socialist majority equal to 69 per cent of the council. The new socialist minority comprises but 36 per cent of the council. The cause of this great change is not found in any single recent event, but lies in the history of a series of related experiments whose present signal failure and folly should be a warning to every community.

The county council was established 18 years ago to govern the immense area surrounding London which has not been admitted to the city proper. From the beginning the control of the council has been in the hands of the socialists. Their defeat now is the sequel to the recent defeat of the socialist element in the city of London. Both events are the result of extreme municipalization carried to a logical conclusion. In the 18 years the debt of London increased to \$515,000,000, and the annual budget of the county and parishes to \$105,000,000. Taxes rose until they approached confiscation. This will be appreciated when it is recalled that taxes in London are paid by householders or tenants and are based upon annual rentals; and that in some London boroughs the tax rate had become 50 per cent of the annual rent, and the average tenant, paying about \$500 per annum for rent, was burdened by taxes in the sum of \$185 yearly. The taxes, together with the enormous amounts obtained by the creation of increased indebtedness, were expended in the establishment or maintenance of municipally-conducted enterprises. Although the acquisition of the properties of the water companies which supply the city of London and the creation of a sewage system may have been legitimate, the cost of these undertakings, \$187,372,610, seems to exceed the value of the results yielded.

The scheme of municipalization had only its beginning in those enterprises. The council proceeded to expend \$55,000,000 in the electrification of tramways and the extension of municipal lines. In return for these expenditures the council can show an inadequate system 121 miles in length. Municipal ferries on the Thames took \$1,520,000, and were operated with an annual deficit of \$250,000 or one-sixth of their total cost. Free billiard-saloons and Turkish baths were maintained at the taxpayers' expense. Public appreciation of the artistic was to be fostered by the free decoration of privately-owned buildings.

Factories owned and operated by the municipality com-

peted with private enterprises, and the latter were taxed to meet losses of these rivals. Socialism, rampant, ran madly to its destruction. The destruction has come before the cost of the experiment became too great to be borne and it will not involve repudiation of debt, as public ownership did in America in an earlier generation. There are evidences that Manchester, Glasgow, Birmingham and other cities that have ventured too far in the direction from which London has turned back are bethinking themselves and preparing to take an inventory. They will do well to strike a balance and to be guided by what it shows. London is not the only city in which tax-fed industry is a failure and tax-feeding, when long continued, an impossible, expensive luxury; it was merely the first to come to knowledge of itself.

THE FUTURE OF THE STEAM BOILER.

Viewed in the light of comparative floor space per unit of output, the steam boiler has been, in the opinion of many engineers, hopelessly distanced by the steam turbine, so far indeed, that prominent engineers have expressed the belief that a further reduction of the floor space per kilowatt output of the turbines would be useless, as it is now difficult to group the boilers in a satisfactory manner to supply the turbines, without the use of long steam mains.

The reasons for the present rather discouraging outlook for the steam boiler is the set opinion engineers have come to accept regarding the amount of heating surface required per boiler horsepower in an economical boiler. This figure, which is at present accepted as a standard, is roughly 10 square feet of heating surface per boiler horsepower, or, approximately eight square feet per kilowatt developed in a condensing turbine using superheated steam. Such large heating surfaces are thus required, that the boilers necessarily cover a considerable floor area, and it becomes difficult to construct single boilers of large capacity, a 1,000-horsepower boiler at present being considered a very large unit. In spite of this, 10 square feet still continues to be a standard on which the capacity of boilers is estimated, and it is often noted that some manufacturers boast of the moderate rating of their boilers, allowing 12.5 square feet of heating surface for each boiler horse power. There is no doubt that these capacities, and the allowance of heating surface now considered as a standard will in the near future be looked upon as a wasteful extravagance. These facts are borne out by some practical experience, and by principles, the proper interpretation of which have been strangely overlooked.

To begin with the practical side of the question, we have only to consider what has been done in marine and locomotive practice—a digression which may seem irrelevant here, but which we feel is justified in that the marine and locomotive engineers have been compelled to attack the boiler problem from a standpoint which has not yet, but will soon arise in stationary practice, i. e., the greatest evaporation in the least space, and for the least weight possible, and combined with these, the utmost economy.

In locomotive practice, there is often developed at the highest speeds, more than one-half indicated horsepower per square foot of heating surface, or what would be equivalent to about one kilowatt per square foot of heating surface—if the turbine is run condensing. Another instance worthy of careful attention is the performance of the steam yacht "Turbina 1," which developed an indicated horse power in the turbines for each .55 square foot of heating surface, and even this exceptional figure was exceeded in some of the trials. Including the auxiliaries, the turbines here required about 17 pounds of steam per indicated horse power per hour, and since a turbine generator can develop a kilowatt-hour on 17 pounds of steam, the result for the present purpose is, a

pounds of steam, the result for the present purpose is, a kilowatt output for each .55 square feet of heating surface, or in other words, 16 times the power developed in our modern stations.

Although, of course, the economy of these boilers under the condition just stated is probably not as high as in a well operated modern plant, the results obtained are much higher than might at first be expected, an evaporation of 7.7 pounds of water per pound of coal being shown by the locomotive boiler, and about 7 pounds per pound of coal for the Yarrow boilers in the "Turbinia 1." The questions which these examples no doubt bring up are, how such results are possible, and what bearing they have upon the subject of stationary boilers.

In these particular cases, the high evaporation secured per unit area, is due to the very rapid circulation of the water through the tubes, and more particularly because of the high velocity of the gases over the heating surface, combined with a high furnace temperature obtained by the use of forced draft. The latest experiments conducted show that as the furnace temperature is increased, the efficiency of the furnace decreases, which is explained in part by the escape of unburned hydrocarbons, owing to the reduced time the oxygen has to combine with the gases, and the reduced air supply per pound of combustible, which also consequently lessens the chance of all the carbon molecules coming into contact with oxygen molecules while they are at a sufficiently high temperature. Hence when the reduction of furnace efficiency is taken into consideration it can be easily understood that the efficiency of the heating surfaces was probably at least as high, if not higher than when the water evaporated per unit of heating surface was less than in the foregoing examples.

The preceding discussion prepares the way for Prof. John Perry's statement in his book, "The Steam Engine and Gas and Oil Engines," that the efficiency of a boiler is constant, regardless of the conditions of firing, rate of combustion, quality of the coal, furnace temperature, or quantity of air supplied to complete combustion, etc., and a further statement, that the capacity of steam boilers can be increased at least ten times, with a probable increase in efficiency as well as capacity.

Such statements should certainly be of the most vital interest not only to engineers, but to the owners and managers of power plants as well. It will undoubtedly seem absurd to most engineers to assert that these statements are fully within reason and will probably in the near future affect most startling savings of space and weight, as well as money in investment and maintenance. Strangest of all, however, is the statement that the efficiency of the boiler is independent of the furnace temperature and quantity of air supplied. For 100 years it has been believed that the efficiency of a heating surface depended only upon the difference in temperature of the water and the hot gases, but, upon careful mathematical investigation this does not appear to be true; and, furthermore, the results of the most careful boiler tests conducted by the United States Geological Survey indicate the truth of the statement in every respect. For the most part, an examination of the curve sheets in the paper read by Professor L. P. Breckenridge of the University of Illinois before the Western Society of Engineers on March 20, 1907, of which an abstract is given on another page of this issue, shows that the efficiency of the boiler remains constant in spite of the variations in the furnace conditions.

Many engineers will probably express the opinion that such high rates of evaporation as would be required to bring about the results suggested by the foregoing discussion would rapidly burn the tubes and heating surfaces and it may be well to call attention to the fact that the evaporation per square foot of heating surface in the firebox of locomotive boilers often reaches 50 pounds, and in some of the loco-

motive boilers used in torpedo boat practice, the evaporation probably often exceeds 70 pounds in the firebox section. Further, the most eminent authorities have stated that no danger of burning the heating surfaces need be feared under a rate of 150 pounds per square foot per hour. It should be distinctly noted, also, that even with the poor circulation in the firebox portion of locomotive boilers, there is comparatively little danger of the sheets being burned, so long as they are kept free from scale. With improved circulation, preferably by mechanical means, there would be absolutely no danger, and, in fact, no doubt with improved circulation, even with an evaporation of 100 pounds of water per square foot per hour, the tubes would last longer than in present practice. A rate of 50 pounds per square foot would correspond to about three kilowatts per square foot of heating surface.

In chart 1, the almost constant efficiency with variations in CO_2 and furnace temperature is clearly shown, as is likewise the efficiency in chart 2 both of which, as well as the many other charts not presented herewith, bear out the statements made.

An explanation of these facts is that as the absolute temperature of the furnace gases increases, the volume increases in the same proportion, since the volume is directly proportional to the absolute temperature, the velocity of the gases would also increase in proportion to the temperature and the time the gas is in contact with the surface will therefore vary inversely as the absolute temperature. The density, however, is inversely proportional to the absolute temperature, and hence there are fewer molecules per unit volume of the furnace gases. Since these quantities all vary and are dependent upon each other, the rate of transfer of heat per unit area of the heating surface remains constant, as will also, therefore, the efficiency of the surface. This is a fact which should have been recognized years ago, and had it been, it is possible that the boilers of today would be comparatively as compact as the turbines.

A point which from an operating standpoint may be of value, is that it was found, at least for the types of furnace now generally employed, that the efficiency of combustion can not be judged by the CO_2 alone, although the most favorable results were obtained when the volume of CO_2 was about 8 to 10 per cent of that of the flue gases. The best method of determining the most economical results is to increase the per cent of CO_2 until CO is found in the flue gases. This, of course, cannot be determined by the automatic CO_2 machines, and requires the service of a chemist, which has been suggested before in these columns.

The conclusions which are, therefore, warranted from the theoretical, as well as from the practical standpoint, are that an excessive furnace temperature, above, say, 2,300 degrees F., will not give an increase in efficiency which is warranted, and that the repairs to the furnace setting and firebrick arches will be greatly reduced by working with a moderate furnace temperature, without any loss in efficiency of the heating surfaces, while the efficiency of the furnace, for reasons previously given, will be materially increased. The fact that the heat transmitted per square foot of heating surface is almost wholly dependent upon the velocity of the gases parallel to the surface, indicates that a greater number of baffles should be employed, thus increasing the velocity of the gases. This also applies to the velocity of the water over the heating surfaces, and no doubt it would be perfectly justifiable to use mechanical means for circulating the water, as tests have shown that the circulation in the best of modern boilers is entirely too sluggish to obtain high rates of evaporation per unit area. The fact that excessive temperatures are not advantageous implies that the grate area should be increased, and mechanical means provided for properly mixing the gases and air so as to insure complete combustion. By these means, the size of the boilers could be greatly reduced with a probable gain in efficiency, besides

the reduced cost of land, interest on the investment, and maintenance charges.

BOOSTER VERSUS END-CELL REGULATION.

Time and again the question of booster versus end-cell regulation is brought before engineers and, from the frequency with which the subject is discussed, it appears that both parties to the argument remain perfectly convinced in their own opinion. Such was the case at the meeting of the Western Society of Engineers held on March 15, 1907, at which Mr. J. M. S. Waring, of the Electric Storage Battery Company, addressed the society on "The Application of the Storage Battery for Lighting, Power and Railway Service."

The paper of the evening dealt with the various applications of storage batteries, and more specifically with different methods of regulation, and of connecting the battery to the line. Storage battery characteristics and the operation of the carbon regulator and boosters were carefully explained in a very simple and concise manner by the aid of numerous diagrams. The question of regulation by the use of boosters or end-cells was discussed by a number of the members of the society. Advocates of the end-cell method brought out the fact that it is difficult to determine the exact booster capacity that will be required, for, if the booster installed is of sufficient capacity to meet the demands put upon it in an emergency—such, for instance, as a heavy short-circuit—then the machine is abnormally large for its ordinary work and requires an excessive investment, on which there is no return; while, if it is just large enough for the normal maximum load, there is serious danger that it will be disabled by a heavy short-circuit or overload; or, if the booster is properly protected by circuit-breakers they will frequently open the circuit, thus causing an interference with the service which the modern central station will, if possible, avoid at any cost. Furthermore, the advantages of the storage battery are seriously imperiled by the booster, because the booster is liable to be damaged or burned out by lightning, since the natural path of the lightning is through the booster to the battery, which in effect serves as an excellent and efficient form of tank lightning arrester.

Of course, besides the economy which may be effected through the use of a storage battery to carry the peaks of the load and thus to reduce the engine, generator and boiler capacity required, one of the chief advantages of the storage battery is to serve as an unfailing reserve. This advantage may be totally lost if a booster is connected to the line between the batteries and the load. The disadvantage of the end-cell method of regulation is that the battery switches cannot easily be automatically controlled to meet sudden demands for power which cause the voltage to drop suddenly. As the battery switch must generally be controlled by hand, the voltage may not be as constant as with the booster method of regulation, and the generators, through carelessness, may be subjected to momentary overloads. It would seem, however, that this disadvantage is counterbalanced by the reduced liability of a complete disablement of the service.

The Stone & Webster Engineering Corporation of Boston, Mass., has plans under way for the construction of an electric interurban road connecting Galveston and Houston, Tex., 50 miles; for building 20 miles of branch lines to towns on Galveston bay in Texas, and also for a 75-mile electric road between New Orleans and Baton Rouge, La., the syndicate having bought the Baton Rouge street railways. Stone & Webster now own the electric street railways in Dallas, Ft. Worth, Houston, Galveston and El Paso and the interurban line connecting Dallas and Ft. Worth. The Texas legislature has passed a bill giving interurban electric railway companies the right of eminent domain. The bill was drawn especially in the interest of the Galveston-Houston line.

ANNUAL REPORTS OF RAILWAYS.

International Traction Company, Buffalo.

In the annual report of the International Traction Company of Buffalo for the year 1906 the president, Henry J. Pierce, emphasizes the improvements which are in contemplation to meet the needs of Buffalo and the other communities which are served by the system. The territory traversed by the 356 miles of railway lines in the system comprises the cities of Buffalo, Lockport, North Tonawanda, Tonawanda, Niagara Falls, N. Y., Niagara Falls, Ont., and about twenty villages and townships. There are over 500,000 people in this territory.

Among the improvements planned are the following:

Construction of a new double track line between Buffalo and Niagara Falls, giving the system four tracks between those two points.

Construction of two new car houses, one on Broadway, Buffalo, at a cost of \$225,000; the other at Hertel avenue, Buffalo, at a cost of \$130,000.

Purchase of 50 new cars for Buffalo city service.

Extensions in Buffalo, Niagara Falls and Lockport.

To carry out these undertakings Mr. Pierce states that it will be necessary, as the company cannot increase its bonded indebtedness, not only to expend the profits of 1907, but also to borrow \$1,000,000 from the banks. While regretting that dividends must be delayed, Mr. Pierce adds:

We believe that we are best serving the interests of the stockholders by maintaining their magnificent property in first-class physical condition, and by making such betterments and extensions as are necessary to keep abreast with the growth of the territory served.

The financial results of the year, with comparisons, are briefly stated as follows:

	1906.	1905.	1904.
Gross earnings from operation.....	\$4,972,688	\$4,484,643	\$4,088,426
Operating expenses	2,884,985	2,483,663	2,412,769
Net earnings from operation.....	\$2,087,703	\$2,000,980	\$1,675,657
Miscellaneous income	69,110	68,562	64,515
Gross income less operating expenses.	\$2,156,813	\$2,069,542	\$1,740,172
Interest, taxes, rentals, etc.....	1,691,959	1,652,376	1,606,052
Net income	\$ 464,854	\$ 417,166	\$ 134,120

In reviewing the growth of business, the relations of the company with its patrons, and the improvements completed or planned, Mr. Pierce says:

This section of the country, already one of the great centers of steam railroad and lake transportation, is attracting the attention of manufacturers by the extraordinary facilities and advantages it affords in which to locate factories whose product is distributed throughout the country. There are unmistakable evidences that the growth of the frontier of western New York will be phenomenal in the near future, and it is already taxing the capacity of the International Traction Company lines to keep pace with its progress.

Believing in the future of Buffalo and its vicinity, and realizing the value of the franchises which the company enjoys, the management has endeavored to establish as perfect a street railway service as is possible under the physical conditions confronting it, with the result that not only have the company's revenues increased, but its efforts are appreciated by the residents of the cities and towns which it supplies with transportation facilities, as is evidenced by the friendly attitude of the people, the press and the municipal authorities.

The property is being operated upon the theory that it is the first duty of public utility corporations to give first-class service in return for the privilege to operate, and in the belief that the corporation so conducted will not only establish itself firmly in the good opinion of the people whom it serves, but will secure a stability which will inure to its own lasting benefit.

During 1906 the physical condition of the property was not only fully maintained, but improved. The new car shops, finished during the year, are as complete as any in the country and afford every facility for the proper maintenance of equipment; a new model substation was established on the east side of Buffalo; 150 new cars, of the most up-

to-date type and costing nearly \$1,000,000, were purchased; 12 miles of track were laid through Fillmore avenue, Buffalo, under franchise obtained in the fall of 1905, and this line will be open for traffic in the early spring.

In view of the fact that a fast electric line is to be built from Toronto by way of Hamilton to Niagara Falls, Ont., in the near future, and as an electric line, now under construction, between Lockport and Rochester will be completed during 1907 (both of which lines are to connect with our system), and as the capacity of our Niagara Falls line is already taxed to the utmost by present travel, a franchise has been secured, and it is proposed to build within the next 18 months a new double track line, over its own right of way, between Buffalo and Niagara Falls, connecting at Tonawanda with our Lockport division.

United Railways of St. Louis.

In the annual report of the United Railways Company of St. Louis for 1906 there is published a summary of the financial results and traffic statistics from 1900 to 1906. In the year 1900 the strike seriously hampered the operations of the company, but a comparison of 1906 with 1901 will show fairly the development of the business. Gross earnings from operation and other income have increased from \$5,783,912.72 in 1901 to \$9,146,348.25 in 1906, or 58 per cent. The figures for the years 1901, 1905 and 1906 are as follows:

	1906.	1905.	1901.
Earnings from operation and other income	\$9,146,348.25	\$8,460,016.01	\$5,783,912.72
*Operating expenses, taxes and depreciation	5,567,411.65	5,318,368.80	3,692,400.58
Surplus over operating expenses, taxes and depreciation	\$3,578,936.60	\$3,141,647.21	\$2,091,512.14
Interest on funded debt, miscellaneous interest and organization expenses	2,377,476.68	2,387,915.47	2,040,932.14
Net income	\$1,201,459.92	\$ 753,731.74	\$ 50,580.00
Dividends on preferred stock	649,160.00	649,160.00	576,210.00
Surplus	\$ 552,299.92	\$ 104,571.74	
Deficit			\$ 525,630.00
*Depreciation—1905, \$421,752.39; 1906, \$455,681.09; none charged in former years.			
Traffic Statistics—			
Revenue passengers	183,237,886	170,009,691	117,546,811
Transfers and passes	81,183,324	74,231,470	46,449,131
Total passengers	264,421,210	244,241,161	163,995,942
Percentage of passengers using transfers	41.81	41.48	36.76
Average Passenger Earnings:			
Per revenue passenger	4.91	4.90	4.86
Per total passenger	3.40	3.41	3.48

The gross earnings and other income in 1906 were as follows:

Passenger receipts	\$8,997,240.90
Advertising privilege	47,500.00
Mail	38,326.00
Express	10,673.28
Rental of power	12,048.62
Interest (on deposits and securities)	26,728.69
Miscellaneous	13,830.76
Total	\$9,146,348.25

Operating expenses were \$4,623,989.68, and taxes \$487,740.88 and charges for depreciation \$455,681.09.

In referring to the depreciation reserve fund the president, John I. Beggs, says that the policy inaugurated in 1905 has been maintained during 1906. Each month five per cent of the gross receipts was carried to a depreciation reserve fund. The entire amount so credited in 1906 was expended on the property, together with \$36,505.02 of the balance left in the account at the end of 1905. The fund therefore amounted on December 31, 1906, to \$178,055.03.

The fire insurance reserve fund was increased during the year by charges against operating expenses of a small percentage in excess of the actual premiums paid. This fund amounted at the end of the year to \$59,172.15. The injuries and damages reserve fund was also increased by charges to operating expenses of an amount in excess of that paid out on account of these claims. This fund stood on December 31, 1906 at \$398,360.62. There were held for investment for the fire insurance reserve fund 500 shares of preferred stock of the company, and for the injuries and damages reserve fund 3,335 shares of preferred stock at the end of the year.

The report discusses at length the acquisition of the St.

Louis & Suburban Railway. The United Railways Company gave 40,000 shares of its preferred stock for the entire outstanding stock of the St. Louis & Suburban, and assumed the \$7,500,000 bonds and about \$447,000 floating debt of the Suburban company.

On July 1, 1907, \$1,500,000 underlying 6 per cent bonds of one of the constituent companies of the United Railways Company will mature. There are reserved for their retirement \$1,500,000 of 4 per cent bonds. The discount at which these bonds will be sold will be charged against the surplus or carried to a suspense account to be charged off during a series of years.

Capital expenditures during the year were as follows:

Track and roadway construction	\$ 619,055.71
Electric line construction	96,970.39
Real estate, buildings, tools and fixtures	235,436.39
Miscellaneous equipment	26,971.82
Power plant buildings and equipment	73,620.94

Less cars and electric equipment of cars sold	\$1,052,055.25
	118,025.84

Total.....\$ 934,029.41

During the year the operation of the union depot power plant was discontinued and part of the machinery sold. A new substation is under construction and when it is completed the Cass avenue power plant will be discontinued. Rotary converters having a combined output of 4,000 kilowatts have been installed in new substations and considerable machinery moved to more advantageous points. In the year about 25¼ miles of track were reconstructed with 9-inch grooved rail laid on concrete and 1.6 miles were laid with 75-pound T-rails.

Union Passenger Terminal and Other Improvements at Portland, Ore.

The Portland Railway Light & Power Company has purchased the block bounded by First, Second, Pine and Ash streets, in Portland, Ore., and will immediately draw up plans and specifications for a large fireproof building five or six stories high for a union passenger terminal and for the general offices of the company. It is planned to use the station as a terminal for all the lines entering the city. Besides the usual terminal and office purposes the building is to be used for the display room of the electric light department, as headquarters for the employes, and for offices to be rented to other electrical and railway interests. The equipment of the Alder street substation is also to be located there.

In regard to other improvements contemplated by the company President H. W. Goode is quoted as follows:

"The power situation is fully taken care of for the next few years by the Cazadero plant, which recently started operations with an immediate capacity of 15,000 horsepower, which can be increased to 25,000 horsepower when required. The company has other plans which are being rapidly matured for power development, which will take care of the future after the capacity of the plant at Cazadero is exhausted.

"At the American Car Company's works, St. Louis, and the General Electric Company's plant at Schenectady, 100 additional cars and their electrical equipment are being manufactured. Forty of these cars will be delivered in Portland by May 1. The rest of the 100 will follow during the present year. The cost of these cars will be between \$400,000 and \$500,000. This new equipment will perfect the service on many lines, on which, owing to the rapid growth of the city, there has been some complaint about overcrowded cars during the rush hours. Meanwhile, about twelve new cars will soon be turned out of the company's own shops, which will be used until the other cars arrive.

"Within about 30 days, the company will begin the work of placing all its wires underground in the center of the city and will also commence laying mains for its steam heating system, a franchise for which was recently granted."

SHOPS OF THE NORTH JERSEY DIVISION OF THE PUBLIC SERVICE CORPORATION.

(Continued from Page 350.)

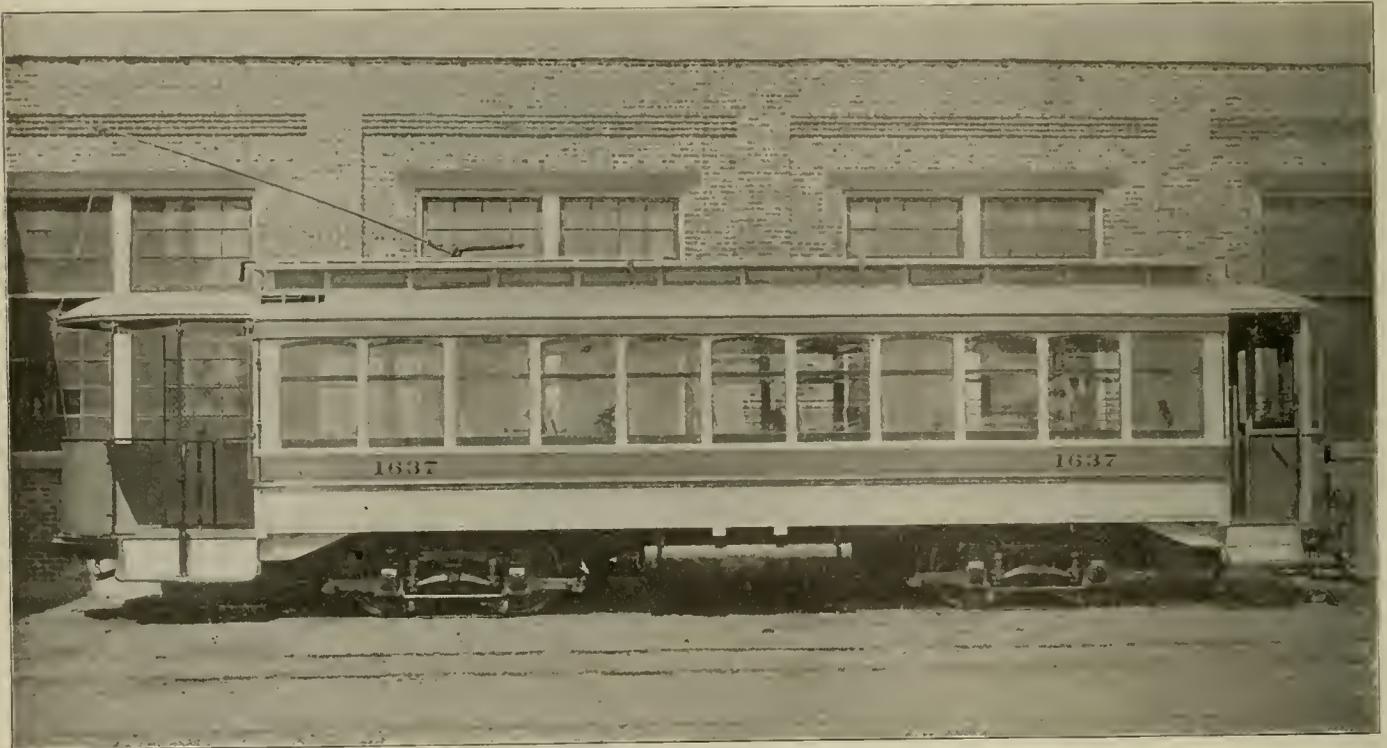
On the balcony of the machine shop on the west side of the old machine shop building is found the armature room. This is a particularly clean and well kept department. It would be thought from an inspection of this room, and judging from the small number of repair parts lying about, that the system is much smaller than it really is. However, this is probably due to the number of machine tools installed for readily and properly handling the work. Each armature is supported on two armature stands. These are built so that the armature may be raised or lowered and conveniently revolved so that the winder has ready access to the work. The soldering irons are all heated in gas furnaces, which are also attached to the stand, handy for the workman.

One of the cuts herewith shows the new field-winding machine, and another the new armature-banding machine. These were designed particularly for the work. The arma-

Also located on the balcony is the taping department. At present this work is done by hand, as the amount of work is not sufficient to require any automatic machinery. Directly under the winding department is the fireproof room and oven for baking and drying the armature fields. This is heated by steam coils underneath the floor. The room also contains dipping vats. One of the accompanying cuts shows the entrance to this room and a number of armatures ready to be distributed to the various terminals. It will be noticed that each is supported on its own armature buggy. The armature buggies strike the observer as being exceedingly convenient, for not only do they protect the wires and insulation but are handy to move about.

Erecting Shop.

Passing from the machine shop to the erecting shop it is noted that the south end of that building is reserved for the carpenter work. An accompanying cut shows a number of the machines in this shop. In connection with this shop there is an exhaust outfit that takes away the shavings to



North Jersey Shops—Standard Car of the Public Service Corporation of New Jersey.

ture-banding machine is driven by worm gear that has a friction brake, and the whole is operated by workmen by foot lever. The wire is held by a reel resting on the frame of the carriage, working parallel with the armature shaft. The tension is obtained by running the wire around and through a series of steel wheels, from which it is led to an adjustable arm. The tension is thereby kept constant and the work is under the perfect control of the operator. Formerly the armatures were banded by the old method, that is, by hand, and much trouble was experienced by the breaking and loosening of the wires. We are informed that the work done on the new machines gives very little trouble. The field-winding machines are also operated by worm and gear and have a friction brake so that the movement of the machine is controlled with a foot lever, leaving the operator free to work directly on the coil. Three of the machines appear in the cut but there are six installed, which easily handle all the work of the system. It may be noted that all of the armature work for the entire division is done in this department. The present field-winding machines are in iron frames.

the boiler room. It was noted that the workmen are installing a new 48-inch sanding machine. There is also a special machine roller for shaping the new steel panels that have been adopted for car bodies.

The erecting shop is equipped with several shallow pits, which are used for doing carpenter work on cars when the work is of a kind that necessitates getting beneath the bodies. It will be noted that the belting arrangement for the carpenter shop is above the floor. This was found necessary on account of the trouble with water in this particular vicinity, which prevented the installation of the driving machinery underneath. However, the machine tools are so well disposed that the belting does not interfere with the progress of the work. The erecting shop forms the second stage of the complete overhauling of the car, which first goes to the truck shop and then, after the motor work, forging and machine work have been finished, is taken out on the transfer table between the buildings and transferred to the erecting department.

It is to be noted that the general arrangement of tracks in the shops provides that all the tracks shall be short. This

makes a particularly convenient layout for handling cars and is an example of what is now generally conceded to be the most modern practice. From the erecting shop cars are taken out on the second transfer table and are passed to the paint shop building. The transfer table is very simple and of substantial design, made up of standard wheels and axles, supporting twin girders of $\frac{7}{8}$ -inch and 8-inch plates that carry heavy trilby rail. The table operates on three tracks and the driving motor is fed from a third rail and this makes a particularly clean and neat arrangement. The transfer table is arranged with direct electrical driven "nigger head," so that cars encountered in the buildings

storage tank runs out and it is necessary to do the washing with city water, but every advantage is taken of the roof water as long as it lasts. The paint shop is heated by direct steam, this being preferred to the hot air that is used in the other buildings. The direct steam system provides sufficient heat to maintain a temperature of over 80 degrees even during zero weather. The fact that ample provision has been made for properly heating the building enables the work of finishing to be satisfactorily carried on at all times.

The paint shop is large enough to accommodate comfortably 70 or 80 large cars and we understand that five or six cars are turned out every day. On the south side of the



North Jersey Shops—Method of Storing Cars Under Canvas in Yard.

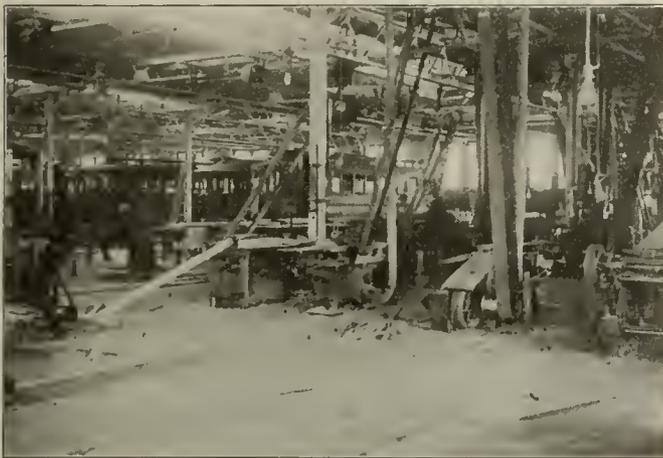
without power or electrical equipment are pulled on and off the table by means of a cable operated by the revolving drum.

Paint Shop.

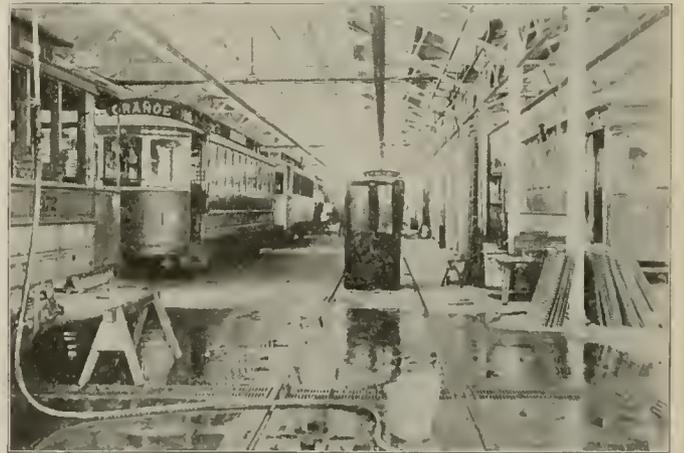
On going into the paint shop one cannot avoid being impressed with the general design of the building with regard to the lighting arrangement. All the light is practically north light and in such abundance that the work is carried on almost as if in the open. Directly across the entire front is a series of washstands so that every car can be washed

building is a section not containing tracks and here the finishing work is done. After the sashes are washed in the vats they are placed on a table that has a revolving frame and when varnished are neatly stored upon the stationary racks that run in rows back to back perpendicularly to the wall. One of the accompanying cuts shows a view of the interior of the paint shop.

All the paints, varnishes, oils, etc., are kept in storage in a separate building and we present herewith a cut showing the effective manner in which the material is stored in



North Jersey Shops—General View in Carpenter and Erecting Shop.



North Jersey Shops—General View in Paint Shop.

down as soon as it enters the building. Over each track is a water pipe with a place for attaching hose.

All of the rain water that falls on the shop buildings is taken to a concrete cistern, from which it is elevated by an automatic electrically driven centrifugal pump to a 20,000-gallon tank, 60 feet high. This tank supplies the water for washing the cars and we are informed by the superintendent that soft water is much preferred for cleaning the woodwork. Not only is it effective in removing dirt, but it also accomplishes this result with the minimum of injury to the car bodies. There are of course times when the supply in the

tanks. One man is in charge of the paints, oils, etc., and these are given out to painters in small quantities, as desired. At night all the varnish, paints and oils are entirely removed from the paint-shop building proper to the storage house. The method of storing paints indicated in this cut cannot fail to commend itself to all who have a considerable amount of painting to be done. The arrangement always excludes inflammable material from the main building as most practicable and reduces almost to a minimum the fire risk from the storage of material. On the south side of Ferry street are the storage barns, where out-of-season equipment is stored. The cars are taken from the

storage barn through the shops, by first going directly across through the machine shop, and then through that building until they come out of the east end of the paint shop, ready for service, or to be taken to their respective divisions. It may be of some interest to note the method of storing cars in the open with canvas covers, as seen in one of the accompanying cuts. We are informed that these cars, after standing outside for an entire season with the canvas covers, are

storerooms at operating terminals, where material is used by inspection and car men.

There is also a complete fireproof oil house. Both storeroom and oil-house are located so that steam cars can be brought into the yard and the contents unloaded directly into the building. The oil-house has a separate room for the storage of waste and has a capacity of two carloads of oil.

One of the cuts presented herewith shows an electric



North Jersey Shops—Method of Storing Paint Supply.

in as good condition as when first stored. For example, the summer car that comes out of the paint shop when finished is often placed in the yard under the canvas cover and when the weather has so moderated that the car is ready to go into service, the varnish is found in practically as good condition as when it came out of the paint shop. The canvas covers are of duck, in two sections, laced together with heavy twine through brass eyelets. The covers cost about \$50.00 per car, and a life of five or six years would make it appear



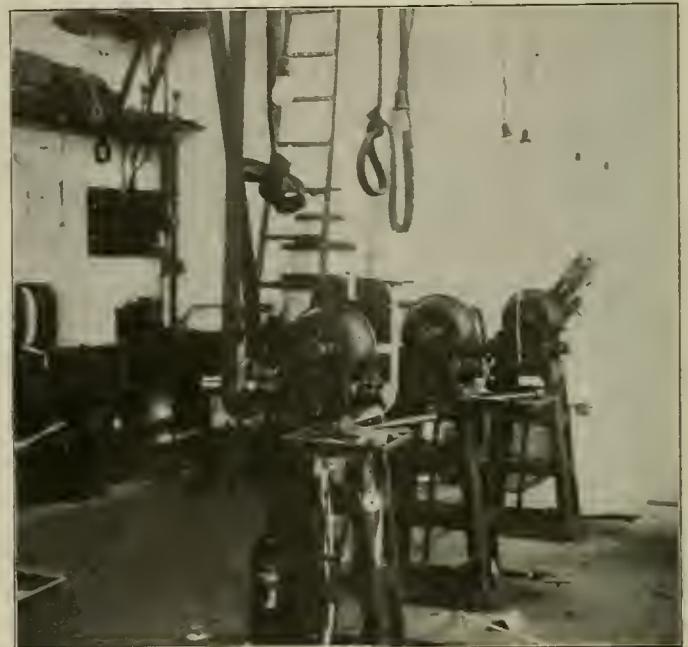
North Jersey Shops—Entrance to Bake-Oven Room, Showing Armatures on Buggies.

locomotive that was built at the shops and that is used for switching cars to and from the steam road racks and elsewhere about the yards. From the view of the Plank Road shops presented in the Electric Railway Review of March 16, 1907, page 346, it is seen that the buildings are adjacent to and have connection with the railroad tracks, making it easy for carload material to be switched directly to the shops. The board fence in the rear of the shop building is 7 feet



North Jersey Shops—Self-Supporting Jib Cranes with Air Hoists.

that the cost of storing with this method is much more economical than if buildings were erected. At the west end of the property is located the general storeroom and iron yard of the shops, and one of the accompanying cuts gives a view of the iron rack in the center of this yard and shows the shelves arranged along the inside of the exterior wall of the yard for holding castings, etc., that are not affected by the weather. From the general storeroom regular supply cars distribute material to the auxiliary shops and small



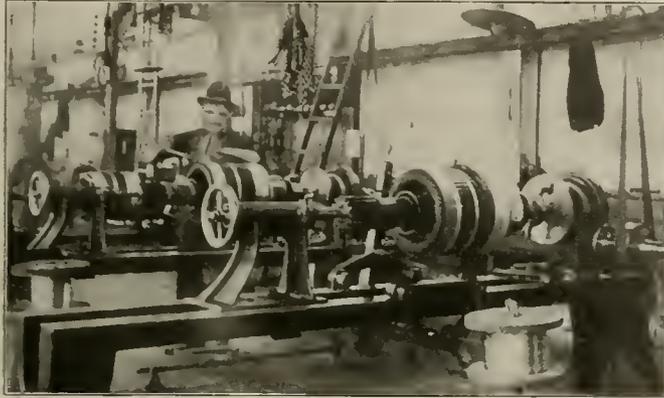
North Jersey Shops—Field-Coil Winding Machines.

high and the posts are run 2 feet above the fence proper, supporting three barbed wires, so that it is difficult for any one to gain admittance to the grounds without going the regular route.

The fire protection of the Plank Road shops is so complete that it deserves more than ordinary mention. All the buildings are equipped with inside 2-inch hose connections and auxiliary fire alarm sets, whereby an alarm can be turned directly into the city department from almost any part of

the property. The interiors are also equipped with numerous automatic fire extinguishers and a sprinkling system. Outside are fire hydrants and a main fire house, equipped with hose cart and reel with 500 feet of hose, a 55-gallon chemical fire engine, hooks, ladders, axes and everything necessary for fighting fire.

The company has organized a regular fire brigade so that every man goes to his post on the sounding of the special



North Jersey Shops—Armature Banding Lathes.

signal, which is a penetrating air whistle. In connection with the sprinkling system, which is of the dry pipe type, there is an electrically-driven centrifugal fire pump, of a capacity of 1,000 gallons per minute, and it is of particular interest that the pump is one of the first of the centrifugal type installed in connection with a sprinkling outfit. On a test it maintained a pressure of 100 pounds per square inch with four hose connections on the line, each equipped with Underwriters standard hose pipes. Besides the fire pump there is a steel storage tank 117 feet high, which contains 50,000 gallons of water. It will be seen that in case of fire and a break in the city main, there would be sufficient water available to put out any ordinary conflagration, besides producing a heavy pressure on the sprinkling lines at all times, giving plenty of leeway to start the pressure pump. The sprinkling system is very neatly arranged. All the heads are on the roof. This idea is effectively carried out with a shop of this particular type, with single floor construction



North Jersey Shops—Switching Locomotive Built and Used at Shops.

and low roof. At each dry valve is placed an electric gong so that if the sprinkling head that is connected with any particular valve goes off, an electric contact is made so that the gong at the valve besides sounding an alarm at the special location also sounds a main gong in the boiler house, where men are on duty at all hours. At the same time an annunciator in the boiler house points out the number of the dry valve that controls the particular head that has exploded. It is evident that as soon as the gong in the boiler

house sounds, the man on duty knows the exact location of the trouble, and he immediately blows the fire whistle, which gives the alarm and gets the shop fire department into action.

We are indebted to Mr. A. H. Stanley, general manager of the street railway department, for the privilege of presenting this article, and to Mr. Martin Schrieber for assistance in compiling the data.

DIRECTORY OF ELECTRIC RAILWAY ASSOCIATIONS.

American Street and Interurban Railway Association. Secretary, Bernard V. Swenson, 29 West Thirty-ninth street, New York.

American Street and Interurban Railway Accountants' Association. Secretary, Elmer M. White, assistant treasurer Birmingham Railway Light & Power Company, Birmingham, Ala.

American Street and Interurban Railway Engineering Association. Secretary, S. Walter Mower, general manager Southwestern Traction Company, London, Ont.

American Street and Interurban Railway Claim Agents' Association. Secretary, B. B. Davis, claim agent Columbus Railway & Light Company, Columbus, O.

American Street and Interurban Railway Manufacturers' Association. Secretary, George Keegan, 2321 Park Row building, New York, N. Y.

Canadian Street Railway Association. Secretary, Allan H. Royce, president Toronto Suburban Railway, Toronto, Ont.

Central Electric Railway Association. Secretary, W. F. Millholland, secretary and treasurer Indianapolis Traction & Terminal Company, Indianapolis, Ind. Next meeting, Dayton, O., March 28.

Colorado Electric Light Power & Railway Association. Secre-



North Jersey Shops—Rack for Holding Iron Supply.

tary, John F. Dostal, Denver Gas & Electric Company, Denver, Colo.

Iowa Street and Interurban Railway Association. Secretary, L. D. Mathes, general manager Union Electric Company, Dubuque, Ia. Next meeting, Clinton, Ia., April 19 and 20.

Massachusetts Street Railway Association. Secretary, Charles S. Clark, 70 Kilby street, Boston, Mass. Meetings held in Boston on second Wednesday of each month, except July and August.

Northwestern Electrical Association. Secretary, R. N. Kimball, Kenosha, Wis. Annual meeting, Milwaukee, Wis., January, 1908.

New England Street Railway Club. Secretary, John J. Lane, 12 Pearl street, Boston, Mass. Meetings held on fourth Thursday of every month.

Oklahoma Electric Light Railway and Gas Association. Secretary, Charles W. Ford, Oklahoma City, Okla. Next meeting, Oklahoma City, April 22 and 23.

Pennsylvania Street Railway Association. Secretary, Charles H. Smith, superintendent Lebanon Valley Street Railway, Lebanon, Pa.

Southwestern Electrical and Gas Association. Secretary, R. B. Stichter. Annual meeting, San Antonio, Tex., May 14, 15 and 16.

Street Railway Association of the State of New York. Secretary, J. H. Pardee, general manager Rochester & Eastern Rapid Railway, Canandaigua, N. Y.

Wisconsin Electric and Interurban Railway Association. Secretary, Clement C. Smith, president Columbia Construction Company, Milwaukee, Wis.

It is announced that the Houston (Tex.) Electric Company will build a clubhouse for its employes, equipped with a library and reading room and patterned after the clubhouse recently built by the San Antonio Traction Company in San Antonio, which has proved a source of gratification both to the men and to the company.

PROGRESS OF THE TRACTION CAMPAIGN IN CHICAGO.

The Citizens' Non-Partisan Traction Settlement Association of Chicago has distributed 50,000 buttons bearing the inscription, "Vote for the Traction Ordinances, C. N. P. T. S. A." A series of four postal cards containing arguments in favor of the ordinances has been prepared, and two of the cards have already been distributed. With the second postal card a "nut-shell" version of the ordinances was distributed. The association has adopted the plan of sending copies of the ordinances to all who raise objections to them and it has been found that many of the objections were based on misinformation.

A new organization called the "Strap Hangers' League" has been formed to advocate the approval of the ordinances. Walter L. Fisher, who was Mayor Dunne's original traction expert, advocated favorable action on the ordinances before a meeting of the league on March 19. Mr. Fisher said in part:

I have said before since this controversy arose, and I have said it for the last 12 months, ever since my official connection with this matter, that the one thing which the city had not established, and the one thing which it was most uncertain as to whether it could establish, was its ability to raise the money necessary to buy this property under the \$75,000,000 ordinance of any other ordinance which the present opponents of this ordinance would advocate and which would be adopted by the people.

The fundamental question that is involved is whether or not under the existing conditions in the money market of the world (because the flurry that we had the other day in Wall street is not confined to Wall street) the city has the ability to finance those securities.

Shall we wait, shall the people of this community permit the present intolerable conditions to continue while the officials of the city find out or attempt to find out the only means by which municipalization is possible under the law?

These ordinances were intended to present a proposition on which the advocates and the opponents of municipal ownership could safely unite without sacrificing the principles or convictions of either one, so that both of them could say, as the mayor said in the Werno letter: "We can provide for first-class service and we can settle the question of municipal ownership when we have established our legal and financial ability to take them over and have made the necessary political provisions that are absolutely essential to any successful management under public control."

These ordinances were drawn on the theory that the time when the city could best purchase—most advantageously purchase—would be at the expiration of the 3-year immediate rehabilitation period. It was not, however, limited to the right to purchase then. If these ordinances are adopted, six months from February 1, 1908, the city can give notice, and on that day it can purchase and take over the properties.

It also can wait the three years, and if the service is then satisfactory, if the financial terms are then working out so every one is content, it can wait until the next year, and the next year, and the next, and it can take advantage of that provision in the law whenever it desires to do so.

The decision of the United States supreme court which holds invalid the 99-year franchises in Chicago has been filed in the federal court of Chicago. The attorneys for the city of Chicago and the Chicago Union Traction Company will argue the question as to whether the entering of the decree will cloud the right of the company to continue the use of certain tracks. Judge Grosscup announced that he will hear the arguments on April 4 and 5.

The New York state board of railroad commissioners has decided to discontinue, at least temporarily, the issuing of the quarterly reports showing statistics as to transportation in Greater New York. These reports have been issued every three months for several years and have been remarkably complete in detail. They have given for each quarter the cash fares, the transfers and the total cash fares and transfers received by each street railroad operating company; the greatest number of passengers carried in one day, the car mileage, and the number of transfer points. The reports have furnished the opportunity of ascertaining just how efficient the service of each company has been. No reason is given for the decision.

NEW YORK RAILROAD CLUB.

An interesting paper by Walter C. Kerr, president, Westinghouse, Church, Kerr & Co., on "The Conduct of Electrification Work" was read before the members of the New York Railroad Club at their meeting held on March 15, 1907. An extract from the paper follows:

Many electrical considerations begin by getting tangled in chaotic, irrelevant discussion, due to thinking of the details first, when consideration should be limited to the broad problem of how the results produced through electrification will compare with the present steam traction. It can be easily, cheaply and quickly determined whether in any case electrification is warranted or not. If not, the job is finished. If warranted, the next step is determination of the main elements and their applicability to the case in hand, leading to the work being authorized and the appropriations approximately made to perform it.

I call attention to certain fundamental differences between electric and steam traction. Steam traction consists of specially differentiated and entirely independent units, which can be very unlike in many ways. Electrification is essentially a system in which there is correlation of the highest order; in which every part of the whole operation is dependent on every other part and its individual operation. A new type of steam locomotive or other steam railway appliance can be tried in a small way before adoption. An electric system must be completely installed, with a large expenditure of money, time, power of decision, and faithful constructive work, in an exceptionally new and rapidly advancing art, before it may exhibit its merits or defects. Those charged with the administration of such work must make profound decision as to how the electrification shall be accomplished, to utilize the best means to safeguard cost, quality, time, hazard and insurance against wide departure from normal performance.

I have time to discuss only a few considerations, which to my mind are important, though not always sufficiently regarded.

The accomplishment of a physical project necessitates logical decisions as to what to contemplate, what to determine, the detail of what shall be designed, and how it shall be designed and specified, the method of construction and finally, the modification of existing methods to the new type of operation. This sequence is often forgotten or never known.

A steam railway may accomplish this in one of three ways: (1) It may create a new department within itself to conduct it. (2) It may associate with it an already established competent organization of engineer-constructors as a department within the road. (3) Or it may employ engineers to make determinations, designs and specifications, and with their assistance let segregated contracts for the work.

No one method may be so good as to be perfect, but it is my belief, as well as my practice, that the second method covers at the present time more desirable features and fewer limitations than any other.

A road cannot quickly and safely create such a department containing needful knowledge and experience, nor is a large department for this purpose, at first, financially warranted.

Such an undertaking requires the correlated work of an organization of engineer-constructors of widely different talent, trained in working co-operatively to a given end. This, too, gives the existing departments of any road time to become practically familiar with such work and shape themselves to later conduct it.

The general contracting process need not be mentioned here, as it is not well adapted to this class of work.

I therefore would summarize my views of the best mode of the conduction of electrification work in the statement that it is for each road to undertake its own work at first hands through the best facilities it can command, which if sufficiently developed within its own organization needs no outside assistance, but when not so developed and, especially in the first instance, it should be through the employment of a thoroughly organized and competent department which for the time being it makes its own.

The Boston Elevated Railway Company, which operates an extensive system of elevated, surface and subway lines in Boston, Mass., has applied to the Boston municipal government and to the selectmen of the suburb of Brookline for permission to carry baggage, express and freight matter over its lines, as a common carrier, under the railroad laws of 1906.

REPORT OF A BOARD OF ENGINEERS ON NEW YORK CENTRAL LOCOMOTIVES AS RELATING TO THE WOODLAWN WRECK.

Since the derailment of an electric train on the New York Central, near Woodlawn, on February 16, an investigation of the forces to which track is subjected by the operation over it of the electric locomotives used by the New York Central and of steam locomotives of the Atlantic type, has been made by a board of experts. The board consisted of representatives of the New York Central, the General Elec-



New York Central Woodlawn Wreck—Electric Locomotive

tric Company and the American Locomotive Company and of Professors Swain and Allen of the Massachusetts Institute of Technology.

The result of the investigation is given as follows:

Comparison Between Steam and Electric Locomotives on a 3-Degree Curve with 4½ Inches Superelevation.

The statement has been published "that there is no science of curve mechanics." While this in a general way is a correct statement, it is nevertheless true that the subject has been quite fully discussed by Wellington in his "Economic Theory of Railway Location" (pages 281 to 313) and the essential elements of the problem and methods of calculating indicated. Experimental determination of values for the various constants entering into the problem is a

(2) Component of slipping in the direction of the tangent of track, due to unequal rail lengths inside and outside.

(3) Net effect of centrifugal force (superelevation of outer rail considered).

The locomotive must be revolved against these forces (1 and 2), and such a pressure applied as will cause the locomotive to follow the curve. The point about which the locomotive revolves with respect to itself as affecting the wheel slippage may be determined mathematically for all practical purposes and the stresses resulting from these two effects can be easily determined by calculation. In determining these, due consideration should be given to the action of the rigid wheel base on the curve in question, taking into account the clearance in the gauge and the clearance between the main drivers and the rigid frame.

It will be appreciated that the radial slip on the front outside driver when rounding the curve is self-contained and of itself does not tend to displace the rail, and that the radial slip on the inside front driver does tend to displace the outer rail acting through the front axle to the flange of outer front driver.

If the clearance between the driving wheel hubs and the locomotive frame is more than the ordinate of the curve at the second axle, the second axle will run to the outer rail until the flange of outer second driver bears against the rail and thus the frame of the locomotive does not have to carry the radial slippage of the second set of wheels.

The centrifugal effect (3) and superelevation of the outer rail are readily calculated and need no explanation.

Thus, with the major elements taken into consideration, it is entirely possible to practically calculate all of the guiding effect necessary.

To solve the problem to the last refinement becomes a complicated and tedious investigation. The slight variation under actual conditions of operation, condition of track, stiffness of parts, etc., introduces constantly changing stresses which would make a solution to the last refinement on any one given condition, of no practical value. With due consideration to the fundamental and major elements, the problem can easily be solved and the guiding effect determined sufficient for all practical purposes.

Considering (a) the condition where the second driving axle bears against the locomotive frame and so transmits the radial thrust of the second axle to the outer front driver, a comparison of the New York Central electric locomotive



New York Central Woodlawn Wreck—Steam Locomotive, Atlantic Type.

very difficult matter and is the reason for the non-existence of a science of curve mechanics.

A partial analysis of the guiding effect provided on steam locomotives shows that the fundamental elements have been considered and the guiding effect determined therefrom are borne out in practice.

The guiding effect provided for electric locomotives of the New York Central is not only theoretically in accord with what is required, but has the same structure and relation of parts as already provided on steam locomotives and operating successfully.

There might be mentioned three fundamentals of "mechanics of curve resistance":

(1) Component of slipping in the direction of the radius, due to curvature.

with the Atlantic type steam locomotive on a 3-degree curve with a 4½-inch superelevation shows that the pressure of the steam locomotive driver against the rail is greater at all corresponding speeds. The resultant shear on the spikes, however, allowing for the friction of the rail on the tie plate, is less with the steam locomotive than with the electric.

The difference between the pressure against the rail and the shear on the spikes is affected so far as the drivers are concerned by the height of the center of gravity under the influence of centrifugal force increasing the vertical pressure on the outer rail. The greater effect of the higher center of gravity of the steam locomotive disappears, however, at the higher speeds by reason of the increasing preponderance of the horizontal force due to centrifugal action. At about 90 miles per hour the shear on the spikes for the steam loco-

would be approximately the same as that of the electric locomotive, but at this speed the steam locomotive would be in danger of overturning.

The maximum shear on the spikes is not necessarily caused, however, by the driving wheel of the locomotives, but at certain speeds may exist at the leading wheel of the guiding truck. Although the pressure of the guiding truck wheel against the rail may be actually less than that of the driver, the weight upon the rail of the guiding wheel is so much less that the resultant shear on the spikes is consequently greater. On the electric locomotive the shear on the spikes, due to the guiding truck, is in excess of that due to the drivers up to about 40 miles per hour. On the steam

of 19 per cent; but, on the other hand, if the comparison is made on the basis of the two forward drivers, bearing against the outer rail of the electric locomotive, the unbalanced pressure is 2,780 pounds, as compared with 4,890 pounds on the steam locomotive, a difference in favor of the electric locomotive of 43 per cent.

The ultimate shearing resistance of the standard spikes used on the curve in question ranges from 14,440 pounds to 17,060 pounds. Assuming a factor of safety of 4, the permissible shear per spike is 3,810 pounds to 4,265 pounds.

The 100-pound rail in use on the curve acts as a continuous girder distributing the stresses over several spikes, but to be conservative, two spikes may be taken as resist-

Table of Comparative Shear on Spikes at Leading Truck Wheel and at Driver Wheels for Electric Locomotives and New York Central Atlantic Type Steam Locomotives on 3-degree Curve, Superelevation 4 1/2 Inches.

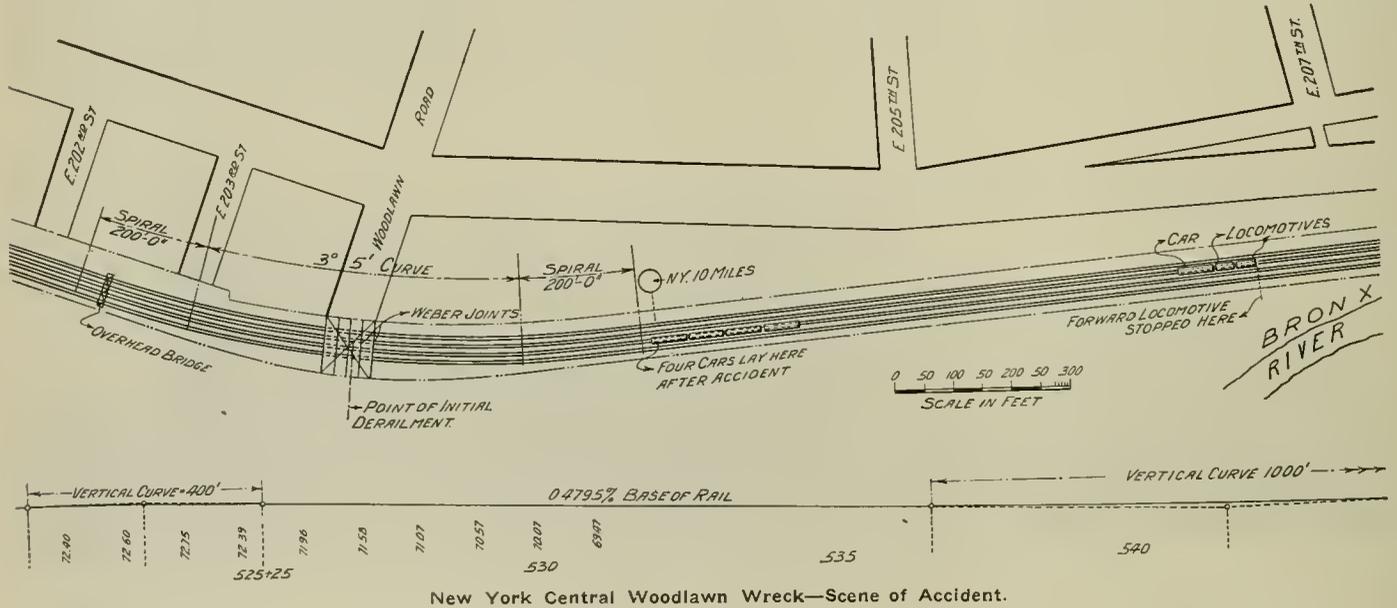
Miles Per Hour.	Rail Thrust Leading Truck Wheel.	Friction Between Rail And Tieplate Leading Truck Wheel.	Shear on Spikes by Leading Truck Wheel.	Rail Thrust, Leading Driver, Second Driver Not Against Rail.	Rail Thrust, Leading Driver, Second Driver Against Rail.	Friction Between Rail and Spikes by Leading Driver, Second Driver.	Shear on Spikes by Leading Driver, Second Driver Not Against Rail.	Shear on Spikes by Leading Driver, Second Driver Against Rail.
Electric Locomotive.								
40	6,410	4,000	2,410	4,740	3,860	4,180	560	.....
50	6,600	4,030	2,570	7,400	4,120	4,360	3,040	.....
60	6,830	4,050	2,780	10,470	4,480	4,650	5,820	.....
70	7,100	4,080	3,020	14,130	7,460	5,000	9,130	2,460
80	7,400	4,100	3,300	18,360	11,000	5,360	13,000	5,640
Steam Locomotive (Atlantic).								
40	7,830	3,200	4,630	6,120	6,260	6,280	.....	.....
50	7,950	3,210	4,740	7,450	6,220	6,720	730	.....
60	8,130	3,240	4,890	11,230	5,460	8,170	3,060	.....
70	8,170	3,330	4,840	15,390	7,570	9,420	5,970	.....
80	8,200	3,430	4,770	21,160	13,020	11,250	9,910	1,820

locomotive the shear on the spikes due to the guiding truck is in excess of that due to the drivers up to about 65 miles per hour, and this shear exceeds that of either the driving or truck wheel of the electric locomotive up to about 57 miles per hour.

Considering (b) the condition where the second driving axle clears the locomotive frame by reason of the end play and so bears directly against the outer rail without transmitting to the leading driver the thrust due to its radial slip, the pressure against the rail of the leading steam locomotive driver as in the condition (a) is greater at all corresponding speeds. The resultant shear on the spikes is less,

ing the unbalanced outward thrust. Consequently at 60 miles per hour we have actual maximum shears with either steam or electric locomotives ranging from 4,440 pounds to 4,890 pounds borne by two spikes, which with a factor of safety of 4, are proper for shears of 7,620 pounds to 8,530 pounds. In other words, the actual factor of safety is approximately 7.

In conclusion, it appears that on the basis of the forward driver only bearing against the outer rail, the electric locomotive imposes slightly greater unbalanced stresses than the steam locomotive, whereas, on the basis of the two forward drivers bearing against the outer rail, the steam locomotive imposes considerably greater unbalanced stresses. There-



New York Central Woodlawn Wreck—Scene of Accident.

however, with the steam locomotive due to the effect of its higher center of gravity.

Under this condition (b) with the electric locomotive the shear on the spikes due to the guiding truck is in excess of that due to the drivers up to about 75 miles per hour. On the steam locomotive the shear on the spikes due to the guiding truck is in excess of that due to the drivers at all speeds and this shear exceeds that of either the driving or truck wheels of the electric locomotive up to 75 miles per hour.

Regarding the stress on the outer spikes of the outside rail, it will be seen from the accompanying tables that for a speed of, say 60 miles per hour on a 3-degree curve with a superelevation of 4 1/2 inches, the maximum shear on the spikes with the forward driver only bearing against the outer rail is 5,820 pounds for the electric locomotive, as compared with 4,890 pounds for the steam locomotive, or a difference

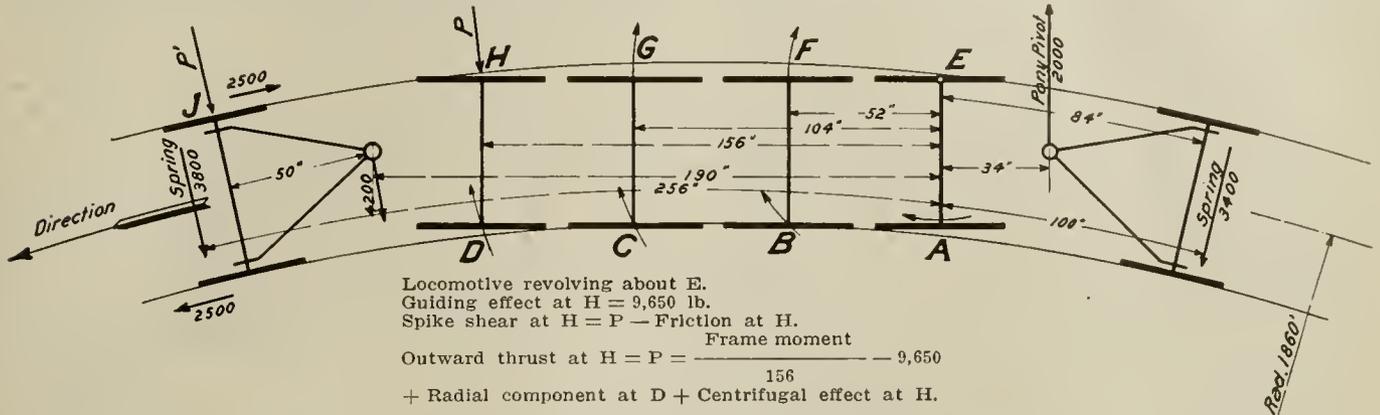
fore, the shearing force on spikes, one on the outside of the outer rail in each tie, with tieplates, on 3-degree curves, properly maintained, with a superelevation of 4 1/2 inches, is far within the limits of safety for speeds in excess of the so-called "equilibrium speed" of about 46 1/2 miles per hour to which the superelevation of 4 1/2 inches corresponds.

Assuming 25 per cent coefficient of friction between wheels and rails and between rail and tie plate, on a 3-degree curve with 4 1/2 inches superelevation, the maximum pressure of truck or driving wheel of electric or steam (Atlantic type), second drivers not bearing against the outer rail, is as follows:

Miles Per Hour.	Against Rail, Pounds.	Resultant Against Spikes, Pounds.
40	Steam truck..... 7,830	Steam truck..... 4,630
50	Steam truck..... 7,950	Steam truck..... 4,740
60	Steam driver..... 11,230	Steam truck..... 5,820
70	Steam driver..... 15,390	Electric driver..... 9,130
80	Steam driver..... 21,160	Electric driver..... 13,000

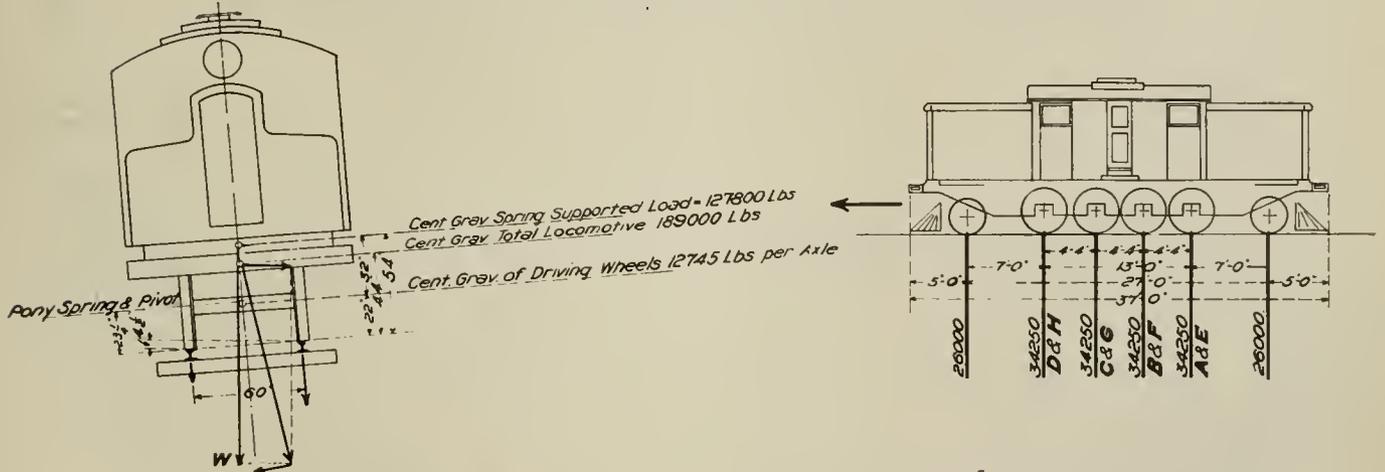
On a 3-degree curve with the clearances provided in the design, the outward thrust of the second driving axle would be carried by the flange of its outer wheel. Therefore the following values are based on maximum pressure of truck

In compliance with your request of February 28, I have made a careful examination regarding the circumstances of the train accident at a curve on track No. 3 near Woodlawn bridge. I have visited the curve and inspected the



Speed M.P.H.	Centrif. Effect at H	Friction Resistance Rigid Wheel Base								Rad. Component at B	Axle CG not thrusting against rail		P'	Spike shear at J
		A	B	C	D	F	G	H	P		P			
40	-1590	3600	5150	4620	4380	3440	3920	4180	4080	4740	560	3860	6410	2410
50	1320	3450	4980	4300	4200	3560	4280	4360	3930	7400	3040	4120	6600	2570
60	4880	3300	4800	3980	3900	3740	4560	4650	3640	10470	5820	4480	6830	2780
70	9050	3130	4620	3720	3580	3940	4830	5000	3350	14130	9130	7460	7100	3020
80	13790	2900	4400	3430	3200	4150	5100	5360	2970	18880	13020	11000	5640	3300

New York Central Woodlawn Wreck—Data for Electric Locomotive.



Weight of Pony Truck = 5100 Lbs.
Driving Axle play in frame $\frac{3}{8}$ "
Cent Grav Pony Truck 244"

Speed M.P.H.	Weights on Rigid Wheel Base							
	A	B	C	D	F	G	H	
40	14325	20570	18500	17500	13725	15745	16750	
50	13775	19975	17100	16800	14275	17140	17450	
60	13125	19300	15945	15645	14945	18300	18605	
70	12425	18500	14900	14300	15745	19355	19950	
80	11425	17600	13770	12770	16650	20470	21480	

New York Central Woodlawn Wreck— Data for Electric Locomotive.

or driving wheel of electric or steam (Atlantic type), second drivers bearing against outer rail, are computed:

Miles Per Hour.	Against Rail, Pounds.	Resultant Against Spikes, Pounds.
40	Steam truck..... 7,830	Steam truck..... 4,630
50	Steam truck..... 7,950	Steam truck..... 4,740
60	Steam truck..... 8,130	Steam truck..... 4,890
70	Steam truck..... 8,170	Steam truck..... 4,840
80	Steam driver..... 13,020	Electric driver..... 5,640

Except in four instances, the electric locomotive shows less maximum unbalanced pressure than the steam locomotive.

Opinion of Professor Merriman.

In a letter dated March 4, 1907, to G. W. Kittredge, chief engineer of the New York Central, Prof. Mansfield Merriman says:

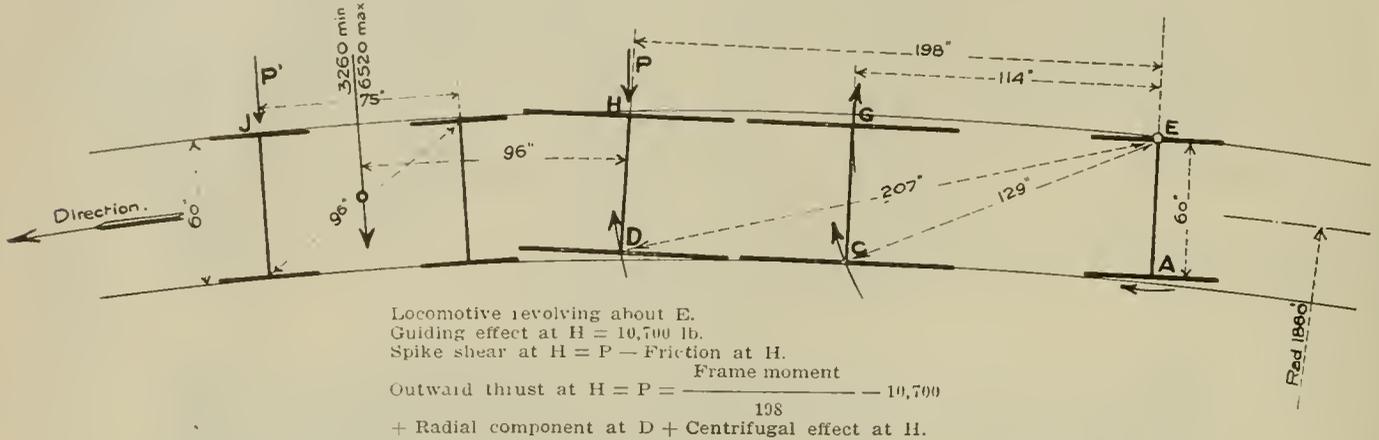
four tracks, noting the behavior of the rails and cross-ties under the passage of both steam and electric locomotives. I have examined the three computations made by Mr. Anderson, Mr. Carpenter and Professor Swain regarding the pressures exerted by the wheels of the electric locomotive against the outer rail of the track, and have also made computations of my own.

All these computations agree in regard to the total centrifugal force exerted by the locomotive and in regard to the diminution of this due to the superelevation of the outer rail, but they differ materially in the results obtained for the pressure which causes the skewing of the locomotive wheel base. This is due to different assumptions made by the computers as to the position of the center of rotation of this wheel base, as to the influence of the movable front axle, and as to the values of the coefficients of friction.

The problem of the forces required to skew a rigid locomotive wheel base around a curve is one of great complexity. I have seen in print only one discussion of it, namely, that given in Wellington's "Economic Theory of Railway Location," but this discussion states general principles only without formulas or numerical computations. In my opinion, a

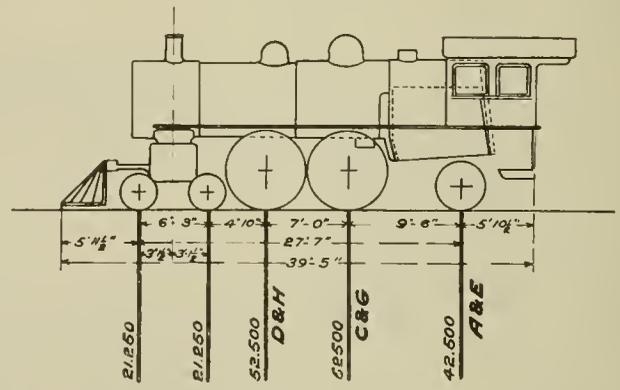
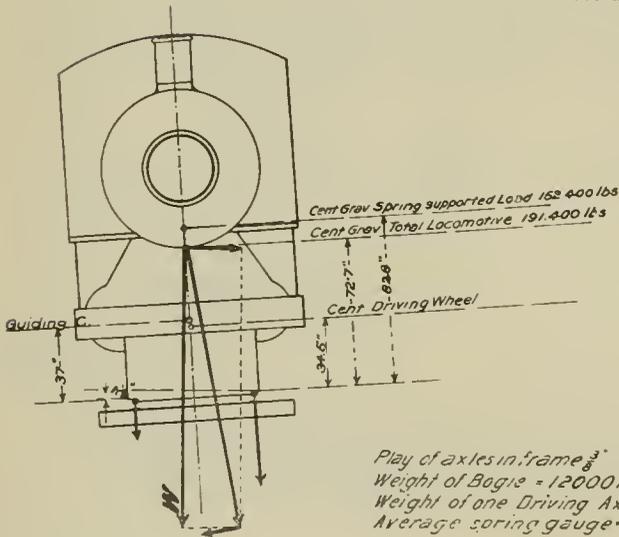
the pressure as distributed over two spikes, the factor of safety is 3.4, which is satisfactory. These computations hence indicate that the accident must have been due to some other cause than the radial pressure developed under the normal action of the locomotive.

In justification of the assumption that the pressure was



Speed M.P.H.	Cent. Eff. at H	Friction Resistance Rigid Wheel Base					Rad. Comp. at D	Axle G-C not thrusting against rail		Axle C-E thrusting against rail		P'	Spike Shear at J
		A	C	D	G	H		P	Spike Shear at H	P	Spike Shear at H		
40	-380	5530	6770	6770	6280	6280	6280	6120	—	6260	—	7830	4630
50	1970	5130	6340	6340	6720	6720	6080	7450	730	6220	—	7950	4740
60	7450	4650	5810	4890	7250	8170	4680	11230	3060	5460	—	8130	4690
70	13090	4150	5260	3640	7800	9420	3500	15390	5970	7570	—	8170	4840
80	21050	3410	4480	1810	8580	11250	1730	21160	9910	13020	1820	8200	4770

New York Central Woodlawn Wreck—Data for Steam Locomotive.



New York Central Woodlawn Wreck—Data for Steam Locomotive, Atlantic Type.

Speed in M.P.H.	Weights on Rigid Wheel Base.				
	A	C	D	G	H
40	22120	27085	27085	25165	25165
50	20540	25365	25365	26885	26885
60	18590	23245	19545	29005	32705
70	16590	21055	14555	31195	37695
80	13640	17945	7245	34305	45005

definite solution of this problem, on which all experts can agree, cannot be possible until experiments and measurements have been made to determine the facts which now must be roughly assumed.

The computations which I have made or examined indicate that the front outer driving wheel of the electric locomotive may have exerted a pressure against the outer rail on the 3-degree 5-minute curve of from 5,000 to 10,000 pounds at a speed of 60 miles per hour. Taking the highest figure, using 17,000 pounds for the ultimate shearing strength of a spike, as determined by Professor Lovell, and considering

distributed over two spikes, I note that all bridge specifications consider the weight of a wheel to be distributed over three ties, indicating that experience has shown this to be true. Also when tie plates are not used, track specifications require rail braces to be placed against the outer rail of a 3-degree curve on every third or fourth tie, indicating that experience has proved that the radial pressure under a wheel is distributed over at least three ties.

As a professor of civil engineering for twenty-eight years, it has been my duty to instruct students in the principles of railroad construction and maintenance. I have always presented to them the theory of centrifugal force on a curve and of the superelevation of the outer rail, but have never given a discussion of the resistance of the spikes against shearing. I have never seen in print a discussion of the resistance of spikes on the outer rail of a curve and have never heard that such computations have been made by engineers of maintenance of way. Practice in this matter appears to have been the result of experience alone. I do not consider myself negligent in having omitted to present this topic to my classes and I do not think that omission to make

such computations should subject any railroad official to the charge of negligence.

Precautions Taken Before Operating Electrically.

The management of the New York Central took extraordinary care to secure the best results in the design, construction and operation of its electrical equipment, and at this time it is proper to call attention to recite some of the precautions:

The vice-president in charge of electrification associates with himself the best talent obtainable in the country, also the contract for the construction of the locomotives was entrusted to one of the most reputable electric manufacturing companies in the United States with the requirement that associated therewith should be one of the most reputable locomotive manufacturers, so as to secure a combination of the talent of both concerns.

Following the thorough discussion, investigation and decision as to design, the actual construction of the locomotives was limited to one machine, so that after thorough test any needed improvements that were discovered might be incorporated in the remainder of the total order of thirty-five locomotives.

The first completed locomotive was tested on a six-mile experimental track for over two years, covering over fifty thousand miles of actual service, under the constant inspection of the vice-president in charge of electrification and his associates; also of both manufacturing companies and of inspectors appointed by the operating department that was to use the locomotives, as well as by the construction department.

Correction is needed of a wrongful impression given by the public press that the testimony given regarding the shifting of the track in the ballast on one of the curves in the experimental track at Schenectady during high speeds, was an indication of something wrong about the electric locomotive. Exactly the contrary deduction should be drawn. The electric locomotive was purposely driven at speeds of 75 miles per hour around a curve that was elevated for but 60 miles per hour, so as to accentuate any tendency that might exist with the locomotive to spread the gauge. This very high speed caused a centrifugal force sufficient to move the ties in the gravel ballast, but there was absolutely no widening of the gauge under such extreme conditions, thus demonstrating that even with such excessive speeds around insufficiently elevated curves, producing a centrifugal force sufficiently great to shift the track in the ballast and distort the curvature, would still not cause a widening of the gauge on this inferior track. In other words, this test demonstrated that the method of spiking curves in ordinary practice was sufficient to meet even abnormal conditions.

The maximum speeds in miles per hour of these electric locomotives, running light in still air, with 600 volts on straight level track, for different positions of the controller are as follows:

	One Locomotive.	Two Locomotives.
Controller in full series notch.....	28	30
Controller in full series parallel notch.....	50	52
Controller in full parallel notch.....	86	90

HANDLING BAGGAGE IN CONNECTION WITH STEAM ROADS.

The Birmingham Light & Power Company and the city transfer company of Birmingham, Ala., are parties to a system of suburban baggage transfer that is, because of its successful operation, of unusual interest. These two companies have entered into an agreement whereby parcels of baggage received by the transfer company at the depot are given the street railway company for suburban delivery.

All railroad traffic of the country surrounding Birmingham centers at the union station. Passengers whose real destinations are in one of the populous suburban towns invariably purchase tickets from distant points to Birmingham and depend upon the electric cars to carry them to the point they desire to reach. As is customary in cities an agent of the transfer company meets all incoming trains and takes charge of baggage that passengers desire to have delivered either in the city or in the suburbs. If it is for suburban delivery the baggage is taken to the station of the street railway company, loaded into a freight car and afterwards carried to its destination and delivered by the street railway employes. In a similar manner baggage checked from any

point on the electric lines is delivered to the transfer company at Birmingham and thence to the baggage room at the depot. A charge of 50 cents is made for each piece of baggage transferred. One-half of this amount goes to the street railway company for its share of the work.

So thoroughly has the system been developed that during the year it has been in operation only one piece of baggage has been lost. Inasmuch as no provision is made on the electric cars for carrying baggage the system is claimed to be as satisfactory to patrons, so far as the service is concerned, as though baggage interchange arrangements existed between the steam and electric railways.

The checks given as receipts for baggage do not vary in form from those used by transfer companies in other cities. The method of issuing the checks when baggage is received and taking them up when the delivery is made is the same as that in vogue on steam railroads. In addition to the check, however, the electric railway company has a baggage waybill and receipt which latter it is necessary for the recipient of baggage to sign before the delivery is made. This latter provision is merely a safeguard that the company has found advisable to adopt.

SPECIAL SIGNALS AT CAR HOUSES.

On high-speed interurban roads and even in the suburban divisions of city systems it is often necessary to inform motormen of changes in operating conditions beyond certain points in the line which might otherwise be passed at too high a speed. Unless some kind of special signal is in service, the delay incurred in stopping for orders may lengthen the schedule unduly, or in the absence of accurate information as to the track ahead a car may be run too rapidly for safety. If the schedule does not require motormen to stop regularly at all car houses it is highly important that some simple means be installed to signal approaching cars or trains that something unusual is afoot.

This can readily be accomplished by the use of incandescent lamps mounted in waterproof boxes over the track to be governed, colored glass being set in the front of the box to give the indication desired. By connecting four lamps in series in the box, grounding the last lamp terminal, running the other side of the line to the car house office and connecting it with the trolley through a fifth lamp and single-pole switch, a simple and reliable hand signal is made available. The fifth lamp should either be labeled with a pilot designation or glassed with the proper color to avoid mistakes in setting the signals. Several of these lamps and switches mounted on a common slate panel close by the window and private telephone enable the approaching cars to be controlled with ease from the office.

In a recent installation of this kind the car house and shops were located near the bottom of a steep hill and to avoid the danger of a collision between an approaching car and any other car which might be standing at the time on the main line in front of the car house, a yellow caution signal of four lamps was installed at the top of the grade, the fifth lamp and switch being in the office. To bring any approaching car to a full stop outside the shops a couple of lamp signals were mounted over each track, the red indications being controlled in the above-mentioned way from the office panel board. On this particular road cars do not stop at the shops without special signal. Although the line is double-tracked, there are places upon it which are too narrow to allow the simultaneous passage of cars and the largest snow plows used on the road, so it has to be operated as a single-track line in certain places at times. One of these sections of too limited clearance begins near the shops, and to warn motormen of the presence of plows a four-lamp blue signal is installed, the control being in the office alongside the other switches. The reduction of one stop helps the schedule, saves the power cost of accelerating from a standstill and the wear and tear of braking. The lamps do not consume current except while signals are needed, and as someone is on duty all the time at the shops, their operation is a matter of no trouble whatever.

EXTENSION OF A PIONEER SINGLE-PHASE LINE IN CALIFORNIA.

The very satisfactory traffic, both freight and passenger, which the Vallejo Benicia & Napa Valley Railroad Company has enjoyed since it began operating some two years ago has warranted the construction of an extension of the line which will more than double the territory served. The San Francisco Vallejo & Napa Valley Railway Company has recently been organized to build the extension, the grading for which is now practically completed. When the new track is in operation the company will be able to offer excellent service from San Francisco by steamer to Vallejo, thence by the present single-phase electric line to Napa, 17 miles, and by the new extension, 18 miles, to St. Helena.

Track and Roadway.

This extension from Napa to St. Helena will serve an especially fertile and well-populated valley, the terminus, St. Helena, being a well-known health resort with a permanent population of 2,500 people. The roadbed as now graded is practically tangent for the entire distance. The company has a private right of way and the maximum grade is one of but 1.28 per cent for a distance of 1,000 feet. In the entire 18 miles the rise is only 245 feet. The track is of standard construction, with 60-pound rails, and rock ballast. Continuous joints are used, bonded with 10-inch "Protected" rail bonds with 7/8-inch terminals.

Japanese Oak Ties.

It is interesting to note that the ties for the extension were purchased in Japan. They are Japanese oak with 9-inch bearing faces, 6 inches thick and 8 feet long. It is said to be practically impossible to purchase for quick delivery oak ties at any reasonable price. For this reason redwood is generally used. It was found possible to purchase the Japanese ties which are cut from firm oak at a price even less than that paid for local redwood.

Electrical Construction.

The overhead construction for the new line will be similar to the present Westinghouse practice, comprising a No. 000 grooved trolley wire, supported by a catenary messenger hung from large porcelain insulators, these, in turn, being hung from angle-iron bracket arms. The insulation is sufficient for operating at 6,600 volts, but at present a voltage of 3,300 is used. Current is collected by the standard Westinghouse pantagraph trolley with flat sliding contacts. The results obtained with this sliding contact trolley are said to be very satisfactory; the wearing part, or contact plate, is found to give service for about 30,000 miles. No delays are caused by the trolley jumping the wire, neither is there any attention necessary from the conductor.

It is thought that the present current-transforming apparatus as installed at Napa will be sufficient to supply the new extension. This installation includes two Westinghouse motor-generator sets, each of 400-kilowatts capacity. Current is supplied from the high-tension transmission lines of the Bay Counties Electric Company, is stepped down to a suitable voltage for operating the three-phase motors of the motor-generator sets and these regenerate the power as single-phase current, which is, in turn, stepped down by transformers along the line and fed to the trolley wire at 3,300 volts pressure.

New Cars.

With the completion of the extension there will be put into service eight new cars of the Pullman type, which are now being built by the Niles Car Company. Two of the new cars will be of the combination type with baggage and smoking compartments. Each car will be 56 feet long overall and 9 feet wide over sheathing. The vestibules will have swinging doors to form motormen's side-cabs when desired. The interior finish of the car bodies will be mahogany with

an Empire-type ceiling and lamps concealed by inverted holo-plane bowls. The seating capacity of each car will be sufficient for 64 passengers.

The car bodies will be mounted on Baldwin M. C. B. trucks with steel-tired wheels. All the electrical equipment will be supplied by the Westinghouse Electric & Manufacturing Company. Each car will have a quadruple equipment of No. 132A motors (100 horsepower), an oil-cooled auto-transformer, and control apparatus for double-end single-car operation or for multiple-unit operation. To facilitate train operation Gould automatic couplers and Westinghouse A. M. M. air brake equipments with graduated release and quick recharge will be used.

SAFETY OF ELECTRIC LOCOMOTIVES.

At a meeting of the New York Railroad Club on March 15, 1907, Frank J. Sprague in discussing the recent Wood-lawn wreck on the New York Central & Hudson River road, spoke in part as follows:

There was enough power concentrated at the head of this ill-fated train to account for almost anything if not intelligently handled, and yet the same wreck might have occurred whatever the power used. Of course the "deadly third rail," or the use of the direct instead of the alternating current, had nothing whatever to do with this disaster. There were no electrocutions, and what fire there was, whatever the cause, occurred directly over the broken connection of a pinch gas tank and was quickly put out. There is not the remotest evidence that the third rail caused even this slight fire, but there is plenty of evidence that this particular third rail was instantly automatically cut out of service, and that it was impossible to restore it until the wreck was cleared.

Now a word as to this particular electric locomotive, and what is uppermost in every man's mind, because of this accident. As to the machine itself, I feel, and believe that its designers and builders can feel pride in its construction and general performance. Neither its low center of gravity, nor its rigid wheel base, both so gravely referred to in "scientific" articles, were the causes of the accident. Under the existing circumstances perhaps I can only refer to this unhappy affair negatively rather than affirmatively for the various investigations which are under way, and the relations of railroad officials and engineers to the matter forbid my expressing affirmative opinions. But there are some things I think I know, and so far as they affect the design of these locomotives, my practical comment is that I take every opportunity to ride in them, and I doubt if there is an engineer on the road who has been employed in driving them who would not prefer a berth in their cabs than in that of any steam locomotive on the New York Central.

A paper was also presented by W. J. Wilgus, vice-president of the New York Central & Hudson River, in which he said:

Recently very elaborate calculations have been made by the engineers of the two manufacturing companies and of the railroad, and also by Professor Swain of the Massachusetts Institute of Technology, demonstrating the correctness of the conclusions reached as a result of the practical tests above described, as to lack of any undue effect upon the track, and also as regards favorable comparison with steam locomotives. These calculations have of course taken into account the height of center of gravity, as well as all of the other elements that have to be considered in connection therewith.

As to the reflections on the installation regarding the use of the third-rail direct-current system, I cannot too emphatically state the untruthfulness of the articles that have appeared to the effect that the third rail had something to do with the cause of the wreck and injuries to passengers. As a matter of fact, the third rail worked perfectly as to the automatic cutting off of the current by the circuit-breakers and the insulation of the rail from contact with equipment and passengers. All of the evidence before the coroner and board of railroad commissioners shows conclusively that the third-rail system in no manner had anything to do with the accident or the results that followed it.

In ending I would like to state that during the searching investigations of the railroad company and also by the coroner's jury and the board of railroad commissioners, nothing has yet developed that shows that the electric installation was in any way, shape or manner responsible for this great disaster.

EXPERIMENTS WITH CONCRETE TIES.

At the annual meeting of the American Railway Engineering and Maintenance of Way Association at Chicago, on March 19, 20 and 21, the committee on ties presented a report which contained some information on concrete ties. As the American Street & Interurban Railway Engineering Association has issued a circular on concrete railway ties, which was published in last week's issue of the Electric Railway Review, an abstract of that portion of the report of the tie committee of the American Railway Engineering and Maintenance of Way Association which refers to concrete ties is published herewith.

The committee calls attention to three elements very necessary to remember in the consideration of designs to replace wood ties:

(1) An efficient method of fastening the rail to the tie. This is a problem present with the wood tie also, if the life of the tie be considered.

(2) The requirement of a considerable measure of elasticity in any tie. There is always a tendency of the ballast to become unstable and the track to become center bound, and the wooden tie has met the condition, because it is elastic. Neither the steel nor concrete tie offers the same elasticity, and either will require greater care in track surfacing and maintenance.

(3) No metal tie has yet been designed that offers a satisfactory method of insulation, and this, of course, is a serious objection in view of the rapid increase in installation of block signals. It will be found necessary, doubtless, to use fiber as an insulating material, and that wears so rapidly that it will be a source of considerable trouble and expense to attempt to maintain insulating pieces on each tie. Concrete is almost an insulating material and it will probably be practicable to design a concrete tie that will overcome this difficulty. On the other hand, the construction of such a tie will require a great deal of care to prevent contact through the metal reinforcement.

Reinforced Concrete Ties.

The committee presents a report made to J. W. Kendrick, second vice-president of the Atchison Topeka & Santa Fe Railway System, on "Reinforced Concrete Ties," by E. O. Faulkner, in November, 1904:

HARRELL TIE.

This was perhaps the first type of reinforced concrete ties used in America. Thirty were inserted in the Pennsylvania Company's track in 1899, near the Union Station, Chicago, the concrete being molded around a truss of 1-inch rods put together like a trussed brake beam. From first to last they were in service about 17 months, the last tie being taken out in the fall of 1900. Shortly after they were first laid, single ones had to be removed, and this continued at intervals until all were taken out. Some broke in the middle, others gave way at the fastenings or under the track rails, so that toward the end, oak ties had to be sandwiched between them to help out. Later on Mr. Harrell made a number under what he claims to be a better pattern so far as track fastenings, etc., are concerned, and 10 were placed in a switch track of the Western Foundry & Steel Company at Hegewisch, Ill., in August, 1901. Three have since been removed on account of a car derailment breaking them; the rest are still in service in good condition, but being in an industry sidetrack, there is no strain or service test, and under these conditions they should last for many years.

KIMBALL TIE.

This consists of two concrete bearing blocks shaped like a pole tie, each 3 feet long, 9 inches wide, and 7 inches thick, joined by two 3-inch channels, 2 inches apart, placed back to back and molded in the concrete, the bearing of the rail being taken by a cushion block of white oak, 3 inches thick, 9 inches wide, and 18 inches long, secured to the concrete base by bolts, the track rail being spiked to these blocks in the usual way and elm plugs set in the concrete to take care of the additional length of spikes.

Two were inserted in the Pere Marquette tracks at Saginaw in 1900, the blocks being held together by a piece of scrap rail; later, one was taken out and sent to the Roadmasters' convention in Milwaukee in the fall of 1901. It was put in the track in one of the local yards, and has since been lost sight of. The one still in service at Saginaw I found in good condition, excepting that one of the cushion blocks was badly cracked and would soon need renewing. Before being used

these blocks were treated with Avenarius Carbolinum. There was some rust on the old rail connecting the blocks, but nothing to hurt. Two others were inserted in the Saginaw yards in the fall of 1901, but were afterward taken out, though for what reason I could not learn. Eight more were put in the main track at Saginaw; these I found still in service and in good condition, some of the cushion blocks being somewhat sun checked; on removing the ballast from one or two ties I found very little rust on the connecting bars, the spikes were holding all right, and the ties looked well, but the test is not in sufficient numbers to warrant any practical conclusion. The ballast was gravel, and there were no cracks in any of the concrete blocks. Another tie was laid in the Port Huron yard in 1902, but no one knows where it is, or what has become of it. Two were laid in the Walkerville yard, and two near Pelton, Ont., in September, 1903. I am told a derailment occurred on the yard ties, the wheels passing over the wooden cushion blocks without damage, excepting that some slivers were broken off where the first wheels struck them. Ten were also furnished the Nickel Plate in 1903, eight of which were laid east of Euclid avenue station, Cleveland, and two broken. I did not look up any of those inserted in 1903, as the time is so recent. There were 30 furnished the Grand Rapids electric railway for street car use, also one to the Detroit United Railway, which was put in at Gross Point. In 1902, 3,400 feet of the Pere Marquette track in Jefferson street, Bay City, was laid with these ties without the connecting channel bars, the two blocks being laid in cement up to the level of the top of the rails. This piece of track has been widely advertised, and is in good condition; but where railway tracks are laid in cement and in paved city streets it cannot be considered a test, so far as concrete ties for ordinary use are concerned.

ALFRED TIE.

This is one designed by the then chief engineer of the Pere Marquette. Fourteen were put in near the Kimball ties at Saginaw, Mich., in November, 1902, as an experiment, and all removed early in 1904 on account of breaking between rails, the design being faulty. Nine of a new pattern were inserted in the same place in the summer of 1904; of these one is broken close to the track rail and several others already show signs of rail cutting, there being no cushion or protection between the base of the rail and the top of the tie; one has cut in $\frac{1}{2}$ of an inch in three months; others nearly as much. Ten were laid in September, 1904, at Wixom water tank, where engine fires are cleaned, and wooden ties destroyed by cinders. These 10 are said to be in good condition; it was dark when we passed, so that I could not see them personally; 24 more were laid in a sidetrack opposite Saginaw passenger depot in October, 1904, and immediately after laying them a ditch for a drain pipe was dug parallel to the track, within 6 inches of the ends of the ties. Of 87 alongside the ditch, 56 were cracked or broken, some in two or three places, and of the remaining 127 away from the ditch, one was broken close to the inside rail. The ditch extended for some distance, where there were wooden ties in the same track, but none of these were damaged by reason of its location.

BURBANK TIE.

The reinforcement consists of an iron plate and a twisted bar of iron, bent at each end and welded to tie plates, which rest on wooden blocks and support the track rail. I was told there were 147 in the Hecla Mining Company's track, near Bay City, Mich., and two in the Hecla Belt track at one of the crossings in the outskirts of the city. I could not go personally to the mining track, but sent another man, in order to learn how the ties looked; he has since advised me that he could not find a concrete tie in any mining or belt track owned by the Hecla company, excepting the two spoken of, and these I found myself so badly broken after three months' service of switch trains that there is no question about the design being defective.

HICKEY TIE.

The reinforcement here consists of $7\frac{1}{2}$ feet of scrap track rail imbedded in the concrete; outside of this the other features of the tie have been changed from time to time as defects developed. First, the rail fastenings were improved, then it became apparent that on account of track rail cutting into the concrete, some protection had to be furnished, and a tie plate was tried. This has proven insufficient for the purpose, and Mr. Hickey now says a larger cushion of metal or wood must be placed between the rail base and the tie to prevent rail cutting. He has a number inserted in St. Thomas yard (Ontario), also 10 at Kingsmill, east of St. Thomas, in Michigan Central main track, under heavy service, and 6 at Taylor; in all between 35 and 40 ties, most of them having been in over two years, and one, still in good condition, three years. The greater portion are more or less cracked, and some broken, but Mr. Hickey says he will keep on experimenting, and hopes yet to be successful. He is the general roadmaster of the Michigan Central lines in Canada. No derailment has occurred so far on these ties.

BRUNSON TIE.

The reinforcement here consists of some small strips of iron, surrounded by concrete, wooden plugs being molded in the concrete in which to drive the spikes, the track rail resting directly on the concrete. Nineteen of these were laid in Chicago Junction Railway stockyards tracks in September, 1904, near Forty-first and Halsted streets, Chicago. Two months after service I found cracks between the rails in 14 out of the 19, some being cracked in two places. The rail was also beginning to cut into some of them, especially joint ties. Nothing but slow switch train movement passes over them, and

while this is heavy, it can scarcely be said that the test is sufficient to establish the value of the tie. No derailment has yet occurred on any of them.

SEELEY TIE.

This was a concrete tie without any reinforcement whatever, the only iron used being the bolt going through the concrete for rail fastenings. Ten were placed in the tracks of the Toledo Terminal Railway in August, 1903, and the superintendent informed me that they were all taken out again in less than two weeks on account of their breaking, and falling to pieces. Six or eight were also put in a sidetrack on the Lake Shore & Michigan southern, at Air Line Junction, Toledo. I did not go to see these, as the roadmaster said they were badly broken, and would soon come out, adding further that if they had been in main track they would have been removed long before this.

COLORADO & SOUTHERN RAILWAY TEST.

In the summer of 1901 the officials of the Colorado & Southern Railway had three ties made and put in the yard at Argo, near Denver, the reinforcement in each tie consisting of three steel strips $\frac{1}{2}$ inch thick, 4 inches wide and 8 feet long. These ties were broken beyond further use in the spring of 1902 by an engine truck derailment, there being no protection on the outside of the tie to withstand any such shock.

AFLECK TIE.

The reinforcement here consists of a piece of angle iron imbedded in the concrete, with a slight groove for rail seat, in which a wooden shim can be placed if desired, the rail being fastened to the tie by bolts coming up from the bottom. One was placed in a sidetrack at Dune Park, Ind., on the Lake Shore & Michigan Southern, in September, 1903. It is cracked in several places, but, in view of its location, is still considered safe. In March, 1904, 15 more were put in at Chesterton, Ind., but, as they were not entirely satisfactory to the maker, he took them out and put 15 others in in June, 1904. These are still in service, but are all cracked a little. They are also in sidetracks, as the Lake Shore & Michigan Southern officials do not consider it advisable to place them in the main line. The roadmaster says that so far, and as located, they have given fair satisfaction.

The Pennsylvania Lines West of Pittsburg are also testing this same tie, 87 out of an order for 100 being placed in the main line at Emsworth, Pa., in October, 1904. I examined these with the roadmaster a month later, and found six marked for removal before the close of the month, and another one has a broken end. They are on broken rock ballast in a track where heavy traffic and fast trains are continually running over it, the conditions being evidently too severe for the tie in its present shape.

BUHRER CONCRETE TIE.

The reinforcement of this tie consists of one-fourth part of a 30-foot scrap rail, inverted so that its base acts as a surface for the track rail, the rest of the reinforcement being heavily imbedded in concrete somewhat in the shape of a hewn tie, at the bottom, the rails being fastened to the tie by clips. There are 3,222 of these in service on a number of roads, viz.: Ann Arbor, 77; Lake Shore & Michigan Southern, 2,095; Pennsylvania Lines West of Pittsburg, 350; Lakeside & Marblehead, 550; Lake Erie & Western, 20; Chicago & Northwestern, 15, and Sandusky Water Works Company's tracks, 115. Of these, 40 were inserted in 1902, and so far there are only two failures; 707 were inserted in 1903, of which 19 failures have been reported; and 2,415 were inserted in 1904, of which nearly all the failures are on the Pennsylvania lines. This is the most successful of all concrete ties I have seen, and under favorable conditions it certainly makes a fine looking track. I saw marks of a freight car (said to have been loaded) derailment at Milwaukee, the wheels of one truck having passed over several of these ties without damaging them in the least, and I was told of one or two other instances where derailments had occurred, no damage being done to the ties.

In four out of the six roads the ties were in gravel ballast, and no exception could be taken either as to the appearance of the track or the condition and service of the ties. On the Lakeside & Marblehead there are 550 ties inserted on a 12-degree curve in the yard at Danbury, O., and this piece of track has been widely photographed, as evidence of the success of this type of reinforced ties; it is certainly hard to beat, but every condition is favorable, and the ties have only been in service one winter. On the sixth road (Pennsylvania Lines West) it was reported the experience of concrete ties had so far not been satisfactory, and it was not proposed at present to further extend the experiments in this direction. The Pennsylvania Lines West have the Affleck (before mentioned) and the Buhrer ties. Of the latter, 248 were furnished in December, 1903, for insertion in the main track at Emsworth, Pa., which were all put in by March, 1904. In June, of same year, 100 were replaced, and on November 19 following I saw a carload of new ones standing on the sidetrack to replace broken ones. Including this carload it made 469 received since December, 1903, with 116 good sound ties in track in November, 1904, and a balance of 7 remaining in reserve. Mr. Buhrer explained that in the first lot of ties shipped, the concrete in nearly all of them had frozen before it set, and they should never have been used. I can only account for the failures here by the fact that the rock ballast is so rigid as not to conform or give way to the movement of the ties when trains are passing over them, while the gravel ballast does, as I noticed this very clearly while on the Lake Shore & Michigan Southern. These are the only failures of the Buhrer ties worth mentioning, yet if the strength of a chain is no greater than that of its weakest

link," the failures of these ties in rock ballast and under heavy service must materially limit their value, irrespective of success under more favorable conditions.

CHICAGO BURLINGTON & QUINCY RAILWAY TEST.

The engineering department of the Chicago Burlington & Quincy at Chicago is engaged in a series of tests of reinforced concrete ties, having placed a number in a sidetrack at Hawthorne near Chicago about two months ago. The time is yet too recent to prove anything, but as the officials are proceeding in a careful and practical way, the result should go far to establish the possibility of ultimate success in reinforced concrete ties. I believe, however, they will yet have to make further changes in their design to accomplish this.

ULSTER & DELAWARE TEST.

A number of reinforced concrete ties were placed in the Ulster & Delaware track near Rondout, N. Y., in the summer of 1904, on account of the satisfactory service of one tie made and inserted in May, 1903. Tieplates 8 by 9 inches, $\frac{1}{4}$ inch thick, are set in the concrete and support the track rails, which are fastened by bolts coming up from below the reinforcement; this latter consists of a piece of angle iron set in the concrete, the edge coming within $\frac{1}{4}$ inch of the surface. The first derailment on these ties will severely test them, as there is no support for the corners. They weigh 450 pounds each.

There are two or three makes of concrete ties besides those mentioned, which have been put into service on a few other roads during the past summer, but as the locations were somewhat scattered and the experience too recent to expect any result, I did not visit them.

REINFORCED CONCRETE TIES ABROAD.

If there is one continent more than another where we might expect to find concrete ties it is in Europe, where wood is scarce and costly, but so far as I can learn only three tests have been made abroad up to the present time, and they are as follows:

SARDA TIE.

The reinforcement here consists of five metal plates placed vertically in a mold, held by thin bars or wires, and cement poured in around them. Four were inserted in October, 1900, near Bordeaux, and in the summer of 1902 there were more laid, a slight change being made in construction so that rail fastenings could be replaced without damaging ties. Felt tie plates 0.2 inch thick were placed between tie and rail to reduce the shock, but within a year these had worn so that they could not be found. The greatest rolling weight was 14 tons on a single pair of drivers. The weight of the tie was 308 pounds and the cost in our money \$2.80 each. Some of this make of ties were also inserted in the tramway company's track at Perpignan, France, and also some in the main track of the Northern Railway of Spain, but no reports are obtainable as to results. The chief engineer of the French State Railways says the experiment is too recent for definite conclusion, and that as the usual life of wooden ties is fifteen years, a long time must elapse before conclusions can be reached as to whether cement is superior to wood in its power to resist shock, atmospheric changes, and other conditions, and further that so far as economy in track labor or material is concerned, none will be effected unless the cost of concrete ties can be materially reduced.

The Voiron St. Beron Railway (1-meter gauge) has been experimenting with a reinforced concrete tie consisting of three trusses of steel (18½ pounds), a plug of hardwood being imbedded in the concrete to hold rail fastenings. The weight of the tie (length 5 feet 11 inches) is 232 pounds, and a layer of wood or felt is placed on top of the ties under the rail to lessen vibration. Sixty were inserted in March, 1903, at Revol, and at another place a stretch of track has concrete ties alternating with ordinary wooden ones. This gives no test worth anything, but in April, 1904, all were said to be in perfect condition and the company were laying 250 more.

In Germany, a section of the state railways near Briesen is laid with reinforced concrete ties in main and side tracks, under heavy traffic. The rails are fixed to the tie by an automatic locking device in which the grip between the tie hooks and the rail increases in proportion to the weight of the rolling load, the tie hook releasing its tight grip of the rail as soon as the train or car has passed over it, the claim being made that this action gives an elasticity to the roadbed necessary for economical maintenance of equipment. The ties were laid in September, 1897, and are said to be still in good condition.

In Italy, on the Adriatic Railway, experiments have been under way for some years, so that in 1900 a number of ties were put in service at or near Ancona, and, according to latest reports, were giving good service; this is very general, but is all the information I can get. The tie weighs about 300 pounds and costs \$2.30.

On the French railways in Cochinchina a number of concrete ties are said to be in use, having an inverted T section with an enlargement of the stem upon which the track rests (practically an I-beam), but the number said to be in service is so large that I would not care to quote the statement without better authority, which is not available just now.

The following additional data have been obtained by the committee from other sources:

PERCIVAL TIE.

This is a reinforced tie of concrete and bars of iron, the section of tie being somewhat trapezoidal, except that the difference between faces is greater than in the Buhrer tie.

The fastening of the rail is by a screw spike into babbitt sockets poured in the concrete at the time of manufacture. The rail rests on a block of gum 9 by 15 by $\frac{1}{4}$ inches, which forms a

cushion and relieves the concrete from the severe action of the metal rail of limited section which would readily work into it.

A test of these ties in a road of heavy traffic has shown good results for two months. It is not possible yet to tell what the value of the tie will be.

CHENOWETH TIE.

This tie is a simple bar of concrete of the same size and uniform section as the usual wooden tie, the reinforcing material being a winding woven wire sheet, wound in circular manner. The wire used is No. 16 with a ½-inch mesh.

The rail is supported upon a shim of wood acting as a tie plate, through which bolts are set with threaded top. The bolts are set in a similar manner to stone bolts. The clip is used to fasten the rail in place, in a manner similar to the method used in other types of manufactured ties. The ties have been in only a short time, and no results are yet manifest.

HEARING ON MILWAUKEE ELECTRIC RAILWAY SERVICE IS RESUMED.

The investigation of the Wisconsin railway commission into the service of the Milwaukee Electric Railway & Light Company was resumed in Milwaukee on March 19. An account of the previous hearing was published in the Electric Railway Review of March 2, 1907. John I. Beggs, the president of the company, appeared before the commission and indicated the new lines and extensions which, in his opinion, should be built eventually to accommodate the growing traffic.

Mr. Beggs stated that the service is being improved constantly and that extensions are being made. He announced that the company has acquired nine acres of the shooting park and other property at Thirty-eighth and Vliet streets on the State street line, and that large car shops will be built there so that the company can manufacture its own equipment. These shops will replace the Kinnickinnic shops, which will be abandoned. Mr. Beggs said that the Fond du Lac avenue line would probably be extended to the city limits within a year. When this extension is built a large car house will be erected. Thirteen new cars were added last October to the company's equipment, 15 were added in December and 19 in January. These were the last of 100 cars ordered two years ago. Mr. Beggs said that the service appears to be improved now in comparison with November and December because during the short days of those two months people were inclined to crowd on the first cars, but as the days grow longer people were disposed to wait a few minutes for comfortable places.

The expenditure of money on improvements, Mr. Beggs said, is one of his methods for saving bankrupt properties, and he has "provoked people to ride" by improving the service, so that the traffic in Milwaukee has increased from 9 to 10 per cent per annum as compared with a 4 per cent increase in population.

In referring to the decline in the bonds of the company, Mr. Beggs said: "If the present craze continues it will be very difficult for any public utility corporation to continue its improvements." Mr. Beggs added, however, that he thinks there is no danger of a panic.

Abuse of Transfer Privilege.

The city attorney, John T. Kelly, suggested a double transfer system on the north side and Mr. Beggs replied that a single transfer was had enough. He said that clubmen boasted of petty larceny in detailing how they had made a round trip for one fare. Mr. Beggs, as an instance, showed how a business man might take an Oakland avenue car and get a transfer south on the Farwell avenue line at Brady street and Farwell avenue, eat his lunch, and then return down town on the same transfer. Other transfer points where the same difficulty has been experienced were mentioned by Mr. Beggs, who said that the company has no method of keeping a check on transfers and that thousands of fares are lost every day. Mr. Beggs added that even though empty cars are in sight, people will frequently over-

crowd cars on the chance that their fares will not be collected.

All complaints regarding the service of the company are referred to Mr. Beggs and investigated. Mr. Beggs said that he replies in person to 90 per cent of the complaints. "I try to be the worst crank on our system," he added. He said that conductors are instructed to sweep the cars at the end of runs. Ventilation is a problem, as it is difficult to suit all people.

In comparing air brakes and hand brakes Mr. Beggs said that air brakes are used on the St. Louis roads because the cars are heavier in that city than in Milwaukee; and air brakes are used on the interurban lines near Milwaukee because of the high speed at which the cars are run. He favored the continued use of hand brakes on Milwaukee city cars because he believes the air brakes would get out of order. Mr. Beggs spoke also of the flat wheels caused by the use of air brakes. There were 75 flat wheels on 25 interurban cars in December and 22 on 400 Milwaukee and Racine city cars; in January there were 92 flat wheels on interurban cars as compared with 28 on Milwaukee and Racine cars; and in February 72 flat wheels on interurban cars as compared with 24 on the city cars.

New Form of Transfer.

At the hearing on March 20 Mr. Beggs said that a new form of transfer is being prepared which will have the full date printed upon them. The transfers which are in use now do not bear the name of the month.

A statement was filed by the company showing an increase in the number of cars operated of 73 from February 28, 1906, to February 15, 1907. The total number of cars operated on the latter date was 503.

W. B. Tarkington, the superintendent of transportation, explained the difficulty which the company meets in providing men with sufficient regular work to maintain a force large enough to operate all the cars during the rush periods. On March 15 1,062 men were employed, with 40 in training. Three hundred had been employed by the company since 1901. 400 from 1901 to 1905, inclusive, and 320 since 1906. Five hundred and forty-six were employed in 1906, of which a large number resigned.

On March 21 the city attorney announced that he will introduce testimony on the subject of air brakes from Bion J. Arnold of Chicago at a subsequent hearing. N. A. Christensen testified regarding air brakes. The commission will hear the arguments in the case at Madison, Wis., on April 23.

BUFFET SERVICE OF THE FT. WAYNE & WABASH VALLEY TRACTION COMPANY.

During the past year the Ft. Wayne & Wabash Valley Traction Company has provided a buffet service on its limited cars operating between Ft. Wayne and Indianapolis, Ind. The service has heretofore been conducted under the supervision of the operating officials, but on March 1 of this year the buffet concession was let to Mr. E. J. Longfield, a Ft. Wayne caterer, who has other similar concessions in his home city. Under Mr. Longfield's direction the service will be more elaborate than has heretofore been furnished and a large and varied menu will be provided, on the à la carte plan. No spirituous liquors are to be sold.

The buffet compartment is located between the parlor and smoking compartments of the car and is equipped with shelves and cupboards for the storage of provisions, etc. An alcohol vapor stove is provided for cooking purposes. One attendant who acts as cook and waiter accompanies the car. At present only one buffet car is operated, but it is expected that later in the season another car will be added. Under the present schedule the car leaves Ft. Wayne daily at 9:20 a. m. and returns from Indianapolis at 7:40 p. m. The running time between the two cities is four hours and 20 minutes.

TRAIN DISPATCHING ON THE LIMA & TOLEDO RAILWAY.

The Lima & Toledo Traction Company has recently made many changes in its method of dispatching trains by telephone and in the fixtures provided for the dispatcher's office at Lima, Ohio. The movement of trains on the several divisions of the railway operated by this company are now directed from the office located in the tower of the new office building at the intersection of North Main street and Grand avenue.

The dispatcher's desk which is herewith shown was made under the directions of Mr. J. E. Cochran, electrical engineer of the company. It contains many original features designed to facilitate and simplify the dispatching of trains on the several divisions operated by the company and to provide ample room for the train-sheets and other forms essential in recording the movement of trains.

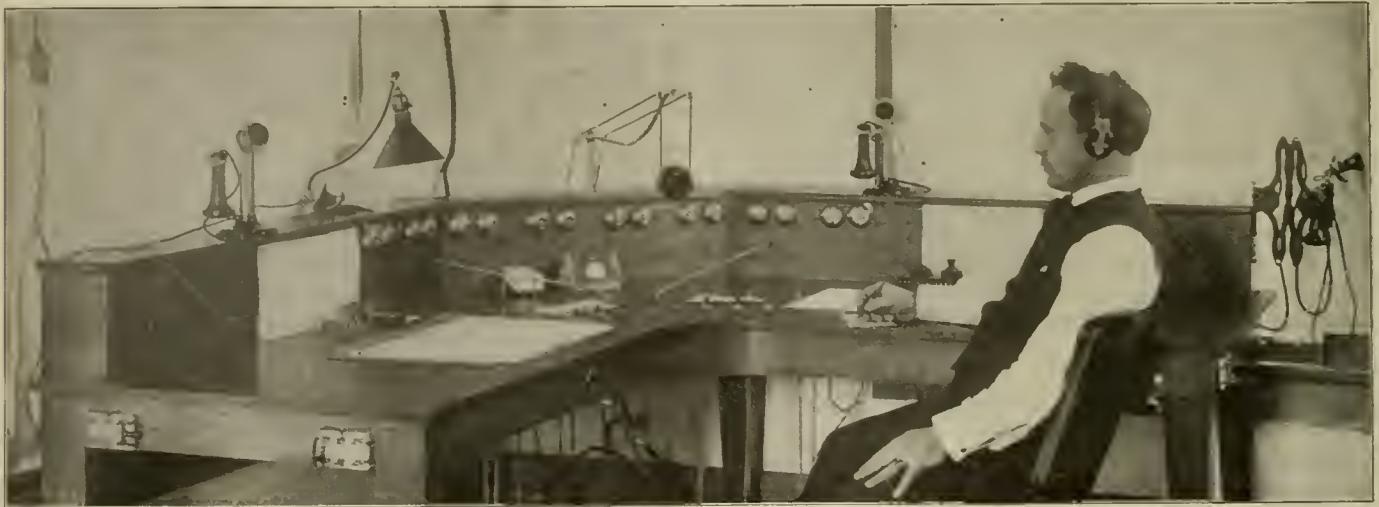
The desk is made of oak and is so constructed that it occupies but a small space in the corner of the dispatcher's room. The top, which is 30 inches above the floor, is L-shaped, the respective wings being 4 feet long and about 3 feet wide. At the rear a box-shaped back is raised 12 inches above the surface of the table. Mounted on the

used when the regular apparatus is out of repair, or when it is necessary to have more than one dispatcher at the desk.

In addition to the company's own telephones there are provided in the office two public telephones, the Bell and the Home, which have local and long distance connections. These are used only in cases of emergency or when the company's wires are not in good working order. Each substation is also provided with the long distance connections which enable the attendants to quickly get into communication with the dispatcher in case of an accident or other unusual occurrence.

Dispatching Lines.

The dispatching wires of the Lima & Toledo Traction Company are about 140 miles in length. These wires are strung on pony-groove glass insulators and are transposed every 800 feet on double-petticoat transposition insulators. No lightning arresters or ground wires are used. The wires are strung for a greater part of the distance within five feet of the high potential, 33,000-volt transmission line and less than 16 inches from the 600-volt feeder cables. The fact that the lines are seldom noisy, are never disturbed by induction and are not interrupted by grounds and short circuits indicates that they are firmly constructed and well insu-



Lima & Toledo Traction Company—Dispatcher's Table and Switch-board in Office at Lima, O.

back are eight sets of magneto bells which are used in place of the usual switchboard drops to indicate that a call is being made. Under these bells are switch-line taps by which the various lines can be connected. Inside of the box at the rear of the table are located the batteries, and generators used on the various lines leading into the dispatcher's office.

On the surface of the table and arranged along the front where the two wings join are eight two-way cams and eight plug taps. These from left to right are connected direct to the line circuits respectively as follows: (1) Ft. Wayne division; (2) city ticket office; (3) general manager's office; (4) master mechanic's office; (5 and 6) future extension; (7) Columbus & Lake Michigan (steam) division; (8) Toledo division.

By the use of the cams and plug taps any two or all of these divisions can be connected and communication between the various offices established. By means of small split switches either the Holtzer-Cabbot automatic generator or the hand magneto generators, both of which are provided, may be used by the dispatcher in placing calls. The switchboard fittings are all of the Kellogg type.

The dispatcher is provided with the regulation telephone head-gear and receiving trumpet and an adjustable mouth-piece. There is also provided at either side of the dispatcher, as he sits at the desk, a desk telephone set which may be

labeled. At sidings and intermediate points, where jack-boxes are located, double-pole switches are provided for testing out line troubles should they occur.

Dispatching Methods.

The Lima & Toledo Traction Company operates electric cars over three separate properties: (1) the Lima city division, (2) the Ft. Wayne division, (3) the Toledo division, and steam trains over the Columbus & Lake Michigan Railroad. The movement of trains over these various divisions is directed by telephone from the Lima office.

All substations and principal agency stations on the electric divisions are connected by telephone with the dispatcher's office. Telephone jack-boxes are stationed 20 poles apart along the entire length of the railways and three additional boxes are provided at switches where cars are scheduled to meet. This provision for the train crews to get in touch with the dispatcher's office at frequent intervals makes an ideal condition for the operation of cars.

The method of dispatching cars as practiced on this railroad does not vary to any extent from that of many other interurban lines in the central states. The standard train-sheet and train order blanks are used.

Before leaving a terminal station the motorman obtains written orders either to run on his schedule or to report for orders at a stated siding. The method of obtaining orders at other than the terminal stations varies somewhat from

that of other railways. When a motorman gets into communication with the dispatcher he reports his train number, motor number and the number of the siding from which he is talking. He is then directed either to take a siding, to wait for a train which he is to meet or to proceed on orders that are then given. In receiving running orders the motorman stands at the telephone and the conductor, with an order blank in his hand, stands immediately behind him. The motorman repeats the orders as they come to him over the wire and the conductor writes down the orders as they have been repeated. The motorman then takes the train order and reads to the dispatcher what has been written. If the order as copied is correct he is given an "O. K.," the time, and the initials of the dispatcher, all of which are written on the order. The order is then posted in the cab and the train proceeds in accordance therewith.

CENTRAL ELECTRIC RAILWAY ASSOCIATION COMMITTEES APPOINTED.

President H. A. Nicholl of the Central Electric Railway Association has appointed the following standing committees for the current year:

Committee on "Lighter Car for Interurban Service": R. C. Taylor, Indiana Union Traction Company, Anderson, Ind.; W. H. Evans, Indianapolis Traction Company, Indianapolis, Ind.; G. E. Tracy, Cleveland & Southwestern Traction Company, Kamms, O.; W. P. Jackson, Central Market Street Railway, Columbus, O.

Committee on "Express Company Contracts with Interurban Railways": A. A. Anderson, Indianapolis Columbus & Southern Traction Company, Columbus, Ind.; George Whysall, Columbus Delaware & Marion Railway, Marion, O.; F. D. Carpenter, Western Ohio Railway, Lima, O.

Subject Committee: E. C. Spring, Dayton Covington & Piqua Traction Company, West Milton, O.; J. L. Adams, Indiana Columbus & Eastern Traction Company, Dayton, O.; J. C. Rothery, East Liverpool Traction & Light Company, East Liverpool, O.; Thomas Elliott, Indiana Columbus & Eastern Traction Company, Cincinnati, O.; C. F. Smith, Findlay Bowling Green & Southern Traction Company, Findlay, O.

Insurance Committee: H. N. Staats, Cleveland, O.; H. J. Davies, Cleveland Electric Railway, Cleveland, O.; Harrie P. Clegg, Dayton & Troy Electric Railway, Dayton, O.

Finance Committee: C. N. Wilcoxon, Cleveland & Southwestern Traction Company, Kamms, O.; George Whysall, Columbus Delaware & Marion Railway, Marion, O.; Thomas McReynolds, Kokomo Marion & Western Traction Company, Kokomo, Ind.; W. B. Wright, Indianapolis & Cincinnati Traction Company, Rushville, Ind.; H. E. Vordemark, Ft. Wayne & Wabash Valley Traction Company, Ft. Wayne, Ind.

Standardization Committee: R. C. Taylor, Indiana Union Traction Company, Anderson, Ind.; W. H. Evans, Indianapolis Traction Company, Indianapolis, Ind.; F. Heckler, Lake Shore Electric Railway, Fremont, O.; M. E. Baxter, Western Ohio Railway, Wapakoneta, O.; W. A. Gibbs, Indiana Columbus & Eastern Traction Company, Newark, O.

Publicity Committee: F. D. Norveil, Indiana Columbus & Eastern Traction Company, Indianapolis, Ind.; George Davis, Electric Traction Weekly, Cleveland, O.; Cale Gough, Street Railway Journal, Chicago, Ill.; L. E. Gould, Electric Railway Review, Chicago, Ill.; Mr. Grimes, Ohmer Fare Register Company, Dayton, O.

Transportation Committee: F. J. J. Sloat, Cincinnati Northern Traction Company, Hamilton, O.; F. T. Hepburn, Lima & Toledo Traction Company, Lima, O.; F. J. Stout, Lake Shore Electric Railway, Norwalk, O.; Charles G. Lohman, Chicago South Bend & Northern Indiana Traction Company, South Bend, Ind.; F. A. Davis, Scioto Valley Traction Company, Columbus, O.

The Levant Herald reports that the Turkish government has prolonged the concession of the "Société des Tramways de Constantinople" until the year 1933, and the company has undertaken to substitute electric for animal traction, and to construct within five years three new lines: To Pera, from the Galata-Sérai Tunnel; from Pancaldi to Tatavla; to Stamboul from the Mosque of Faith. It has also undertaken to double-track the present line from Galata to Ortakeuy.

SHELTER SHEDS ON THE ILLINOIS VALLEY RAILWAY.

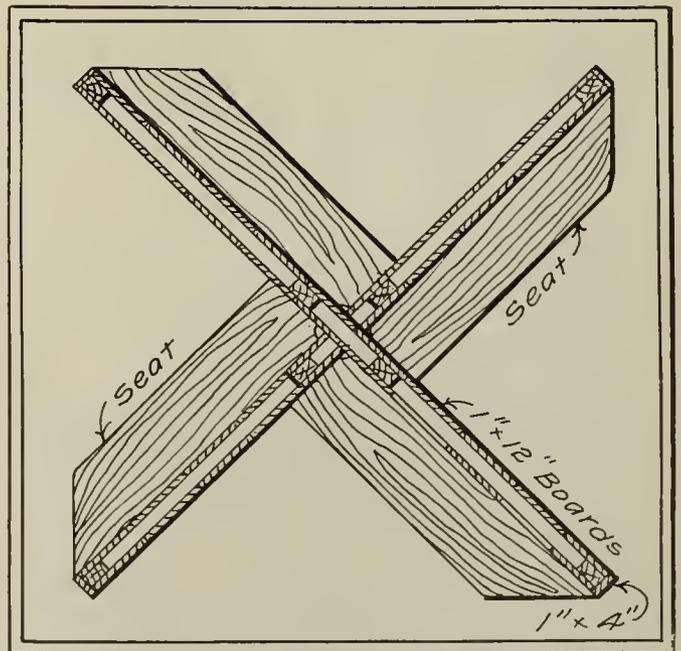
The route of the Illinois Valley Railway is 40 miles long, connecting the cities of Ladd and Seneca, Ill., and passing through the cities of Spring Valley, Peru, La Salle, Utica,



Illinois Valley Shelter Shed—General View.

Ottawa and Marseilles. The road serves a thickly settled mining district which affords good patronage.

At many of the highway crossings the company has erected shelter sheds. The design adopted for the construction of these sheds was obtained through a widely advertised



Illinois Valley Shelter Shed—Section Above Seats.

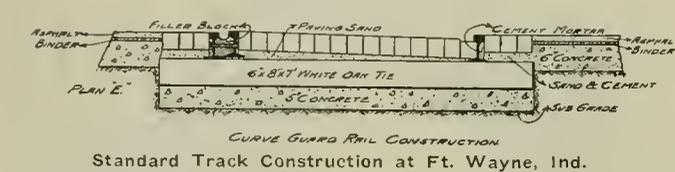
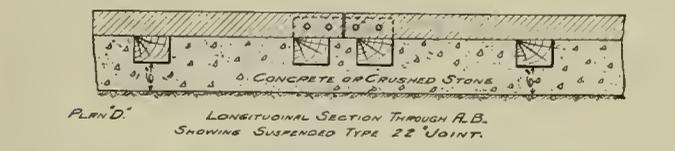
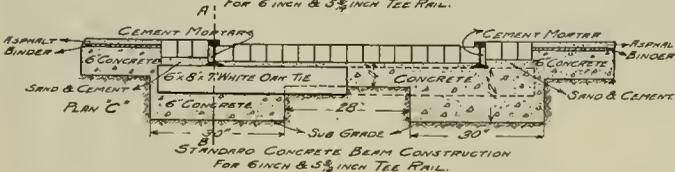
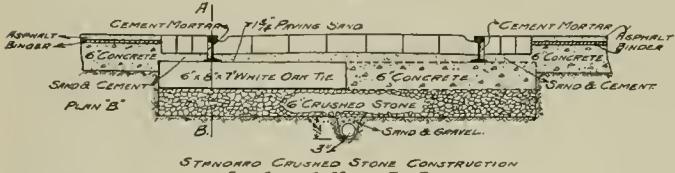
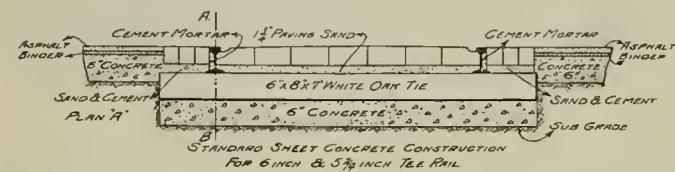
competitive prize contest held some few months ago. The type of shed chosen is practical and yet rather novel. The floor covers a ground space 10 feet square and the shed is 11 feet high to the peak of the roof and 7 feet 6 inches high to the gables. It is constructed entirely of 2 x 4-inch timbers and 1 x 12-inch boards. There are no side walls, but protec-

tion from the weather is afforded by the arrangement of the interior partitions. The shed is divided into four equal compartments by these partition walls which radiate from the center of the shed to its four corners. In each quarter of the shed there is a smooth plank seat five feet long and one foot wide. Other details of the construction are shown in the accompanying illustrations. It will be noted that in stormy weather there are two compartments that will always offer protection from the rain or snow. The roof extends a short distance over the platform surrounding the shed.

STANDARD TRACK CONSTRUCTION IN PAVED STREETS AT FT. WAYNE, IND.

The city council of Ft. Wayne, Ind., has granted the Ft. Wayne & Wabash Valley Traction Company permission to use four different types of track construction in the paved streets of that city. The selection of a desirable type of construction to suit the conditions is left to the company as long as the standards are adhered to.

The types as shown are to be made standard for 6-inch and 5 3/4-inch T-rails. Where the grade of the street is less than one per cent either the sheet concrete construction of Plan A or the crushed stone construction of Plan B may be used. Where the grade is greater than one per cent the concrete beam construction of Plan C may be used. The bill



Standard Track Construction at Ft. Wayne, Ind.

of material per lineal foot of track for these three types of construction is as follows:

Plan A.

- Concrete, 215 cubic yards.
- Nose blocks, 6.6.
- Paving blocks, 24.
- Ties, 30 feet of 5 3/4-inch rail, 10.
- Ties, per 30 feet 7-inch steel, 8.

Plan B.

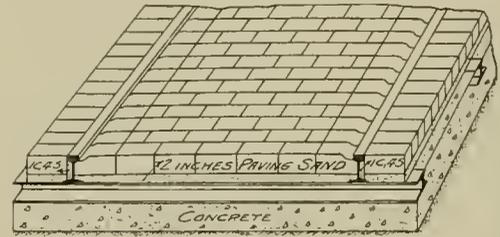
- Concrete, .088 cubic yards.
- Crushed stone, .128 cubic yards.
- Nose blocks, 6.6.
- Paving blocks, 24.
- Ties, per 30 feet 5 3/4-inch rail, 10.
- Tile 30 feet per 30 feet of rail.

Plan C.

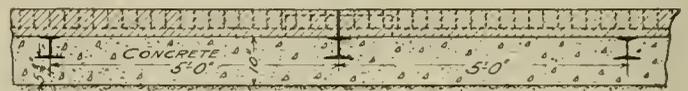
- Concrete, 204 cubic yards.
- Nose blocks.
- Paving block, 30.
- Ties per 30 feet 5 3/4-inch rail, 10.
- Ties, per 30 feet 7-inch rail, 8.

As is shown in the illustration either the Metropolitan groove or the Metropolitan straight paving brick laid flat may be used next to the rail.

Plans D and E show respectively the longitudinal section



STANDARD STEEL TIE CONSTRUCTION FOR 6" RAIL PLAN F"



LONGITUDINAL SECTION THROUGH RAIL Standard Track Construction at Ft. Wayne, Ind.

of track through A-B with the suspended type of 22-inch joints and the guard-rail construction on curves.

Plan F shows the standard steel-tie construction for 6-inch T-rails.

NEW POWER STATION FOR ROANOKE RAILWAY & ELECTRIC COMPANY.

The announcement has been made by J. W. Hancock, general manager, Roanoke Railway & Electric Company, that this company soon will spend \$225,000 for a new power house, and \$108,000 for new cars and improvements to the roadway and equipment.

The construction plans for the new power house have been ready for some time, but the company has withheld any announcement because it had not found any desirable location for the plant.

A site of about 3 1/2 acres in Roanoke, Va., has recently been purchased from the Norfolk & Western Railway Company. The new plant will be very favorably located on this triangular plot between the tracks of the Tidewater Railroad, the Roanoke river and the Winston-Salem tracks of the electric company. This location, which is near the center of the city, affords excellent opportunity for obtaining coal and an ample supply of condensing water.

The power house will be constructed of reinforced concrete throughout and have a floor space of approximately 100 by 150 feet. The general arrangement of the engines and boilers will be similar to that of many of the large modern stations, provision being made so that the capacity of the plant can easily be increased.

At present five 400-horsepower boilers will be installed and three turbine generating units. One of these will be a 1,500-kilowatt turbo-generator and the others will each have a capacity of 500 kilowatts, making a total of 2,500 kilowatts as the capacity of the present plant. The turbines are to run condensing, the Roanoke river furnishing an unlimited supply of water.

The present capacity of the plant, it is believed, will be more than sufficient to meet the demands of the street railway, lighting and power purposes.

When the contemplated improvements have been completed, the management believe that for its size Roanoke will have one of the best equipped power houses and street railroads in the country.

FUEL TESTS UNDER STEAM BOILERS.

At a meeting of the society held March 20, 1907, Professor L. P. Breckenridge presented a paper entitled, "A Review of the United States Geological Survey Fuel Tests Under Steam Boilers." The work of the testing plant was outlined,

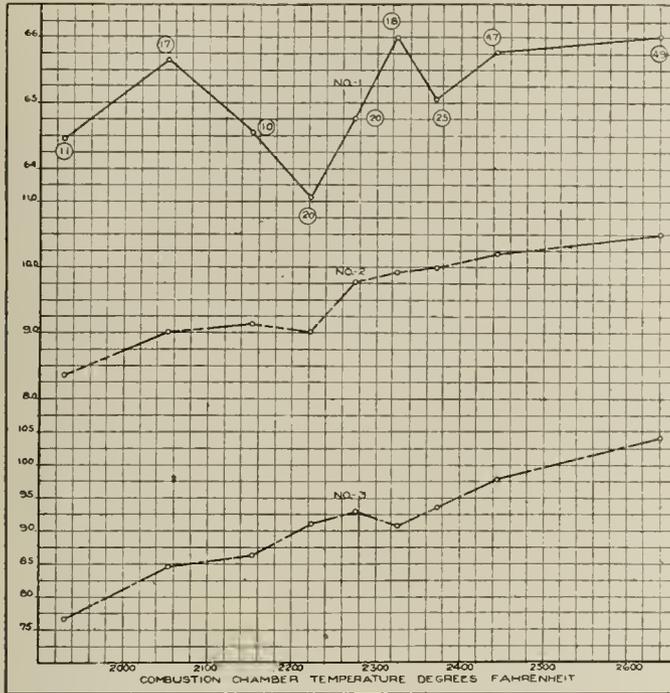


Figure 1.

Curves showing relation between combustion chamber temperature and the following:
 No. 1 efficiency, 72%.
 No. 2 CO in flue gases, samples taken in hood.
 No. 3 per cent rated capacity of boiler developed.
 Classified on combustion chamber temperature as basis.

and the many curve sheets presenting the results of some 500 separate tests were carefully explained. Walter T. Ray and Mr. Kreisinger, who assisted in this work, also added

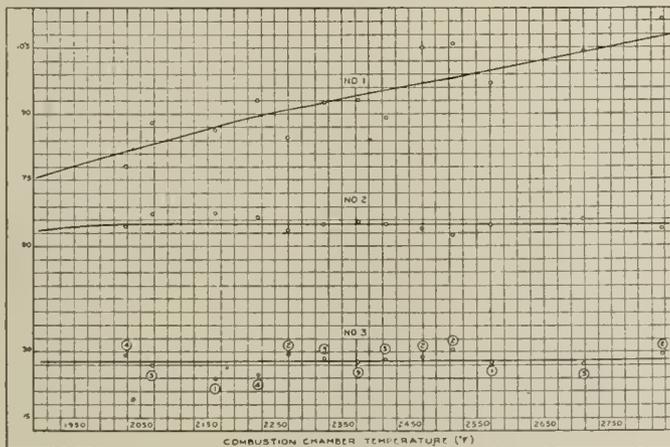


Figure 2.

Curves showing relation between combustion chamber temperature and the following:
 No. 1 per cent rated capacity developed.
 No. 2 efficiency, 72%.
 No. 3 per cent unaccounted for plus per cent loss up stack.
 Classified on combustion chamber temperature (°F).
 Using Illinois and Indiana coals.

much of value to the paper, and to the discussion which followed the reading of the paper.

As the paper was too long to be reprinted in full, an extract of the part of greatest interest is presented herewith with a few of the many instructive charts.

Some of the special investigations made by the Boiler division are given somewhat in detail in this paper. These investigations are:

- (1) Observation of circulation of water through the water tubes of the Heine boiler.
- (2) Experiments with a small multitubular boiler to test the theory of heat transmission through boiler tubes.
- (1) The observation of the circulation of the water in the boiler tubes was made with a specially constructed circulation indicator shown in Fig. 3. This apparatus consists of a four-blade propeller revolving on an axis inside of a boiler tube. To the hub of the propeller is firmly attached a

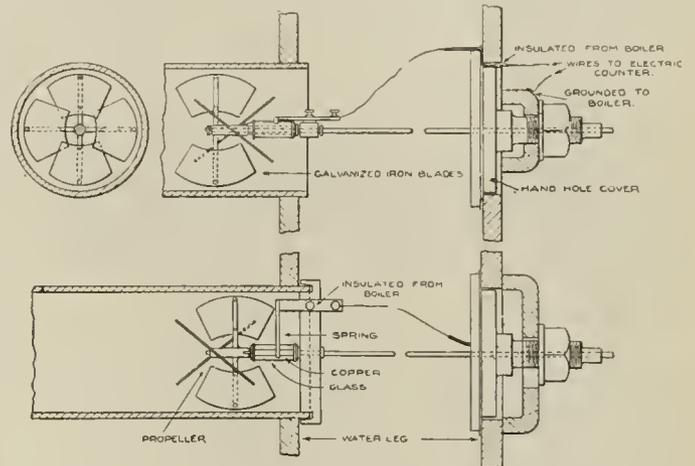


Figure 3.

Assembled view showing location of circulation indicator in boiler.

glass commutator with a single copper strip which has a metallic contact through the axis of the propeller with the boiler. Every revolution this copper strip makes an electrical contact with a steel brush which is insulated from the boiler. One terminal of a low voltage battery is attached to the brush, and the other is grounded to the boiler. A telephone receiver placed in the circuit enables an observer to tell whenever the brush and the copper strip on the commutator completes the circuit, and thus count the revolutions per minute. The blades of the propeller make an angle of 30 degrees with the axis of the propeller, and are 1 1/4 inches wide, the distance across the outside edges being 3 1/4 inches. The boiler tubes are 3 1/2 inches inside diameter.

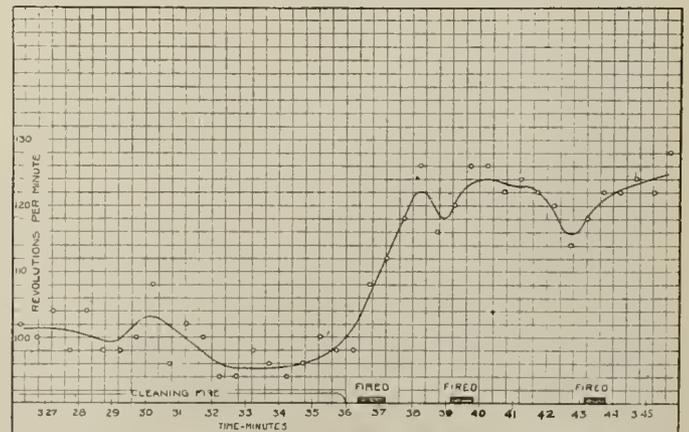


Figure 4.

Observations with circulation counter. Propeller in back of boiler middle tube, third row from bottom. Test No. 379.

The velocity of water as calculated from the dimensions of the propeller is 11.6 inches per revolution, or taking the friction of the propeller into account it may be taken as one foot per revolution.

Chart No. 4 shows the effect of cleaning fires and of firing, on the speed of water circulation in a tube of the boiler, as measured relatively by the circulation indicator. The circulation is quite prompt in its changes and the values obtained vary considerably. The readings were taken by re-

ording the number of revolutions in a 15-second interval opposite time figures, and from such data the revolutions per minute were calculated and plotted on this chart.

The increased circulation of water during and immediately after each firing agrees well with the optical pyrometer readings.

An important point observed is that the circulation rapidly drops behind the amount of steam made (per cent rated capacity developed), especially at high rates of working. Thus at 70 per cent rated capacity the average rate of revolution of the indicator was 80 per minute. At 105 per cent rated capacity the rate of revolution was 102, whereas to be proportional it should have been 120; the speed of circulation fell about 15 per cent short.

This is reasonable, when we consider that, so far as one can make any speculations, the circulating forces are per-

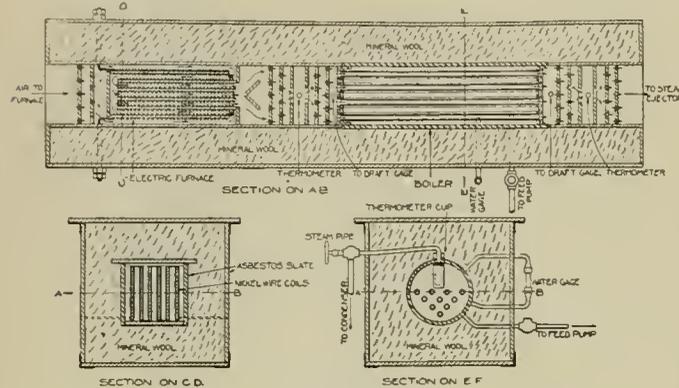


Figure 5.

Apparatus for determining the rate of heat transmission through boiler flues.

haps roughly proportional to the amount of steam generated and entangled with the rising water, while the frictional resistance to circulation is perhaps proportional to the square of the average velocity of circulation.

This failure of circulation to keep up proportionally with demands on it must decrease the efficiency of the boiler at higher rates of working, by allowing a proportionally larger percentage of the water heating surface to be covered with steam bubbles, thus virtually reducing the heating surface.

At a later date, the same circulation indicator was put in the middle tube of the lowest row in the rear end of the boiler; this was one of the tubes mostly enclosed in clay tiles. The numbers of revolutions per minute for various capacities are given in the following table:

Capacity, horsepower	58.2	91.4	118.2	92.2
Revolutions per minute	217	257	273	291
Number of readings	78	8	7	12

In an earlier experiment the same circulation indicator was placed in the third row of tubes from the top of the boiler and it was found that the rate of revolution was very slow indeed. This indicates that the bottom row of tubes was doing far more work than any other row of tubes, and that as we go from the bottom row up, the amount of work done decreases very rapidly.

The probability is that the bottom row of tubes absorbs a large portion of the total heat, mostly on account of conduction through the clay tiles and radiation onto the exposed portion of the tubes in the rear over the hot brick-work. This probability makes it easy to realize that the efficiency of the boiler, as a heat absorber, may well rise far more rapidly with increased furnace temperature, than is indicated by the equation for heat absorption from the gases due to convection only.

(2) An apparatus designed for experiments relating to the laws governing the rate of heat transmission from the gases through the boiler plate, is shown in Fig. 5. It consists of an electric furnace, small horizontal multitubular boiler, a small surface condenser, and a steam ejector for producing draft.

The electric furnace is made of six coils of No. 13 pure nickel wire which is wound around rectangular pieces of asbestos slate $\frac{1}{8}$ -inch in thickness. These coils are placed vertically in a trough of asbestos slate, with a space of about $\frac{3}{8}$ inch between them, and baffled in such a way that the air passes three times through the furnace before it leaves it.

The boiler is 8 inches long and the shell is 4 inches in internal diameter. There are ten copper flues of 3-16-inch internal, and $\frac{1}{4}$ -inch external diameter; this making the thickness of the metal 1-32 of an inch. The heads of the boiler

are covered with a layer of asbestos paper about $\frac{1}{4}$ -inch thick so that only the heating surface of the flues remains effective. The boiler is equipped with a gauge glass, pipe for feeding in water, pipe for pressure gauge and thermometer cup for getting the temperature of the steam. The thermometers used for measuring the temperature of gases entering and leaving the boiler are screened by perforated pieces of asbestos slate from the radiation of the furnace and boiler and also from radiation to the outside. The two screens nearest to the thermometer have only one square hole in the center so that the stream of heated gas is contracted around the thermometer bulb. This precaution makes the thermometer reading represent more nearly the average temperature of the streams of gases. All the boiler connections and the trough around the boiler are covered with hair felt to reduce the radiation losses to a minimum. It is the intention to use in these experiments three boilers of different lengths and to determine the effect of the length of flue on the heat absorption, and also to test flues of different diameters.

The surface condenser is made of two concentric copper tubes; the inner of these is for steam and the outer one for a stream of cooling water.

The steam ejector for producing draft is a standard $\frac{3}{8}$ -inch pipe, placed in the center of a contracted pipe made of galvanized sheet iron which takes the gas away from the rear end of the boiler.

Before a test is started the apparatus is brought to the temperature at which the test is to be run. After starting a test all conditions are kept as nearly uniform as possible.

Chart No. 6 shows the relation of the velocity of air to the rate of heat transmission. The figures near each point indicate the average temperature of air entering boiler for each test. The most striking feature in the chart is that all the points of nearly the same temperature, fall in the same straight line. This means that when initial temperature remains constant the heat transmitted per second is directly proportional to the velocity of air. Another striking feature is that as the temperature of gases entering the boiler rises, the constant temperature lines fall closer together. This means that when the velocity of air is constant, the heat absorption increases at a decreasing rate, as the temperature becomes higher; that is, the heat absorption is not directly proportional to the temperature of the air. The same increase at low temperatures is much more effective than at higher temperature.

There is one objection that might be brought against the results plotted in Chart No. 6, and that is that the water

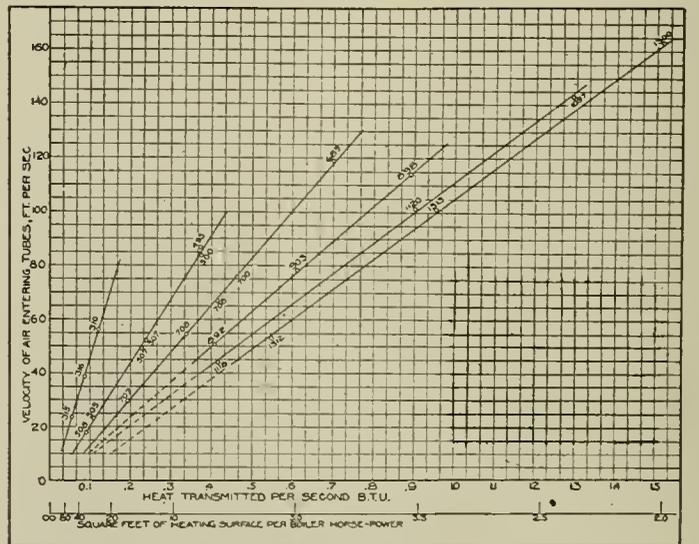


Figure 6.

condensed per second, was used in calculating the velocity of the air. This method of calculation makes the velocity somewhat dependent on the rate of heat absorption and tends to bring the points into a straight line. Experiments are now being conducted with improved apparatus in which the electrical energy used in heating the air is accurately measured and will be used in calculating the velocity of gases, which velocity will then be independent of the water condensed. The fact that the heat absorption increases when the velocity increases remains, although more complete experiments with improved apparatus may show that the relation between heat absorption and velocity of gas deviates slightly from the straight line function.

OPERATING FEATURES OF REACTION TURBINES.

Time Required for Warming Up.

One of the questions which have often been asked regarding the operation of a steam turbine is regarding the time required to bring it up to speed and put on full load, the turbine starting cold. The answer to this question is in general, that the turbine can be started and full load put on it in the time required to warm up and start the air and circulating pumps. This, then, naturally means that a turbine can be started up more quickly than a reciprocating engine, as it does not take as long to warm the small engines driving the air and circulating pumps as would be required to warm the main engines. To illustrate, in an emergency a 5,500-kilowatt turbine was started cold, synchronized and full load thrown on, in a little more than one minute. This is, of course, not desirable, and may cause trouble because of unequal expansion and contraction, but it shows, nevertheless, how little time is required in an emergency.

Under normal conditions the turbine should be warmed gradually and the condensation drained out before sufficient steam is turned on to turn it over, and then the valve should be opened slowly, and the speed gradually increased just as would be done in the case of a reciprocating engine. The normal time for starting a turbine is five to seven minutes, and if that much time is allowed no trouble need ever be feared. A point which should always be remembered is that it is better to give plenty of time for warming before starting, but that should an emergency arise when it is absolutely necessary to get a unit under steam quickly, it is far better to open the throttle wide as rapidly as possible rather than use only a short time for warming. The reason for this will be evident when the expansion of the metal is considered. If too short a time is allowed for warming, the parts entirely surrounded by steam naturally warm first, and the shell, which is far heavier than the rotor and is exposed to the air on one side, will not become warm as quickly as the rotor, and for this reason the shell will heat locally, thus causing it to warp, which is liable to bring the blades in contact with the spindle and the shell. Hence it is better, if absolutely necessary to start up quickly, to turn on full steam pressure as rapidly as possible, as local heating is less likely to occur and therefore also the danger of accidental contact of the blades.

Starting Turbines.

Before starting a turbine the engineer should be sure the water service is in working order, as it is essential that the oil shall be cooled and the glands supplied with water. Otherwise heating of the bearings is likely to occur and the vacuum will not reach the maximum obtainable, as air will leak in through the glands if there is no water service for them. Besides reducing the vacuum obtainable, there will also be a small loss due to the increased work put on the air pump.

Quality of Gland Water.

A point which no doubt would not seem of any serious importance is the quality of the gland water. Although the quantity of gland water is not large, if it contains large quantities of scale-forming salts trouble may arise in time, owing to the deposit of the salts in the shell of the turbine. The temperature of the exhaust steam is sufficiently high to precipitate some of the scale-forming salts on the shell, low-pressure dummy and low-pressure end of the spindle. While the results of this are not very serious, they may cause considerable annoyance. For instance, if the scale does not happen to form evenly all around the rotor, or some of it should crack off on one side, it would probably throw the spindle sufficiently out of balance to cause trouble, and if not attended to, might in time cause the bearings to wear or heat. Further, another way in which the

formation of scale may become apparent is by an overheating of the adjustment thrust block. In a case which recently came to notice the scale had broken off the shell and became lodged in the equalizing pipe between the exhaust pipe and the low-pressure dummy chamber. If this pipe were entirely clogged nearly the entire thrust, which is balanced by the low-pressure dummy, would be thrown on the thrust block, which, not being designed as a thrust block, but simply to maintain the desired clearances, would no doubt seriously overheat. It is needless to say that if the water contains any gritty material in suspension it should be filtered, as it would cause needless wear of the glands, thus increasing the amount of gland water required.

Obstructions in Strainers and Blading.

As a rule strainers are placed in the steam pipe to prevent small pieces of oxide scale or other foreign material from the inside of the steam pipes from entering the turbine blades, but sometimes in spite of these strainers some of the material will work its way through and either be lodged in front of the first ring of guide blades or pass through the turbine without doing any harm, as any object which can pass the small openings in the first row of blades cannot cause any trouble in the rest of the blades. The most serious result of this deposit of scale is the closing of the first ring of guide blades, so that the required volume of steam cannot pass into the high-pressure blading. The consequence is that the auxiliary overload valve opens sooner than it normally should, and the steam consumption per kilowatt-hour will be increased, as the steam entering the second step through the auxiliary overload valve is not expanded completely. A further effect which this may have is the slowing down of the turbine on a heavy overload, which might be sufficient to throw the generators out of step. As stated, the indications which point to this difficulty are the opening of the overload valve before full load, and in an extreme case, slowing down seriously on overloads. The only remedy in these cases is to open the turbine case and remove the obstructions, making sure that pieces of waste, tools, etc., are not left in the turbine when it is closed, as these might cause serious trouble. Slowing down of the turbine recently caused a certain engineer unlimited annoyance and trouble. After examining the valve, blading, condenser and nearly every conceivable part of the turbine he accidentally opened the strainer and found it almost completely closed with scale and dirt. If abnormal slowing down should occur, it would therefore be wise to examine the strainer first before opening up the turbine and looking for an obstruction in the blades. As an obstruction in either place will cause the overload valve to open prematurely, so that alone is not a criterion of where the trouble is located. Choking of the strainer is liable to happen to any type of turbine, as is also to a great extent the trouble from scale-forming water, depending only upon the arrangement of the shell and rotor.

The Effect of Priming.

It has been repeatedly shown that priming of the boilers will not cause any serious damage to a reaction turbine, and even large slugs of water may pass through a turbine, causing no further inconvenience than a slowing down of the turbine until the water has passed out, yet care should be exercised by the attendants to avoid opening up any of the valves on the line to the turbine before the pipes are well drained. For, as stated, though in general no serious trouble is caused by water, it has happened that all the blades have been stripped off the rotor by a large slug of water entering the turbine at a high velocity, and while not highly probable, such accidents can easily happen again through carelessness, and in such cases the attendant can only console himself with the thought of what would have happened had it been a reciprocating engine in place of a turbine.

PIPING AND POWER STATION SYSTEMS.—XXXIV.

BY W. L. MORRIS, M. E.

In nearly every case the condenser discharge line would be located at a higher elevation than the intake, owing to the variation in the level of the water supply at different seasons. If this variation is only four feet, and there is two feet of water in the intake when the water is at its lowest level, then the overflow from the hot well should be six feet from the bottom of the intake, thus making it possible for the discharge waterway to cross the intake waterway and leave at least four feet under the discharge waterway for the intake. Many plants are arranged with the intake and discharge waterway next to each other, a practice the ultimate economy of which is doubtful, there being a slight saving in construction cost which is counterbalanced by loss in operation owing to the rise of temperature of the intake. If a surface condenser is to be installed both waterways should be kept at the same level regardless of the variation in the height of the water supply, and in this case a considerable saving in the cost of construction would result if the two waterways are placed in the same trench.

Class I 9. Branches to and from the Cooling Tower.

The various makes of cooling tower are all quite similar in their general construction and operation. Details shown in Fig. 265 (I 9-1) are common to all makes. The water is distributed over the tower filling at the top and allowed to percolate through the filling downward against the rising current of air. The different forms of filling furnished by the manufacturers of water towers are ordinarily rated at 1 to 1.125 square feet of cooling surface per pound of steam condensed and the cost of the cooling tower materials, not including the foundations, brick lining, motor to drive the fan nor cost of erection, is generally from 10 to 14 cents per square foot of cooling surface. The height of the tower is generally about 32 or 33 feet, measured from the top to the bottom of the metal casing. The metal casing is calked so that the water will not leak through the seams.

The lowest section of the casing would ordinarily be not less than $\frac{1}{4}$ inch and the top section not less than $\frac{1}{8}$ inch

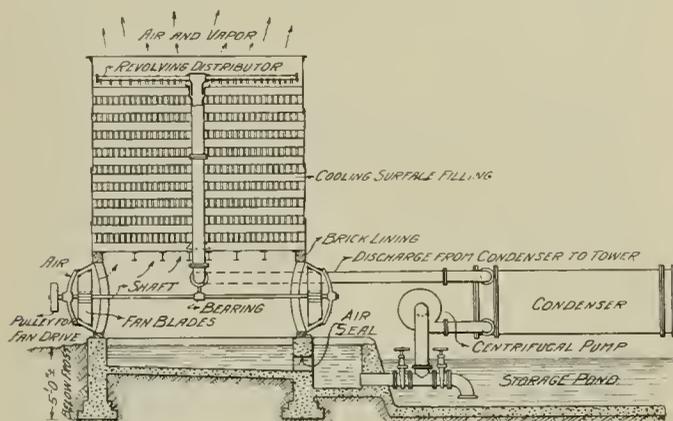


Figure 265-(19-1).

thick. The distributor is supported on hollow brass balls and the bearing surfaces of the sleeves at the end of the discharge pipe are of brass to insure that the distributor will revolve with but very slight pressure at the nozzles. The I-beams shown to support the filling, rest on the brick lining. The air at the base of the tower being under a slight pressure, the water seal shown is required where the water is discharged from the tower to a storage basin as it prevents air from passing through this opening. The size of fan required does not appear to be standardized among the different manufacturers, as those supplied vary from two

8-foot to two 10-foot fans to supply the draft for a tower for 30,000 pounds of steam per hour.

Different manufacturers employ different materials for the cooling surfaces. The most commonly used material is wood, the most satisfactory wood for this purpose being swamp cypress, in surfaced boards 1 inch by 8 inches set on edge about $\frac{1}{2}$ inch apart. Each layer is laid at right angles to the one below it. Glazed tile is also used, unglazed tile being very unsatisfactory due to its moisture ab-

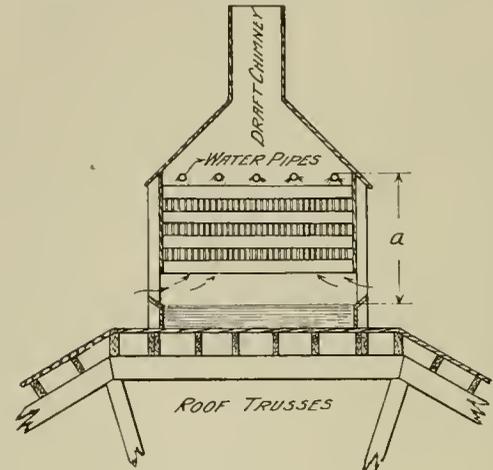


Figure 266-(19-2).

sorbing capacity. This causes the unglazed tile to freeze and crumble in cold weather when the tower is not in operation. Besides simply the loss of money and inconvenience of replacing the tile, it also damages the pumps, owing to the grit carried along by the water, and furthermore the pipes are liable to become clogged with the deposit.

Another material which is quite satisfactory for filling is galvanized wire screening. These are hung from the top in such a manner that they can be easily removed and replaced when they are eaten out. The chief advantage of the wire screen construction is that it offers the least possible resistance to the flow of air through it, making it possible to cool the water by natural air draft instead of by the use of a fan. This, in itself, is quite a saving, as it requires 1 horsepower for each 1,000 pounds of steam per hour which is condensed, or about 2 per cent of the power developed by the main engine. For instance, about 35 horse-power is required to drive the fan for a 2,000-horsepower engine. To avoid the expenditure of this power it would be economy to invest \$125 for each horsepower saved, or, in other words, for a plant as stated, an expenditure of \$4,375 additional for a natural draft tower would be justified. This would be five times the outlay required to pay the difference in cost of the two systems. The saving in power would unquestionably pay the difference in yearly cost of maintaining wire screens in good order. In considering natural draft cooling towers, it should be especially noted what duty would be required of the circulating pumps to determine whether they would require more or less power owing to the elevation to which the water must be pumped.

The ideal system is, of course, to raise the water the least possible distance and, at the same time use natural draft. Figure 266 (I 9-2) shows the cooling tower arranged for natural draft and the distance, *a*, reduced to the least possible. This tower is shown of rectangular construction instead of round, as in Figure 265, as the rectangular form would be more suitable where it is necessary to support it on the roof. The reason for placing this form of tower on the roof is to insure a better circulation of the air and also because the air farther from the ground is somewhat cooler.

(To be Continued.)

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL.B., OF THE CHICAGO BAR.

Burden of Proof Where Gate was Not Securely Fastened.

The burden of proof is on the carrier, the supreme court of Louisiana holds, in the case of *Spurlock v. Shreveport Traction Company*, 42 Southern Reporter, 575, to show why the contract of safe carriage was not fulfilled. Thus, where a passenger fell from the platform of a street car and was killed, in consequence of the gate not being securely fastened, the question being as to whether the gate had been insecurely latched or was unlatched by the passenger himself, the burden of proof lies on the car company. When a question arises as to the working of a mechanical device, for instance, as to whether it was possible for a certain link to stay insecurely on a certain knob, the safer plan is to produce the device itself in court and demonstrate its operation.

Not Required to Do Any Paving Before Laying Tracks.

A franchise ordinance providing that an electric railway company "shall keep paved and in good repair 8 feet in width for single track and 16 feet in width for double track in the center of the streets where its track shall be laid," the supreme court of Illinois holds, *Uhlich's Estate v. City of Chicago*, 79 Northeastern Reporter, 598, that the provision that the railway company shall keep paved a strip in the center of streets "where its tracks shall be laid" does not require the railway company to pave any portion of any street before the time when it proceeds to lay its tracks in that street. And it says that it is confirmed in this view by the fact that the company is given a discretion whether to construct a single-track or a double-track railway, for it is manifest that, before it exercises that discretion, it would be impossible to determine what portion of the roadway the railway company is, by the ordinance, required to pave.

Damages for Expulsion for Refusal to Pay Fare Twice.

There is a wide difference in the opinions of courts of last resort, the court of appeals of Kentucky says, *Camden Interstate Railway Company v. Frazier*, 97 Southwestern Reporter, 776, as to the measure of damages that a passenger is entitled to recover in case of his wrongful expulsion for refusal to pay fare a second time. The courts of a number of states hold that it is the duty of a passenger to pay the extra fare demanded if he has the money, thereby avoiding expulsion; and in such cases the passenger is only entitled to recover the amount wrongfully exacted, in the absence of such aggravating conduct on the part of the persons in charge of the train as would entitle him to punitive damages. These cases are placed upon the ground that it is the duty of the person who has been deprived of a contract right to reduce the damage as much as possible; and that if he has the money to pay the extra fare he should do so, and thus minimize the injury sustained.

Other courts hold that a passenger who has paid his fare and thus acquired a contract right to transportation to the point of destination may stand upon his right and refuse to pay the fare wrongfully demanded, and, if ejected, may recover substantial damages.

This court is disposed to accept as correct the latter view. When it says a passenger has performed his contract by paying to the carrier the correct sum requested for his passage, the carrier has no right to demand that he shall again pay, and, if such demand is made, a passenger is under no duty to minimize the damage that the carrier may have brought upon itself by its wrongful act. The carrier has no more right to wrongfully exact money from a passenger than any other party to a contract has to demand money without legal right. If a party to an ordinary contract should break it, because the other party would not submit to wrongful exactions, there would be no difference of opinion that the

person injured could recover such damages as would compensate him for the injuries sustained. Nor would it be said that the injured party must submit to extortion or unjust demands to relieve the offending party of the damages that he might be subjected to as a consequence of his wrongful act. And this court is unable to perceive why a carrier should occupy a more favorable position in this respect than the ordinary citizen.

Injury to Conductor Putting in Route Sign.

A conductor being directed to take out a car for a certain route and finding that the designation blocks attached to the roof of the car could not be worked was told to put in slat signs. He climbed on the dashboard, rested his weight upon the roof of the car until he got near enough to reach the sign, and then endeavored to place a slat under the band which held the frame. The band came off, and he fell. The appellate term of the supreme court of New York holds, *Carroll v. Union Railway of New York City*, 101 New York Supplement, 745, that the coming off of the band did not establish the negligence of the company. It says that the purpose of the band was to hold the slats or signs, and it could not be inferred ipso facto (by the act itself), in the absence of all evidence, that in getting upon the dashboard the conductor was induced to rely to any extent upon it for support. The mere happening of the occurrence was not proof of liability. Moreover, when it was considered that the band was used only for the purpose of keeping the sign in place, was not its breaking immaterial? Was not the reasonable solution of the plaintiff's own testimony upon this point that for some unexplained reason he lost his balance, and in falling tore off the band, which under no circumstances could have been expected to resist the strain of his weight?

Conductor Dragged Into Pit at Shop.

A conductor was walking behind a car to guide the trolley pole along its wire, when, as he testified, all of a sudden the motorman shot ahead into the car shop, the pole came off, the ropes twisted around his hand and kind of lifted him, and dragged him into a pit inside of the car barn or shop, injuring him. But the second appellate division of the supreme court of New York holds, *Dulfer v. Brooklyn Heights Railroad Company*, 101 New York Supplement, 207, that while the pit was a cause without which there would have been no injury, yet the proximate cause of the injury was the conduct of the motorman, who was a fellow servant of the conductor. Moreover, it thinks that it could not be said that the company in the exercise of due care should have foreseen that in such a situation as was described its motorman might have managed a car so as to carry one in the relative situation of the plaintiff off his feet and cast him down into a pit ten feet within the barn.

Justice Gaynor, concurring, says that the plaintiff testified that he did not know there were pits in the repair shop and was not instructed that there were any, and on this the case was sent to the jury. But it is submitted that this testimony was wholly incredible. It is a matter of common knowledge that pits are necessarily there. We all know it, and yet this court was asked to credit a railroad employe who said he did not know it. Courts should not allow themselves to be imposed on by obvious falsehoods; to do so gives a false notion of the administration of justice, and hegets disrespect for it. The belief that courts can be fooled should be dispelled. Aside from this, the proximate cause was the negligent act of the motorman, his shooting of the car ahead so suddenly and rapidly. Even if the plaintiff knew the pit was there he would have been dragged into it just the same by the rope which entangled his hands. It followed that the failure to inform him that pits were in the shop was of no importance—if the court was to accept his pretense that he did not know it.

News of the Week

Central Electric Railway Association.

Mr. H. A. Nicholl, president, announces that the regular meeting of the Central Electric Railway Association will be held at the Algonquin Hotel, Dayton, O., on Thursday, March 28, 1907. The meeting will assemble at 10:30 a. m. and after a brief business session the following papers will be read: "Track Bonding," by Thomas B. McMath, chief engineer, Indianapolis Traction & Terminal Company, Indianapolis, Ind.; "Car Wheels for Interurban and City Service," by C. Skinner, master mechanic, Scioto Valley Traction Company, Columbus, O.; "Trolley Wheels," by M. M. Baxter, electrical engineer, Western Ohio Railway, Lima, O.; "Car Inspection," by Lees M. Jacques, master mechanic, Ft. Wayne & Wabash Valley Traction Company, Ft. Wayne, Ind.; and the report of the committee on "Express Company Contracts with Interurban Railways." A special car will leave the Traction Terminal station at Indianapolis promptly at 6 a. m. for Dayton and those desiring to make the trip are invited.

Philadelphia Traction Situation.

By a vote of 77 to 76 the house of representatives of the Pennsylvania legislators voted down on March 19 the Fahey bill, which was based on the recommendation of the Retail Merchants' Association that a new law be enacted which would enable the city of Philadelphia to enter into contracts with the Philadelphia Rapid Transit Company in accordance with the plan approved by the directors of the company.

The Trades League has received an opinion from its counsel, J. C. Jones, criticizing the McNichol and Fahey bills, which have been introduced in the Pennsylvania legislature for the purpose of making it possible for the city of Philadelphia to negotiate with the Philadelphia Rapid Transit Company. The Trades League will try to persuade other organizations which have shown any opposition to the Retail Merchants' Association plan to join in the protest against the plan, which has been approved by the directors of the Transit company. At the meeting of the Trades League at which this action was decided upon, a resolution was offered and passed commending the Rapid Transit company for its Market street elevated structure.

Both Car Gates Open in New York.

As the result of an ordinance which went into effect on March 12, an order has been issued by the New York City Railway Company directing that both gates on the rear platform of surface cars running in upper Broadway be kept open between Fifty-ninth and Manhattan streets. The order was brought about at the request of citizens of the upper West Side, who stated that the space between the tracks between the points mentioned is wide enough to give ample standing room for passengers getting on and off the cars, and it was also maintained that the space between the tracks and the curb is so narrow as to endanger the safety of persons waiting to take cars or leaving them hastily, on account of the possibility of being run down by passing vehicles. Oren Root, Jr., vice-president and general manager of the company, is quoted with reference to the new order as follows:

"Passengers are accustomed to leaving the cars by the right gate. They are also accustomed to leaning against the closed left gate. The distance affected by the new order is so short that passengers will never get accustomed to the left gate being open. Enough accidents happen now from people falling from the cars. The accidents along upper Broadway will be more than doubled."

Rapid Transit Affairs in New York.

The rapid transit commission on March 16 began advertising for bids for the construction of the Center street section of the bridge subway loop, known as route No. 9. Bids will be opened on April 11. The work is to be completed in 21 months and the successful bidder must give a bond of \$300,000. A public hearing on the form of contract for the Seventh and Eighth avenue routes will be held on March 25.

Corporation Counsel Ellison on March 18 advised comptroller Metz that the city is in no way responsible for the damages to property along Park avenue caused by the building of the subway. The amount of damages was fixed by a referee at \$350,000 and the property owners brought claims against the city, but the corporation counsel says that the city was not a party to the proceedings to fix the damages and that the responsibility rests with the contractors or the rapid transit commission; that the city is not liable for any of the acts of a commission appointed by the state. The Interborough Rapid Transit Company has expressed a willingness to pay half the amount.

The Retail Dry Goods Association has adopted the report of a committee appointed to investigate the transit problems of the city and has adopted resolutions pledging the association to take an active interest in the future in all questions relating to rapid transit facilities. In view of the growing needs of the city, the association thinks that if the municipality on the one side and the traction capital and experience on the other, would "unite in a common purpose and eliminate the friction habitually arising between them, they could bring about some solution of this vexing problem." In conclusion it was resolved that a committee be appointed from the members of the association, "whose duty it shall be to take up this problem and confer with all the authorities, state and municipal, with all the interests represented in the transportation systems of New York and with all other local organizations and

civic bodies and with full power to discuss and negotiate, formulate and report any plan or plans, looking to that relief, of which the whole people of the city stand greatly in need."

Theodore P. Shonts, the new president of the Interborough-Metropolitan Company, has been conferring with the heads of various civic organizations to learn their ideas as to the improvement of the street railway service. As a result of the conferences it is stated that there will be organized a central civic organization with representatives from 53 civic organizations, and that Mr. Shonts will take up transit problems with this central body.

Officers' Association of the Ft. Wayne & Wabash Valley Traction Company.

The Ft. Wayne & Wabash Valley Traction Company of Ft. Wayne, Ind., which operates an extensive system of about 150 miles of electric railways in northern Indiana, has recently adopted a plan for promoting the general welfare of the company and securing the benefits of co-operation among the official staff, which should be productive of excellent results. The "Officers' Association of the Ft. Wayne & Wabash Valley Traction Company" has been organized, the membership consisting of the heads of the various departments of the company and such other employes as in the opinion of the president of the association may seem desirable. The object of this organization, as stated by the constitution, is the advancement of the welfare and the best interests of the Ft. Wayne & Wabash Valley Traction Company, the attainment of the highest possible operative efficiency and through co-operation and the interchange of ideas, plans and experience the mutual benefit of all members of the association.

The association has the usual officers, the general manager of the company, C. D. Emmons, being ex-officio president of the organization. Regular meetings are to be held on the first and third Monday of each month and an annual meeting is to be held on the first Monday in March of each year.

Transfer Rule Upheld.

The appellate division of the supreme court of New York has decided, in the case of Ketchum v. New York City Railway Company, on March 15, 1907, that the rule requiring the passenger to ask for a transfer at the time of paying his fare is reasonable and that the company may refuse to issue a transfer if asked for at any other time. Justice Scott wrote the opinion of the court, in part as follows:

"That a common carrier of passengers not only has the right, but is bound, to make rules and regulations to insure the safe, effective and comfortable operation of its corporate business is undoubted, and it is equally clear that it is entitled to adopt and enforce rules designed to protect itself against fraud and impositions.

Proceeding to discuss the specific regulation in question in the present case, Justice Scott says that the company is clearly entitled to protect itself against dishonest passengers who might seek to obtain more than one transfer. Continuing, Justice Scott says:

"The evidence shows, and common experience verifies the fact, that at certain hours the defendant's cars are very crowded, and it would be an impossible task to require a conductor to carry in memory every passenger to whom he had given a transfer in the course of a long trip. Under this system the only passenger likely to be inconvenienced because he had not demanded a transfer upon beginning his journey would be one who started without the intention of transferring, and then, during the trip, changed his mind. We see no reason to suppose that such cases would be at all numerous. We are, therefore, of the opinion that the regulation in question, considered with respect to the system now in operation, is reasonable and lawful."

The plaintiff was awarded a judgment of \$62 in the municipal court, which was later confirmed by the appellate term. The appellate division now reverses this judgment.

Iowa Street & Interurban Railway Association.

Secretary and Treasurer L. D. Mathes has announced the final programme of the fourth annual convention of the Iowa Street and Interurban Railway Association, to be held at the Lafayette Inn, Clinton, Ia., on April 19 and 20. The following papers will be read: "The Steam Motor Car—Its Value for Interurban Service," by W. G. Wagenhals, who is the inventor of the car to be described; "Amusements—How Should This Feature Be Handled by Operating Companies," by H. W. Garner, general manager Oskaloosa Traction & Light Company; "Freight Handling by Electric Lines," by H. H. Polk, president Interurban Railway; "Joint Operation of City and Interurban Cars Over City Tracks," by Isaac B. Smith, traffic manager Iowa & Cedar Rapids Railway & Light Company; "Effective Methods of Handling Peak, or Rush-Hour Traffic on City Lines," by E. L. Kirk, general manager Sioux City Traction Company; "Modern Train Dispatching Methods on Electric Railways," by P. P. Crafts, general manager Iowa & Illinois Railway.

This programme is one which will be of great interest and value not only to the members of the Iowa association but to the street railway fraternity in general. The several numbers are in the hands of men who are entirely capable of handling them in an able manner.

The local committee, consisting of Mr. P. P. Crafts, R. M. Howard and Thomas Crawford, have also announced the arrangements which have been made for the benefit of the guests both to this convention and to that of the Iowa Electrical Association, which will also be held at the Lafayette Inn on April 18 and 19. As is customary at conventions, it will be necessary for delegates to double up at the hotel rooms. Rates at the Lafayette Inn are from \$2.50 to \$3.50 a day for each person on the American plan.

Reservations have also been made at the Revere House and the Grand Hotel at the same rates. Space for manufacturers' exhibits, also current for light and a limited amount of power will be provided in the basement of the Lafayette Inn, free of charge. The current furnished will be single-phase, 60-cycle, 110 and 220 volt alternating, and 600-volt direct current. Guests are requested to advise the committee by April 15 of their space reservations and the amount of current required. The committee has provided for several entertainments for the delegates. Badges of all delegates will be accepted for transportation on the Clinton Street Railway, Iowa & Illinois Railway and the Tri-City Railway.

Arrangements have been made with the Western Passenger Association for a rate of one and one-third single-trip fare on the certificate plan, from any part of the state of Iowa and from Chicago, St. Louis and Minneapolis, based on a single-trip rate of three cents per mile.

Paralleling of Steam Roads by Electric Lines.

The appellate division of the supreme court of New York recently gave a decision ordering the state board of railroad commissioners to grant a certificate of convenience and necessity to the Rochester Corning & Elmira Traction Company for building its proposed line connecting the cities named. The certificate had been denied at the time of the application on the ground that the territory was already adequately served by the Erie Railroad. In delivering the decision the court said:

"The question was not whether the through transportation facilities between termini or even between the larger cities were inadequate, but whether the people living along the line of such steam railroad and between its stations required additional facilities. Indeed, between points a long distance apart the trolley roads do not compete with the steam roads. The passengers and freight which the former carry are as a rule carried to the station of the latter. In all essential respects the two serve separate purposes each equally necessary to the convenience of the public.

"This policy has been adopted by the board of railroad commissioners so uniformly that it may be regarded as the settled policy of the state, to-wit: to permit steam railroads to be paralleled by trolley roads, however ample the facilities furnished for travel by such steam roads between terminal points or between principal stations, and so notwithstanding such trolley road may reduce the earnings of the steam roads. The primary purpose of a trolley road is to convey people directly from their homes to the nearby villages or cities or vice versa."

The opinion further states that facilities for through service between Rochester, Corning and Elmira are now reasonably adequate, but the evidence demonstrates that the facilities for local traffic are wholly inadequate; that trains are run infrequently; that the stations are comparatively long distances apart, and that a considerable portion of the territory is not accommodated by existing railroads, which will be more closely paralleled by the proposed railroad than such railroads usually have been by such construction in other parts of the state. The fact that the Erie proposes to electrify its line does not alter the proposition, as electrification will not convert it into a street surface railroad. The opinion continues:

"The passenger trains may run more frequently, but with all the changes suggested, the people along the route will not have such facilities as is understood will be afforded by a street surface railroad. The evidence shows that the population to whom the line of the proposed road would be reasonably accessible averages between 400 and 500 per mile, not including the population of either Rochester or Elmira, and the evidence very conclusively shows that such population has at the present time very inadequate transportation facilities along the greater part of such route. That fact becomes apparent upon examination of the time tables of the existing roads."

Legislation Affecting Electric Railways.

Iowa.—A bill has been introduced in the house which gives automobile lines running on tracks the same status under the laws as electric interurban lines.—Another bill before the house provides that city railways must allow all interurbans the use of their tracks, trolley wires, power, depots and warehouses to enter the city. It provides that if the interurban and the street railway cannot agree as to the terms of the compensation which the interurban is to pay the street railway for the use of its tracks and other property the state railroad commission shall fix the compensation. A bill requiring that the vestibules of street cars shall be enclosed on all sides for the protection of employes has passed both houses of the legislature.

Massachusetts.—It is reported that a bill will be introduced in the legislature to allow interurban electric roads to build elevated structures on which to enter cities.

Minnesota.—A bill introduced by T. J. Brady of St. Paul makes it unlawful for any street car company or its employes in charge of the cars to carry or permit to be carried more than 15 passengers in excess of the seating capacity of the cars.—Two bills for reduced fares have been considered by the committee on express, telegraph and electric railways, one providing for a 3-cent fare in rush hours and another for eight tickets for 25 cents.—Another bill provides that in addition to any liability now existing by law, every street railway company shall be liable to each passenger of such company for damages in an amount to be fixed by the jury for failure to perform any duty owing by it to any of its passengers. The bill provides that this bill shall not affect the liability of such companies under the existing laws nor shall it be construed as in any way limiting the right to recover for personal injuries as now authorized by law.

Missouri.—The house has passed a resolution for a constitutional amendment authorizing the city of St. Louis to issue bonds for the construction of a municipal subway.—The house has defeated the 5-cent fare street railway bill, which was introduced to prevent the St. Joseph street railway from charging a 15-cent fare for a round trip to its park at Lake Contrary.—An ordinance introduced into the St. Louis city council provides for 3-cent fares within the city and five half-fare tickets for 10 cents for children between the ages of 3 and 12 years.

Nebraska.—A committee of the senate has recommended for passage a bill passed by the house creating a state railway commission, whose powers include jurisdiction over street railways, which are declared to be common carriers.

New York.—The senate judiciary committee and the assembly railroad committee will hold a joint hearing on March 27 on the "public utilities" bill. At the same hearing other bills relating to New York rapid transit will be considered, including Senator Foelker's bill providing for a New York city railroad commission, Senator McCarren's bill abolishing the present rapid transit commission and Senator Grady's bill providing for a public utilities commission for New York city, to have charge of railways, lighting and telephone companies. Mr. Grady has also introduced a bill providing for a 5-cent fare and universal transfers within the city limits on lines controlled by one company.—Senator Saxe has introduced a bill providing for the removal of the New York Central tracks from Eleventh avenue. It provides for a subway between Thirtieth street and Sixty-second street, with accommodations for six tracks, all to be constructed at the expense of the company; from Seventy-second street to One Hundred and Twenty-second street and from One Hundred and Forty-sixth street to Spuyten Duyvil the tracks are to be walled up at the expense of the railroad company and covered over at the expense of the city out of the money to be paid by the railroad company for the right of way to be granted west of the present tracks; between One Hundred and Twenty-second street and One Hundred and Forty-sixth street an elevated structure is to be erected to meet the grade and to permit the intervening streets to have a clearance to the river front. Electricity is the motive power provided for.

Pennsylvania.—The bill introduced by Representative Fahey to permit the reorganization of the Philadelphia Rapid Transit Company under the plan proposed by the Retail Merchants' Association has been defeated by the house of representatives by a vote of 76 to 77. The bill provided that any city, borough or township may enter into contracts with any street railway, surface, elevated, underground or motor power company, leasing and operating the franchises and property of such company, within the limits of the municipality or townships, affecting, fixing and regulating the franchises, powers, duties and liabilities of such companies and the regulations and respective rights of the contracting parties.—Another bill introduced by Mr. Fahey, requiring traction companies to secure the right of way from local authorities before being granted a charter, has been amended so that the same provisions shall apply to existing companies desiring to make extensions.—The Homsher bill giving the right of eminent domain to electric railways has been recommitted and a substitute bill has been introduced in the form of an amendment to the general electric railway laws of 1899, providing that in order to avoid dangerous curves, heavy grades, streams, public bridges or grade crossings, companies shall have the right to acquire and occupy private property for the laying of tracks, and shall be empowered to divert their tracks from the highway to the property, and from thence back to the highway whenever and as often as they may deem it expedient to do so.—The strip which may be condemned for ordinary trackage is not to be more than 45 feet wide, and the right of eminent domain is conferred when the owners of at least 51 per cent of the foot frontage of the proposed route give assent to the construction of the line.

Tennessee.—A bill to take the power of assessment of street railways from the railroad commission and to give it to the local tax assessors has been defeated by the senate.—A bill has been introduced in the house which requires street railways to equip their cars with projecting fenders in front, made and attached to the car according to the latest improvements and modern methods of the art.

Texas.—The so-called "Jim Crow" law, providing for separation of races on street cars, has been passed by both houses. In many cities of the state the provisions of this law are already enforced by city ordinances.

Block Signals for Ft. Wayne & Wabash Valley.—The Ft. Wayne & Wabash Valley Traction Company has arranged for the installation of manually operated block signals at points where the interurban cars enter the city of Ft. Wayne.

Service Hearing at Richmond.—The Virginia Corporation commission will hold a public hearing at Richmond on March 27 to hear complaints of the mayor of Portsmouth against the Norfolk & Portsmouth Traction Company on account of alleged defects in the service.

Grand Rapids Railway Increases Wages.—General Manager B. S. Ifanchett of the Grand Rapids (Mich.) Railway Company has announced that at the recent meeting of the directors it was voted to increase the wages of conductors and motormen 10 per cent, effective on June 1.

File Bills Against Yerkes Estate.—The North Chicago Street Railroad Company and the West Chicago Street Railroad Company have filed bills in the United States circuit court in order to secure from the Yerkes estate an accounting of the transactions of the late Charles T. Yerkes with the North Shore Electric Railway

Company and the Chicago Union Traction Company, and his alleged appropriation of funds that belonged to the companies.

Ask for Reduced Fare.—The West End Improvement Club of Council Bluffs, Ia., has filed a complaint with the interstate commerce commission asking that the Omaha & Council Bluffs Street Railway be compelled to reduce its present rate of 10 cents for carrying passengers from Council Bluffs to Omaha.

Pittsburg Railways Company Increases Wages.—An increase of pay for conductors and motormen of 2 cents an hour has been announced by the Pittsburg Railways Company, effective on April 1. Under the new scale the men will receive 25 cents an hour for the first two years, 26 cents an hour for the third year and 27 cents an hour thereafter.

Butte Street Railway Strike Settled.—The strike of the motormen and conductors of the Butte (Mont.) Electric Railway, which completely tied up the street railway service of the city for two days, March 19 and 20, was settled on March 20 when the company agreed to an increase of wages from \$3.00 to \$3.50 a day and the men agreed to return to work on the following day.

To Instal Telephone System.—The Detroit, Jackson & Chicago Railway has decided to instal its own telephone system for car dispatching instead of using a leased line of the Michigan State Telephone Company as at present. Fifty-three instruments have been ordered from the Stro-nberg-Carlson Manufacturing Company of Chicago and a new switchboard will be installed at Ypsilanti, Mich., which will continue as the dispatching headquarters.

Indiana Columbus & Eastern Mileage Book.—A coupon book containing coupons for 350 miles was placed on sale on the Columbus & Zanesville, Dayton & Union and Dayton & Richmond divisions of the Indiana Columbus & Eastern Traction Company this week for \$5. The books are good only on the divisions on which they are sold, and it is expected that all the divisions of the company will be supplied within the next few weeks. The books are good for bearer or a party of two or more, and by use of them the rate is reduced to 13-7 cents a mile. The books also contain coupons for checking baggage.

Evening Course of Instruction in Electrical Engineering.—It has been announced that the regular evening course in electrical engineering was started on March 18, 1907. The hours are from 6 to 10, four evenings a week—Monday, Tuesday, Wednesday and Thursday. The first year's course is physical laboratory work, covering mechanics, heat and light. The second year's course covers the rotary converter and the alternating and direct-current generator and motor characteristics. The third year's course covers alternating current generators and motors, over a very complete range of conditions and uses. The work is in charge of Messrs. Woodworth, Rogers & Nies.

Rental for Tunnel Exits.—The rapid transit commission of New York has filed a certificate to the Hudson & Manhattan Railroad defining the terms of the rental to be paid to the city of New York by the railroad company for exits from its tunnel, now being built under the Hudson river, to be situated in Fourteenth street, near the westerly side of Sixth avenue; Twenty-third street, near the westerly side of Sixth avenue; two on Twenty-eighth street, near the easterly side, and near the westerly side of Sixth avenue. The certificate also defines what space is to be considered and paid for as vault space, and fixes payments to be made for such space at 4 per cent per annum, on the valuation of horizontal area occupied. The mode of calculating payments is based on valuation placed on the adjoining property. Payments to the city are to be begun on the day when the railroad company shall commence actual operations.

Test of Street Railway Fenders and Wheel Guards.—A pamphlet has been issued by the commonwealth of Massachusetts setting forth the result of about 50 experiments made on 10 different makes of fenders, under the supervision of the board of railroad commissioners. The tests were made on dummies for the most part, lying in different positions on the ground between the rails, and only in a few cases were the dummies supported in an upright or standing position. The speed of the car was in general from 3 to 10 miles per hour. While the results of these experiments are interesting, the value is, to say the least, doubtful, though they may possibly indicate the fenders and wheel guards which are absolutely worthless and possibly more a source of danger than a protection to pedestrians. With dummies it is certainly an impossibility, under the most favorable circumstances, to determine their true value in saving life, and they will furnish absolutely no indication as to the effect that they will produce on the limbs of human beings.

Dedication of Engineering Societies Building.—The preliminary plans for the dedication week of the new engineering societies building in New York have been announced. On Tuesday, April 16, there will be formal dedication exercises in the afternoon and a general reception in the evening. On April 17, designated as "Founder's Day," there will be addresses by representatives of the founder societies and institutions. On the afternoon of April 18 there will be a session of the American Institute of Mining Engineers, at which H. T. Hildage will present a paper on "Mining Engineering in New York City," describing the excavation and tunnel work now being carried on by the Pennsylvania. On the evening of April 18 there will be a session of the American Society of Mechanical Engineers, at which Brig.-Gen. William Crozier will make an address on "The Ordnance Department as an Engineering Organization." On April 19, there will be a session of the American Institute of Mining Engineers and an informal smoker for members of all societies.

Construction News

FRANCHISES.

Boston, Mass.—A franchise has been granted to the Boston Elevated Railway for an electric line through the Middlesex Falls Parkway from Union Park in Somerville to Spot Pond. The line will be 4½ miles long and its terminal will be near the Winchester reservoirs and Bear Hill observatory.

Davenport, Ia.—Application for permission to build a street railway in Davenport has been made by Alfred Hurst, Owen McCaffrey and H. M. Tracey. This will be part of an interurban line which it is proposed to build from Maquoketa to Davenport. The franchise if granted will give the company the right to use the tracks of the Davenport & Suburban Railway in Front street between Main and Perry.

Decatur, Ill.—A 50-year franchise to build its line through Decatur has been applied for by the Decatur Sullivan & Mattoon Transit Company. It is stated that arrangements have been made for an interurban station on East William street, and that all right of way has been secured along its proposed line.

Elyria, O.—The Cleveland Southwestern & Columbus Railway Company has made application for permission to lay additional tracks on various streets, including a double track on the new Broad street bridge and for a 25-year extension of its existing franchises.

Janesville, Wis.—H. H. Clough, Madison, Wis., has filed acceptance of the franchise recently granted to the Madison & Janesville Interurban Railway, which proposes to build a line between Madison and Janesville by way of Edgerton and Stoughton. When this is completed a continuous line between Madison and Chicago will be in operation.

Kansas City, Mo.—The Kansas City St. Joseph & Excelsior Springs Railroad is seeking a franchise to cross two streets in Kansas City with the \$3,000,000 bridge which it will build over the Missouri river. It is stated that provision has been made for three other railroad systems to cross the bridge, and that a roadway for pedestrians and teaming traffic will be maintained by means of a toll system. Permission also is sought by the company to occupy certain streets in the north end with its tracks, and to build a tunnel under Locust street from Fifth street to the Belt Line tracks.

Lockport, N. Y.—An application to double track the East avenue line in Lockport to the city line has been made by the International Railway Company of Buffalo. This will form a connection with the proposed electric line from Rochester.

McAlester, Okla.—A 40-year franchise was granted on March 11 to the Choctaw Railway & Lighting Company to build and operate an electric railway in McAlester. The franchise permits the use of T-rails.

Mansfield, O.—An ordinance has been passed by the city council of Mansfield permitting the Mansfield Railway, Light & Power Company to lay its tracks in certain streets of the city, the franchise to be in force until February, 1925. The line must be built by October, 1907.

Mineola, L. I.—The Mineola Roslyn & Port Washington Traction Company has asked for a franchise to construct its line over certain streets later to be determined upon by mutual agreement between the company and abutting property holders. The New York & Long Island Traction Company also will present application for a franchise to operate its line in Mineola.

Mt. Vernon, O.—A franchise has been granted to the Mt. Vernon Electric Railway Company to extend its lines on certain streets for interurban purposes. The ordinance recently introduced granting a franchise to the Mansfield Southern Traction Company was not passed.

North Yakima, Wash.—A 50-year franchise has been granted to the Yakima Intervalley Traction Company for a local street railway in North Yakima and for a system of interurban lines in the Yakima valley; one from North Yakima through Yakima City and the Moxee district to Zillah, and a branch from North Yakima to Wide Hollow. Five miles are to be completed and in operation within a year, 5 miles completed each year for two years thereafter, and the entire system, 60 miles, to be in operation in five years. The line ultimately will extend to Priest Rapids on the Columbia river. It is stated that steel rails and other materials are en route from the East, and that actual construction will be started by April 1. W. A. Bell of North Yakima is interested.

Pittsburg, Pa.—The Pittsburg Railways Company has been granted franchises for several extensions to its lines. The Federal Street & Pleasant Valley line will be extended along Robinson and Lacock streets, forming a loop. The Washington avenue bridge measure, which opens the way for a short line to Pittsburg from Avalon to Bellevue over the Union bridge, has been passed by the council. The company also was granted a franchise to operate its line in Woodland avenue from Brighton road to Shady avenue. A 30-day extension in which to complete its Nunnery and Spring Hill lines was granted.

Portland, Ore.—The Portland & Mt. Hood Railway Company has been granted a franchise for terminal facilities in the east side of the city and to lay tracks on the principal streets. This is in con-

nection with the interurban line which will be built to the base of Mt. Hood; from there a cog line will run to the summit and a hotel will be erected on one side of the mountain for the accommodation of tourists. The estimated cost is about \$2,000,000 and several years will be required to finish the road. It is stated that work will be started inside of two months. Dr. McCorkle of Portland is interested.

Richmond, Ind.—The Richmond (Ind.) & Hamilton Interurban Railway has made application for a franchise to build its line from Richmond, Ind., to Hamilton, O., through Boston and Darrtown in Butler county, Ohio. It is stated that the right of way has been secured and financial backing assured by the State Trust & Loan Company of St. Louis, Mo. Herman Duhme, Sr., Wyoming, O., is interested.

St. Louis, Mo.—The ordinance granting the St. Louis Electric Terminal Company, a subsidiary of the Illinois Traction Company, a franchise for lines from the Mississippi river to the heart of the city, was passed last week by the city council. The ordinance is now before the house of delegates for consideration.

Schofield, Wis.—The Wausau Street Railroad Company has been granted a 35-year franchise in Schofield for the Wausau-Stevens Point line.

Seattle, Wash.—The Seattle Electric Company has applied for franchises for the new extensions to South Park and Ranier Beach. Action will be taken by the county commissioners on April 17.

Troy, N. Y.—The Trojan Railway Company, incorporated in New York on March 15, has applied for a franchise to build its 1½-mile line in several of the streets of Troy. The United Traction Company also is seeking permission to extend its lines in Troy. The board of contract and supply has the applications under consideration.

Washington, Pa.—A franchise has been granted to the Pittsburgh Railways Company by the East Washington borough council to lay its tracks on East Beau street. It is stated that the road will be completed by the middle of September.

Yonkers, N. Y.—The Bronx Yonkers & White Plains Railroad has been granted a franchise for a line from Yonkers to White Plains, 11 miles. Practically all of the necessary consents of property holders have been obtained.

RECENT INCORPORATIONS.

Belt Line Street Railway.—Incorporated in Pennsylvania to build one mile of road in Ellwood City, Lawrence county. Capital stock, \$6,000. George W. Young, president.

Bolivia Railway.—Incorporated in Connecticut to construct and operate public utilities in South America and to build and maintain railroads, steamboat lines, telegraph and telephone systems. Capital stock, \$10,000,000. Incorporators: Jacob G. Metcalf, Lake-wood, N. J., president; Edward W. Burdick, Englewood, N. J., vice-president; H. Starr Giddings, New York City, secretary and treasurer.

Georgia Electric Railroad.—Incorporated in Georgia to extend the present Brookwood line of the Georgia Railway & Electric Company to Buckhead, Ga. Its incorporators include several stockholders of the latter company. It is stated that as soon as the new bridge over the railroad at Brookwood is completed and the present county line to Buckhead has been widened, work on the new line will be started and possibly cars be in operation next fall. By its completion a direct line from Buckhead to Atlanta will be afforded. Incorporators: P. S. Arkwright, Thomas K. Glenn, G. W. Brine, H. N. Hurt, S. E. Simmons, W. H. Glenn, Atlanta, Ga., and R. E. Cullinane, W. B. Stovall, F. M. Sisk and W. H. Wright.

Index & Northern Railroad.—Incorporated in Washington to build an electric line from Index to Mineral City, 16 miles. Capital stock, \$1,000,000. Incorporators: C. F. Naething, New York; John S. Jurey and T. E. Ellis of Seattle.

Prairie State Traction Company.—Incorporated in Illinois to build an interurban electric line from Whitehall and Roodhouse to Pana, Ill., through Athensville, Scottville, Palmyra and Girard. Principal office, Whitehall; capital stock, \$6,000. Incorporators: A. P. Grout, Winchester; Jett A. Kirby, Jerseyville; E. S. Greenleaf, Jacksonville; H. C. Morrow and H. O. Tunison, Whitehall; James Walker, Scottville; Scott Etter, Palmyra; W. H. Bowen, Alton, and George Morrow, Athensville, Ill.

Puget Sound Skykomish & Eastern Railway.—Incorporated in Washington to build an electric road from Index to Galena, 10 miles. Capital stock, \$500,000. Incorporators: Nicholas Rudibeek, E. H. Guie and S. P. Eckl.

Trojan Railway.—Incorporated in New York to build and operate an electric street railway in Troy, N. Y. The line will be double-track and will be built in what is known as the North End. It will traverse the following streets: From Second avenue on East Eighth street to Fourth avenue, north to Tenth street, east to Sixth avenue, north to Twentieth street and thence to Second avenue, about 1½ miles. Incorporators: Joseph A. Powers, president; J. Thomas Dennin, vice-president; A. R. Joy, secretary; Andrew L. Draper, treasurer; John Flynn, Daniel J. Halpin, Thomas O'Connor and C. A. Roemer, all of Troy; Henry A. Fitzsimmons of Waterford, and others.

Walsenburg & Western Railway.—Incorporated in Colorado to build an electric railway to connect various points in Huerfano, Costilla and Saguache counties. Capital stock, \$100,000. Incor-

porators: E. W. Griffith, L. E. Rowland, F. E. Guy, George C. Barnard and F. J. Jackson, all of Denver.

Waumandee Railroad.—Incorporated in Wisconsin to build a railroad from Waumandee to either Cochrane or Fountain City, Wis., about 12 miles. Capital stock, \$125,000. Incorporators: R. S. Cowie, J. M. Smythe, Whitehall; F. C. Richmond, Arcadia; B. L. Van Gordon, Taylor, and G. O. Linderman, Osseo.

TRACK AND ROADWAY.

Alabama City Gadsden & Attalla Railroad.—This company is reported to have ordered rails for 18 miles of extensions. J. D. Gaboury, general manager, Gadsden, Ala.

Alfarata Electric Street Railway, Alexandria Pa.—This company, which was incorporated last December to build an electric railway from Alexandria to Tyrone Forge, Pa., has elected the following officers: John Phillips, president; Henry Knede, vice-president; Samuel Spyker, secretary; W. G. Kanaga, treasurer.

Algiers (La.) Railway & Lighting Company.—It is reported that 14 carloads of T-rails have been delivered for the construction of the line from Algiers to Gretna, La. The girder rails for the city lines are being shipped. The ties and poles, which have been treated by the American Creosote Works at Southport, La., are on the ground, and it is expected that the line will be completed by June 1. R. S. Stearnes, 222 Elmira avenue, New Orleans, general manager.

Atlanta Macon & Griffin Electric Railway.—This company has engaged Arthur Geister, 29 Broadway, New York, to investigate the subject of water power to furnish electricity for the operation of the railway which will connect the towns named in the title. It is stated that work on the construction will begin about April 1. W. J. Kincaid of Atlanta is president.

Alton Jacksonville & Peoria Railway.—Work on this line from Alton to Peoria via Jacksonville, Ill., has been in progress for some time and track is now being laid north from Alton. It is the intention to complete the line to Jacksonville this year; beyond that point the route has not yet been located. Eighty-five pound rails are being used, with the intention of handling freight. A. O. Outten of Jerseyville, Ill., president; Robert Curdie of Alton, secretary.

Batavia Medina & Ontario Railway.—The Orleans Construction Company of Buffalo, N. Y., has a contract for building a single-track railway from Olcott to Batavia, N. Y., via Somerset, Lyndonville and Medina.

Beaumont (Tex.) Traction Company.—It is expected that the construction of the extension of the Park street line to the Joachimi addition, about 2 miles, will be completed in about three weeks. The track is all laid.

Beloit Traction Company.—The first carload of rails and special work has arrived for the 6-mile city system this company is to build this spring at Beloit, Wis. It is expected to have the road in operation by July 1.

Biltmore, N. C.—A corps of surveyors is now engaged in making a preliminary survey for an electric line to run from Biltmore to Montreal, N. C., 18 miles, connecting at Biltmore with a line from Asheville. It is stated that financial arrangements have been made and that construction will begin at once.

Boston, Mass.—Bids will be received by the Boston Transit Commission until April 4 for constructing section 6 of the Washington street tunnel.

Brighton & Newcastle Railway.—This company is now surveying the route for an electric line from New Brighton to Newcastle, Pa., with a branch to Ellwood City and Wampum.

Bruce & Farish Interurban Railroad.—This company has been organized in Los Angeles, Cal., to build an electric railway through the fruit section and will be ready to let contracts some time during May or June. The officers are: Wainwright Mollisai, president; Frank Ferriss, vice-president, and F. L. See, secretary. The capital stock is \$700,000. Surveys are now being made, although the route has not yet been announced.

Brunswick & Middletown Electric Railway.—This company, recently incorporated at Brunswick, Md., to build an electric line from Brunswick to Middletown via Petersville, now has a corps of engineers making a preliminary survey of the road. William Schnauffer of Brunswick is one of the incorporators.

Calgary, Alta.—It is reported that the city council has decided to build a municipal street railway 12 miles long with an equipment of 12 cars. W. L. Thorold, city engineer.

Canadian Pacific Railway.—It is reported that this company has become interested in the West Kootenay Power & Light Company of Roslyn, B. C., and will utilize the power thus developed in the electrification of several of its mountain divisions.

Canton & Youngstown Railway.—This company has let a contract to the Collins Construction Company of Chicago for the construction and equipment of an electric single-track line, connecting the cities of Canton and Youngstown, O., with a spur from a point north of Congress Lake to the city of Akron, in all about 65 miles of track. The road has three terminals with a population of 50,000 and upward, each. The average population served, per mile, including terminals, is over 3,200, and the road opens up between Akron and Youngstown a new country not now having trolley facilities. A large part of the bond issue has been provided for. Herman C. Raff, 63-65 Wall street, New York, is interested.

Chattanooga Railways.—It is stated that this company will build an electric railway line up Lookout mountain. Surveys have been made. D. J. Duncan, Chattanooga, Tenn., general manager.

Chester (Pa.) Traction Company.—By a decision of the Pennsylvania Supreme Court this company must depress its tracks on the Chester and Darby pike for a distance of about 6 miles out of Chester, to the level of the highway.

Chicago Lake Shore & South Bend Railway.—President J. B. Hanna, South Bend, Ind., has announced the plans for terminal arrangements at Kensington, Ill., where connection is to be made with the Illinois Central Railroad, running into Chicago. Both roads will build terminal stations at Kensington, connected by a subway, and through tickets will be sold. The road is now under active construction from South Bend, Ind., and 15 miles of track-laying has been completed.

Chicago South Bend & Northern Indiana Railway.—It is reported that this company is making arrangements to operate a joint through limited cars from South Bend to Warsaw, Ind., by way of the Winona Interurban Railway. This will require a change in a curve near Goshen.

Cincinnati Bluffton & Chicago Traction Company.—This company is now surveying a line through Wayne county, Indiana, which will run from Bluffton to Portland, Winchester and Richmond, Ind.

Cincinnati Northern Traction Company.—This company is now making preparations for building a new line over a private right of way from Middletown to Hamilton, O., which will be 1½ miles shorter than the present line. Surveys have been made and work is to begin within 10 days. The J. C. Carland Construction Company of Toledo has the contract and agrees to have the work completed by December. The grading involves about 200,000 cubic yards of excavation and filling. The only town to be left out in the change of route is Engleside. C. A. Alderman, chief engineer, Hamilton, O.

Columbus & Lake Michigan Railroad.—Engineers in the employ of the Schoepf syndicate are engaged in making surveys for the entrance of the road into Defiance, O., preparatory to electrifying the road this summer. Much of the track is to be relaid and the roadbed is to be improved.

Consolidated Railway Company, Harford, Conn.—This company is said to be contemplating the construction of an electric road from Dayville through Allawaugan and Ballouville to Pineville, Conn.

Dallas Consolidated Electric Street Railway.—Work is now in progress on the Colonial avenue extension of the Ervay street line and the first two blocks of track have been laid and several curves installed.

Davenport, Ia.—J. E. Voorhies and J. T. Lannigan of Monticello, Rev. M. S. Murphy of Castle Grove, L. Matthews of Manchester, T. B. Miller of Stanwood, A. C. Cole of Olin and George Escher of Tipton, are interested in a proposed line from Davenport to Manchester, Ia., and have secured a right of way from Davenport to Lime City, 25 miles, and a committee of the Davenport Commercial Club has been appointed to take steps toward the formation of a company.

Eastern Pennsylvania Railways Company.—It is announced that this company will soon begin the construction of several extensions, including lines from Minersville to Branchdale and Tamaqua, and possibly to Tremont and Tower City; also from St. Clair to Frackville. Many of the lines running out of Pottsville are to be rebuilt and improved. W. E. Harrington, general manager, Pottsville, Pa.

Evansville Henderson & Uniontown Traction Company.—This company proposes to build an electric railway about 25 miles long through Henderson and Uniontown, Ky., and Evansville, Ind. T. Bethell of Henderson, Ky., is the promoter.

Galion Mt. Gilead & Delaware Railway.—It is reported that this company is meeting with success in securing the right of way for its proposed line from Galion to Delaware, O.

Girard Electric Coal Belt Railway.—A company has been organized at Pittsburg, Kan., with the above title to build an electric railway from Girard east to Mulberry, Kan., through a coal mining territory. President, James McFarland; vice-president, J. A. Wayland; secretary, L. H. Phillips; treasurer, Howard C. Leonard.

Goldfield, Nevada.—It is reported that Los Angeles capitalists, including A. Benham of the Los Angeles & Santa Monica Electric Railroad, are contemplating the construction of an electric road from Goldfield to Tonopah.

Greenfield, Mass.—The construction of an electric railway from Greenfield to Northfield, Mass., is now under consideration by the citizens of this town. The road will be 13 miles in length, and the cost is estimated at \$300,000. C. H. Webster and F. W. Williams of Northfield are interested.

Illinois Traction Company.—Bids are to be opened this week for the grading on the Springfield-Jacksonville line, amounting to about 300,000 cubic yards. The contract will call for finishing the grading by August 1. Surveys have been completed and practically all of the right of way has been secured. It is expected to have the line completed in October.

Indiana & Ohio Traction Company.—It is reported that about \$85,000 has been subscribed of the \$100,000 capital stock of this company, which proposes to build a line from Richmond, Ind., to Hamilton, O., and to secure entrance to Cincinnati over the tracks

of the Cincinnati Northern Traction Company. A. C. Lindemuth of Richmond, Ind., is interested.

Indiana Columbus & Eastern Traction Company.—After a conference with the city authorities of Richmond, Ind., Hugh McGowan of Indianapolis, announced that the company would build a new line through the wholesale district for freight service and that the company would also apply for a franchise for the Dayton & Western division, which has been operating without one.

Indianapolis Crawfordsville & Western Traction Company.—It was announced at a meeting of the directors on March 6 that work on the road is progressing rapidly and that the track will be ready for the operation of cars between Indianapolis and Crawfordsville by June 1, the date that was set some time ago for the opening of the line. The Electrical Installation Company of Chicago are the engineers and contractors.

Indianapolis Huntington Columbia City & Northwestern Railway.—J. E. Sweatt of Russellville, Ky., superintendent of construction, writes that this line is now in construction from Huntington to Goshen, Ind., 66 miles; that it is expected to extend the line ultimately to Indianapolis. Track has been laid this year from Syracuse to Vawter Park, 4½ miles. The line has been surveyed from Huntington to Goshen, 60 miles, and grading has been completed from Vawter Park to Benton, 10½ miles. M. V. Ryan of Utica, N. Y., is the contractor; Thomas A. Bell, St. Louis, Mo., president; D. L. Horner, Upland, Ind., chief engineer. The headquarters of the company are at Syracuse, Ind.

International Railway, Buffalo, N. Y.—President H. J. Pierce in his annual report states that this company proposes to build during the present year an extension through Elmwood avenue and Chippewa, Franklin, Mirgan, Genesee, Pearl and Seneca streets, Buffalo; also a 1-mile extension in Niagara Falls to Riverdale cemetery; an extension of a double-track line for a mile through East avenue, Lockport; an extension of about ½ mile on Delevan avenue, Buffalo.

Inter-Urban Railway, Des Moines, Ia.—We are officially advised by Frank S. Cummins, chief engineer, that this company is not planning any extensions this year which will require the use of any new material, or any contract work.

Iowa City, Ia.—The permanent right of way survey for the Davenport-Iowa City interurban has been completed. The surveyors have been working inside the city limits of Iowa City. They state that the line of the road is almost ideal for easy construction work.

Johnstown, Pa.—The Westinghouse Electric & Manufacturing Company is reported to be preparing specifications and estimates for the complete electrical construction and equipment of an electric railway from Johnstown to Westmont, Pa. Surveys are now in progress.

Kentucky Central Traction Company.—The survey for the line between West Point and Elizabethtown, Ky., was completed last week and nearly all of the right of way has been secured. It is stated that the line will be built this year and extended later to Lincoln Park and Bowling Green. G. J. Lampton, of Louisville is one of the promoters.

Lima & Toledo Traction Company.—C. F. Heidley of Leipsic has secured the right of way for the extension from Leipsic to Toledo as far as Waterville and is now at work between that point and Toledo. It is reported that the Schoepf syndicate is negotiating with the Wabash Railroad Company for the purchase of a part of that company's abandoned crosstown right of way into Toledo, which would give the Lima & Toledo an independent entrance to the city.

Little Rock & Hot Springs Electric Railway.—Financial arrangements are being made for building this line from Hot Springs to Little Rock, Ark., and it is stated that New York men have agreed to take three-fourths of the stock if the remainder can be subscribed locally.

Mansfield & Wooster Electric Railway.—It is reported that financial arrangements are being made for this line which is proposed to connect Mansfield and Wooster, O., 41 miles. Surveys have not yet been made, but a part of the right of way has been secured. Samuel L. Kinsey of Pittsburg, president.

Mt. Hood Railway & Power Company.—This company, which is backed by E. P. Clark and others of Los Angeles, Cal., has surveyed several alternate lines from Portland to Mt. Hood, Ore., and men are now engaged in securing right of way. The success of their efforts will determine the route chosen to a great extent. Plans are being prepared for a \$1,000,000 power plant on the Sandy river. Eighty-pound rails will be laid. F. C. Finkle, Los Angeles, consulting engineer.

Monterey Fresno & Eastern Railway.—It is reported that this company has let a contract for the grading of the entire line from Monterey to Fresno, Cal., 140 miles. Grading is to begin April 1 and be rushed to completion. An order for 13,500 tons of steel rails has been placed with the Lackawanna Steel Company, Buffalo, N. Y. The company will also operate a steamship line between Monterey and San Francisco.

New York Northern Railroad.—This company has been organized with headquarters at Watertown, N. Y., to build an electric railroad from Watertown to Oswego, 56 miles, through Houndsfield, Adams, Henderson, Ellisburg, Sandy Creek, Richland, Mexico, New Haven and Scriba. It is also proposed to extend the line later from Watertown to Carthage and possibly north to the St.

Lawrence river. The territory proposed to be served is at present without railroad facilities. Foster P. Rhines, president, Frank Barry secretary, Watertown.

Northern Traction Company.—Two miles have been graded, between Hibbing and Chisholm, Minn., on this line, which is to run from Hibbing to Biwabik, Minn., connecting the towns of the Mesaba range.

Okanogan Electric Railway.—Reports from Riverside, Wash., are that the electric road, projected by A. M. Dewey of Spokane, which was to be built from Nighthawk to Brewster, Wash., has changed its route and is being surveyed from Nighthawk via Loomis, Fish lake, Johnson Creek valley, across the government's Okanogan irrigation project to the new town of Omak, on the Okanogan river, across the latter, through Omak pass on the south half of the Colville reserve to the mouth of the Spokane river, and thence on to a terminus in Spokane.

Philadelphia & Garrettford Street Railway.—This company, which operates cars from Sixty-third and Market streets, Philadelphia, to Clifton Heights, has decided to continue its line to Collingdale. A loop will be made at Collingdale, and the cars will return again to Sixty-third street and also connect with the elevated line at Sixty-ninth street. Work on this extension will be commenced shortly.

Pittsburg & Butler Street Railway.—The line from Butler to Mars, Pa., is now ready for operation and between Mars and Pittsburg the work is being completed so rapidly that it is expected to have the line in operation by about May 1.

Rochester Railway.—It is reported that the engineering department has in preparation plans for the construction of about 20 miles of additional track in different sections of Rochester, N. Y.

Sacramento Electric Gas & Railway Company.—C. W. McKillip, assistant manager, Sacramento, Cal., writes that this company has recently completed an extension of the Highland Park line from Twenty-fourth and Bonita avenue to Oak Park, via Curtiss Oaks, 6,400 feet. Sixty-pound T-rail is used, laid on 6 by 8 inch by 8-foot ties on a foundation of 6 inches of rock covered with earth.

San Antonio (Tex.) Traction Company.—General Manager W. B. Tuttle has announced that a 2-mile extension is to be built to the North Flores street line, taking in Beacon Hill, Treasure Hill and other suburbs in the northern part of the city. The rails have been ordered. The company is now awaiting rails for the double-tracking of the Hot Wells line, the extension of the San Pedro line and other smaller extensions.

Somerset Water Light & Traction Company.—This company has recently completed and put in operation a new line from Somerset to Ferguson, Ky., a new town just south of the city. W. G. Hunter of Somerset, president.

Southern Light & Traction Company, Natchez, Miss.—W. B. Moorman, superintendent, writes that this company proposes to build an extension from Natchez to the National Cemetery, $\frac{3}{4}$ of a mile.

Southeastern Traction Company.—Surveyors are at work east of Cambridge, O., locating the line which this company proposes to build between Wheeling, W. Va., and Zanesville, O.

Texas Traction Company.—An order has been placed with the Carnegie Steel Company for the 80-pound steel rails for the line from Dallas to Sherman, Tex., 64 miles, delivery to begin this summer. The company has four grading outfits at work between Sherman and McKinney, and now that the engineers have completed the work of locating the line south of McKinney, grading forces will this week be put to work between that point and Dallas, and the grading pushed to completion by the time the rails begin to arrive. J. F. Strickland of Dallas is president; F. A. Jones, Dallas, chief engineer.

The City Traction Company, Grafton, W. Va.—This company has been organized with John T. McGraw of Grafton, president, to build a street railway $2\frac{1}{2}$ miles long.

Toledo & Chicago Interurban Railway.—Orders have been placed for the rails and ties to be used on the extension from Auburn to Waterloo, Ind., and as soon as the material is on the ground it is expected to begin construction. Surveys are being made from Waterloo west to Kendallville, paralleling the Lake Shore & Michigan Southern Railway. It is planned to build a spur from Brimfield to Albion and Rome City. F. B. Perkins, general manager, Kendallville, Ind.

Toledo Fostoria & Findlay Railway.—This company, which now has a line in operation from Findlay through Fostoria to Ploverville, O., is now planning to build on to Toledo this spring, a distance of 17 miles. It is expected to enter the city over the Lake Shore Electric Railway tracks, probably from Cronillard's Corners. The company has advertised for bids for ties and is planning to push the work. J. E. Reeves of Canal Dover, O., is president.

Tulsa Street Railway.—Tracklaying on the street railway in Tulsa, I. T., has been commenced. It is the intention to have two miles completed and in operation by May 1. C. H. Bosler, president.

United Railways & Electric Company, Baltimore, Md.—It is reported that this company will erect a power house near Bay Shore Park to cost about \$100,000, and two substations, one on West Lombard street and the other on Hartford avenue. C. O. Vandevanter, chief engineer.

Utah Light & Railway Company.—It is reported that this company is preparing plans for the construction of a substation in Salt Lake City. O. A. Hannonid, electrical engineer.

Walla Walla Valley Traction Company.—I. W. Anderson, president of the Northwestern Gas & Electric Company, which has acquired the property, states that the work of erecting poles and wires and laying the track is progressing rapidly and that cars should be operated over the line from Walla Walla to Milton and Freewater, Wash., in 60 days.

Washington Baltimore & Annapolis Electric Railway.—Every effort is being made to have this line completed between Baltimore and Washington by July 1. The main line between Baltimore and Washington, about 40 miles, will be double-tracked the entire distance and 80-pound rails will be used. The Annapolis Washington & Baltimore steam road, which extends from the main line at Odenton, Md., to Annapolis, 14 miles, is being electrified and the 56-pound rails are being replaced with 80-pound steel. Most of the grading has been completed and rapid progress is being made on the five bridges. There will be no grade crossings on the line and few curves. Construction crews have been at work night and day for about two months on the grading in several deep cuts and on the concrete subways under railroad crossings. The Baltimore terminus is at Park avenue, Marion and Liberty streets, where a large terminal station is being erected. Power will be received from the Potomac Electric Power Company of Washington. The Roberts & Abbott Company of Cleveland has the general contract for building the road. The offices are at 801 Maryland Trust building, Baltimore.

Washington Water Power Company, Spokane, Wash.—The stockholders have recently voted to increase the capital stock from \$5,000,000 to \$10,000,000, and it is announced by Henry M. Richards, president, that the money is to be expended in betterments and extensions of the railway lines. The company operates 72.5 miles of road, 54.5 of which are in Spokane.

Winona Interurban Railway.—R. M. Murray, chief engineer, Winona Lake, Ind., writes that this company, which has a line in operation from Warsaw to Goshen, Ind., is now building from Warsaw south to Peru, 44 miles, via Mentone, Akron, Gilead and Chili. The track is laid and the overhead work completed from Peru north to Chili, 10 miles, and grading has been completed to Gilead, 7 miles from Chili. Grading is now in progress between Gilead and Warsaw. The overhead construction is of the bracket type. The power house at Winona Lake is completed and substations will be erected at Mentone, Gilead and Brownell. Allis-Chalmers-Bullock power equipment is used. Contracts are to be let for 34 miles of copper wire. The ties are being furnished by the Standard Tie Company, the rails by the Carnegie Steel Company, and the overhead material by the Electric Service Supplies Company. The roadbed is 16 and 22 feet; maximum gradient, 2 per cent, and maximum curvature outside of cities and towns, 3 degrees. The rails are 70-pound A. S. C. E. section. The bridges for the line are nearly completed. H. J. Heinz, Pittsburg, Pa., president.

POWER HOUSES AND SUBSTATIONS.

Boston Elevated Railway.—This company will have installed in its Lincoln wharf station, on Atlantic avenue, the largest direct-current engine-type generators ever constructed. These generators will have a capacity of 2,700 kilowatts at 600 volts, when operated at a speed of 75 revolutions per minute. These machines will have 32 poles and the armatures will have an open slot winding, with the armature coils securely held in place by wedges, which thus facilitate the replacing of coils should any become damaged and obviate the use of band wires. The brushes will be oscillated parallel to the shaft by the standard Allis-Chalmers oscillator, which prevents the wearing of ridges in the commutator face and keeps it always in perfect condition.

Gray's Harbor Railway & Light Company.—This company will spend about \$250,000 on improvements during the coming summer. A large power house will be constructed near Electric park, midway between Aberdeen and Hoquiam, Wash. It is stated that work on the new improvements will be begun at once. Jay D. Cray, Aberdeen, Wash., is general manager and purchasing agent.

Mount Hood Railway & Power Company.—This company has announced that it will begin work at once on two power houses which are to have a combined capacity of 80,000 horsepower. The first plant to be installed will have a capacity of 25,000 horsepower and the cost is estimated at \$1,000,000. The work of locating the site of the reservoir and flume-ways and preparing the power house site is now progressing. The point of diversion of the Sandy river to the power house reservoir will be one mile above Kyler's narrows, near Marmot. It is intended to finally build another plant of 30,000 horsepower, and increase the first plant from 25,000 to 50,000 horsepower. As soon as the plans for the first installment of 25,000 horsepower are completed the contracts for the machinery will be let. These power houses will furnish power and light, besides supplying the power for a railroad up Mt. Hood, which it is estimated will cost \$1,500,000 and will be completed in about two years. The project, it is said, has been successfully financed and is backed by E. P. Clark, Los Angeles, R. C. Gillis, Los Angeles, and A. P. Flening, Pasadena, Cal. Mr. F. C. Finkle is consulting engineer of the company.

Springfield Street Railway Company.—It is announced that this company will spend \$150,000 for improvements during the coming summer. About \$125,000 of this will be spent for a new feed wire for the Belmont avenue line and \$25,000 for the installation of a private telephone system. Some minor improvements will also be made to the power houses. The 2,000-kw. generator which was burned out a few days ago is being repaired and will soon be in service. H. C. Page, Springfield, is general manager.

Personal Mention

Mr. Alexander K. Cuthbert has been appointed express agent of the United Traction Company, Albany, N. Y., succeeding Mr. Charles H. Armatage.

Mr. Frank T. Edson, who has been acting as tax agent for the Ft. Wayne Van Wert & Lima Traction Company, has had his jurisdiction extended over all of the Scheopf lines.

Mr. Allen Jones has been appointed superintendent of the Monroe (La.) Street Railway, which is owned and operated by the municipality, succeeding Mr. B. L. Jakeway, resigned.

Mr. L. W. Harrington, who was recently appointed soliciting passenger and freight agent of the Columbus Delaware & Marion Railway at Columbus, O., has added to his duties those of claim adjuster.

Mr. A. J. J. Pfeiffer has been appointed general manager and chief engineer of the Calcutta Tramways Company, Limited, succeeding the late Mr. Martyn Wells. Mr. Pfeiffer was for a time connected with the Thomson-Houston Company and has had charge of the equipment of several important roads in Europe.

Mr. C. M. Thomas, formerly a public accountant at Cincinnati, O., has accepted a position with the accounting department of the Indiana Columbus & Eastern Traction Company at Cincinnati. Mr. Thomas was auditor of the Muncie & Portland Traction Company at Portland, Ind., while that line was under construction. He was also at one time traveling auditor for the Chicago Cincinnati & Louisville Railway Company.

The directors and executive officers of the Public Service Corporation of New Jersey invited some of the friends of Mr. A. H. Stanley, the retiring general manager of the street railway department of that corporation, to a farewell dinner in his honor at the Waldorf-Astoria, New York, on Friday evening, March 23. Mr. Stanley leaves for London about April 1 to become general manager of the United Underground Electric Railways Company.

Mr. Charles H. Armatage has been appointed traffic manager of the United Traction Company and its subsidiary companies, with headquarters at Albany, N. Y.; effective on March 14. The duties of traffic manager heretofore have been combined with those of the operating department, but on account of the expansion of its passenger and freight business the company has deemed it advisable to separate the two departments. Mr. Armatage is well known in the local street railway circles of Albany, having been identified with the railway systems there for several years, and for the past six months has served as superintendent of the express department of the United Traction Company.

Mr. A. V. Schroeder has resigned as division superintendent of the Illinois Traction System at Decatur, Ill., to become general manager of the La Crosse Water & Power Company, with headquarters at La Crosse, Wis. This company, which is a holding corporation for several subsidiary companies, is now building a 30-mile interurban line between La Crosse, Wis., and Winona, Minn., which, when completed, will form part of an extensive interurban system that is to be developed in the two states. It also is building a large dam across the Black river in Wisconsin, which will furnish power for its lines and for commercial purposes. For some time prior to his present appointment Mr. Schroeder was superintendent of the Springfield (Ill.) Light Heat & Power Company, resigning about a year ago to accept the position of superintendent of the McKinley properties at Decatur. He will assume his new duties on April 1.

Obituary.

John C. Reilly, well known as a pioneer street railway and business man of Pittsburg, died of heart trouble at the Kirkwood hotel, Camden, S. C., where he recently had gone for his health, aged 63 years. Mr. Reilly was born in Pittsburg on February 20, 1844, and received his education in the parochial schools of that city. He entered the employ of the Pennsylvania Railroad Company when a young man, where he remained for eight years. He later became identified with the livery firm of Burns & Reilly and while engaged in that business established a line of omnibuses from which has been developed the present street railway system of Pittsburg. Mr. Reilly, associated with Thomas S. Bigelow and James D. Callery, built the first street car lines in that city, and when they later were taken over by the Pittsburg Railways Company, he became a director in the former company, which position he held at the time of his death. He also was president of the Washington National Bank, which he organized, a director in the City Insurance Company, and member of several clubs.

The General Electric Company, Schenectady, N. Y., has just purchased 700 acres of land for a factory site east of the city of Erie, Pa., and extending from the Lake Shore Railroad to the lake front. As soon as the weather permits the work of erecting the buildings will be started. Approximately 400 acres of the land will be set aside for residential sites for the employees. It is the intention of the company to inaugurate and carry out a systematic and consistent plan, which will result in the building of comfortable and attractive homes on this portion of the property. The company does not intend to abandon any of its present plants or to divert to Erie any considerable portion of the work now being done by the other factories, but the rapid growth of the business and the demand for increased output requires additional manufacturing facilities.

Financial News

Atlantic City (N. J.) & Suburban Traction Company.—Holders of the securities of this road have been notified that an assessment of about \$20,000 is necessary and that the bond interest must be met in script instead of cash.

Chattanooga Railways Company.—Directors have been elected as follows: Howard S. Graham, John Graham, C. P. King, L. H. Parsons, S. W. Foulkes, F. H. Treat, of Philadelphia, and Frank Spurlock of Chattanooga. The following officers have been re-elected: John Graham, Philadelphia, president; C. P. King, Philadelphia, vice-president; W. H. Lawton, Philadelphia, secretary and treasurer; and D. J. Duncan, general manager.

Cedar Rapids (Ia.) & Marion City Railway.—The capital stock will be increased from \$400,000 to \$450,000.

Columbus (O.) Railway & Light Co.—This company has leased from the Columbus Traction Company all the property of the Central Market Street Railway Company including track, rolling stock, stations, substations, all machinery, etc., also all franchises, rights of way, etc., and all property that may be acquired during term of this lease, 50 years, renewable for 50 additional years, and for 50 additional years from January 1, 1907; the lessees agree to pay the interest upon \$500,000 of 5 per cent 20 year first mortgage bonds to the Continental Trust Company, trustee, and a sum sufficient each year to pay the dividends at the rate of 5 per cent upon \$250,000 preferred capital stock of the lessor company, and to pay dividends upon \$500,000 common stock as follows: 1 per cent on January 1 and July 1, respectively, in 1908, and on January 1, 1909, 1½ per cent on July 1, and January 1, 1910, 2 per cent on July 1, 1910, and January 1, 1911, 1¼ per cent on April 1, July 1, and October 1, 1911, and quarterly thereafter on January 1, April 1, July 1, and October 1, of each year and to pay such dividends respectively on 5 days before they become due, first installment being payable December 26, 1907, and the lessee shall pay to the Continental Trust Company, trustee, a sum equal to 5 per cent of the gross earnings of the railway to create a sinking fund to secure the payment of the said \$500,000 bonds.

Columbus Urbana & Western Traction Company, Columbus, O.—It is reported that control of this company will be sold to the Columbus Magnetic Springs & Northern Railway Company of Delaware, O.

International Traction Company, Buffalo.—William Salomon & Co. of New York, offer for sale \$570,000 of an authorized issue of \$600,000 of 4½ per cent car trust certificates dated June 15, 1906, and maturing \$30,000 semi-annually on June and December 15, until June 15, 1916, inclusive, at prices yielding 5½ per cent interest. The bonds are secured by equipment valued at \$825,000.

Lincoln (Ill.) Street Railway.—Control of this company has been purchased by F. H. Schott of Chicago, who will form a new corporation, the Lincoln Railway & Light Company, with \$150,000 capital stock.

Rockland South Thomaston & Owl's Head Street Railway, Rockland, Me.—The property and franchises of this company were sold at receiver's sale on March 8 to Moses Well & Sons of Philadelphia for \$13,925.

San Bernardino Valley Traction Company, San Bernardino, Cal.—At the annual meeting of stockholders on March 12 the following directors were re-elected: A. C. Denman, Jr., E. D. Roberts, George M. Cooley, W. DuB. Brookings, J. S. Wood, Henry Fisher, J. H. Fisher, E. S. Graham and O. D. Collins. A. C. Denman, Jr., has been elected president; George M. Cooley, vice-president; J. S. Woods, secretary, and E. D. Roberts, treasurer.

Springfield (Ill.) Consolidated Railway.—The following directors were re-elected on March 16: H. D. Walbridge of New York city; C. M. Clark of Philadelphia; William Jarvis of Louisville, Ky.; Bluford Wilson, E. W. Payne, P. B. Warren, Emil G. Schmidt, William H. Brown and Charles Ridgely of Springfield. Officers were elected as follows: President, H. D. Walbridge; first vice-president, Bluford Wilson; second vice-president and general manager, Emil G. Schmidt; secretary and treasurer, William H. Brown; assistant secretary and assistant treasurer, George E. Hardy.

Springfield (Mass.) Street Railway.—An issue of \$300,000 additional stock to liquidate outstanding debt and to provide for improvements has been authorized by the Massachusetts board of railroad commissioners. The new stock is to be sold at \$170 per share.

Washington Water Power Company, Spokane, Wash.—The stockholders have voted to increase the capital stock from \$5,000,000 to \$10,000,000, and it is announced by Henry M. Richards, the president, that the money will be expended in betterment of the electric railway system and the extension of several lines. The directors were re-elected as follows: William A. White, George H. Southard and Frank Lyman of New York; H. M. Richards, D. L. Huntington, J. D. Sherwood, Thomas G. Thomson, J. P. M. Richards, A. B. Campbell, J. N. Glover and Huber Rasher of Spokane. The officers of the company re-elected for the year are: President, Henry M. Richards; first vice-president, A. B. Campbell; second vice-president and general manager, D. L. Huntington; treasurer, H. E. Perks; secretary, H. L. Bleeker. The corporation has 72.5 miles of railroad, 54.5 miles of which are in Spokane. Its power transmission lines reach 225 miles, the longest being to the Coeur d'Alene Mining camps, 110 miles.

Manufactures and Supplies

ROLLING STOCK.

Topeka Railway, Topeka, Kan., is figuring on the purchase of eight new cars.

International Railway, Buffalo, N. Y., expects to purchase during the present year 50 additional cars.

North Shore Electric Railway, San Francisco, Cal., is reported in the market for 20 high-speed interurban cars.

Mississippi Valley Electric Railway, Nauvoo, Ill., now under construction, is in the market for new equipment.

Union Traction Company of Kansas, Independence, Kan., has ordered two cars from the American Car Company.

Rockford & Interurban Railway, Rockford, Ill., is building in its shops at Rockford four express cars for interurban use.

Marion Bluffton & Eastern Traction Company, Bluffton, Ind., is in the market for a large city or a small interurban car for immediate delivery.

Southern Kansas Railway, Light & Power Company, Cherryville, Kan., is reported in the market for new equipment. R. C. Rollings is president of the road.

Cedar Rapids & Marion City Railway, Cedar Rapids, Ia., is building four 30-foot, 8-bench, open cars at its own shops. The car floors have already been laid and the work of assembling the bodies is being rushed.

Memphis Street Railway, as reported in the Electric Railway Review of March 16, has placed an order with the American Car & Foundry Company for 25 high-speed semi-convertible cars for September delivery.

Pittsburg McKeesport & Greensburg Railway, Greensburg, Pa., has ordered four double truck cars from the St. Louis Car Company. The length of the car bodies will be 34 feet and will be 46 feet 2 inches long over bumpers. They will have a seating capacity of 52 people and are for interurban service.

Columbus Railway & Light Company, Columbus, O., has purchased from the G. C. Kuhlman Car Company 10 double-truck cars. These will be 28 feet in length inside, 42 feet long over all, equipped with longitudinal seats and General Electric air brakes. These cars are for delivery by June 1.

San Francisco Vallejo & Napa Valley, Napa, Cal., as reported in the Electric Railway Review of February 9, has placed an order with the Niles Car & Manufacturing Company for eight new cars of the Pullman type, two of which will be combination smoking and baggage cars. The cars will be 56 feet long, 9 feet wide over sheathing and will have a seating capacity of 64 passengers. The interior of the car bodies will be finished in mahogany. They will be equipped with Baldwin trucks and the entire electrical equipment will be supplied by the Westinghouse Electric & Manufacturing Company, including a quadruple equipment of No. 132A motors (100 horsepower), air brakes and Gould automatic couplers.

Meridian Light & Railway, Meridian, Miss., as reported in the Electric Railway Review of March 16, has placed an order with the Southern Car Company of High Point, N. C., for five semi-convertible cars for May and June delivery. The specifications and special equipment will be as follows:

Length—	Weight	18,000 lb.
Body.....20 ft. 8 in.	Wheel base.....	7 ft. 6 in.
Over vestibule.....	Body	Wood
Width—	Curtain fixtures	Acme
Inside.....7 ft. 5 in.	Curtain material.....	Pantasote
Over all.....8 ft. 2 in.	Trucks	Brill 27-E
Seating capacity.....		
		32 persons

Niagara Gorge is having two Brill semi-convertible cars built at the Collinwood shops of the J. G. Brill Company, the order for which was placed the latter part of 1906. The cars are for delivery in May, and will have a seating capacity of 44 persons. The specifications and special equipment will be as follows:

Wheel base.....	4 ft. 6 in.	Width, inside.....	7 ft. 11½ in.
Length of body.....	30 ft. 8 in.	Over all.....	8 ft. 2 in.
Over vestibule.....	35 ft. 4½ in.	Body and underframe....	Wood
Over all.....	40 ft. 1 in.		

Special Equipment.

Air brakes	Westinghouse	Interior finish	
Brake rigging.....	Brill hand brake	.....Cherry and 3-ply birch	
Curtain fixtures .....	.....	Motors...4 Westinghouse	101-B
.....Acme spring roller		Roofs	Monitor deck
Curtain material.....	Printed duck	Safety tread	Wood
Fenders	Philadelphia	Trucks	27 GE-1
Headlights .....	.....	
.....United States arc light			

Brooklyn Rapid Transit Company, Brooklyn, N. Y., as reported in the Electric Railway Review of March 16, has placed an order with The J. G. Brill Company for 100 passenger cars of the semi-convertible type for surface use, to be built at Elizabeth, N. J.; also 100 semi-convertible cars for elevated service, 50 of which will be built at Laconia, N. H., by the Laconia Car Company, and 50 at Newark, O., by the Jewett Car Company for delivery during

October, November and December. The specifications call for the following details:

100 Surface Cars.			
Seating capacity.....	38 people	Width, inside	7 ft. ½ in.
Weight	33,000 lb.	Over all	8 ft. ½ in.
Wheel base	19 ft. 5¾ in.	Height, inside	8 ft. ¾ in.
Length of body.....	28 ft.	Track to trolley base.....	
Over vestibule	37 ft. 2 in.	.....	8 ft. 11¾ in.
Over all	38 ft. 3¾ in.	Body and underframe....	Wood

Special Equipment.

Bolsters	Bar steel	Interior finish...Cherry natural	
Center bearings.....	Cast steel	Motors	Not decided
Curtain fixtures.....	Acme	Roofs	Monitor
Curtain material	Pantasote	Safety tread	Universal
Destination signs .....	.....	Sanders	
.....Co. standard block sign		.....Silver & Co.'s Reliable	
Dust guards.....	Wood	Seats	
Fenders	Empire	.....Heyward	
Gears and pinions.....	Steel	Bros. & Wakefield—Rattan	
Gongs	Brill Dedenda	Side bearings	Cast steel
Hand brakes.....	.....	Trolley poles	Nuttall
Co. standard, St. Louis handle		Trucks	
Heating system.....	.....	.....Standard motor	
.....Consolidated Car Heating		truck—Maximun tractor	
Headlights .....	.....	Ventilators	Monitor sash
.....Dayton incandescent		Vestibule..Built in—Open sides	

100 Elevated Cars.

Seating capacity.....	54 people	Sill to trolley base..9 ft. 4½ in.	
Weight	69,000 lb. (approximately)	Track to trolley base.....	
Length of body.....	40 ft. 5 in.	.....	12 ft. 6½ in.
Over all	48 ft. 11 in.	Body	
Width, between posts..	7 ft. 6 in.	.....Wood with steel	
Over sheathing.....	8 ft. 7 in.	in corner and double posts	
Height, inside.....	8 ft. 3¾ in.	Underframe	Pressed steel

Special Equipment.

Bolsters, body.....	Pressed steel	Heating system	
Brakeshoes	Cast iron	.....Consolidated Car Heating	
Center bearings.....	Cast steel	Headlights	Eureka arc
Control system.....	Multiple unit	Interior finish	
Couplers..Van Dorn automatic		Cherry natural—White ceiling	
Curtain fixtures.Curtain Sup. Co.		Markers	Dresser
Curtain material.....	Pantasote	Motors, type and number....	
Destinations signs .....	.....	.....2—Type not yet decided	
.....Flat signs hung on railings		Roofs	Monitor
Door fastenings .....	.....	Safety tread	Universal
.....Coburn tracks and sheaves		Seats	Hale & Kilburn
Dust guards	Wood	Side bearings.....	Cast steel
Gears and pinions.....	Steel	Trolley poles and attachments.	
Gongs and hand brakes.....	.....	.....Nuttall	
.....Co. Standard		Ventilators	Monitor sash

SHOPS AND BUILDINGS.

Chicago City Railway.—This company is building a car storage house at Thirty-eighth street and Cottage Grove avenue, which will be 235 by 368 feet in area. The William Crilly Company has the contract.

Cincinnati Traction Company.—This company has recently purchased the property and is now preparing plans for the construction of an addition to the present car barns on Vine street.

Columbus Delaware & Marion Railway.—This company has taken an option on property on Gay street, Columbus, O., on which to erect a freight station.

East St. Louis & Suburban Railway, East St. Louis, Ill.—It is reported that this company will erect a 1-story car shop at Granite City, Ill., to be of brick and reinforced concrete construction, composition roof, iron and steel work, skylights, etc., at an estimated cost of \$50,000.

Georgia Railway & Electric Company.—This company has secured the first floor of the new Atlanta Birmingham & Atlantic office building on Walton and Fairlie streets, Atlanta, to be used as a freight and passenger terminal station for the suburban and interurban lines.

Grand Rapids Railway.—This company is negotiating for the purchase of property on the West Side, in Grand Rapids, Mich., on which to erect a \$75,000 car house. It is stated that work will be started as soon as the property is secured.

Illinois Traction Company.—A contract has been let for the construction of a car storage house at Decatur, Ill. Other contracts are to be let within a few days for a storehouse of brick and concrete construction 150 by 200 feet in area, and a general repair shop of brick and steel construction 250 by 350 feet in area. This building will contain an armature room and a machine shop and will be provided with 12 tracks. To the rear of the repair shop will be a blacksmith shop 50 feet square. An oil storage house and several smaller buildings will also be erected on the same site, which was purchased some time ago. L. E. Fisher, general manager, Decatur, Ill.

International Railway.—This company will build this year a new car house on Broadway, Buffalo, at a cost of \$225,000, also a car house on Hertel avenue, Buffalo, at a cost of \$130,000.

Lehigh Valley Transit Company.—This company has let a contract for a new office building and carpenter shop at Allentown, Pa. The building will be of cement block and about 100 feet

square. The section devoted to office purposes will be three stories high. The company's new car house on Madison street will be ready in a few days.

Mississippi Valley Electric Railway, Nauvoo, Ill.—This company, which was recently incorporated to build a line from Keokuk and Ft. Madison, Ia., to Nauvoo, Ill., is in the market for equipment and supplies.

New Bedford & Onset Street Railway.—The Massachusetts railroad commission has granted this company a permit for a spur track in Marion, Mass., that will enable it to build its proposed freight and express station in a central part of the village.

Newcastle & New Wilmington Street Railway.—This company has secured a site for a terminal station at Newcastle, Pa.

Pacific Electric Railway, Los Angeles, Cal.—This company is building a carpenter and paint shop at Sherman, Cal.; also a passenger and freight station at Beverly.

Toronto & York Radial Railway.—This company has purchased a block of land on Yonge street, Toronto, Ont., on which to erect a large passenger and express station to handle the large traffic which is expected when the new line to Lake Simcoe is opened in a few weeks.

TRADE NOTES.

Armin Schotte has recently accepted a position with W. S. Barstow & Co., of New York and Portland, Ore.

Allis-Chalmers Company, Milwaukee, Wis., has opened a branch office at 316 Godchaux building, New Orleans, La.

F. P. Boas has been appointed superintendent of field work of the Eureka Automatic Signal Company, Lamaqua, Pa.

General Electric Company, Schenectady, N. Y., has declared a quarterly dividend of \$2 a share on the stock, payable April 15.

E. M. McIlvain, formerly president of the Bethlehem Steel Company, has been elected president and general manager of the Robins Conveying Belt Company, Park Row building, New York.

Emil Callman & Co., manufacturers of insulating varnishes and compounds, formerly located at 299 Pearl street, have removed to larger and more convenient quarters at 100 Washington street, New York.

Ralph W. Bacon, formerly superintendent of the structural department of the Bethlehem Steel Company, has resigned to accept the position of general superintendent of the Robins Conveying Belt Company of New York.

C. W. Lytle, superintendent of the Pittsburg plant of the American Steel Foundries, has been appointed district manager to succeed Harry Wright, who was recently elected president of the Ohio Steel Foundry Company, at Lima, O.

Pressed Steel Car Company has removed its western office from the Fisher building to the fourteenth floor of the Old Colony building, Chicago, where J. H. Mitchell, manager of sales of the western district, will make his headquarters in the future.

George K. Preston, secretary to A. C. Dinkey, president of the Carnegie Steel Company, Pittsburg, has been appointed assistant to the first vice-president of the company to succeed Homer J. Lindsay, whose death was recently reported in these columns.

Meredith Construction Company, Terre Haute, Ind., has been incorporated with an authorized capital of \$20,000 to build steel bridges, viaducts, subways, steel structures, etc. The directors of the company are Fred C. Meredith, Lawrence M. Stoff and Paul J. Meredith.

W. J. Dolan, who was formerly connected with the Remington Typewriter Company, and later with L. P. Smith Brothers of Syracuse, N. Y., has accepted a position in the sales department of the Dayton Pneumatic Tool Company, with headquarters in Pittsburg, Pa.

Allis-Chalmers Company, Milwaukee, has closed a contract with the New York New Haven & Hartford Railroad for all the air-brake equipments required on the electric cars controlled by this road. This contract covers electric railways in thirty cities and includes about 4,000 cars.

W. S. Morehouse, formerly with the A. S. Cameron Steam Pump Works, New York, has accepted the position of manager of works with the Green Fuel Economizer Company, Matteawan, N. Y. Mr. Morehouse is a graduate of the Worcester Polytechnic Institute, is a member of the American Society of Mechanical Engineers and of the American Foundrymen's Association.

J. G. White & Co., New York, have increased their capital stock from \$3,000,000 to \$5,000,000 to provide working capital to handle properly a largely increased business. At the present time the company has \$20,470,000 of contracts on its books, none of which has been completed. The regular quarterly dividend of 1½ per cent on the preferred stock has been declared, payable April 1.

Yale & Towne Manufacturing Company, 9 Murray street, New York, has recently awarded contracts for building extensions to its press shop and cabinet lock department at Stamford, Conn. The press shop extension will be one story high, approximately 80 by 150 feet, resting on 40-foot piles, with brick walls and timber roof with sawtooth skylights. The floor will be of reinforced concrete designed for a live load of 250 pounds. The cabinet lock department extension will be one story high 42 by 80 feet of wood con-

struction, with gravel roof and concrete foundation and retaining wall.

Narragansett Machine Company, Providence, R. I., is extending its main building, which, when completed, will have a ground measurement of 250 by 60 feet. The addition will be used entirely by the fender and steel locker department. Since the Consolidated Car Fender Company moved its offices to the plant of the Narragansett Machine Company, the fender interests have reached such proportion that an addition to its plant was thought advisable.

Columbia Brake Shoe & Foundry Company, Cincinnati, O. reported in our issue of March 9 as the new name of the Columbia Foundry Company, will devote its exclusive attention to the manufacture and sale of brake shoes for steam and electric railways. The company state that already they have become standard on several railways and that in the near future the foundry will be doubled, and the capital stock of the company increased in order to meet the demand for its products.

Foote, Pierson & Co., New York, will about April 15 move their offices and business from 82-84 Fulton street, where they have been located for the past twenty-three years, to 160-162 Duane street, corner Hudson street, where they will occupy the entire five floors. This will provide room of more than double its present quarters. New and improved machinery will be installed, enabling the company to handle a much larger volume of business than heretofore. The company are well known manufacturers of telegraph instruments, fire alarm apparatus, measuring and testing instruments and a large variety of electrical specialties.

B. F. Sturtevant Company, Boston, reports the following recent sales of mechanical draft apparatus: Scranton Railway Company, Scranton, Pa., for maximum output of 6,000 horsepower; Lowell Gas Light Company, Lowell, Mass., for burning coke breeze in connection with 500 horsepower marine boilers; apparatus for Mexican Central Railway, Tampico, Mex.; Washburn Brothers Company, Glasco, N. Y.; Hitchings & Co., New York, and the Monarch Supply Company, Toronto, Ont. Among the sales for its rotary type high pressure blowers are: Equipments for the Union Manufacturing Company, New Britain, Conn.; John Russell Cutlery Company, Turners Falls, Mass.; Greer Filter Company, Hamilton, O.; Riverside Boiler Works, Boston, Mass.; and the Andrew McLean Company, Passaic, N. J.

Railway Steel Spring Company, New York, at the annual meeting of its stockholders held on March 7 re-elected its retiring board of directors with the exception of George G. McMurtry, who was chosen to fill the vacancy of Charles Scott, Jr., resigned. The income account of the company for the year ending December 31, 1906, as compared with 1905, is as follows:

	1906.	1905.
Net earnings	\$ 2,341,120.19	\$ 1,949,993
Interest on Latrobe plant bonds.....	215,587.48	.....
Balance	\$ 2,125,532.71	\$ 1,949,993
Dividend, preferred (7 per cent).....	944,979.00	944,977
Balance for common.....	\$ 1,180,553.71	\$ 1,005,016
Dividend, common (4 per cent).....	539,988.00	539,988
Surplus	\$ 640,565.71	\$ 465,028
Account Latrobe plant purchase.....	450,000.00	.....
Final surplus	\$ 190,565.71	\$ 465,028
Previous surplus	2,045,899.16	1,580,571
Total surplus	\$ 2,236,464.87	\$ 2,045,899

ADVERTISING LITERATURE.

General Storage Battery Company, 42 Broadway, New York, has issued a convenient printed manuscript containing instructions for the installation and operation of transportable batteries. The instructions are issued by the operating department and should be of particular value to all who have the handling of storage batteries.

Kinnear Manufacturing Company, Columbus, O.—"Car Barn Doors" is the title of a well-executed pamphlet describing and illustrating the Kinnear steel rolling fireproof door as used for this purpose. A description of the general features of these doors appeared in the daily edition of the Electric Railway Review at the time of the Columbus convention.

John B. Watson, Drexel Building, Philadelphia.—Bulletin No. 31 describes a great variety of electric railway rolling stock and power machinery, some new and some which has been taken from service for various reasons and can therefore be obtained on advantageous terms. Each item is fully described and many cars are illustrated with engravings from photographs. The same pamphlet announces that this dealer has on hand a large number of steel bridges which have been removed from steam railways on account of increased weight of motive power and rolling stock.

American Conduit Company, 140 Nassau Street, New York.—This company has issued cards containing interesting information concerning the insulating conduits for railway and power house work which it manufactures, with drawings showing the detailed construction of the jumper system used by the Pennsylvania Railroad. The company has also issued convenient tables from which the cost of stone, sand, labor and cement per cubic yard of concrete at the various proportions in which the materials are to be mixed, can be determined at a glance, with a range of assumed probable costs of these materials per cubic yard as a basis.

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The papers and discussions at the meeting of the Central Electric Railway Association at Dayton, O., on Thursday of this week were all on subjects of the greatest interest to the practical men who are directly responsible for proper operation and maintenance of track and equipment. Reference to the report of this meeting, which appears elsewhere in this issue, will indicate a number of the questions to which special attention is now being given. The exchange of data as to the results of tests and the defects developed in service shows that there is need of further investigation before conclusions of wide application can be drawn. The association has an important field for its work and the interest manifested by the active members representing the shop and track departments of the electric railways is extremely gratifying.

The proposed trolley location for the new lines of the Denver & Interurban Railway, as described in the Electric Railway Review of March 9, 1907, page 321,

Placing the Trolley Wire Off-Center. The cars of this road will take current direct from the trolley wire at 11,000 volts pressure and steam locomotives will draw freight trains over a portion of the route. By reason of these conditions it is proposed to support the trolley wire (No. 0000, grooved) 22 feet above the tops of the rails and not over the center of the track but above a line just outside one rail. Thus can a short bracket-arm be used and the poles still be more than the usual distance from the nearest rail. The catenary wires, insulators, brackets and, in fact, the trolley wire and all its supporting members will largely escape the smoke and steam from locomotive stacks. With the trolley wire at one side, the lives of trainmen on box cars will not be endangered, because even though the wire should sag for some reason it would still be out of reach of the employe unless he should make a deliberate attempt to reach for it. This offset-trolley construction is in use abroad

and its introduction here seems to be warranted where double service is to be operated.

One of the most resourceful subjects for discussion in steam engine literature has been that of the reduced economy of steam boilers on the heating surfaces of which scale has formed. According to circumstances, and the motives of the speaker or writer, the loss in economy of a boiler having one-sixteenth inch of scale—of any character—has been stated at anywhere from 2 to 20 or even 30 per cent; the general opinion, if there has been any, as stated in the technical papers and textbooks, is probably about 15 per cent loss for each sixteenth inch of scale. In the earlier discussions of boiler scale, the effect on the economy of the boiler has always been considered as affected simply by the thickness of the scale without any thought as to its composition, or structure. The tests made by Prof. Edward C. Schmidt on this subject are of most vital interest to all users of steam boilers, and, as might be expected, from a large number of tests, it has been found that the loss in economy of the boiler is affected more by the structural form of the scale than by its composition or thickness. The reasons for these results should be evident when the extremely low conductivity of steam and water in a stated condition are considered. Nearly all solids have a fairly high conductivity, while the more porous materials, as our knowledge of pipe coverings should lead us to infer, have a much lower conductivity. The only criticism which might be made of Professor Schmidt's experiments is that the thickness of scale employed was rather too slight, and the temperature range too limited. In spite of these facts, however, the experiments are of great value, as they indicate clearly that the resistance to the transmission of heat is dependent more upon the structural formation of the scale than upon its chemical composition and thickness. The indications are, so far, that the lighter and more porous scale presents the greatest resistance to the transmission of heat, as the hollow

spaces permit the formation of small globules of superheated steam, which is one of the most effectual heat non-conductors known. The loss with different thicknesses of scale was not sufficiently defined to permit of any definite conclusions, but from the light which has been thrown on the subject, the loss to be expected from one-sixteenth inch of scale may roughly be taken at, say, 8 per cent.

It is not general practice to ascertain and record the exact weights of new cars. Especially is this true when new rolling stock equipment is assembled at the purchaser's shops. There are perhaps those who find it satisfactory to adjust and readjust the brake-rigging on new cars until the wheels do not slip under a test application of the brakes, but a decidedly more accurate and workmanlike adjustment could be had if the exact weight of the car were known. If the weight as used in calculating the lever-arms of the rigging happens to be inaccurate, then there results the necessary varying of the air pressure, which again confuses the solution of the problem of correct braking percentage and uniform applications for all the cars of one system. To those who would consider accurate records of the weights of rolling stock as "extra refinements," we would suggest that the saving in brake shoes and wheels would undoubtedly be a coveted item were the cautions observed.

The preparation and maintenance of an up-to-date set of feeder diagrams including both positive and negative lines, is of so much consequence in the operation of a large city trolley system that it is a little surprising that so many interurban roads have failed to realize the advantages of doing the same thing. To be sure, the feeder arrangements of most interurban lines are extremely simple, but this very fact makes it all the easier to rough out in a loose leaf book or on tracing cloth the essential particulars of the current supply, including the number, length and size of overhead and return circuits, the location of section insulators, switches or circuit breakers, and the positions of adjacent telephones. Diagrams of this kind in interurban railway practice are exceedingly useful in more ways than one, and if they are made up in sizes which can be comfortably carried in the pocket, so much the better. Even in single phase practice it is advantageous to have diagrams at hand for ready reference showing the size of transformer taps where such exist, the location and cross section of copper return cables, the points in the catenary messenger wire where repairs may have been made, localization of trolley breaks, etc. On direct current roads it frequently happens that the growth of traffic requires the installation of additional feeder capacity differing in size from the original layout, and it is most essential that an accurate record be maintained of all such changes. Otherwise, mistaken conclusions are liable to be drawn in studying the conditions of power distribution and consumption. Nothing short of a complete and correct diagram showing the exact number of feet, the kind of wire and the size, including the trolley, at all points of the road should be sought. The line and track foremen, the electrical engineer's department and the superintendent all would find these data time-saving and helpful. It would be useful not only in regular operating work, but in placing quick orders for repairs, and in making the annual inventory of the road's physical property. The arrangement of interurban feeders may be simple, but it is surprising how many varieties of copper and aluminum sometimes find their way into the overhead circuits of a single road.

THE PARALLELING OF STEAM RAILWAYS BY ELECTRIC RAILWAYS.

The decision of the appellate division of the supreme court of New York state ordering the state railroad commission to grant a certificate of convenience and necessity to the Rochester Corning & Elmira Traction Company, which was reported in the *Electric Railway Review* of March 23, 1907, page 403, is perhaps most interesting and important for the strength of its reasoning. The certificate had been denied at the time of application on the ground that the Erie Railroad already met all the transportation needs of the territory in which the electric company proposes to operate. In the abstract, there would seem to be little in the law to prevent an electric railway company from building alongside of a steam railway as well as anywhere else. But New York has a statute which prohibits a railroad corporation from constructing a road until the railroad commissioners certify that "public convenience and necessity" require it. It is this statute which called for this decision.

Connecticut also has a statute, section 8 of chapter 169 of the public acts of 1893, which provides that no street railway shall be built or extended from one town to any other in the public highways, so as to parallel any other street railway or steam railroad, without a judicial finding that public convenience and necessity require its construction. The supreme court of errors of Connecticut says, in re the application of the Shelton Street Railway Company, 69 Connecticut Reports 626, that in this statute the "public convenience and necessity" sufficient to "require the construction of such street railway," means a condition existing at the time of the application, in respect to the applying railroad, the mode of public travel, the manner in which those needs are to be supplied, and the probable effect of the proposed road upon the whole question of adequately supplying those needs, as well as in respect to the road proposed to be paralleled, that, in the judgment of the trier, will justify the interference with private rights involved. Railroad companies chartered by the legislature have expended large sums of money in the construction of their roads, which are practically wasted unless the road can be used without loss for the transportation of passengers and freight. It is obviously for this reason that the provisions of section 8 were incorporated into the general act, and so a legal right given to existing roads to protection against a certain kind of parallel road, when the construction of such road is not shown to be, under all the existing conditions, of public convenience and necessity. For the protection of such legal rights an existing road may apply to the courts.

In the case of the Chicago & Milwaukee Electric Railroad Company versus the Chicago & Northwestern Railway Company, 211 Illinois Reports, 352, 5 Street Railway Law, 266, it was conceded that a railroad company cannot appropriate or condemn a strip off of the right of way of another railroad company longitudinally. But the court was disposed to the view that the authorities announcing the doctrine that one railroad company cannot condemn longitudinally the right of way of another, had reference only to the right of way of the width which the railroad company is authorized by the statute to condemn. A 50-foot strip of land owned by the railway company and adjoining its 99-foot strip, but being no part of it, was not exempt from condemnation on the theory that it was part of the right of way. If it were within the 99-foot strip, it would be exempt, whether actually needed by the owner for railroad purposes or not, so long as the owner was engaged in the business for which it was chartered. Being outside the 99-foot strip, the question of its exemption depended upon other considerations. It being evident that the railway company owning it did not need it then, and would not need it in the immediate future, while the electric railroad company needed it then for a present public purpose, for which it had the power to acquire a right of way by condemnation, the remote and uncertain needs of the railway com-

pany owner must yield to the present and certain right of the electric railroad company.

These decisions, taken together, state pretty fairly the law on this subject, if they do not make it. They are also equitable and just, and leave comparatively little to be desired as far as they go. Monopolies, it must be remembered, are in general obnoxious to the law and to the courts. But the latter believe, as the supreme court of Illinois said in the case of the Central City Horse Railway Company versus the Fort Clark Horse Railway Company, 81 Illinois Reports, 523, that competition, an honest, healthy competition, is productive of good. At the same time, the court adds that the law affords no aid to that kind of competition which claims the right to crush a competitor in order to advance a rival interest.

THE INFLUENCE OF STEAM PRESSURES IN TURBINE OPERATION.

There are certain considerations, both in the design and operation of reaction steam turbines, which cast a doubt on the advisability of selecting the highest pressures. The tendency in design has been very much, for a time at least, toward the increasing of steam pressures, a practice which without question was the natural result of the experience gained with multiple stage expansion in reciprocating engines. Also, the theory of the turbine, if not minutely investigated, leads to the too broad conclusion that the steam turbine is particularly well adapted to the use of extremely high pressures. This is, however, not a fact, if all things are considered, the truth being that the turbine is more particularly adapted to the economical use of low-pressure steam, while, within reasonable limits, the reverse is true of the reciprocating engine.

A statement which may at first appear rather broad, and at the same time novel, is, that the cost of construction of a steam turbine is inversely proportional to the square root of the initial steam volume, and that the efficiency is to a measurable degree also a function of the volume. The reasons for this are that the diameter of the high-pressure spindle is directly proportional to the square root of the initial steam volume, and the work done by each ring of blades is directly proportional to the square of the blade velocity, and hence, the number of rows of blades in the high-pressure turbine is inversely proportional to the initial volume. Further, the cost in excess of a certain fixed cost for the governor bearings and shell is nearly directly proportional to the number of blades in the turbine. While these are the principal reasons for the statements made, there are many others of minor importance which would take far more space to explain than can be given at this time, and for the present they are not essential to the argument, though they have been given due weight in the comparisons presented herewith.

A glance at some of the tendencies of reaction turbine design and practice bear out these statements, as, for instance, the design of the double-flow turbines, in which the high-pressure spindle is entirely dispensed with, and is replaced by a high-pressure impulse turbine, the exhaust of which is utilized in the usual low-pressure reaction turbine. In marine practice, a similar condition is found, as well as in a large part of the European reaction turbines installed in stationary practice. In these cases, what is equivalent to the employment of an impulse turbine is obtained by using low steam pressure, or throttling the high-pressure steam, thus further superheating it, and causing the desired increase in volume. Further, the fact that small reaction turbines are not constructed for moderate speeds is another indication of the truth of the principles stated, for in the latter case the cost of construction with small steam volumes is prohibitive. In all these cases, the chief object is the reduction of the cost of construction, and, incidentally, a small gain in efficiency. It should be borne in mind that it is the low-pressure end of

the turbine which is most efficient and produces the largest results for the least money.

Of course, increasing the steam pressure will also decrease the steam consumption of the turbine, for, with a given terminal pressure, more heat units are converted into work, but this alone cannot be considered, for the relative economy of the boiler, and the increased cost of boilers, piping and turbine must be considered as well. The more rapid deterioration of the boilers and piping under high pressure must also be borne in mind, though these cannot easily be reduced to actual figures.

An operating feature which is worthy of the most careful consideration is the reduced danger of accidental contact of the blades when low steam pressure is used, partly because of the reduced length of the shell which reduces the difficulties experienced from unequal expansion and contraction and warping, but chiefly because of the greater stiffness of the spindle, which materially lessens the "whipping." As a certain thickness of the metal of the spindle is required to hold the blades, and this thickness must be greatly exceeded in spindles of small diameter and considerable length to give the desired stiffness, the spindle will be considerably lightened by the use of low-pressure steam, thus reducing the pressure on the bearings, which will consequently be subjected to less wear, and assist in assuring that the shaft always rests on an oil film.

An examination of all the information available shows that the evaporation per pound of coal is about 7½ per cent higher in a boiler operating at 100 pounds per square inch gauge pressure than in a boiler working at 285 pounds gauge, provided that all the other conditions except the steam pressure are the same in both cases.

In the accompanying table are shown the comparative results of turbine and boiler combined for pressures of 100, 150, 225 and 285 pounds gauge. The superheat in each case is 100 degrees F. The steps for arriving at these figures are not given here for lack of space, but it will suffice to say that they are based on the principles set forth, and from them they can easily be deduced.

Gauge pressure, pounds.....	100	150	225	285
Relative evaporation of boiler. Water per pound of coal.....	1.03	1.00	.97	.955
British thermal units, theoretically available in turbine. One pound, absolute, back pressure.....	317	339	367	381
Initial volume of one pound of steam in cubic feet.....	4.6	3.2	2.35	1.85
Relative steam consumption of turbine..	1.04	1.00	.98	.94
Relative cost of construction of turbine..	.90	1.00	1.10	1.20
Relative diameter of high-pressure spindle	1.24	1.00	.84	.72
Relative length of high-pressure spindle..	.65	1.00	1.50	2.15
Relative stiffness of spindle to resist "whipping"	6.4	1.00	.177	.037
Relative coal consumption of turbine and boilers combined.....	.99	1.00	1.00	1.01

As will be observed by an examination of the table, all results have been compared with the turbine and boiler operating at 150 pounds per square inch gauge pressure, as this is probably the most generally used pressure at present. A further examination shows that the cost of the turbine designed for 100 pounds gauge pressure would be but approximately 90 per cent of the 150-pound turbine, while the turbine designed for 285 pounds would cost about 20 per cent more, while, when all is taken into consideration, the coal consumption for the low-pressure turbine would probably be about 2 per cent less than that for the turbine built for 285 pounds pressure. The most vital point to be observed, however, is the relative lengths and stiffness of the spindles, that of the low-pressure turbine being but about one-fourth as long, and 150 times as stiff, as that of the turbine designed for 285 pounds pressure. This alone would be a great inducement to use lower steam pressure, as it would permit slightly smaller radial clearances, and at the same time reduce the danger of accidental contact.

There is, however, an increase in economy with reduced pressure, not only in coal consumption, but through a great reduction in boiler piping and turbine costs, which means

reduced depreciation and maintenance, while the cost of repairs should also be far less than when high pressures are employed. The reduction of maintenance charges and increased safety of operation of the turbine are the principal points of advantage, since the increase in economy is not of itself sufficient to induce the adoption of lower pressures. The only object of going into the cost and economy of the turbine so completely is to show that there need be no fear of reduced economy by reduced steam pressure. Low pressure and higher superheat are the lines along which the reaction turbine should develop, and, in some designs of turbine, an increase in the degree of superheat will show far greater gains than indicated here, as the "water-brake" action which detracts from the efficiency at certain loads would almost if not wholly disappear. It is not intended in the suggestion regarding the use of superheat to advocate the extremely high temperatures sometimes found in practice, but simply as the temperature of the saturated steam decreases with diminished pressure, the degree of superheating may be increased an amount equal to the difference in the saturation temperatures.

ELECTRIC RAILWAY EXPRESS AT BOSTON.

The application of the Boston Elevated Railway Company to the Boston city government for the right to carry freight and express matter on its system, points the way toward a general realization in Massachusetts of the possibilities of the electric roads in the work of handling light merchandise. The large urban systems of the east have been somewhat conservative in their attitude toward the express business, perhaps because of the importance of their dense passenger traffic and the lack of uniform practice on other roads doing a parcel business in other parts of the country. The influence of local suburban express companies has also been hostile to this enlargement of scope by electric roads.

Experience in light freight handling in the middle west has shown how valuable such a service can be in the vicinity of large cities, and in New England there is now a decided tendency toward the establishment of such traffic. In Massachusetts a number of companies have applied to the municipal authorities for consent to carry freight, and are doing so under the regulations of the railroad commission. The Old Colony Street Railway is distributing many parcels in the territory between Brockton, Providence, Fall River and New Bedford to the great convenience of the public and the larger employment of its equipment. At Conway, Mass., an electric line connecting with the Fitchburg division of the Boston & Maine Railroad is empowered by a special charter to carry every kind of freight. It has been pointed out that it is a great saving to the inhabitants of that hilly region to have their coal and other heavy merchandise hauled by electricity, and there is no doubt that in this case the public interest is served by the granting of the fullest transportation privileges. In Maine, the Atlantic Shore Line is handling important electric freight service in the region between Portsmouth, Dover and Kennebunkport, and the Boston & Worcester's grant of permission to do a freight business is one of the most recent developments in the field.

Obviously a freight-carrying privilege is worth comparatively little to an electric road unless it can receive and deliver merchandise at some fairly central point in the terminal cities in which its passengers are deposited. The attitude of the large urban companies in large measure decides the feasibility of express service in any thickly settled locality. The objection that such service is liable to interfere with the regular passenger traffic does not hold much weight, for the reason that the freight service can generally be deflected from the main lines of city travel, and a large part of the business can be handled in the night or early morning. The present methods of hauling farm and market gar-

den products into cities in the early morning by horses and wagons whose routes parallel the idle tracks of many trolley lines are entirely out of touch with the progressive spirit of the times.

The private local express company is really a development of the system whereby individuals go shopping for their neighbors and return home laden with bundles; it is relatively expensive, infrequent and on the whole unequal to the demands of the times for speed. The use of the trolley lines as light freight carriers enables orders to be filled much more rapidly, and to this extent cuts into the perquisites of the local expresses; but it is certain that the enlargement of facilities for freight handling by electric cars is such a public benefit that it is poor policy to stifle competition by refusing electric roads freight-handling rights in the interests of the horse-drawn expresses. Doubtless it is wise in most cases to limit the matter which can be handled to materials other than explosives and bulky or very low-grade freight which can always be most profitably hauled on the smoother profiles of the steam railroads, but a liberal elasticity in the list of light merchandise which is permitted for trolley transit, works to the lasting convenience of the shipping public.

LIABILITY FOR PLATFORM AREAS.

The full bench of the supreme court of Massachusetts recently ruled that the Boston Elevated Railway Company is liable for damages in case of injury to its passengers resulting from crowded platform areas, with particular reference to the Sullivan Square terminal. It was claimed that the platform was too small for the accommodation of the passengers who could be and were delivered upon it, and the company was criticized for "continuing to assemble on its platforms at certain hours of the day such large crowds, necessarily going in opposite directions, that those on the outside, in spite of all they can do, are carried off the platform into the trench in which the tracks are laid."

Peculiar rulings on transportation service have often been made by this court, and this one seems to be no exception. The one substantial fact which persons outside the street railway business never seem to be able to grasp is the physical impossibility of handling all the traffic of a great city in the rush hours without crowding of streets, stations and cars. The public as a whole simply cannot realize the burden which the common desire of everybody to go home within an hour or two of the same time throws upon even the best organized transportations systems. A company may spend hundreds of thousands of dollars upon its extra rolling stock, its stations and its operating organization; it may employ scores of inspectors with police powers to cope with the avalanche of travel which chokes its lines between 5 and 6 p. m. on business days, but no known method exists of enforcing courtesy in the individual passenger. The Sullivan Square terminal is probably the largest single electric railway station in the world, and its liberal dimensions are the object of instant comment of transportation experts. If it were to be rebuilt it is doubtless true that the experience of nearly six years of operation would suggest the importance of separating opposing streams of passenger movement—and the plans for the Dudley Street and Forest Hills terminal changes suggest this; but considering the volume of traffic which has passed through this station in the past six years the low accident record is certainly one for congratulation. Far more than 500,000 persons a week pass through Sullivan Square terminal, and if a traffic of this magnitude is at times congested by the typical American desire to annihilate the distance between surface cars and trains connecting by free bodily transfer on the same level, the mere matter of a few square feet more or less of platform space is not going to solve the problem.

ANNUAL MEETING AND DINNER OF THE NEW ENGLAND STREET RAILWAY CLUB.

One of the most efficient and active technical societies in the country composed of street railway men is the New England Street Railway Club, which held its seventh annual meeting and dinner at the Hotel Somerset, Boston, on Thursday of the present week. The club has a membership of 620 and the attendance at the dinner reached the exceptional number of 400. Nothing could more certainly indicate the importance of the industry and the scope of its operations than the high character and ability of the men who were gathered together on the occasion.

The business meeting of the club was held in the afternoon and was devoted chiefly to the election of officers, which resulted as follows:

President—Henry C. Page, Springfield, Mass.

Vice-Presidents—M. C. Brush, Newtonville, Mass.; Horatio Bigelow, Norwich, Conn.; J. Brodie Smith, Manchester, N. H.; F. H. Foote, St. Albans, Vt.; D. F. Sherman, Providence, R. I.; E. A. Newman, Portland, Me.

Secretary—John J. Lane, Boston, Mass.

Treasurer—N. L. Wood, Boston, Mass.

Executive Committee—Paul Winsor, Boston, Mass.; W. D. Wright, Providence, R. I.; C. H. Hile, Boston, Mass.; John F. McCabe, Worcester, Mass.; E. A. Sturgis, Boston, Mass.; Charles C. Peirce, Boston, Mass.; George C. Ewing, Boston, Mass.

The new president, Henry C. Page, has been engaged in street and electric railway work for many years. He is about 43 years of age, and 22 years ago went to work for the Lynn & Boston Street Railway, running a car from Chelsea to Boston. He served for three years as conductor, and was then rapidly promoted until he was placed in complete charge of the schedule arrangement and car dispatching of the company. He made such a success of this that, after the Boston & Northern Street Railway Company was formed, taking over many lines, he soon became its general superintendent, in charge of 450 miles of track. His particular success on this road lay in his method of handling employes, and his arrangements of the schedules. About four years ago he took the position of general manager of the Berkshire Street Railway Company at Pittsfield, Mass. He remained there until June, 1905, when the Consolidated Railway Company secured the property, as well as the Springfield Street Railway, and Mr. Page was appointed general manager of the latter system, which position he now holds.

The dinner and social features in the evening were in charge of two committees, a committee of arrangements, of which Charles C. Peirce was chairman, and a reception committee, of which M. C. Brush was chairman. This is equivalent to saying that matters were well arranged. Readers of the Electric Railway Review know that Mr. Peirce has no equal in either arranging or entertaining. The efforts of both committees were made all the more effective by the assiduous labors of J. J. Lane, the secretary of the club and the editor of its publication, the Street Railway Bulletin.

The after-dinner speaking was serious and impressive. John I. Beggs, president of the American Street and Interurban Railway Association, discussed the relation of the work of the club and similar bodies to that of the American association and its affiliated organizations. He also spoke with emphasis of the present attitude of the public toward street railway corporations, and of the need which the present crisis creates for the most careful attention on the part of street railway managers to see to it that no cause should be given for dissatisfaction on the part of the public.

Hon. George T. Blackstock of Toronto, who made such a profound impression with the speech which he delivered at the Philadelphia convention in 1905, was the next speaker. He delivered an oration, rather than a post-prandial speech, which was remarkable for its finished diction, wide range of thought and lofty spirit. It dealt with the commercial and political relations between Canada and the United States

and with the need for the prosperous people on the North American continent to think more of the other things in life than mere money making and pleasurable dissipations.

Rev. Willard Scott, D. D., of Worcester, Mass., showed that he was a witty man of the world, as well as an earnest teacher of religion, by a speech that taught moral lessons while at the same time it kept his auditors smiling when they were not shaking with laughter.

Guy Murchie, of the legal department of the Boston & Worcester, presided gracefully as toastmaster. The evening closed with a rising vote of thanks to Chairman Peirce and his assistants for the successful manner in which they had provided for the entertainment.

MEETING OF THE CENTRAL ELECTRIC RAILWAY ASSOCIATION.

The regular meeting of the Central Electric Railway Association was held at the Hotel Algonquin, Dayton, O., on March 28. The first session was called to order at 11:25 a. m. by the president, H. A. Nicholl, about 70 members of the association being present.

E. C. Spring made a short address congratulating the new president, to which Mr. Nicholl made an appropriate reply, and the association then proceeded to the regular order of business. After minutes of the meeting held at Indianapolis on January 24, last, had been read and approved, T. B. McMath read a paper entitled "Track Bonding." This paper and a summary of the discussion upon it will be found on page 422.

The next business was the paper on "Car Wheels," by C. Skinner. This paper and an abstract of the discussion will be found on page 423.

The session was then adjourned until after lunch. On again calling the meeting to order at 2:40 p. m., the chair announced the appointment of committees as published in the Electric Railway Review for March 23, 1907, page 395, and also the appointment of the following executive committee: H. A. Nicholl, Indiana Union Traction Company, Anderson, Ind.; E. C. Spring, Dayton Covington & Piqua Traction Company, West Milton, O.; C. C. Reynolds, Terre Haute Indianapolis & Eastern, Indianapolis.

The paper on "Trolley Wheels," by M. Baxter, was then read. This paper and the discussion will be found on page 425.

L. W. Jacques then read a paper on "Car Inspection," which, together with the discussion, will be found on page 421.

A. A. Anderson (Indianapolis Columbus & Southern), chairman of the committee on "Express Contracts," reported that because of lack of time only a progress report could be submitted.

George Whysall (Columbus Delaware & Marion) stated that his company recently had made a contract with the Wells-Fargo Express Company on a tonnage basis, but with an increased allowance according to valuation of shipments, which gave his company 1½ times local freight rates on local business and regular freight rates on through business. Employes operating express cars were paid by the express company, and wages of employes operating cars used jointly were equally divided between the express and the railway companies.

R. C. Taylor (Indiana Union Traction Company), chairman of the committee on "Lighter Cars," reported progress, and stated that a request for data as to capacity, weight, etc., of cars now used would soon be issued.

H. N. Staats (Cleveland), chairman of the committee on "Insurance," submitted the following report, which was accepted and ordered filed:

During the past two years extensive investigations have been made relative to the best plans for promoting the interests of traction companies and electric light and power companies, along the lines of insurance.

As a result of these investigations, the American Rail-

way Insurance Company of Cleveland, O., has been incorporated and organized with a capital and surplus of \$500,000. The officers and directors of the company are men representing railway, light and power companies, and the business of the company will be confined exclusively to these interests.

In addition to the American Railway Insurance Company there has been incorporated the Traction Mutual Insurance Company and the Electric Mutual Insurance Company. These companies will co-operate with the American Railway Insurance Company.

In the opinion of your committee, all the members of the Central Electric Railway Association may be profitably consolidated into one organization, to the extent, at least, of the insurance of their properties against destruction or damage by fire. We approve the plan of insurance adopted by the companies named and recommend the earnest co-operation of every road connected with the Central Electric Railway Association.

The chair then announced that the next meeting of the association would be held at Indianapolis on May 23 next.

W. H. Evans (Indianapolis Traction & Terminal) suggested that the association take up for consideration the proper standards for brakeshoes, wheel treads and flanges, axles, and journal boxes, and the committee on "Standardization," of which he is chairman, was instructed to report at the meeting in May.

Adjourned.

INDICTMENTS FOR NEW YORK CENTRAL WRECK.

The grand jury which has been investigating the wreck near Woodlawn on the New York Central & Hudson River road on February 16, has voted three indictments for manslaughter in the second degree against the company, A. H. Smith, vice-president and general manager, and Ira A. McCormack, general superintendent electrical division. The penalty, if found guilty, is 15 years imprisonment or a fine of \$1,000, or both, for the officials, and a fine of \$5,000 for the corporation. In its presentment the jury makes the following statements:

The wrecked train left the track at the middle of a curve under the Woodlawn bridge, the immediate cause being the spreading of a rail on the outer edge of the curve, following the shearing of the spikes on the outside of said rail.

In the morning of February 16 the engineer of an electric locomotive train passing around the said curve at a speed of about 60 miles an hour, noticed a roughness of track at the point where the rail subsequently spread, sufficient to cause him to report it. An ordinary inspection by track walkers later in the day failed to locate the defect. Subsequent trains passed over the said point of track at normal speeds and no roughness was observed. No subsequent train seems to have exceeded a speed of 50 miles an hour at that point until the Brewster express arrived.

The fatal train was traveling at a speed which calculations by the experts from the company that made the locomotives (based on the distance required to bring the locomotive to a standstill) show to have been at least 60 miles an hour, and which has been estimated by competent observers as high as 70 miles.

After more than a month of careful investigation by experts from the New York Central & Hudson River Railroad and other companies, no defect in roadbed or rolling stock has been discovered which could have caused a wreck at normal speed. The evidence leaves no doubt that the disaster was directly due to some combination of circumstances developed and made disastrous by excessive and abnormal speed.

The curve in question was constructed and safe for a normal speed of about 46 miles an hour. The company had made no calculation to ascertain, and had no definite knowledge of, how much higher speed could be attained without passing the limits of safety. There were no rules in existence to limit trains to the speed known to be normal and safe. Instead, reliance was placed on the judgment of engineers not to exceed safe speeds.

This, it is claimed, has been the best railroading practice for years. With steam locomotives an experienced engineer could easily estimate his speed, and readily feel when he was going around a curve faster than the normal or so-called equilibrium speed.

The safety of this practice depends manifestly upon having trained and experienced engineers. The new electric locomotives have a much lower center of gravity and run with

greater smoothness than the steam locomotives. On this account men not experienced with them tend almost invariably to underestimate their speed, and their action at excessive speed on curves is much less noticeable. They are capable of drawing trains at a speed highly dangerous on the said curve.

If the question of safety in speed was to be left as before to the engineers, it was essential that such engineers should have experience with their engines sufficient to train them to form a competent judgment.

Prior to the installation of a fast passenger electric locomotive service between New York and Wakefield, but one experimental or dummy train was run over the route on schedule. With the exception of the engineer of that train, it seems that none of the engineers who were to operate the new locomotives had been over the route on schedule time in an electric locomotive before being put in charge of a train required to run on schedule time and carrying passengers.

The course of instruction for such engineers had required only four days' practice on a trial track about 2½ miles in length.

Many of the engineers had apparently never ridden on an electric locomotive at a speed even approximating that required by the schedule. While all of them had probably had experience with steam locomotives, they were put in charge of fast trains carrying passengers drawn by electric locomotives at a time when they knew nothing, by experience, of the speed capacity of such locomotives.

The engineer of the wrecked train had not received sufficient instruction to enable him to form a judgment of any value as to the speed at which he was running his train. The disaster was a natural result of such carelessness. This matter should not have been left entirely to the discretion of the company.

DIRECTORY OF ELECTRIC RAILWAY ASSOCIATIONS.

American Street and Interurban Railway Association. Secretary, Bernard V. Swenson, 29 West Thirty-ninth street, New York.

American Street and Interurban Railway Accountants' Association. Secretary, Elmer M. White, assistant treasurer Birmingham Railway Light & Power Company, Birmingham, Ala.

American Street and Interurban Railway Engineering Association. Secretary, S. Walter Mower, general manager Southwestern Traction Company, London, Ont.

American Street and Interurban Railway Claim Agents' Association. Secretary, B. B. Davis, claim agent Columbus Railway & Light Company, Columbus, O.

American Street and Interurban Railway Manufacturers' Association. Secretary, George Keegan, 2321 Park Row building, New York, N. Y.

Canadian Street Railway Association. Secretary, Allan H. Royce, president Toronto Suburban Railway, Toronto, Ont.

Central Electric Railway Association. Secretary, W. F. Millholland, secretary and treasurer Indianapolis Traction & Terminal Company, Indianapolis, Ind. Next meeting, Dayton, O., March 28.

Colorado Electric Light Power & Railway Association. Secretary, John F. Dostal, Denver Gas & Electric Company, Denver, Colo.

Iowa Street and Interurban Railway Association. Secretary, L. D. Mathes, general manager Union Electric Company, Dubuque, Ia. Next meeting, Clinton, Ia., April 19 and 20.

Massachusetts Street Railway Association. Secretary, Charles S. Clark, 70 Kilby street, Boston, Mass. Meetings held in Boston on second Wednesday of each month, except July and August.

Northwestern Electrical Association. Secretary, R. N. Kimball, Kenosha, Wis. Annual meeting, Milwaukee, Wis., January, 1908.

New England Street Railway Club. Secretary, John J. Lane, 12 Pearl street, Boston, Mass. Meetings held on fourth Thursday of every month.

Oklahoma Electric Light Railway and Gas Association. Secretary, Charles W. Ford, Oklahoma City, Okla. Next meeting, Oklahoma City, April 22 and 23.

Pennsylvania Street Railway Association. Secretary, Charles H. Smith, superintendent Lebanon Valley Street Railway, Lebanon, Pa.

Southwestern Electrical and Gas Association. Secretary, R. B. Stichter. Annual meeting, San Antonio, Tex., May 14, 15 and 16.

Street Railway Association of the State of New York. Secretary, J. H. Pardee, general manager Rochester & Eastern Rapid Railway, Canandaigua, N. Y.

Wisconsin Electric and Interurban Railway Association. Secretary, Clement C. Smith, president Columbia Construction Company, Milwaukee, Wis.

The Société Anonyme Westinghouse of Paris, France, has closed a contract for the electrification of an important portion of the Italian State Railways, the main line from Genoa to Milan.

FT. WAYNE & SPRINGFIELD SINGLE-PHASE RAILROAD.

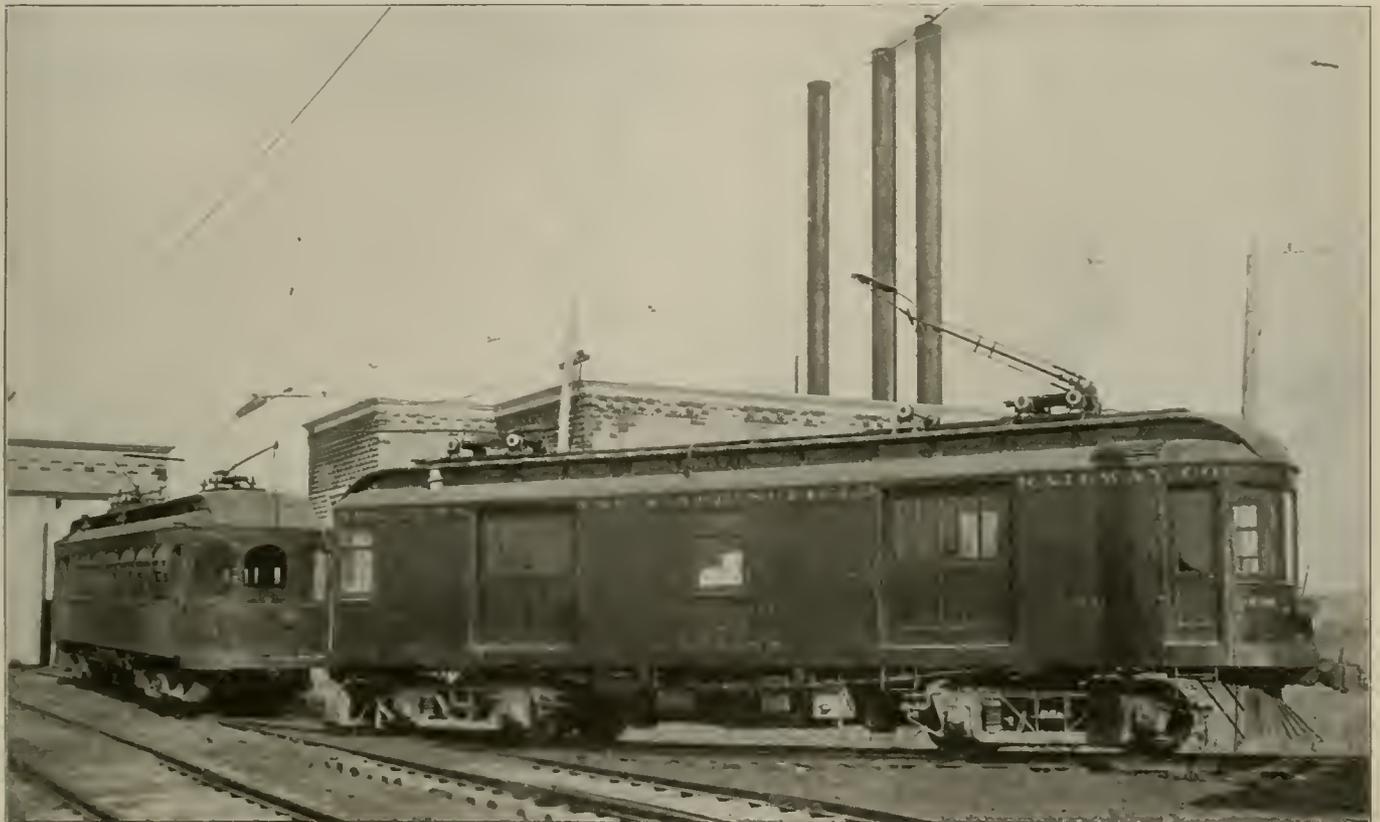
The first division of the Ft. Wayne & Springfield Railway Company's line has been completed and cars are now operating between Ft. Wayne and Decatur, Ind. This company was originally organized to construct and operate an electric railway from Ft. Wayne, Ind., to Springfield, Ohio, but it was later decided, because of subsequent railway development in western Ohio, to build from Ft. Wayne south to Portland, Ind., a distance of 50 miles. Though the route was changed, the original name was retained, and the line now in operation comprises the first division of the railway as it is to be built under the revised plans. The construction of the second division will soon be under way from Decatur to Portland, where connection will be had with the Muncie & Portland Traction Company's new line, which was described in the *Electric Railway Review* for October, 1906, page 929.

of the subgrade. The upper dressing is composed of a substantial gravel which was obtained from the company's own pit located about midway between the present terminals. Concrete was used exclusively in the bridge abutment and waterway construction. There are eight bridges of the deck girder type and one 155-foot span truss bridge on the line. The latter spans the St. Mary's river at a point a short distance from the power plant. Each bridge is of 100 tons capacity.

The tracks are laid with 70-pound A. S. C. E. section steel rails on standard ties. The rails are joined mechanically by standard six-bolt splice bars and electrically by the Ohio Brass Company's No. 0000 soldered bonds.

Power House.

The power house and car barns are situated on a 14½-acre tract of ground, owned by the company, located just



Ft. Wayne & Springfield Railway—Showing Cars Standing in Front of Power House.

The line is operated electrically by single-phase alternating current with a line pressure of 6,600 volts. The overhead work is of the latest type of catenary construction and the line throughout is well designed. The franchises which the company holds run for 50 years. The line is located favorably for controlling a healthy freight and passenger traffic. The city of Ft. Wayne, the northern terminus, with its suburbs has a population of 61,000 and Decatur has a population of 5,000. The estimated population adjacent to the right of way between Ft. Wayne and Decatur is 13,000, making a total estimated population of nearly 80,000 to be served by the line. In addition to this, the company is drawing a large patronage from the four other interurban lines radiating from Ft. Wayne.

Track and Roadway.

The completed section of the Ft. Wayne & Springfield Railway, 21.6 miles long, parallels the old Piqua pike and is almost wholly located on private right of way from 30 feet to 100 feet in width. The maximum grade on the line between Ft. Wayne and Decatur is 1.8 per cent and the greatest curve

is five degrees. Much care was given to the construction north of the city of Decatur. The east, north and south walls of the power house are constructed of concrete blocks moulded in sections 8 by 12 by 24 inches in area and are provided with interior air chambers. There were 7,200 blocks used in the power house construction. These were made by day labor at an average cost of 15 cents each. They were mixed in the proportion of one part cement to two parts sand and were cast in an Ideal concrete block machine. After the material was delivered to the machine, which was located near the power house site, it took four men to make the blocks at the rate of 100 a day. It required about ten days of good weather to dry the blocks sufficiently to allow them to be placed in position in the walls of the building. They were laid in cement mortar. The west wall of the structure is sealed up with sheet steel, and is designed to allow for future extensions of the building. All the material except the cement was obtained entirely from the property owned by the company.

The power house occupies a floor area 78 feet by 103

feet in dimensions. The boiler room is 42 feet by 68 feet in area and the balance of the building is divided into an engine and a transformer room.

Boiler Room.

The boiler room equipment consists of three Stirling boilers of 227-horsepower rated capacity each. They are arranged in two banks and work under a steam pressure of 150 pounds. Each boiler is provided with an iron smoke-stack 42 inches in diameter and 85 feet high above the grate surface. Two Platt Iron Works boiler-feed pumps, 7 and 4½ by 10 inches, are located between the two banks of boilers. They receive supply-water either from a 3,000-gallon storage tank or direct from the heater.

At the rear of the boilers is located a 1,000-horsepower Cookson heater, a storage tank 8 by 10 feet, and a condenser pit 6 by 10 by 24 feet. In the pit, the top of which comes

dividing the building into two fireproof parts. The engine room floor is elevated 6 feet above that of the boiler room. The foundations supporting the engines and generators are of concrete. The generating equipment consists of an 18 and 36 by 36-inch Buckeye engine of 675-horsepower capacity, which is operated at 125 revolutions per minute. It is direct connected to a Westinghouse single-phase, alternating-current generator of 450 kilowatts capacity. There are also located here a belt and an engine-driven exciter of 22½ kilowatt capacity each. The former is driven by a belt from the fly-wheel and the latter is driven by a Westinghouse junior engine.

Alternating current is generated at a line pressure of 6,600 volts and is fed direct into the trolley wire. No feeder or auxiliary wires have been provided and as the line loss is but slight it is not expected that they will be necessary to



Ft. Wayne & Springfield Railway—Catenary Construction on Tangent.

up flush with the floor of the boiler room, is located a jet condenser and a 6 and 8½ by 6-inch service pump, which supplies the storage tank. The water supply is taken either from the well or from the discharge of the condenser.

Water is obtained from the St. Mary's river, about 100 yards from the power house. A main service pipe, 15 inches in diameter, leads from the river to a well, 25 feet deep and 10 feet in diameter, which is located in front of the boiler room. An 8-inch suction pipe leads from the well to the condenser.

The main steam header, 10 inches in diameter, is located along the dividing wall between the engine and boiler rooms. The steam pipes leading from the boilers pass with quarter-bends overhead direct into the header. From the header the steam is led by 3 and 7-inch pipes with quarter bends to the engine. The steam exhaust, 14 inches in diameter, is arranged so as to allow the engine to be worked either condensing or non-condensing. All pipes are covered with the Phillip-Carey 85 per cent magnesia.

Between the boiler and engine rooms a partition wall, built of concrete blocks, extends from the floor to the roof

maintain the desired pressure when the road is extended to Portland.

At the south side of the power house a transformer room 14 by 30 feet in area has been provided. In this room is located one Westinghouse 200-kilowatt step-down transformer, which is used in reducing the line pressure from 6,600 to 550 volts alternating current for use on the trolley wire within the corporate limits of Decatur.

Overhead Lines.

The overhead construction is of the catenary type and is composed of a No. 0000 grooved trolley wire suspended from a 7/16-inch galvanized iron wire cable which in turn is supported by T-shaped iron brackets. The hangers supporting the trolley are connected to the catenary cable every 10 feet by ½-inch iron rods clamped to the trolley and cable respectively by screw clamps and messenger clips. Ordinary span-wire construction is used. The poles used in the pole line construction are in 30, 35 and 40 foot lengths, except in towns, where they are 55 and 60 feet long. In addition to the trolley wire these poles carry telephone and signal

wires. The cars are dispatched by telephone, the dispatcher's office being located at Decatur.

At Ft. Wayne, where the company's cars enter onto the city tracks of the Ft. Wayne & Wabash Valley Traction Company, the direct current of the city line is used. Substantial line circuit breakers and a dead-line span 200 feet in length

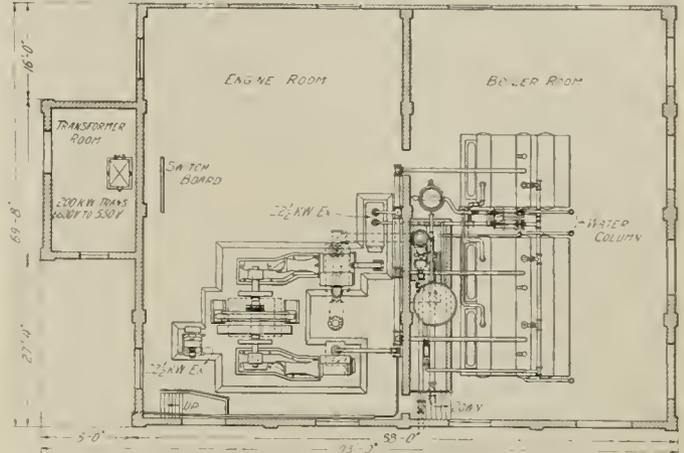
tion. After the circuit breakers have been passed and the switches are again opened, the car is allowed to continue its journey.

Car Barns.

The car barns, rectangular in shape, occupy a floor space 31 by 151 feet. The walls are 24 feet high. This building is also constructed of concrete blocks and is so designed that



Ft. Wayne & Springfield Railway—Car Barn and Power House.



Ft. Wayne & Springfield Railway—Plan of Power House.

are provided where the connection is made. Westinghouse type-A oil switches are used for cutting the current in or out on the dead piece of trolley. This precludes the danger of the high voltage overlapping onto the low voltage direct-current construction. A similar arrangement is made at Decatur, where the low voltage for city operation is substituted

an addition can be built onto the west or south sides without interfering with the general layout. Two tracks enter the building from the east side. Concrete pits are provided under both tracks at the front of the building. The shops are equipped with a 22-inch lathe, a 16-inch shaper, a 22-inch



Ft. Wayne & Springfield Railway—Catenary Construction on Curves.



Ft. Wayne & Springfield Railway—Cut-out Boxes and Line Circuit Breakers.

for the high voltage. In running in either direction cars are brought to a stop with the trolley bow or wheel on some part of the dead section. After the car circuit and the current collector have been changed either for direct-current or for alternating-current operation (according to the direction the car is going), current is thrown into the dead sec-

tion. After the circuit breakers have been passed and the switches are again opened, the car is allowed to continue its journey.

Equipment.

The car equipment at present consists of three three-compartment passenger cars 53 feet in length and one express car 48 feet in length over all. The cars are each

equipped with four Westinghouse No. 106 alternating-current quadruple motors, each of which has a rated capacity of 75 horsepower. They are designed to operate successfully with either alternating or direct current. The baggage car is mounted on Peckham and the three passenger cars on Baldwin trucks of the heavy M. C. B. type. Westinghouse air-brakes and multiple-unit alternating-current and direct-current train control are used. The cars are equipped with the bow trolley for high voltage, alternating-current operation and with the trolley pole and wheel for direct-current and low voltage alternating-current operation.

The work of building from Decatur to Portland, the second division of the railway system, will begin early this spring. The right of way for this division has already been secured.

Personnel.

The general offices are located at Decatur, Indiana. The organizers of the company and the officers are: President and general manager, W. H. Fledderjohann; vice-president and general counsel, John H. Koenig, St. Mary's, O.; secretary, B. A. Fledderjohann, New Bremen, O.; treasurer, M. H. Wilson, Cleveland, O.; general superintendent, T. W. Shelton; superintendent of construction, Edwin Fledderjohann.

FIVE-CENT FARES.*

The five-cent fare with universal transfers is virtually the American idea of the street car fare, and will undoubtedly prevail in this country for many years to come. The wage-earner in America is better able to pay a five-cent fare than his European brother is the three-cent fare. The use of the "zone" system would never be popular in America, as it tends to congestion, misery and disease, by breeding tenement houses. In this country the enterprising laborer and artisan, with his home in the suburbs of the city, is carried to and from his work regardless of distance, for five cents. Whereas, under the foreign zone system he would have no alternative than the restricted slum district in the zone in which he worked.

All people do not ride of necessity. The short ride may be termed a luxury. The long ride is, however, a necessity. Shall we reduce the price of the luxury and raise the price of the necessity? To do so would be un-American.

Everything which enters into the daily life of the average citizen almost without exception, has risen in value during the past few years, excepting street car fares, which in reality are being reduced (although the fare may remain at five cents), for the reason that as the city grows, the lines are extended and a longer haul is given by the transportation company.

The great question of wages is the basis of the cost not only of the operation of the railway, but of its construction, and practically, all the materials and machinery which it requires in its equipment.

Take by way of comparison Denver, Colo., and Glasgow, Scotland. Wages of the trainmen in both of these cities are above the average paid in their respective countries, being as follows:

Glasgow	14 cents
Denver	27 cents

That which is true of the trainmen is true of all other forms of labor. The amount paid for one hour's labor in Denver would buy practically two in Glasgow. (Glasgow is cited as it stands at the head of municipally managed tramways of the world.)

Do the citizens of Glasgow get a corresponding reduction in fares? From the last report it appears that the average rate of fare paid per passenger per mile is 0.9 cents. The average rate of fare charged in Denver during the same period is exactly the same rate.

The maximum ride in Denver for five cents is 15 miles, while in Glasgow it is but 5.8 miles. The lowest rate of fare in Glasgow per passenger mile is 0.8 cents, and in Denver 0.3 cents.

In Glasgow no transfers are issued, while in Denver the universal transfer system prevails, and 14,000,000 passengers availed themselves of them during the past year.

In European cities where lower fares prevail there are fewer miles of railway for the population served. Denver has 26 different routes of street car lines with a population

of 200,000, while Glasgow, with a population of upwards of 800,000 has but 12 lines of railway.

Regarding the subject of taxation. The city of Denver is receiving more in gross taxes annually from its street railway than Glasgow. The amount of taxes paid per capita for the population served is:

Denver	90 cents
Glasgow	17 cents

Of course there may be some special lines here and there throughout the country where very heavy travel is continuous and where the haul is comparatively short. Such individual lines might possibly be operated at a profit on a three-cent fare, but these lines are few and far between, and generally the company which has one or two such lines have many others which are not nearly so profitable, and still others which do not pay expenses, and these lines simply sustain the others.

Therefore the writer does not anticipate the possibility of any marked reduction in street car fares in America in the near future unless the owners are willing to operate them at a loss or the scale of wages in America falls to the level that prevails over the waters.

STATIONS ON THE BRIGHTON BEACH LINE OF THE BROOKLYN HEIGHTS RAILROAD COMPANY.

In the December issue of the Electric Railway Review was published an illustrated article on the Brighton Beach line of the Brooklyn Heights Railroad Company, which for a distance of 6,400 feet from Church street to Fiske Terrace is being reconstructed as an open cut between concrete retaining walls and from Fisk Terrace to Coney Island is being elevated on an embankment. The reconstruction work was undertaken primarily as a problem in grade crossing elimination. Plans have now been prepared by the company for the various express and local stations to be erected along the reconstructed route.

On the open subway from Church avenue to Fiske Terrace these stations will have their platforms at track edge and these will connect by wide stairs with the station structures which are to be bridged over the tracks and at street level. Such structures will include the local stations at Beverly Road and Avenue C and the large express and local station which will extend from Foster to Newkirk avenues. The buildings will be steel framed, copper sheathed and roofed in a deep red Spanish tile. Inside the stations will be finished in oak, made most commodious and equipped with public toilets, ticket offices, waiting rooms and news stands. Electric bell and light signals will give sufficient announcement of coming trains to enable passengers to wait in the stations above the tracks.

The platforms are 8 feet wide and 300 feet long to accommodate eight-car trains without difficulty. They have been built at car-floor level and are reached by short and easy flights of stairs from the waiting rooms. A canopy protection extending their entire length affords sufficient protection from rain and bad weather.

On the south or embankment section of the new work local stations are to be built at Manhattan Terrace, Elm avenue, Avenue U and Neck Road, with express stations at Kings Highway and Shore Road. In these cases the stations are entered below the tracks, the waiting rooms and stations proper being at street level and beneath the girder bridges that will carry the railroad over the highway intersections.

The train platforms will be of the same dimensions as those along the open subway, island platforms being used for the express stations. From each of these stations broad stairs lead down through the concrete retaining walls of the dirt fill to the station buildings, which are built of a handsome grade of repressed brick on the outside and lined with a decorative design of porcelain tile on the inside. Floors will be tiled and the only wood used in the construction will be that which goes into ticket booths and news stands. The entire building will be clean, sanitary and attractive.

A special design of station is to be built at Fiske Terrace where the new road comes from the open cut up upon the embankment. At all stations passengers will pay their fare before entering the trains, the present system of fare collection by conductors being entirely abolished. Overhead wires are to come down and third-rail operation substituted before the opening of the new line early in the coming summer.

*By John A. Beeler, vice-president and general manager Denver City Tramway Company, in "Public Service."

CAR INSPECTION.*

BY LEE W. JACQUES, MASTER MECHANIC, FORT WAYNE & WABASH VALLEY TRACTION COMPANY.

Car inspection, as applied to street railway and interurban service, is to be considered one of the most important points with which the electric railway men have to contend. It should be considered from several different standpoints, viz.:—Safety to the public, maintenance of proper schedules and economy in maintenance of equipment. Proper inspection is the greatest insurance, both to ourselves and to the public, and the only way in which a satisfactory degree of safety can be assured.

As regards the maintenance of proper schedules, inspection greatly reduces the liability of cars failing while in service, and lessens the chances for the public to express opinions regarding the poor service that electric railways maintain for the different city and interurban lines. Poor service has a tendency to make the public, in general, think that electricity is not as reliable as steam, when applied to transportation.

When inspection, as regards the maintenance of equipment, is considered from an economical standpoint, the old adage that "a stitch in time saves nine" is expressly applicable. Inspection of electric cars should be similar to that of locomotives on steam lines, and not like the inspection of railroad cars or coaches, as each individual electric car has its own motive power, in which a small defect may cause serious trouble and much expense and delay.

Accidents, such as the burning out of controllers and derailments caused by broken flanges, etc., can generally, with proper and thorough inspection at frequent intervals, be avoided.

At the present time, especially in the east and the middle west, electric lines handle, daily, many more people than the steam lines; therefore, we should be equal, or superior, to them in the inspection and maintenance of equipment, and have facilities by which each car can have thorough and complete inspection at frequent intervals.

On many of the city lines cars are allowed to run several days without complete inspection. This is generally owing to the crowded condition of shops and pit rooms, as many of the older city lines are still using the same shops, or portions of them, that were used when horse cars were in service. These shops are centrally located in a majority of cases, and floor space and pit rooms cannot be obtained, owing to the excessive price of adjoining grounds. Consequently, the cars cannot all be run over the pit each night, but have to be divided for inspection alternately; and it is sometimes several nights or days before all the cars are inspected. To a large extent this explains why so many cars fail while in service, interrupting schedules and giving great dissatisfaction, both to the management and the public.

Another point to be considered is that most of this work has to be done at night when it is necessary to use torches or extension lights while inspecting all parts under the cars, and an inspector is much more liable to miss defective parts than he would be in daylight. Most street railways, and also other industries, do not think night work can be carried on as economically as day work, which is true to a great extent; but as most city lines have only a few extra cars and limited room, an additional night force, with a competent and wide-awake foreman and inspector, seems to be the only solution.

We believe the inspector should be jointly responsible with the foreman for the condition of the equipment and also the manner in which repairs are made. He should be thoroughly familiar with the different types of equipment he is required to inspect, and it should be his duty to carefully inspect each car underneath as soon as it arrives over the pit; and, if conditions warrant, to complete the inspection of controllers and car bodies afterward, in order to allow room on the pit for the next car. After completing his inspection, he should make a report on a blank form furnished for this purpose. He should also know that the work has been done before the car is allowed to enter service, and should promptly report to his foreman any errors made in repairs.

Shop condition is another point to be considered. When building new shops, would it not be well to consider the fact, that although central location may be sacrificed, considerable advantage would be gained by securing plenty of room for storage, repairs and inspection? Another important fact that is quite likely to be overlooked is the advantage of complete inspection. The cars would pass over the pit each night and the inspector would be allowed time to go over them thoroughly. One or two pits could be located in places where

cars would pass over them. If a car is found to be in good condition it could be taken to a place for storage; and if not it could be taken to a pit room for proper repairs. This would greatly facilitate both inspection and repairs; and also save much time in shifting to get defective cars where they can be repaired.

Interurban shops and barns are generally located in small towns where land is not so expensive, but unless the shops are very modern, conditions are much the same as in cities, as the buildings in most cases are too small to accommodate the increase in equipment that the business now demands. In other words, the present large equipment now used for interurban service, has outgrown shop facilities. However, as these cars are less in number and not so closely scheduled, there is much better opportunity to give them necessary inspection.

At the present time, with the high speed that is required of these cars, their frequent and careful inspection is of the greatest importance, as there are many defects that would not only delay schedules, but might result in serious accident and loss of life. Inspection of interurban cars should be the same as with the smaller equipment, only, of course, more time would be required.

In addition to shop inspection each night, I would suggest that the motorman could be of great service if put through a practical shop course and taught where he would be likely to find the defects, and the best manner in which to correct them. On most interurban lines the schedule allows considerable time to lay over at the end of each trip, and if the motorman was required to inspect and to do light repairs, he would soon become quite proficient. He should provide himself, or be provided, with suitable over-clothes and tools for this work, and he might be the saving of many delays and possibly serious accidents that could be caused by broken or sharp flanges, loose tires, etc., which can readily be detected in daylight. If motormen were placed on the same level and held responsible, as locomotive engineers are in steam railroad service, and were given the proper training, there would be many less failures and interruption of schedules than there are now; and no doubt, in certain cases, accidents would be avoided. This should be the motorman's duty as well as handling the car; however, his defect report to the shop-men should in no way interfere with their inspection.

Many roads contend that it is not necessary for motormen to know too much about electrical equipment, and simply teach them to cut out motors, replace fuses and brushes and make other minor repairs. There are some good arguments in favor of this, especially in city services where motormen are quite likely to attempt to make repairs of which they have little knowledge and thus to delay schedules and damage the equipment; but in interurban service, more time could be given to their training and more shop experience afforded, so that they would soon be able to detect many small defects that are now overlooked. At the end of the runs, providing the schedules permitted a lay-over, as most of them do, motormen could make a thorough inspection of all parts of the car that can be easily reached. Many times a motor brush will stick in the brush-holder or there will be broken brushes, loose brush-holders, etc., which can be easily detected and would cause many unnecessary interruptions by pulling the car in for knocking the circuit breaker or blowing fuses. The damage to commutators, brush-holders, etc., should be considered; and in many cases repair bills would be greatly reduced. There are also many other light repairs, such as tightening loose bolts on the trucks or brake rigging which can easily be accomplished. Frequently the loss of a cotter pin in certain parts of the brake rigging will cause the loss of a pin and the result is, the car has no brake. This is generally found out at a point where a stop is very essential, and the newspapers publish an account that the air brakes failed to work, giving full details of the accident.

By a thorough system of car inspection each time the car comes to the shop, and by having motormen thoroughly competent to inspect and to make light repairs at the end of each trip, an unsafe or dangerous condition in cars would not be likely to occur, and we would have the best possible safeguard against any liability of accident, either to the public or the equipment, thereby saving the claim and mechanical departments financially to a great extent. The more frequent and thorough the inspection is by thorough and competent men, the less is the liability to damage suits, and the more economical is the service.

Discussion on Car Inspection.

The discussion on this paper turned largely upon the proper uniforms for the motormen of interurban cars.

F. A. Bundy (Lima & Toledo) said that motormen would

*Read before the Central Electric Railway Association, Dayton, O., March 28, 1907.

take an interest in making careful inspections and were willing and anxious to make the light repairs that were sometimes necessary, provided doing so would not ruin their uniforms. He believed that if the motormen wore overalls and jumpers the best results would be secured.

E. C. Spring (Dayton Covington & Piqua) and George Whysall (Columbus Delaware & Marion) opposed this on the ground that the repair shops should not be spread over the entire road, and that with proper shop management and inspection there was no need for motormen making repairs or inspections of cars that would require them to soil their uniforms; also, they believed men in overalls do not present a good appearance.

W. H. Evans (Indianapolis Traction & Terminal), A. A. Anderson (Indianapolis Columbus & Southern) and C. Skinner (Scioto Valley) approved of overalls for motormen as their experience had been that the clothes question was a very important one; a motorman wearing a comparatively expensive uniform would not go under a car to make some slight repair because it meant the ruin of his uniform, a matter of \$20 or \$25 to him. Mr. Anderson had introduced the overall and jumper uniform on lines entering Indianapolis and said he believed the men presented a better appearance in neat washable clothes than in the shabby cloth uniforms, which cost 12 or 15 times as much and were not renewed and cared for. Mr. Skinner said that the Scioto Valley motormen considered their washable uniforms good enough to wear any place.

In concluding the discussion Mr. Skinner explained that on his line the motormen carefully inspected their cars at each end of their runs. The motormen were carefully instructed by the inspector of air brakes and the electrician and were given practical lessons in assembling dismantled car equipment.

TRACK BONDING.*

BY THOMAS B. MCMATH, CHIEF ENGINEER, INDIANAPOLIS TRACTION & TERMINAL COMPANY.

The earliest track bonding that came to my attention was that of old tram rails laid on wooden stringers. This was done by drilling a $\frac{3}{8}$ -inch hole in the tram near the end of the rail. The bond used was of No. 4 galvanized iron wire. A rivet was started in the hole, about two turns of the wire were taken around the rivet, and then the rivet was set. In speaking of this work some time ago a statement was made that no pains were taken to get good contact. This is the general opinion of present critics. I do not think this was ever the case. Frantic efforts were made to pour solder on the wraps of wire around the heads of those rivets. The head of the rivet was under the rail with a clearance space notched out of the stringer; the end of a rail was raised for installing the bond. The difficulty of the work was increased by the fact that a mule car ran every 10 minutes. It might be added that the contempt of the mule driver for new methods of propulsion and the conceit of the expert applying the bonds found expression in plain language.

The next track bonding effort in my knowledge retained the galvanized iron wire feature, but a wire was run the full length of the track and connected with each joint bond; but even in this type of bonding an effort was made at good contact, as all wire splices were soldered.

The failure of bonding during these periods was not hard to explain. The entire track construction was so weak that the failure to secure a proper return was largely chargeable against the track as well as the defect in capacity of the bond. At this time, while the tram rail was still in use, the $\frac{4}{2}$ -inch girder rail was considered standard construction for horse car work and, it was expected, would be satisfactory for electric cars if only bonded.

The channel pin was generally used with wire bonds and was the first efficient terminal. It was first used with galvanized iron wire up to No. 0000.

This type of bonding held its own in popularity and efficiency until superseded by bonds concealed under the fish plate. The popularity of this type was largely due to the possibility of using all scrap wire from feeders and trolley as bonds. Its efficiency was due to its easy application by un-

skilled workmen; its failure due to the ease with which the copper on exposed track could be stolen.

With the 6-inch girder rail, however, a much better bond was used, known as the Chicago bond. The bonds used by the writer were solid, with No. 0 wire with a large base at the terminal end, and the terminal was threaded. After the terminal was put through the rail a brass nut was put on and pulled tight.

Contact was provided by milling the rail around the hole with a special tool, the large contact being provided by the boss against the milling surface. Special pains were taken to insure contact, as a strip of solder was introduced under this boss and, after heating with a torch, the nut was given an extra turn; and, finally, the end of the thread was riveted to prevent the nut from coming loose.

The next bond which came to my notice was the No. 00 Atkinson Horseshoe, about $2\frac{1}{2}$ inches long. This was presumably applied with a single screw compressor; but in reality a large majority of these bonds were driven in and riveted with a hammer. This bond gave a good result on account of the increase in capacity and because of the fact that it was used on good firm joints. On loose joints, however, the shortness of length and the lack of flexibility soon destroyed the contacts. The No. 000 and No. 0000 Washburn & Moen bond, known as the Crown bond, was the next. This bond had a hollow terminal, which was expanded after its insertion in the rail by a tapered steel plug. These bonds proved to be good. The point of failure was generally in drilling a hole of the exact size needed for the terminal, and the limited expansion the plug would give. The result was loose terminals. There are bonds of this description in track at Indianapolis that test fair now after six to seven years' use.

The standard bond in use in Indianapolis is a No. 0000 10-inch flexible bond with a $\frac{7}{8}$ -inch compressed terminal. With this type of bond the chief difficulty is the connection of the flexible strand or ribbon wire with the terminal. Each manufacturer claims that his process is the best. But all are affected by the personal errors of workmen in manufacture. Certain heat conditions, together with proper manipulation at the exact moment, are essential to production of the good bond. Individual wires badly burned, and wires practically cut through in the process of forging, are frequently found in all these bonds. I know of no practical test that can be applied to ascertain conditions at the merging of the strands into the terminal. In sawing terminals open with a hack-saw, the condition of the surfaces exposed does not prove contacts, as the drag of the saw teeth in a material that flows as readily as soft copper will cover and smooth over irregularities.

If the terminal is quartered by hack-saw cuts down to the flat and these quarters are spread and flattened back by sharp, heavy blows with a hammer, the test may demonstrate the ductility and hardness of the material and may show some measure of the contact between the ribbon wire and the head in cases where the head was originally a separate piece.

For testing all contacts of ribbon or strand wire with the terminal the following is suggested: Hold the head firmly in a vise; after cutting the strands some two or three inches from the head and bending them back against the terminal, take the individual wires and separate them from the head by a strong, sharp jerk. This will show relatively the reduction in area, brittleness and possible defect.

The manufacturers do not pay sufficient attention to smooth terminals. Frequently terminals are so rough that an appreciable flow of material under compression will be required to bring cavities into contact.

A serious difficulty in bonding is the drilling of holes in the rail. New twist drills will bore an exact hole, but if they are ground by hand they will not bore true holes. A tool grinder is therefore essential. A Yankee tool grinder in the shop, or one of the portable tool grinders now obtainable, should be used exclusively for bits. A portable grinder costs about \$15 and, if fastened on a hand car, a wagon bed or even on a block of wood, can be conveniently carried. If the grinder is attached to a piece of board and nailed to a pole or a tie, grinding can be accomplished easily.

In one instance, after carefully bonding some three miles of track, I found at the end of three months that 15 per cent of the bonds were faulty and I am convinced that defectively ground hits were responsible. The original holes were drilled with a Ludlow electric track drill after the track was laid, and the holes were drilled dry so that no oil or dust could prevent contact. The bonds were immediately applied with good compression. It was decided that one of the bits used had evidently, due to defective grinding, drilled a hole nearly $\frac{1}{8}$ of an inch large. The only defective bonds were consecutive along one side of a track, and the holes were found to be too large.

It is necessary to insist on the use of the tool grinder, as men claim they can grind better by hand. Investigation

*Read before Central Electric Railway Association, Dayton, O., March 23.

has shown that all claims of better grinding by hand were due to a wire edge left by the tool grinder which prevents good cutting. The wire edge can be easily removed by the back of a knife blade. If one man is made responsible for the field grinding he will understand the necessary kinds of grinding and will take pride in doing the work well.

The writer has never personally used plastic bonds. His experience with solders of low melting temperature, containing bismuth and mercury, demonstrated sufficiently that such alloys will granulate and disintegrate in time. Soldered bonds are a success when carefully applied. They give good contact and are hard to remove. Good track with firm joints are necessary for the success of a soldered bond.

The use of a bond brazed to the rails by means of an electric brazing device gives the best contact that can be obtained. This process of brazing, however, includes the merging of the ribbon wires into a solid mass for a terminal, which is the most delicate part of bond manufacture. The forging of a bond can be entrusted only to a workman of the highest skill. Railway companies will find it difficult to do work themselves with such a machine unless they are able to find and to keep an operator who possesses the requisite skill.

In Indianapolis there are 40 miles of track with cast weld joints which also provide the electric contact. These joints have been tested several times and show excellent contact. There is about 1 per cent of open joints which have been bonded after five to six years of service.

It is frequently impossible to bond all joints in special work for the reason that the compressor cannot be applied. Long bonds must be used to connect all pieces that would leave open joints. In addition it is best with complicated layouts to use long bonds to jump the entire piece of special work. The size and the number of such long jump bonds depend on the amount of return current to be carried. Long bonds can be made with terminals spliced and soldered to the wire or cable.

Manufacturers charge more for two terminal ends than for a 30-inch cable bond, which, if cut in two, will provide the desired terminals. The reason for this is the manufacturer's secret.

The general rule in cross bonding is to use a cross bond every 500 feet and at both ends of all special work. Double track should be bonded across at least every 1,000 feet. A bond made 66 inches long will suffice for both track and "devil" strip cross bonding.

Bond testing can be done with very simple instruments. The double voltmeter is sufficient. This is wired to knife-edge terminals; one reading is taken through the joint and the other through a similar length of rail. A comparison of the drops shown by each meter will give the relative conductivity of joint and rail. A joint showing three times the resistance of an equal length of solid rail is frequently permitted. Greater resistance indicates that the bond should be renewed. The expense of removing and replacing the pavement, however, frequently prevents proper attention to poor bonds.

It is a slow and tedious task to go over any length of track with a bond tester. Sufficient attention, however, is not generally given to the condition of bonding. A bond supervisor should be employed on all roads, and no other duties should be imposed which will prevent him from making proper inspection. A good bond supervisor will undoubtedly be termed a crank by construction gangs, thus proving his efficiency.

A test car for the general inspection of bonding would be a good investment for roads with considerable length of track. Such a car has made trips over Indiana and Ohio roads. The car gave the general conditions, but registered more open joints than actually existed, as any break in contact between the wheel of the car and the rails will also register as an open joint. In spite of any local defect which may be missed or any non-existing defect which may be registered, the car would show the conditions of bonding at a lower expenditure per mile than any other method.

Discussion on Track Bonding.

A. A. Anderson (Indianapolis Columbus & Southern) asked as to whether Mr. McMath objected to the use of oil in drilling for bonds.

Mr. McMath replied that he did not, provided the oil were wiped off—the cleaner the metal the better—and he suggested the use of emery cloth to cleanse the surface of the hole.

G. H. Kelsay (Indiana Union Traction) stated that in installing bonds recently under the direction of the manufacturer he had used oil and cleaned the holes with gasoline.

W. H. Evans (Indianapolis Traction & Terminal) sug-

gested the use of drills of high-speed steel, which required neither water nor oil as a lubricant.

In response to a question by Mr. Kelsay as to efficiency of brazed bonds, C. N. Wilcoxon (Cleveland & Southwestern) stated that about 15 months ago the Electric Railway Improvement Company had installed bonds for one line of rails on two short divisions aggregating 14½ miles in length. These were of No. 0000 section and brazed. A recent inspection showed that out of 1,200 bonds installed only 7 were defective; of these 5 had broken strands and 2 had one terminal loosened. Later 523 brazed bonds had been installed on track in brick paved streets, where the rail joints were badly worn, and only 27 had proved defective in a recent inspection, which the speaker considered a very good showing.

George Whysall (Columbus Delaware & Marion) gave the cost of installing American Steel & Wire Company's double terminal bonds as from 8 to 10 cents each. In installing 1,000 of these bonds he has experienced trouble in drilling the holes nearer the ends of rails without oil. In a later installation of 1,000 of these bonds oil had been used and the holes cleaned with a cheesecloth swab dipped in gasoline. The speaker believed the principal difficulty in bond installation was that mechanics' work was expected from common laborers.

CAR WHEELS FOR INTERURBAN AND CITY SERVICE.*

BY C. SKINNER, MASTER MECHANIC SCIOTO VALLEY TRACTION COMPANY.

I wish first to state that I have interpreted this subject to mean, "Wheels for Heavy Interurban Cars, Operated over Both Interurban and City Tracks," and in the treatment of the matter at this time I have in mind only the operation of high-speed equipment weighing 40 tons or over per car.

I am fully satisfied that in the selection of wheels for this class of service, the specifications of the Master Car Builders' Association should be adhered to as nearly as possible. It may be, and in our case was, necessary to reduce the size of the wheel flanges somewhat in order to operate over city streets, and I believe the flange dimensions may be safely reduced to 1½ or 1 inch in depth and to 1¼ or 1½ inches through the throat, but I am firmly of the opinion that the 4-inch tread is essential to safe tracking and to obtain proper efficiency in braking, with heavy equipment.

My experience has been that the flangeless brake shoe is best for service in which heavy cars are operated over grooved rail in city streets, for the reason that the flange wear, already excessive, should not be increased by the use of a flanged shoe. We have demonstrated by practical tests that the wear on the wheel flange by the adhering of a brake shoe to the flange of the wheel reduces the possible length of time between tire turnings, by nearly 30 per cent. Therefore, in the operation of heavy equipment at high speed, with flangeless brake shoes, we need a fairly wide tread to obtain sufficient braking power.

The question of safety in tracking is an extremely important one. I believe all will agree that no system of inspection, no matter how thorough, can be depended upon to detect a wheel that is loose and working at the axle fit, at just the time it occurs. Therefore, why reduce the factor of safety from this not unusual trouble, especially when we have to meet a condition in operating over city tracks that greatly increases the liability of wheels to loosen on the axle fit? Recognizing the desire and expediency of having interurban companies operate their cars over the tracks of city companies within the limits of municipalities, I believe that in the operation of this same heavy equipment at high speeds outside of city limits, safety must be the first consideration. I will give a brief resume of the experience of the Scioto Valley Traction Company with the wheel question. This company commenced operation in July, 1904, and until about December 1, 1904, operated on its own T-rail tracks exclusively, not entering Columbus over the city tracks until the latter date.

The records from which data were obtained for this report cover ten 60-foot passenger cars of this company, weighing 42 tons each, and equipped with 36-inch steel tired wheels, having M. C. B. tread with flange 1 inch deep by 11-16 inches thick through the throat. (This was found to be the max-

*Read before Central Electric Railway Association, Dayton, O., March 28.

imum size of flange which could be operated over the groove rail tracks in the city of Columbus).

The accompanying illustration shows the exact wear on flanges of a pair of wheels removed from one of the cars on March 22, 1907; this pair of wheels having been placed under this car November 8, 1906, with tires newly turned to the dimensions mentioned above. The mileage made by this pair of wheels during this interval was 28,000 miles. This wear was, however, somewhat abnormal, as we average about eight months between turnings, or about 48,000 miles. The first five months of our operation, you will recall, was over T-rail, and I would call particular attention to the fact that during that time, our wheel flanges showed no perceptible wear. Since December 1, 1904, or during a period of about 27 months we have been obliged to remove and turn 93 pairs of wheels for no other cause than worn flanges. The distance covered in going in and out of the city of Columbus is seven miles, about one half of which is grooved rail with 1 1/4 inch groove.

In looking at the illustration, you will observe the excessive wear on the inside of the flange. This wear, coming at the angle it does, shows a very severe wedging tendency, which finds its weakest point at the wheel and axle fit. The inertia from the swaying of the heavy car and from climbing the inside of the groove where the track is out of alignment, make it very difficult to maintain an immovable wheel at this fit. In less than two months after commencing operation over the city tracks, we had a large number of loose wheels, that is to say, they had moved out of gauge on the axles notwithstanding that it afterward took from 45 to 60 tons hydraulic pressure to move the same wheels in the shops. We replaced these wheels at from 90 to 125 tons pressure, and have been fairly successful in keeping them tight.

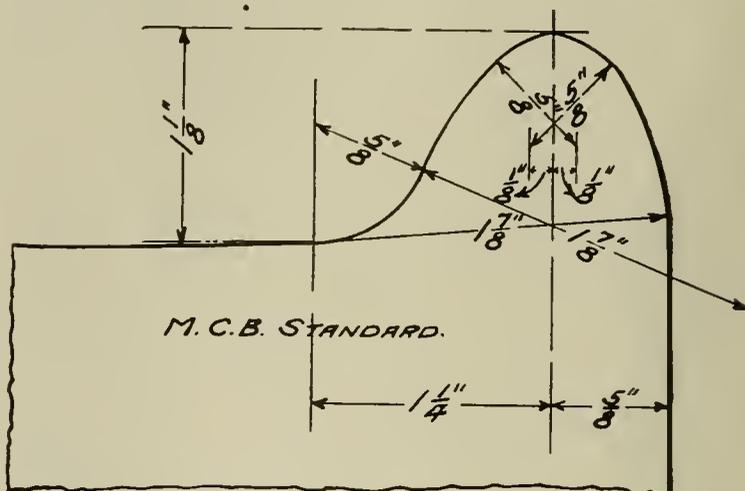
Judging from our experience, I should say that wheels for this class of service should be pressed on at about 90 tons, with a minimum of 70 tons. I have handled wheels of identically the same design on steam railroads for a number of years, using 40 tons as a maximum pressure, with no trouble from loosening.

Although over half of the wheels under the cars covered in this report have been refitted on account of becoming loose, we find it necessary to maintain the most rigid inspection of our wheels. We keep a trained inspector whose principal duty it is to gauge each pair of wheels each day a car is in the shops, which is every alternate day. The spread is measured by a solid immovable gauge and a written record is made of the position of the wheels on the axle. This report is turned into my office, where it is carefully checked with the former records. It is not unusual even now to find a wheel loosened, notwithstanding the enormous pressure at which we put them on.

Some idea of the excessive wear of flanges due to the cause mentioned may be shown by comparison with the life of the same wheel under equipment of equal weight on steam railroads; it is not unusual to obtain a mileage on steam

back to back of wheels accurate, and that the minimum was 4 feet 6 inches.

Replying to an inquiry, Mr. Skinner said he had found no marked difference in the wear of wheels on the gear end of the axle, and that in the drawing submitted the lesser wear was on the gear end. This was contrary to the experience



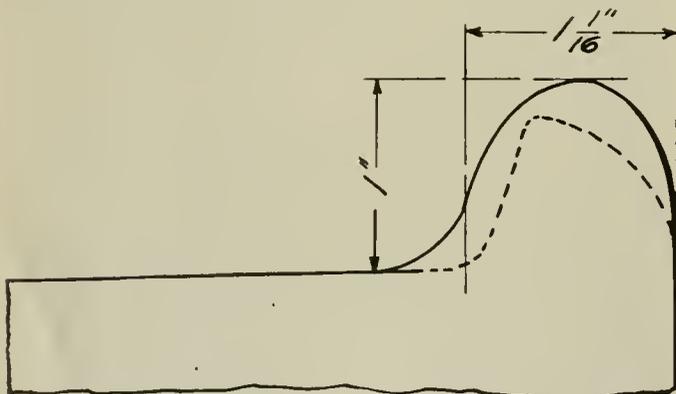
Wheels—M. C. B. Standard Wheel Flange—Full Size.

of a number of speakers, who stated that the wheel on the gear end of the axle showed the greater wear.

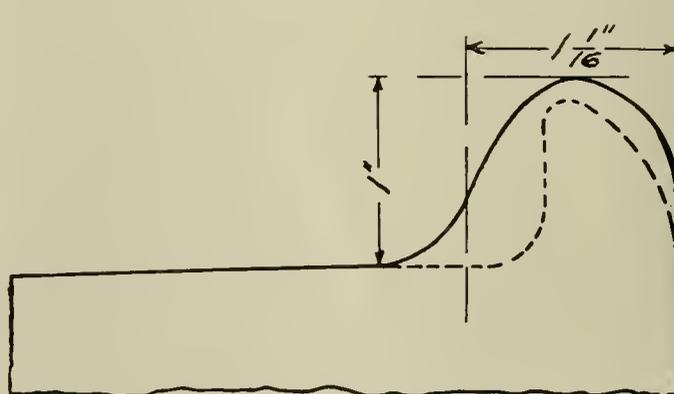
George Whysall (Columbus Delaware & Marion) attributed the trouble with wheel wear on his road largely to the varying gauges of special work in Columbus, which were from 4 feet 3 1/4 inches to 4 feet 9 inches.

F. A. Bundy (Lima & Toledo Traction) stated he found the principal wear on the gear end of the axle, and that steel tires would not run 50,000 miles before the flange wore to 1/2 inch in thickness. In turning worn wheels he made the wheel on the gear end a little large, and did not attempt to bring the flange up to standard gauge. The question of the effect of cars riding on the side bearings having been raised, Mr. Bundy said that this would not account for the result on his road, as there was a clearance of 3-16 to 1/4 inch on his cars.

W. H. Evans (Indianapolis Traction & Terminal) suggested that there might be a difference in wheel wear ac-



Wheels—Flange as Worn—Gear End of Axle—Full Size.



Wheels—Flange as Worn—Non-Gear End of Axle—Full Size.

roads of about 200,000 miles between turnings, while our average is 48,000 miles.

Discussion on Car Wheels.

T. B. McMath (Indianapolis Traction & Terminal) called attention to the drawing submitted by Mr. Skinner and said that with grooved guard rails wheels with 7/8 by 1 1/2 inch flanges would wedge, and tend to produce the effect shown. He considered it very important to have the gauging from

ording as the motors were inside or outside hung, and that the play in pedestals and boxes was an important matter. He also urged the need of careful measurement of wheels to insure that they are properly mated and properly centered on the axle; incompetent or unreliable help should not be employed in this work. In his practice tapes were used for measuring wheels, as he considered calipers unreliable. In turning steel tires the gear end wheel was left from 3-16 to

$\frac{3}{8}$ inch greater in circumference. The speaker considered a vertical flange $1\frac{1}{8}$ inches deep more dangerous than a smaller flange of the proper contour. He believed a 4-inch tread better than narrower ones and stated that in Kansas City no difficulty had been experienced in substituting $3\frac{1}{2}$ -inch treads where $2\frac{1}{2}$ -inch treads had been used before.

Mr. Bundy replied that if the equipment were uniform a wide tread would cause no trouble, but that if different treads were used there would be difficulties in running over switches.

TROLLEY WHEELS.*

BY M. BAXTER, ELECTRICAL ENGINEER, WESTERN OHIO RAILWAY COMPANY.

This paper is intended to deal with trolley wheels for interurban cars. Much time and expense can be saved by using trolley wheels designed for the particular service, and it pays to test them out thoroughly.

When testing a new wheel there should be kept not only car-mileage record of wheel, spindle and bushing, but also the record of complaints from the conductors. It should be known whether the wheel held to the wire and ran quietly. The wheel should be examined when it comes off the test to learn whether it met with accident or was entirely worn out. Spindle, lubricant, bushing and the flange of the wheel should be examined especially to see if the wheel wore true.

It pays to keep a complete record of every wheel used, and this can be done with little cost by the barn man who looks after the trolleys. Each wheel should be stamped and a record made of the date when it went into and came out of service, giving number of the car on which it was placed. This record can be completed by the man who takes care of the car-mileage.

If a record of all wheels is kept some of them will not be allowed to lie along the right of way to be picked up and sold, and we will get them to our own scrap pile. Very often where an extra pole and wheel are carried on a car the trainmen in their haste to make quick repairs and get their car back on time after a trolley wheel accident, will throw the old pole and wheel on ground, expecting the work car crew to pick it up some day.

If a record is kept the manager will know if the wheel manufacturer is keeping his product up to standard. If he learns of some other road, under similar conditions, which claims good results from a trolley wheel test, he will know if he cares to try that wheel.

Many delays on the road from trolley wheel trouble can be done away with by having a good man to inspect the wheels. This inspection should be made every day or after every 500-mile run. Much attention should be paid to the contacts and the collecting springs of wheels. These contacts and springs should be kept clean and in good shape so that the current will not depend upon the spindle for a path to the trolley pole. If it does the lubricant will soon dry out and the spindle or hub will be ruined.

Oftentimes a wheel is condemned when the real cause of the trouble may not be in the wheel. The cause may be in the trolley stand or the adjustment of the wheel in the harp.

To have the life of a wheel increased where double trolley wires are used and where the wheel has a tendency to wear only on one side instead of in the center, the trolley stand should be adjusted so that it will swing freely, but not too freely, for the high-speed road cannot make time with a too sensitive trolley stand. The tension of the wheel on the wire should be watched closely.

Many roads today are making their own trolley wheels from scrap that accumulates on their property. They claim a saving of about 30 per cent.

Discussion on Trolley Wheels.

After reading his paper Mr. Baxter requested that those present who had had experience with graphite bushings, and who made their own trolley wheels, and also those who had had experience with sliding trolleys, would give the results.

George Whysall (Columbus Delaware & Marion) stated that with ordinary care, that is, lubricating the trolley wheels at night only, Kalamazoo wheels made about 2,200 miles; lubricating them once during the middle of the day increased the life to an average of 6,500 miles, and in one case he had got 9,000 miles out of a wheel. He believed, however,

that the cost of the time required to give the extra lubrication was not compensated for by the longer life of the wheel. With the Hensley wheel he secured a mileage from 3,000 to 3,500. Until about two weeks ago the tension used with these was from 40 to 45 pounds 19 feet above the rail. Considerable trouble had been experienced by the trolley wire breaking near the ears. With the tension reduced to from 35 to 40 pounds the trolley wheel would leave the wire and some broken poles resulted. A tension of 40 to 45 pounds would keep the wheel on the wire at the speeds used, which are 40 miles on the average, with a maximum of 60.

Mr. Baxter said that a roller bearing trolley stand obviated the difficulty in regard to the wheel leaving the wire.

F. A. Bundy (Lima & Toledo) said that in applying oil to lubricate the Kalamazoo wheel the graphite bushing was spoiled and that good results from the use of graphite could not be expected under this condition. He had difficulty in keeping the Holland wheel on the wire. With the Hensley wheel twice the life had been secured by using a ball bearing base. Some difficulty had been experienced from scoring of the wheel hub, which he believed to be due to the wheel not being thoroughly cleansed from sand. With his average conditions, with lubrication every alternate day, Hensley wheels made from 3,200 to 3,300 miles. Mr. Bundy considered that the trolley wheel question was a very serious one and that the difficulties experienced were due to attempting to pass 500 to 800 amperes through a small contact area. He considered that a new contact device was necessary, one which would give sufficient area to carry the current needed. He had found that even with tension as high as 50 pounds 19 feet from the rail the trolley wheel would leave the wire if the retriever were not in perfect order, and that a lighter tension, 30 to 35 pounds, with a ball bearing base, kept the wheel to the wire better than the heavier tension and ordinary base. He suggests the use of metal molds for casting trolley wheels, to insure cleaner castings and greater symmetry.

J. E. Cochran (Lima & Toledo) stated that he had 65 miles of No. 000 trolley wire with clinch ears and had found no breaks at the ear, although there had been a few cases of the wire breaking between the poles. Examination showed the wire pitted and burned as badly 12 inches from the ear as at the ear. He believed that the trolley wheel, which had served very well for transmitting 125 amperes, was entirely unsuitable for transmitting 400 to 800 amperes, and that with speeds from 40 to 60 miles an hour there was certain to be arcing at the trolley wheel, which would burn the wire.

Mr. Whysall said that much of the trouble with trolley wheels leaving the wire was due to track and not to the wheel or the wire. A slight variation in the surface of the track caused a comparatively large movement at the height of the trolley wire.

G. H. Kelsay (Indiana Union Traction Company) criticized the design of trolley wheels, stating that many of them were not well balanced and that a wheel not perfectly balanced would cause pounding in the bearing and shorten its life. He believed that a light pole and a light wheel, together with a proper adjustment of the stand, would greatly improve matters. On the Indiana Union Traction lines there were a good many breaks in old trolley wire. This wire was of figure 8 section with clinch ears, 4 or 5 inches long, and the breaks occurred at the ears.

Replying to an inquiry concerning experience with bow trolleys on single-phase lines, Mr. Crouch of the Westinghouse company stated that aluminum sliding trolleys had given from 4,000 to 5,000 miles on 3,300 volt lines, and a greater mileage on 6,600 and 11,000 volt lines.

A. A. Anderson (Indianapolis Columbus & Southern) stated that the trolley tension used with the bow trolley, when he was on the Indianapolis & Cincinnati line, was 20 to 25 pounds, less pressure being necessary than with the

*Read before Central Electric Railway Association, Dayton, O., March 25.

wheel. Mr. Crouch gave the tension with the pantagraph type sliding trolley as from 15 to 20 pounds.

T. W. Shelton (Ft. Wayne & Springfield) stated that his road had been designed with a view to using the bow trolley, but that it was at present operated with trolley wheels, taking current at 6,600 volts. He had no difficulty with the wheel. Mr. Shelton considered that the catenary suspension was the safest, but called attention to the need of considering the difference in the coefficients of expansion of copper and steel, and stretching the copper wire tight; otherwise with higher temperatures there would be very marked sags in the copper wire, as it expanded more for a given rise in temperature than the messenger cable.

The discussion closed with some comments upon iron trolley wheels, Mr. Bundy stating that he had removed iron trolley wheels because he found them covered with copper and felt sure that the trolley wire was being worn rapidly.

VALUES OF TIES OF DIFFERENT MATERIALS.

In Bulletin No. 75 of the American Railway Engineering and Maintenance of Way Association Mr. W. C. Cushing, chief engineer of maintenance of way, Pennsylvania Lines West of Pittsburg, Southwest System, gives a series of tables showing the cost delivered which a white oak tie, lasting 10 years, must reach before it will be economical to use other kinds of tie; how long ties of different materials must last in order to be as economical as white oak costing 70 cents and lasting 10 years; and the first cost which can be paid for different kinds of ties in order to be as economical as white oak costing 70 cents and lasting 10 years. Mr. Cushing states that some of the data used are costs established from actual practice and from reliable information given, while in other cases assumptions have been made from the best information available, and from these apparently trustworthy premises the following deductions have been made:

With white oak ties costing 70 cents delivered on the railroad, it is economical at the present time to buy inferior woods at a price not to exceed 50 cents, have them treated with zinc-chloride or zinc-tannin, lay them in the tracks without the use of tie-plates (except where it is necessary to use them on oak ties) and use a standard railroad spike. A life of ten or eleven years has been found to be a maximum for such ties without the use of tie-plates and better fastenings, and if the life of 10 years is not attained, there will be that much loss to the company.

When a white oak tie reaches a cost of 86 cents or 87 cents delivered on the railroad, it will be economical to use the zinc-creosote process, or straight creosote costing 30 cents, if the tie costs 46 cents delivered on the railroad and will last 16 years; or, it will be economical to use straight creosoting costing 85 cents for treatment if the tie can be made to last 30 years, which is French practice, before the oak tie reaches a cost of 80 cents delivered on the railroad. In both of these cases, it is assumed that tie-plates, wood screws and helical linings are used because ties cannot be made to last more than ten or twelve years without the use of proper fastenings, since, otherwise, the tie will be destroyed by mechanical wear. It is necessary, therefore, to use improved fastenings when we expect to obtain a life of ties greater than ten or eleven years.

It will also be economical to use a steel tie costing \$1.75 delivered, if it will last 20 years.

When the white oak tie reaches a cost of 90 cents delivered on the railroad, it will be economical to use either ties of inferior woods treated with zinc-tannin if a life of 14 years can be obtained, the improved fastenings being used; or a concrete tie costing \$1.50 if it will last 20 years.

When the price of white oak ties reaches \$1 it will be economical to use a steel tie costing \$2.50 if it will last 30 years, a concrete tie costing \$2.25 if it will last 30 years, or an inferior wood tie treated with zinc-chloride if a life of 12 years can be obtained.

With ties of inferior woods costing 46 cents delivered on the railroad we must obtain a life of from 18 to 20 years, whether treated with zinc-chloride, zinc-tannin or zinc-creosote, to make them as economical as white oak ties costing 70 cents. It is assumed, of course, that they must have the most approved fastenings in order to attain an age as great as that.

With inferior woods costing 46 cents delivered on the

railroad, and if the creosoting costs 30 cents, it will be necessary for us to obtain a life of 21 years in order to make them as economical as white oak ties costing 70 cents delivered.

With inferior wood ties costing 46 cents delivered, and with the creosote treatment costing 85 cents as in French practice, it will be necessary for us to obtain a life of 36 years from the ties in order to make them as economical as white oak ties costing 70 cents delivered.

With steel ties costing \$1.75 each delivered, it will be necessary for us to obtain a life of 28½ years in order to have them as economical as white oak ties costing 70 cents delivered. This price is a little less than the cost of the Buhrer steel ties in the tracks at Emsworth.

With concrete ties costing \$1.50 each delivered, it will be necessary for them to last 28 years before they will be as economical as the white oak ties costing 70 cents delivered.

With steel ties costing \$2.50 delivered and concrete ties costing \$2.25 delivered, which are approximately the prices of the Seitz steel tie and the Buhrer concrete tie, in the tracks at Emsworth, it is necessary for them to last over 50 years each in order to make them as economical as the white oak ties costing 70 cents delivered.

In order to make treated inferior woods as economical as white oak costing 70 cents delivered, when the treated ties are equipped with proper fastenings in order to make them last as long as has been found practicable by experience, we can only afford to pay for the ties delivered on the railroad, 10 cents each when treated with zinc-chloride; 20 cents each when treated with zinc-tannin, or creosoted at 30 cents; 23 cents each when treated with zinc-creosote, and 29 cents each when creosoted in accordance with French practice.

In order to make them as economical as white oak ties costing 70 cents delivered, we can only afford to pay \$1.48 each for steel ties which last 20 years, and \$1.79 each when lasting 30 years.

In order to make them as economical as white oak ties costing 70 cents delivered, we can only afford to pay as first cost of concrete ties delivered, \$1.15 each, if they last 20 years, and \$1.57 each if they last 30 years.

We know nothing about the life of concrete ties, and it is at least very desirable to experiment with them for yard and side tracks even though we do not use them in the main tracks, because they might lie undisturbed in yard tracks for many more years than they would in main tracks.

When white oak ties are costing 70 cents delivered (about present prices), we can afford to buy inferior oak and other hard woods at 45 cents to 50 cents (present prices), and have them treated with the zinc-tannin or zinc-chloride processes, and only use common spike fastenings.

Trials of an Exhaust Steam-Turbine Plant.

Glück Auf, of January 19, reports the trials of an exhaust steam-turbine plant recently installed at the pits I. and II. of the Zeche Zollverein, in the Ruhr Basin. About 35,300 pounds of exhaust steam are available per hour, supplied by two hauling engines and by the fan engines, constructed respectively by the Gute Hoffnungshütte and the Maschinenfabrik Hohenzollern. The exhaust turbine was also built at the Sterkrade Works of the Gute Hoffnungshütte, and the thermal storage tank, of the Rateau type, by the Maschinenbau A. G. Balcke, of Bochum. The steam feed in the turbine is controlled by a throttle valve actuated by a hydraulic relay which is connected with the oil-pump, so that on failure of lubrication the steam is at once cut off. The turbine runs at 1,500 revolutions, and is coupled with a triphase generator for 1,000 kilowatts at 1,000 volts; it also drives the exciter, of 16 kilowatts. The feed-pipe from the thermal tank is joined by a branch from the boiler steam system. The trials were conducted during night time, and the small amount of additional boiler steam used was not especially determined. The figures of the subjoined table of results refer to the kilowatts at the terminals of the triphase generator; the exciter current is deducted, and the power absorbed by the condensers is not included. The following are the chief data of the four trials, which were conducted by the Steam-Boiler Association of the collieries of the Dortmund district:

Number of trial.....	1.	2.	3.	4.
Length of trial—hours.....	1½	1	1	1
Barometer—inches of mercury.....	30.2	30.2	30.2	29.93
Vacuum—per cent.	93.46	92.24	92.32	88.29
Revolutions	1,491	1,499	1,496	1,481
Kilowatts	433	728.4	960	1,112
Condensed water—pounds per hour.....	17,730	25,600	31,200	35,130
Steam consumption—pounds per kilowatt-hour	40.98	35.1	34.7	31.6

department may get competitive prices on the various supplies for which the storekeeper has made requisition. It will be noted that this quotation sheet is ruled for the following information: Quantity, description of articles, price, unit on which price is based, and discount.

When quotations have been received they are transferred

FORM 190

THE DENVER CITY TRAMWAY COMPANY.

OFFICE OF PURCHASING AGENT.

DENVER, COLO.,

Please quote lowest prices on articles described below and return this sheet promptly to

Yours truly,

Purchasing Agent.

QUANTITY	DESCRIPTION OF ARTICLES	QUOTATIONS		
		DISC.	PRICE	PER

THE DENVER CITY TRAMWAY CO.:
Above find quotations as requested.

Date 190

Purchasing Department, Denver City Tramway—Figure 2—Purchasing Agent's Copy of Order Sent Foreign Dealers. (Original 8½ by 12 Inches.)

to the requisition blank, shown in Figure 1, being entered under the heading "Quotations Made By." The purchasing agent then completes the information on the requisition blank by designating from which of the quoting firms the materials are to be ordered, how they are to be shipped, and later the order number and its date are transferred to this form.

The original requisition, exhibiting all the information for which it is ruled, is then given to an office assistant who makes out the orders for the material.

When supplies are to be purchased from local firms, copies of whose price lists the purchasing agent has, a form with a heading as shown in Figure 3 is used. Such orders are made in triplicate. One copy (pink) is sent to the local firm, which will fill the order; another copy (yellow, punched

red ink on this order; "To insure prompt payment make all invoices in duplicate, give order and requisition number, and mail same day deliveries are made, if possible."

The form which is forwarded to the storekeeper, Figure 3, exhibits a list of the articles which are supplied by the

Form 282

HUSTLER SLIP.
Material shipped or to be shipped

From _____

On our order of _____ 190

File No. _____	190	Wired	Ack. Due	Ack. Rec'd	190
Ack. Due	190	"	"	"	190
Ack. Received	Their letter	190	"	"	190
To be shipped	190	Will ship	Via		
Inv. and Bill of Lading Due	190	Description:			
" " Rec'd	190				
Ordered Shipped Via	190				
Shipped Via	190				
Due in Denver	190				
Wrote	Ack. Due	Ack. Rec'd	190		
"	"	"	190		

over

Purchasing Department, Denver City Tramway—Figure 5—Hustler Slip for Tracing Foreign Orders. (Original 6 by 4 Inches.)

local firm, the quantity, cost, freight, total cost and cost per unit.

The form which is retained and bound in the purchasing department is ruled to exhibit the following memoranda regarding the invoice from the local firm: Date, amount, rate and amount of discount, net amount, bill number and remarks. These forms are bound in a loose-leaf binder and are not filed away until the purchasing department has received an invoice for all the material included in such an order. When invoices are received the information is entered under the headings just enumerated.

ORDER NO	_____
REQ'N NO	_____
BILL NO.	_____
PRICES CORRECT:-	
PURCHASING AGENT.	
MATERIAL RECEIVED:	
STORE KEEPER.	

The order blanks for materials purchased from dealers not in the city of Denver (foreign) are practically the same as those described for local dealers, except that they exhibit instructions as to the method of shipment and the office copies, Figure 4, have spaces ruled for recording the date,

Folio No.										Account No.									
Date of Invoice	FROM WHOM	Quantity	PRICE		Discount	In what Quantity	F. O. B.	FRT OR EXP.		NET COST		Per	Order Number	Req'n Number	Bill Number	Pat. Cat. Form	Nos.	MEMORANDA	
			Dolls.	Cts.				Dolls.	Cts.	Dolls.	Cts.								

Purchasing Department, Denver City Tramway—Figure 7—Record of Materials Purchased. (Original 14 by 13¾ Inches.)

for binding) is retained by the purchasing agent's office and the triplicate copy (Figure 3, white, punched for binding) is forwarded to the storekeeper. The form which is mailed to the local supply dealer is a formal order exhibiting only a statement of the material and the quantities that it is desired to purchase from this firm. The following notice is printed in

weight and amount of the freight and the number and initials of the car in which the material is shipped.

When orders on foreign firms are sent a "hustler" slip as shown in Figure 5 is made out. The reverse of this slip (not shown) is ruled for indicating any remarks necessary. If in due time no acknowledgment of the order has been re-

LONG THROUGH ROUTES OFFERED BY CHICAGO TRACTION COMPANIES.

The result of the campaign which has been carried on for the approval of the Chicago traction ordinances has been to make the traction question the vital issue of the election which is to take place on April 2.

One of the principal advantages which the people of Chicago will receive, if the ordinances are approved, will be the establishment of through routes which will permit long rides for one fare from one part of the city to another. There is published herewith a map showing the proposed through routes. The descriptions of these routes, as stated in the ordinances, are as follows:

Route No. 1: Beginning at Indiana avenue and Fifty-first street; north on Indiana avenue to Eighteenth street; west on Eighteenth street to Wabash avenue; north on Wabash avenue to Lake street; west on Lake street to State street; north on State street to Division street; west on Division street to Clark street; north on Clark street to Evanston avenue; north on Evanston avenue to Devon avenue; west on Devon avenue to Clark street; returning by the same route.

Route No. 2: Beginning at Halsted street and Seventy-ninth street; east on Seventy-ninth street to Vincennes road; north on Vincennes road to Wentworth avenue; north on Wentworth avenue to Archer avenue; east on Archer avenue to Clark street; north on Clark street to Division street; west on Division street to Clybourn avenue; north on Clybourn avenue to Belmont avenue; returning by the same route.

Route No. 3: Beginning at Lake avenue and Fifty-fifth street; west on Fifty-fifth street to Cottage Grove avenue; north on Cottage Grove avenue to Twenty-second street; west on Twenty-second street to Wabash avenue; north on Wabash avenue to Harrison street; west on Harrison street to Dearborn street; north on Dearborn street to Washington street; west on Washington street to La Salle street; north on La Salle street to Illinois street; west on Illinois street to Wells street; north on Wells street to Clark street; north on Clark street to Howard avenue; returning by the same route.

Route No. 4: Beginning at Seventy-fifth street on South Chicago avenue; north on South Chicago avenue to Cottage Grove avenue; north on Cottage Grove avenue to Twenty-second street; west on Twenty-second street to Wabash avenue; north on Wabash avenue to Washington street; west on Washington street to La Salle street; north on La Salle street to Illinois street; west on Illinois street to Wells street; north on Wells street to Chicago avenue; west on Chicago avenue to Larrabee street; north on Larrabee street to Lincoln avenue; north on Lincoln avenue to Bowmanville (Foster avenue); returning by the same route.

Route No. 5: Beginning at Seventy-seventh street and Vincennes road; north on Vincennes road to State street; north on State street to Van Buren street; west on Van Buren street to Kedzie avenue; returning by the same route.

Route No. 6: Beginning at Seventy-seventh street and Vincennes road; north on Vincennes road to State street; north on State street to Washington street; west on Washington street to Desplaines street; north on Desplaines street to Milwaukee avenue; north on Milwaukee avenue to Armitage avenue; west on Armitage avenue to Forty-fourth avenue; returning by the same route.

Route No. 7: Beginning on State street at Thirty-ninth street; north on State street to Madison street; west on Madison street to Sixtieth avenue; returning by the same route.

Route No. 8: Beginning at Jackson Park avenue and Sixty-third street; west on Sixty-third street to Halsted street; north on Halsted street to Evanston avenue; north on Evanston avenue to Graceland avenue; returning by the same route.

Route No. 9: Beginning at Sixty-ninth street and Ashland avenue; north on Ashland avenue to Twelfth street; west on Twelfth street to Paulina street; north on Paulina street to Lake street; east on Lake street to Ashland avenue; north on Ashland avenue to Clybourn place; east on Clybourn place to Southport avenue; north on Southport avenue to Clybourn avenue; returning by the same route.

Route No. 10: Beginning at Seventy-first street and Western avenue; north on Western avenue to Belmont avenue; returning by the same route.

Route No. 11: Beginning at North avenue and Clark street; south on Clark street to Madison street; west on

Madison street to Ogden avenue; southwest on Ogden avenue to Fortieth avenue; returning by the same route.

Route No. 12: Beginning at Clark street and North avenue; west on North avenue to Wells street; south on Wells street and Fifth avenue to Adams street; west on Adams street to Clinton street; south on Clinton street to Harrison street; west on Harrison street to the intersection of Halsted street and Blue Island avenue; southwest on Blue Island avenue to Western avenue; returning by the same route.

Route No. 13: Beginning at Forty-eighth avenue and Archer avenue; northeast on Archer avenue to Halsted street; north on Halsted street to Evanston avenue; north on Evanston avenue to Graceland avenue; returning by the same route.

Route No. 14: Beginning at Forty-sixth avenue (Forty-eighth avenue when the steam railroad tracks on Forty-sixth avenue are elevated) and Twelfth street; east on Twelfth street to Ogden avenue; northeast on Ogden avenue to Randolph street; east on Randolph street to Fifth avenue; north on Fifth avenue and Wells street to Clark street; north on Clark street to Diversey boulevard; returning by the same route.

Route No. 15: Beginning on Twenty-first street at Douglas Park; east on Twenty-first street to Halsted street; north on Halsted street to Canalport avenue; northeast on Canalport avenue to Canal street; north on Canal street to Polk street; east on Polk street to Fifth avenue; north on Fifth avenue and Wells street to Clark street; north on Clark street to Diversey boulevard; returning by the same route.

Route No. 16: Beginning at State and Thirty-ninth streets; thence north on State street to Lake street; west on Lake street to Austin [Sixtieth] avenue; returning by the same route.

Route No. 17: Beginning at Sixty-third street and Kedzie avenue; north on Kedzie avenue to Chicago avenue; east on Chicago avenue to California avenue; north on California avenue to Belmont avenue; returning by the same route.

Route No. 18: Beginning on Evanston avenue at Graceland avenue; south on Evanston avenue and Halsted street to Madison street; west on Madison street to Sixtieth avenue; returning by the same route.

Route No. 19: Beginning on Chicago avenue at Sixtieth avenue; east on Chicago avenue to Milwaukee avenue; south on Milwaukee avenue to Lake street; east on Lake street to State street; south on State street to Sixty-third street; returning by the same route.

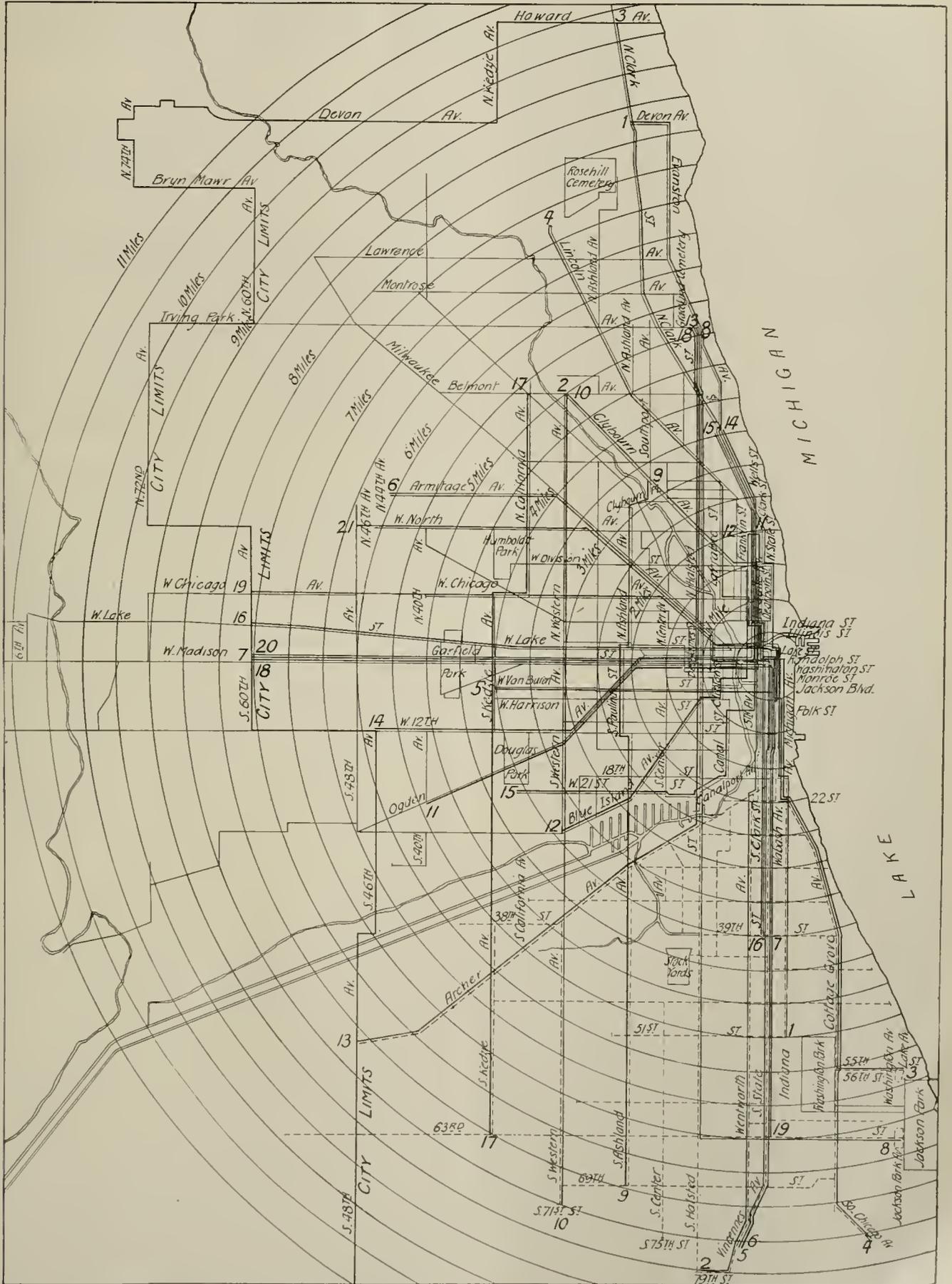
Route No. 20: Beginning on Madison street at Sixtieth avenue; east on Madison street to and around the State street loop [Franklin, Washington, State and Madison streets]; returning by the same route.

Route No. 21: Beginning on North avenue at Forty-eighth avenue; east on North avenue to Milwaukee avenue; south on Milwaukee avenue to Lake street; east on Lake street to and around the State street loop [Dearborn, Randolph, State and Lake streets]; returning by the same route.

CONFERENCE ON MUNICIPAL OWNERSHIP AND PUBLIC RELATIONS.

On March 22 C. D. Wyman of Boston, W. Caryl Ely of Buffalo and Henry A. Robinson of New York, representing the committees on "Municipal Ownership" and "Public Relations" of the American Street and Interurban Railway Association, and B. V. Swenson, secretary of the association, attended a joint conference of the corresponding committees of the associations representing electric light, gas, telephone and railway interests. There was an extended general discussion on the subject of municipal ownership and the relations of corporations to the public and to the state. No definite action was taken. It is announced that both of the committees of the American Association will probably issue within the next few weeks a series of questions to be answered by the street railway companies of the country. The data obtained in this way will be used as a basis for the reports which will be presented by the committees at the 1907 convention.

The Northern Texas Traction Company of Ft. Worth, Tex., which operates the interurban line between Ft. Worth and Dallas, as well as city lines in both cities, is equipping its interurban cars with steel wheels.



Map Showing Through Routes Proposed in Chicago Ordinances Which Are to be Voted Upon April 2.

DISAGREEMENT ON VALUATION OF CLEVELAND ELECTRIC RAILWAY.

An important crisis in the Cleveland street railway situation was reached on Monday, March 25, at the meeting of the city council when President H. E. Andrews of the Cleveland Electric Railway and President A. B. DuPont of the Municipal Traction Company announced that after two months of negotiating they had completely failed to agree on the valuation of the property of the Cleveland Electric Railway. Mr. Andrews submitted an estimate placing the present value of the outstanding stock of the company at \$105 per share, while Mr. Du Pont valued it at \$45.10 per share.

The presidents of the rival companies have been in almost daily conference, assisted by a large force of engineers and accountants, in the endeavor to determine upon the valuation, since January 10, when, following the decision of the supreme court that the Cleveland Electric company's franchise in Central avenue and Quincy street were invalid, the Municipal Traction Company offered to take over the property as a holding company on the same basis as that on which it now operates the Forest City Railway. The plan, in brief, is to lease the property at a rental of 6 per cent on the actual value of the physical property and franchises plus one-ninth, with a provision for ultimate redemption of the stock at 110. The road is to be operated on a 3-cent fare basis and the Cleveland Electric is to receive a security franchise under which it may operate its lines in the event of failure of the holding company plan.

It became known last week that negotiations had been suspended owing to a failure to agree and at the council meeting on Monday night both presidents submitted reports containing their estimates of the valuation and showing the basis on which the calculations were made and on which they disagreed.

Mr. Andrews stated that in making the examination the plan used by the commission which recently appraised the Chicago street railways, of which Mr. Du Pont was a member, had been adopted. He said:

In preparing the preliminary estimates of the value of the physical property, only the cost of labor and material was included, less depreciation, with the intention of adding later the customary percentages for administration, engineering, carrying charges, etc., aggregating, as an average in the case of the Chicago valuation, 20 per cent of the cost of the material and labor.

The value of the unexpired grants was arrived at in accordance with a plan dictated by Mr. Du Pont following the method used in Chicago.

The result for physical and franchise value thus obtained aggregated approximately \$30,500,000, to which, under the proposal of the Municipal Traction Company, one-ninth should be added, making a total of \$33,888,888.88; from this sum the funded and unfunded debt of the company, as of January 1, 1907, should be deducted, leaving a net result of \$24,547,888.99, which, divided by the number of shares of stock of the Cleveland Electric Railway Company outstanding, would show a present value approximately of \$105.00 per share.

During the last week of the negotiations, I suggested that Mr. Du Pont confer with Mayor Johnson with a view of learning whether the method of valuation adopted met with his approval, and was informed that it did not. Whereupon, a day or two later, a surprising proposition was submitted in writing by Mr. Du Pont, providing that no valuation should be given long time grants in Glenville, Collinwood, East Cleveland, Cleveland Heights, Newburg, Newburg Heights, South Brooklyn or Lakewood, nor to certain grants in the city of Cleveland. The proposition also contained an estimate of physical value which did not include all of the various items making up that value, and particularly excluded any consideration for any charges for management, superintendence, engineering, interest on cost during construction, contractors' profits, and other items which were included in the Chicago estimate, and in the Detroit estimate prepared by Professor Bemis and others, and which are usual charges in the construction of any railway, and are as necessary to, and as much a part of, the cost of construction as the cost of rail or any part of its track equipment is.

We are perfectly willing to abide by an arbitration based

upon such methods of valuation as were adopted in Chicago by an impartial commission, of which Mr. Du Pont was one; but cannot consider any offer by the Municipal Traction Company for a lease based upon a value which does not include proper charges for the items of cost enumerated above in making up physical value, and can consider no adjustment which does not contemplate the value of the property operated as a whole, as was the assumption in Chicago.

Mr. Du Pont's report was as follows:

Upon the valuation of many items of physical property, the dates of expiration for most grants and the method of valuing physical property, we were able substantially to agree. The conclusion here expressed, of course, includes such agreed values; but neither Mr. Andrews nor his company are bound by the conclusion as a whole nor the details entering into it.

The total value of the physical property and unexpired franchises of the company is \$17,908,314.24. Adding to this one-ninth, we have \$19,898,126.93, which makes for the outstanding stock a value of \$45.10 per share, redeemable on the suggested plan at \$49.61.

The value here given includes \$1,533,566.84 as the value of the street paving done by the company, though I am informed that this paving is now the property of the city.

Nothing is included for contractors' profits, brokerage, commissions or interest during construction, for two reasons: First, such items are not properly a part of the physical property; and second, if these items are not adequately covered by the bonus of 21 per cent, which is the basis of the suggested plan for determining the redemption value of the stock, any extra allowance on that account should be made by the council.

The value of the physical property has been determined independently of the length of the franchises, and no deduction has been made from the amount so determined by reason of unprofitable grants. To all franchises I have assigned full value. Where, however, lines are composed of portions having different dates of expiration, the later in date being remote from the center of the city, and through unprofitable territory, I have assigned no value to the outlying portion after the expiration of the inlying connection. Such grants are operated even now at a loss and are, in fact, a burden upon the inside lines, and, of course, are not susceptible of profitable operation after the expiration of the inside connection.

The conclusions here stated with detailed figures and reasons were submitted to Mr. Andrews on March 13 with a request that we discuss them in detail and that he suggest any revision that he thought just, with his reasons. I submitted also a schedule of disputed items now allowed, with my estimate of their value in dollars to the company as a basis for further discussion if reasons for allowing them could be advanced, professing myself entirely willing to consider such reasons. I have had no summary of the conclusions reached by Mr. Andrews, nor of the aggregate of his claims, and to my report to him I have had no reply except a verbal comment that we were apparently too far apart to make further conferences useful.

The council took no action but voted to call a public meeting for Wednesday, March 27, to discuss the reports, and invited both presidents to be present. A resolution was then passed requesting the Cleveland Electric company to report to the council at its next meeting the daily receipts and daily car miles since January 10 for the Central and Quincy avenue lines on which the franchises have expired and which have been operated since January 10 for a three-cent fare under an agreement to pay the city any surplus above the actual cost of operation.

The truce agreed to by the companies on January 11 under which all active hostilities have suspended, is still in force, although it may be terminated by either company on 24 hours' notice.

At the public meeting on Wednesday morning Mr. Du Pont submitted a communication to the city council stating that the Municipal company was willing to enter into any lease approved by the council and to operate the lines in the interest of the city and without profit to itself. He also submitted a further explanation of the failure to agree to Mr. Andrews' valuation. A general discussion ensued, in the course of which Mayor Johnson made the surprising statement that in the event of the holding company taking

over the Cleveland Electric lines the city lines should be operated for a 3-cent fare, but that on the outlying suburban lines a 5-cent fare should be charged. The mayor appointed a committee of five to meet with him and the city solicitor to formulate some plan of arbitration, both companies having favored such a plan. The committee will meet on Saturday.

BROOKLYN RAPID TRANSIT COMPANY CLAIMS OVERTAX.

Colonel T. S. Williams, vice-president of the Brooklyn Rapid Transit Company, appeared before the New York State tax commission at Albany on March 22 to protest against the amount of the company's tax assessment for 1907. He declared that the assessments on the company's properties exceed by \$130,000,000 the normal value of its securities, that the increase in the company's assessment was greater than that of the other New York companies, and showed how great increases had been made in previous years.

Colonel Williams submitted a statement in which he said in part:

The total assessment is \$39,436,000, an increase of \$20,905,000 or 54.26 per cent over the final assessment of last year. No other large street railroad system in Greater New York has had its assessments so greatly increased. The increase in the assessment of the Interborough company is 33 1/3 per cent; of the Manhattan Elevated Railroad Company 23 per cent; of the New York City Railway Company 33 1/2 per cent.

A comparison of the increase of earnings of the Brooklyn Rapid Transit system for the preceding year, with the increase of the other companies, does not reveal any justification for an increase in its assessments so far out of proportion with the increase in the assessments of these other companies. The net surplus of the entire system showed an increase of only 4.45 per cent over that of the previous year, and this would have been turned into a decrease had the full amount of taxes assessed been charged during the year.

The increase in the assessment follows an increase of 30.35 per cent in the final assessment of last year over that of 1905, and of 15.55 per cent in the assessment of 1905 over that of 1904. The assessment is 149 per cent greater than that of the year 1900, the first assessment of Governor Roosevelt's commission under the new law. When the validity of the law was established our corporations were the first of the large public service corporations promptly to comply therewith, by paying up in full the taxes assessed, with accumulated penalties, to and including the year 1904, less such deductions as the law entitled them to, with the exception of a few assessments in the suburban districts which are still in litigation, but the amount of which formed a small part of the total.

The direct assessments, state and local, against our property as for the year 1907 already made, are as follows:

Tracks on private rights of way.....	\$ 5,285,800
Parcels on real estate.....	9,238,555
Local capital stock	89,450,000
Special franchises	59,436,000

Total

At last year's tax rate this represents a tax of \$2,512,744.

But this is by no means the extent of our burden. We must pay in addition under other laws a state tax on our gross receipts, a state tax on our privilege to be corporations, a local tax on our receipts, a state tax on our cars, license fees for conveying our passengers across the Brooklyn and Williamsburg bridges, our proportion of the cost of maintaining the state railroad commission, the cost of municipal inspectors, the cost of new paving, the cost of carrying policemen and firemen free and many other impositions, the aggregate of which, if no greater than the amounts actually paid last year, will be \$1,119,612, or a total burden of taxation of \$3,632,356.

This is equal to 18.69 per cent of our gross earnings from all sources for the last calendar year. It is 61.09 per cent of our net earnings, including in expenses only the taxes paid and charged, not assessed, and excluding any charges for capital expenditures. No corporation ever has carried, or ever can carry, such a burden.

In taxes \$2,362,000 represent at last year's tax rate \$236,000,000 worth of property. That is, any holder of \$236,000,000 worth of taxable property would contribute \$2,362,000 toward the public revenues. But this is \$97,000,000 more than the par value of all our outstanding stocks and bonds. With the exception of our oldest company's stock, all of which represent dollar for dollar of actual property and has

never yielded more than a fair return, this is \$130,000,000 more than the market value on January 1 of all our outstanding stocks and bonds.

As to upwards of \$1,100,000 of these taxes, they are beyond the discretionary power of public officers—fixed by law or contract and only changed by revision of law or contract. As to about \$1,000,000 more, the lawfulness of their imposition is hedged about with the safeguards which all real estate and personal property have for their protection, the laws prescribing the method of their assessment and assuring general uniformity and equality, exceptions to which can be readily marked.

But as to the additional assessment of \$59,436,000 which your board has imposed—covering mostly as it does an indefinite, intangible property, already taxed, as we have shown, to a very large amount—there is no method prescribed by law for its determination, no adequate standard of comparison with the assessment of similar properties, no rule of guidance except the intelligence and fairness of the three officers who constitute your board.

We contend that the assessments are excessive further because your board has failed to take into consideration that very large part of the revenues of these companies which come from private rights of way and other sources than the right to operate cars on public streets and places.

DES MOINES FRANCHISE DECREE FILED.

The final decree enjoining the city of Des Moines, Ia., from tearing up the tracks of the Des Moines City Railway Company or from interfering with the company in the enjoyment of its franchise, which the court holds is perpetual, has been rendered by Smith McPherson, judge of the United States circuit court at Des Moines. The language of the decree is plain in declaring that the rights vested in the company by the contract are perpetual except that the exclusive feature of the franchise expired on January 1, 1898. An account of the decision was published in the Electric Railway Review of March 2, 1907. An abstract of the final decree rendered on March 23 follows:

The court decrees that the complainant, the Des Moines City Railway Company, has succeeded by purchase to all the rights granted under the ordinance of December 10, 1866, the said ordinance being one of the said city of Des Moines, entitled, "An ordinance authorizing the construction and operation of certain street railroads in and along the streets of the city of Des Moines," and the said ordinance as subsequently amended and modified, and as ratified and confirmed by said city, constitutes and is a valid and existing contract between the complainant, its successors and assigns, and the defendant, the city of Des Moines; and that the rights vested in the complainant, its successors and assigns by said contract are perpetual, except only as set forth in section 10 of said ordinance by which under said section 10 the exclusive feature was expired by limitation of time. And the court decrees that except as to said exclusive feature recited in said section 10, that the rights vested in complainant, the Des Moines City Railway Company, its successors and assigns, by said contract are perpetual.

It is further decreed that the resolution passed by the city council on December 21, 1905, is hereby canceled, the same being in violation of the rights of complainant company and of the obligation of the said contract.

And it is further ordered that the defendant, the city of Des Moines, and its city council, and mayor, and city solicitor, and all officers of said city, and those hereafter officers of said city, and each and all of them now holding office in said city, and all servants, agents and employes, and all successors in office be, and they are hereby perpetually enjoined from enforcing, or attempting to enforce, said resolution, and from in any manner disturbing, impeding or interfering with the free use and comfortable enjoyment by said Des Moines City Railway Company, its successors or assigns, of any rights, privileges and franchises vested in complainant herein, and vested in any corporation or company or person from whom complainant by purchase or otherwise has acquired rights. And the said ordinance of December 10, 1866, and all amendments thereto save and except the exclusive feature of section 10 thereof, shall be preserved perpetually to the complainant, its successors and assigns.

It is reported in the Des Moines papers that as the case will be appealed by the city to the United States supreme court the company will take no action toward making important improvements or extensions until a final decision is rendered.

MILWAUKEE ELECTRIC RAILWAY SERVICE.

C. N. Duffy, auditor of the Milwaukee Electric Railway & Light Company, was one of the witnesses in Milwaukee on March 21 when the Wisconsin railroad commission heard evidence in the case of the city of Milwaukee against the Milwaukee Electric Railway & Light Company. Mr. Duffy, in showing the disadvantages under which the Milwaukee company labors, said as many cars are being operated as it is practical to operate with the present trackage. Mr. Duffy testified that in February the company carried 7,134,180 passengers and operated the double-truck cars 916,890 car miles. Only 18.53 per cent of the car-seat mileage was used. Mr. Duffy said:

There were only 7.78 passengers carried to a car mile. Out of 397 cars possessed by the company 372 cars were put in service. That is, out of a car capacity of 100 per cent during the month, 93.7 per cent was put in use. No other road in the United States can show such a record. It must be remembered that when the last 75 cars were put in service, 35 old cars had to be taken off. This left only about 40 new cars for service improvement. Taking 5:20 to 6:20 at night as the busiest time of the day, if 372 cars are put in service, and only averaged 60 passengers to the car, it means that 22,320 passengers are carried in one hour or 372 in one minute. Three hundred and seventy-two cars an hour means six cars in one minute and one car in every 10 seconds. I think the capacity of the streets is about reached.

Statistics were presented by Mr. Duffy showing that during the congested period in the evening it devolves upon the company to move 22,320 passengers in an hour, which means one car every 10 seconds. Mr. Duffy stated that in all negotiations with the company the city ought to consider that the franchises will expire on December 31, 1934, and that proper provision should be made for depreciation and the changes forced by evolution. He traced the evolution from the use of mules for cars to cables and then electricity, and suggested that the present power plant might be superseded in time by other more useful methods of supplying power.

N. A. Christensen testified for the city of Milwaukee, saying that out of 65,000 cars in operation in the United States 27,000 are equipped with air brakes. Mr. Christensen denied that cold affects air brakes seriously, stating that air brakes are being used in Stockholm, Sweden, and Montreal, Canada, and that they will be used in Winnipeg. He said that it was as easy to apply the air as to draw water from a faucet. He stated that air brakes do not get out of order easily and that they do not cause flat wheels. The ignorance of operators in adjusting the brakes, he declared, was responsible for the flat wheels.

ANSWER TO PETITION FOR REDUCED FARE.

The West End Improvement Club of Council Bluffs, Ia., has filed a complaint with the interstate commerce commission asking that the Omaha & Council Bluffs Bridge Company be compelled to reduce its present rate of 10 cents for carrying passengers from Omaha, Neb., to Council Bluffs, Ia. John L. Webster, attorney for the company, has filed an answer to the complaint, in which it is claimed that:

The defendant company being a street railway company and not a commercial railroad is not subject to the provisions of the act to regulate commerce, and the rates of fare upon said line of street railroad is not subject to regulation by the interstate commerce commission; that it is not at the present time engaged in the transportation of passengers from Omaha to Council Bluffs, as its line is leased to the Omaha & Council Bluffs Street Railway Company, which operates the line and fixes the rate of fare.

The defendant for further answer avers that a fare of 10 cents from Council Bluffs to Omaha is a reasonable and not an exorbitant or extortionate charge, and in support whereof more particularly avers as follows:

That the distance from the business portion of the city of Council Bluffs to the business portion of the city of Omaha, being the points between which nearly all the passengers arrive and depart who travel upon the said line of road, is

a distance of six miles, and that a fare of 10 cents for the journey is but 1½ cents per mile.

That all passengers whose travel is limited to points within the corporate limits of the city of Council Bluffs only pay five cents for each ride, and the fare of 10 cents is only charged to passengers who travel from the corporate limits of one city to a point within the corporate limits of the other city, including the transportation over the bridge between Council Bluffs and Omaha.

That between the business portion of Council Bluffs and the Missouri river, or the east end of the bridge, there is a large area of sparsely settled territory along which very few persons enter upon or depart from the trains, and that the distance from the east end of the bridge to the business part of Council Bluffs is about three miles. To reduce the fare to five cents, including transportation over the bridge, would mean that the passengers would be permitted to travel from the center of the city of Council Bluffs to the center of the city of Omaha for a gross fare of five cents, which would be less than 1 cent per mile, and which would not yield sufficient revenue to pay the cost of operation and maintenance.

That it is usual and customary at all points on the Missouri and Mississippi rivers to charge a fare of not less than five cents additional to other charges for transportation to cross bridges over said rivers, and that such at all times and places has been regarded as not excessive, nor unreasonable.

The defendant further denies that the fares charged are extortionate or discriminatory, and denies that a fare of five cents would yield sufficient remuneration for the entire transportation of a passenger from Council Bluffs to Omaha, and denies that the complainant, or any of its members, or other persons are subject to the payment of unjust or unreasonable passenger fare for transportation over the said line of road, and denies that the defendant is guilty of any act of discrimination, prejudice or disadvantage in violation of the interstate commerce act, or any of the provisions thereof.

FORM FOR RECORDING PILE-DRIVING PROGRESS.

On the new line of the Winona Interurban Railway between Winona Lake and Peru, Ind., a number of waterways will be crossed with the track supported on pile bents. That the engineering department may be advised of the progress in driving piles and have available a permanent record of the details of the work, the accompanying form has been devised by the chief engineer, Mr. R. M. Murray.

The original records are made in blueprint form on pages 8 by 13 inches suitable for loose-leaf binding. Each page

PILE RECORD										
WINONA INTERURBAN RY. CO.								Division		
Bridge No.				At				Date		
Bent No.	Piling	Length	"W"	"D"	"P"	Penetra-	Gutoff	Remarks		
						tion				
Pile No1										
Pile No2										
Pile No3										
Pile No4										
<hr/>										
Bent No.										
Pile No1										
Pile No2										
Pile No3										
Pile No4										

"W" - Weight of hammer
 "D" - Drop of hammer - last blow
 "P" - Penetration

Inspector.
F-121

Form for Recording Pile-Driving Progress.

contains blank spaces enough for recording the necessary data for six pile bents, each comprising four piles. The data recorded are the kind of piling, length, weight of the driving hammer, drop of the hammer under the last blow, penetration with last blow, total penetration, height at which pile is cut off, and remarks. One blank is filled out for each trestle and forwarded by the piling inspector to the chief engineer's office, where they are permanently filed.

PIPING AND POWER STATION SYSTEMS.—XXXIV.

BY W. L. MORRIS, M. E.

If a surface condenser is used, the relative height of the tower with respect to the condenser is of no importance in determining the power required to handle the circulating water, as the high suction and discharge columns balance each other and the power required for circulating the water is simply determined by the distance *a*. A surface condenser, using water thus cooled would require about 40 pounds of circulating water per pound of steam condensed, and if a centrifugal pump belted to the main engine shaft were employed its efficiency would be about 40 per cent. Hence 100 foot pounds would be expended in raising the required volume of water 1 foot. Assuming the engine to be using 18 pounds of steam per horsepower per hour, the power needed to circulate the cooling water would be 1,800 foot pounds per hour, or 30 foot pounds per minute, approximately, or .001 horsepower for each engine horsepower, for each foot the water is lifted in the distance *a*. This would justify an expenditure of \$0.125 per horsepower for each foot of *a*. If the plant had a 1,000-horsepower unit, the expenditure of \$125 for the reduction of each foot of the distance *a* would be justified.

A jet condenser can be used with economy in conjunction with a cooling tower only when the tower is located so that the hot well discharge will flow without any appreciable loss of head directly on to the cooling surface filling, and the circulating pump raises the water from the basin of the cooling tower up and into the injection pipe to the lower end of the column of water which the vacuum will support.

The design shown in Fig. 265 would require about a 30-foot lift and the jet condenser about 7 feet, making a total of 37 feet which the water would have to be raised. This would require approximately .037 horsepower per horsepower of the main engine. If the water could be taken from the cooling pond the loss of head through the tower would be eliminated, thus making the power required for the condenser but 0.7 horsepower per 100 horsepower of the engine.

The surface condenser is better suited for operation with the cooling tower, as it can be located at almost any elevation and avoid any head loss other than that required at the cooling tower and the friction head of the piping system. There are many installations, however, using elevated cooling towers and the suction type of jet condenser, as shown in Fig. 267 (19-3). This makes a very inefficient installation. The head on the injection pipe is entirely wasted,

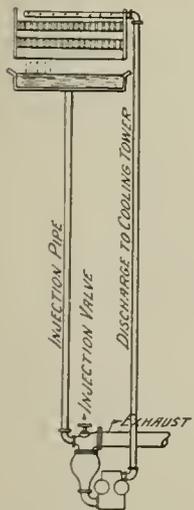


Figure 267-(19-3).

being resisted by closing the injection valve at the condenser. The distance from the pump to the outlet at the top of the cooling tower is frequently as much as 60 feet. Assuming 18 pounds steam per horsepower-hour of the main engine and 40 pounds of circulating water per pound of steam condensed, and a pump requiring 120 pounds of steam per horsepower per hour and having an efficiency of 60 per cent, we find that the circulating pump requires 24.2 pounds of steam for each 100 pounds of steam delivered to the main engine. In other words, the condenser pump requires as much steam to operate it as is saved by operating the engine condensing. It may be that a slight economy is secured in such an instance, due to the auxiliary exhaust steam being delivered to the feed water heater, but the question is, why is not apparatus which is suited to each particular installation employed? By using a surface condenser and the distance *a*,

10 feet, the steam consumption of the condenser pump would be but 1.6 as great as in the preceding case, or about 4 pounds of steam for each 100 horsepower delivered to the engine. This steam, however, would be condensed in the heater and the heat returned to the boiler, thus a very good return on the investment in the cooling tower, condenser, etc., would be secured.

The heat required to operate the pump would be about four times 46 British thermal units and the engine 100 pounds at 913 British thermal units, or $\frac{184}{913} = .2$ British thermal units for the condenser for each 100 British thermal units required by the main engine.

The most conspicuous loss in the operation of condensing machinery in conjunction with cooling towers is that

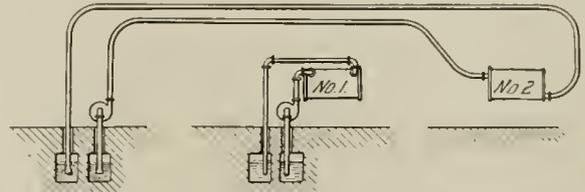


Figure 268-(19-4).

occasioned by the long water line between the cooling tower and the condenser, these lines invariably having a large number of turns and restricted passages. In fact, this difficulty is also conspicuous in the condenser, and in receiving bids on the condenser, as this point should be given careful consideration, as the difference in cost of different apparatus may be deceiving, the higher price being oftentimes the cheaper when the cost of operation is considered. If the lines between the cooling tower and the condenser are long, it is always good practice to increase their size, as the fixed yearly cost on the difference on the investment is less than that saved in the operation. Pipe bends should be used in place of elbows, as each elbow in a 12-inch line, for instance, is equivalent to about 40 feet of pipe. The piping is oftentimes made more compact by using elbows of short radius, etc., as shown in Fig. 268 (19-4) for condenser No. 1, but the resistance in the line of piping is thereby increased. The loss by friction of water flowing through the system shown in No. 2 is no greater than that shown in No. 1. The losses occasioned by short radius ells and square ends at the pipe inlets and outlets makes the avoidable losses of No. 1 amount to about 300 feet of pipe if it is 12 inches in diameter. This saving is sufficient in itself to permit running the line to the top of the roof or an outdoor cooling tower and not show so great a friction loss as that of the short connected system shown in No. 1.

The amount of water lost by evaporation in the cooling operation varies; systems using cooling pans with air circulating under them require less than that necessary for boiler feeding, being as low as 1/2 pound loss by evaporation for each pound of steam condensed. This system requires a very large pan surface, as its operation is dependent upon radiation only. Systems in which the air is passed through the water require much less surface, as the heat is taken up by evaporation as well as by radiation. This style of water-cooling will lower the temperature as much as 15 degrees below that of the surrounding atmosphere, a reduction in the temperature of the water of as much as 50 degrees. With 50 degrees difference in temperature the amount of cooling water required would only be about 20 pounds per pound of steam condensed. If the loss is 7 per cent, then 1.4 pounds of cooling water would be evaporated for each pound of steam condensed. In regular practice it has been found that the water fed to the boiler is sufficient at all times to provide for the evaporation, this being due possibly to the

fact that when the load is very light the fans would not be used, thus reducing the loss by evaporation, the cooling by radiation to the air passing through the tower by its natural draft being then sufficient to cool the water. In cold weather it is generally necessary to draw off a portion of the cooling water, as the evaporation is then less than the water fed to the boiler.

Class J1—Condensation and Air Line from Condenser.

Surface condensers and elevated jet condensers can easily be arranged to separately remove the air by what is termed a dry vacuum pump. Such a pump is designed to handle air only, and the usual construction is similar to the crank and fly wheel type of air compressors. The piston speed of this type of pump is generally high, 400 feet per minute being approximately the normal speed. The clearance is reduced to the least possible amount and in many other ways the pump is designed especially for compressing air, and if by accident even a small amount of water is drawn into the pump, it is liable to be damaged. The total piston displacement of a dry vacuum pump is generally greater than the total displacement of the water circulating pumps, but seldom exceed it by more than 50 per cent. The amount of air discharged by a dry vacuum pump is only a small portion of the piston displacement, and because of the expansion of the air contained in the clearance spaces, compression, resistance of the valves, ports, etc., the quantity discharged varies from 10 to 15 per cent of the piston displacement.

The different types of condensers either permit or require a different method of handling the air or, more correctly speaking, the non-condensable vapor. In a jet condenser, these vapors are mingled with the circulating water and if the water contains organic matter, the volume to be handled would be very much greater than in a surface condenser. Though the elevated jet type of condenser would have the greater amount of air to remove, it requires less special provision for removing the air than the surface condenser.

There are many elevated jet condensers which are maintaining a vacuum of 25 and 26 inches, which have no provision made for the removal of air other than that of the downward flowing column of cooling water, having only centrifugal pumps to maintain the vacuum. Condensers of this type are generally constructed the same as an ejector with the water and the steam meeting in a restricted passage, both having a downward flow at the point of meeting. Owing to the velocity of the mixture of steam and water through the restricted passage, the air which reaches a condensing chamber is carried downward through the tail pipe together with the circulating water and is discharged into the hot well.

The velocity of the water in the tail pipe varies from 250 feet to 500 feet per minute, being greater in large than in small condensers. By using a dry vacuum pump on large size condensers, it is possible to maintain a high vacuum, say, 26 or 27 inches, and requires only sufficient water to condense the steam, thus increasing the temperature of the hot well water, which is desirable if it is to be used for boiler feeding.

(To Be Continued.)

A remarkably long life has been shown by three boilers which were installed in New York in 1863. When last inspected they were pronounced in good condition and the original pressure was allowed. This speaks volumes for the care they have received.

Mr. R. W. Hutchinson, Jr., whose technical work, "Long-Distance Electric Power Transmission," has just been published by the D. Van Nostrand Company of New York, has an article in the March issue of Public Service on "The Question of Municipal Ownership." Mr. Hutchinson is on the staff of the National Brake & Electric Company of Milwaukee.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B., OF THE CHICAGO BAR.

Rising in Open Car to Get Conductor's Attention.

A woman passenger on a small open car occupied an end seat. The evidence showed that she rose from her seat to attract the attention of the conductor while the car was in rapid motion and swaying and rocking violently, as it had been for some time, and stood near the side of the car, facing the rear, until she was thrown to the ground when the motion was checked by the application of the brakes. She had one hand on the back of the seat on which she had been sitting, while the other hand hung by her side. She had traveled over this portion of the road before on the same day, and previously, and knew the condition of the track to be uneven, so as to cause the car to jolt and sway. Upon this undisputed evidence the supreme court of Rhode Island holds, *Cottrell v. Pawtucket Street Railway Company*, 65 Atlantic Reporter, 269, that the woman was not in the exercise of due care, and that a verdict for the company was properly directed.

Construction of Franchise Grants.

The supreme court of the United States says, in *Cleveland Electric Railway Company v. City of Cleveland and Forest City Railway Company*, 27 Supreme Court Reporter, 202, involving rights under city ordinances, that the rules of construction which have been adopted by courts in cases of public grants of this nature by the authorities of cities are of long standing. It has been held that such grants should be in plain language, that they should be certain and definite in their nature, and should contain no ambiguity in their terms. The legislative mind must be distinctly impressed with the unequivocal form of expression contained in the grant, "in order that the privileges may be intelligently granted or purposely withheld. It is a matter of common knowledge that grants of this character are usually prepared by those interested in them, and submitted to the legislatures with a view to obtain from such bodies the most liberal grant of privileges which they are willing to give. This is one among many reasons why they are to be strictly construed."

Choosing or Not Using Fenders Under Ordinance.

Where, by valid municipal ordinance, street cars are required to be equipped with fenders of an approved make, the supreme court of appeals of West Virginia holds, *Ashley v. Kanawha Valley Traction Company*, 55 Southeastern Reporter, 1016, that it is negligence per se (by itself) to operate such cars without such equipment. At the same time the court says in this case that it would not do to show only the violation of the ordinance. It must be shown that such violation was the proximate cause of the injury—that, if the car had been equipped with fenders, as provided by the ordinance, the injury would not have occurred. This was proper to be shown to the jury. It was, however, urged by the company that the evidence in this case showed that there were two kinds of fenders of an approved make, one projecting out in front of the car and the other hanging underneath the front part of the car, and that, this being so, the company would have the right to elect which of the two kinds of fenders it would use, and that, if it should use the last mentioned, the injury would have occurred the same as if no fender had been used. These were questions of fact to be submitted to the jury. If it could be shown that the accident would not have occurred if the car had been equipped with such fender as the ordinance prescribed, and that the car was not equipped with such fender, then this would be negligence sufficient to charge the company. But, upon the other hand, if it could be shown that the accident would have happened if the car had been equipped with such fender, the same as it did when not so equipped, then the omission to provide

such fender would not be the proximate cause of the injury, and the company could not be held liable for failing to so provide them. Evidence tending to show either of these theories was admissible.

Statutory Liability for Negligence.

Section 2864 of the revised statutes of Missouri of 1899 reads: "Whenever any person shall die from any injury resulting from or occasioned by the negligence of * * * any officer, agent, servant or employe whilst running any * * * car, * * * the corporation * * * in whose employ any such officer, agent, servant, employe * * * shall be, at the time such injury is committed, * * * shall forfeit and pay for every person * * * so dying the sum of \$5,000." It was contended, in the case of *McQuade v. St. Louis & Suburban Railway Company*, 98 Southwestern Reporter, 552, that although this section applies to street railroads, the ground of recovery by a person not a passenger is confined to common-law negligence, and does not extend to an injury from a failure to discharge a duty imposed by municipal ordinance. But the supreme court of Missouri, division No. 1, says that it finds no such limitation in the statute. It says that the right of action given by the statute is for negligence; not for negligence as defined by the common law, but as well for negligence that may arise from a failure to discharge a duty imposed by statute or municipal ordinance. The statute makes no distinction, and the court can make none. It contains no such limitation as was contended for, and the court cannot put such a limitation upon its comprehensive terms.

Grants Expiring With Main Line and Consolidation.

In the case of the *Cleveland Electric Railway Company v. City of Cleveland and Forest City Railway Company*, 27 Supreme Court Reporter, 202, the supreme court of the United States says that, in 1891, the right was granted to construct and operate a second or additional track upon a portion of what now appears to be Garden street. It was provided in that ordinance that the right therein granted should be for and until the expiration of the grants for the company's main line. From this the question arose, What was the meaning of the expression "main line" as used in this connection? The ordinance allowed a second or additional track in a street which the company then had the right to use, and was using a single track. So far as that extended grant was concerned, the main line was the rest of the Garden street branch. It could not be possible that it was intended to limit the right to use the second or additional track, in the portion of the street mentioned, to a different time than that which existed with relation to the first track laid down by the company in the same street. Of course, the two grants were meant to terminate at the same time.

Again, the court says that at this time the grant to the company's Euclid avenue line had been extended so that it did not expire until July 13, 1913. Can it be supposed that the council intended that this short length of road, in which a second or additional track was to be laid, was to be operated with two tracks until 1905 and after that with one track until 1913? The court thinks such a construction is not permissible, and that what is meant by the language, "main line," in that ordinance, means the line which is the main line with reference to the extension therein granted; namely, the Garden street branch, and not the Euclid avenue line.

Of a grant of 1885, the court says that it was not made to terminate with the grant for the main line, as that main line might thereafter be extended, but it referred to that grant as it then existed, and it was to be measured by such existing grant, and not by any subsequent extension which might be granted to the Euclid avenue line.

Nor does the court think the time for the termination of the Garden street branch was in any degree affected by the

consolidation of the various roads in 1893, the communication from the railway company, through its vice-president, stating distinctly that it "does not claim any rights greater than the constituent companies forming the organization, and that it intends to obey all ordinances to which each and all the constituent companies were subject." Its intention to issue transfer checks, so as to have a continuous ride for one fare, gave no greater rights to the company than it theretofore had, nor did the resolution of the council, consenting to the consolidation on condition that but one fare should be charged for a continuous ride, give any greater rights to the consolidated company than each of the constituent companies had theretofore enjoyed.

Boys Not Excused from Looking for Cars.

It has been held that a railroad track itself is a sign of danger. It has been held that the danger of going upon such track without looking at all is one so apparent as to be within the easy comprehension of a child of 11½ years of age. A boy, raised in a city and living for years in proximity to steam and street railway tracks, knows as well that a car will kill or maim him if it strikes him as he does that he will get burned if he pokes his hand in the fire; so that the law, the supreme court of Missouri, division No. 1, says, in the case of *Deschner v. St. Louis & Meramec River Railroad Company*, 98 Southwestern Reporter, 737, does not excuse a boy of his age in not using his eyes in so simple a matter as looking for the approach of a car when he is about to enter upon a track laid for cars, and on which they, to his knowledge, run with more or less frequency. But whether he should look twice—that is, a second time, after waiting for one car to pass, to see if another is not closely following it, is a question for the jury. The judgment of a boy must not be measured by the same yardstick with which the law measures the judgment of a man. To make a man out of a boy seems to be the somewhat miraculous work of time and nature, but the court considers it beyond the power (and should be beyond the disposition) of the law. So that, if a boy 11½ years old acts with the prudence of the ordinarily prudent boy of that age, under like circumstances, it is well enough.

Care Required Crossing Electric Railways in Country.

In considering the question of contributory negligence in the case of *Phillips v. Washington & Rockville Railway Company of Montgomery County*, 65 Atlantic Reporter, 422, where the plaintiff was injured while riding a horse across the defendant's track, the court of appeals of Maryland says that it must be borne in mind that the injury did not occur on the streets of a city, but in the open country, where a higher rate of speed in the movement of electric cars is permissible than is allowable along the more crowded thoroughfares of a town. More caution was therefore demanded of a person in crossing a track of an electric railway in the country than would have been necessary in the city. The use of no greater caution in the open country than would have been requisite to constitute ordinary care and prudence in the city would not have been due care and caution on the part of the individual in approaching and going upon an electric railway crossing in the country. An act which would be prudent in the city might be glaringly negligent in the country, and hence the standard by which contributory negligence is to be measured in the two instances necessarily varies with the changed conditions existing in the two dissimilar localities. No two ordinary minds could differ as to the characterization of the plaintiff's act in crossing the tracks with his back turned towards the approaching car. It was obviously negligent, if not reckless, to attempt such a thing. The result that was most likely to follow that conduct did happen, and the consequences must be borne by the person so guilty of incaution or heedlessness.

News of the Week

Convention of Iowa Associations at Clinton.

The plans for the annual convention of the Iowa Electrical Association and the Iowa Street and Interurban Railway Association, which are to be held at Clinton, Ia., on April 18, 19 and 20, have been developed in accordance with the increasing importance of the lighting and the railway properties of that state. In addition to the instructive papers and the discussions, which are being prepared by members of the association, a local committee at Clinton is making elaborate arrangements for the entertainment of the delegates and visitors. The manufacturers' exhibit will be illustrative of the latest devices for lighting and railway purposes.

The local committee on arrangements consists of P. P. Crafts, general manager of the Iowa & Illinois Railway Company; R. M. Howard, general manager of the Clinton Street Railway Company, and Thomas Crawford, manager of the Clinton Gas Light & Coke Company. This committee is giving much attention to the minor details of the arrangements which will aid in making delegates and visitors comfortable during the convention. In addition to this committee a citizens' committee consisting of 25 representative business men has been named to help receive and entertain the guests.

Aside from the exhibits and business meetings, there will be much to interest railway men. The Elks' and the Wapsie club rooms will be thrown open to the visitors during the convention. The following diversions are among the events that have been arranged for by the local committee:

Thursday evening, formal "smoker" at the Lafayette Inn.

Friday afternoon and evening, association's inspection trip to Davenport over the Iowa & Illinois Railway; the party will visit the power houses in Clinton and Davenport and the substations on the interurban line. Lunch will be served at the Commercial Club in Davenport.

Good shows will be provided at the theaters each night.

Boats will be provided for trips up the Mississippi river.

Many other amusement features will be arranged during the week of the convention.

Delegates' badges will be accepted for transportation on the Clinton Street Railway, the Iowa & Illinois Railway and the Tri-City Railway.

Stenographic service, etc., will be accorded the visitors at the offices of the local railways and lighting companies.

The headquarters of the association will be at the Lafayette Inn, where all meetings will be held. About 2,000 feet of floor space in the basement of the inn has been provided for exhibitors, free of charge, so that the only expense to visitors will be for fitting up booths. Each exhibitor will attend to the placing of his display, though the local committee will aid in making arrangements for teams to be used in hauling the exhibits from the freight houses to the exhibit halls. A number of manufacturers and supply companies have already made reservations and others are daily asking for them. All reservations should be made before April 15. The exhibit halls are spacious, well lighted and well ventilated. The hotel accommodations are good. Reservations can be made through Mr. Crafts, chairman of the local committee. It is expected that upward of 400 people will attend the convention.

Rapid Transit Affairs in New York.

The rapid transit commission on March 25 approved and sent to the board of estimate and Corporation Counsel Ellison the form of contract for the Seventh and Eighth avenue subway route. Before taking this action the commission held a public hearing on the terms of the contract, and while there were objections to some of the provisions, and particularly to the power reserved by the board of accepting a bid for an alternate route, which would merely run south to the Battery, from a junction at Forty-second street with the existing subway, the commission voted to make no changes in its original plans.

The contract has now only to be approved by the board of estimate and the corporation counsel before bids are asked for.

Mayor McClellan and the rapid transit commission are said to be anxious to carry out their plans for the new subways, plans upon which nearly three years' work has been spent, before there is a possibility of interference by the passage of Governor Hughes' public utilities bill. Under the provisions of this measure the new commission which would replace the rapid transit commission would have to be appointed within 30 days, and the new body would have the power to undo all that has been mapped out by the present board. If a special meeting is called this week, as expected, the advertising of bids for that subway and the Lexington avenue route could begin on Saturday and the awards made three weeks later.

Counsel to the commission also presented to the board the draft of the contract and specifications for the construction of the second section of the bridge subway loops. This section will extend from Canal street to Broome street. The board decided to hold a public hearing on the provisions of the contract as now prepared on April 11.

It is expected that there will be keen competition in the bidding for the construction for the bridge subway loop. Half a dozen large contracting firms have staffs of men at work in the office of the rapid transit commission on the detailed plans and specifications. It is understood that the commission expects to receive bids from the Degnon Contracting Company, the Cranford Contracting Company, William Bradley, John Shields and the McBean Company, as well as other concerns. The Degnon and Cranford

companies are now employed in building two sections of the subway extension to Brooklyn.

There will also be some out-of-town competitors. An application has also been received from a corporation outside of the city for access to the plans and specifications. The bids will be opened on April 11.

The so-called Steinway or Belmont tunnel, the extension of the present subway under the East river at Forty-second street, will be opened for traffic on August 1, according to a recent announcement. The air pressure in the south tube is to be shut off this week, as the tunneling is completed and the north tube is expected to be completed in 30 days.

After six months of effort the Interborough Rapid Transit Company, which is to operate the East River tunnel from the Battery to Brooklyn, has bought a piece of property in Joralemon street, Brooklyn, for the plant to ventilate the tunnel. Work will be started at once on the shaft from the tunnel to the surface. Through this the electric power cables are to be stretched from each end of the tunnel to the transformer station, in Willow place.

Legislation Affecting Electric Railways.

Illinois.—The senate has passed a bill granting the right of eminent domain to electric interurban railways and to electric companies for the stringing of high-tension wires.

Indiana.—A law passed by the legislature provides that interurban railroads running through a city of 35,000 population or more "shall provide and maintain in said city suitable waiting-rooms," with closets and conveniences, which shall be kept open "not less than one hour next preceding the arrival of all passenger cars or trains that are allowed by schedule." Another law which has been passed provides that any one who offers to tip the porter or waiter in a dining car, Pullman car or interurban car while a passenger thereon, is guilty of bribery. The penalty is a fine of from \$25 to \$100.—The legislature has passed a law requiring steam and electric railway companies to pay a \$1,000 license fee for selling liquor in buffet or dining cars.—A law has also been passed which permits electric railway tracks to be built through the parks and along the parkways and boulevards of a city.

Iowa.—The house has passed the senate bill providing that the front ends of all street cars shall be equipped with vestibules covering three sides of the platform, for the protection of motormen.

Michigan.—A bill has been introduced creating a state railroad commission with greater powers than those now possessed by the railroad commission. The bill provides for the control of electric roads by the commission, except lines wholly within the limits of cities or towns, and for the exchange of freight with steam roads. The exchange of freight is, however, to be only on lines where the electric equipment and facilities are up to a fixed standard, to be determined by the commission. The commission is not given authority to regulate the fares on an electric line, because to do so would be impairing franchise provisions in many cases.

Minnesota.—A bill has been introduced in the house that prohibits any street railway from admitting to its cars more than 15 passengers above the seating capacity of the car.

New York.—Assemblyman Stern of New York has introduced a bill providing that street car transfers may be demanded at any time after the fare is paid. This is aimed at the practice established by the New York City Railway Company of giving transfers only when the fare is paid. A recent decision of the appellate division of the supreme court upheld this regulation of the company.

North Carolina.—The legislature has passed a law, effective on April 1, requiring street railways to provide separate seats for white and colored passengers, fixing a fine for expectorating on the floors, and providing that passengers riding on platforms may not secure damages if injured.

Pennsylvania.—The house has finally passed by a vote of 143 to 30 the Fahey bill which was defeated last week but was reconsidered. The bill was drawn up by the Retail Merchants' Association of Philadelphia and is designed to solve Philadelphia's transportation problem by providing a basis for co-operation between the city and the Philadelphia Rapid Transit Company. The bill provides that "it shall and may be lawful for any city, borough or township, of the one part, and any street passenger railway company, surface, elevated or underground, or motor power company, leasing and operating the franchises and property of such company within the limits of such cities, boroughs or townships, of the other part, to enter into contracts with each other affecting, fixing and regulating the franchises, powers, duties and liabilities of such companies, and the regulations and respective rights of the contracting parties. Such contracts may, inter alia, provide for payments by the companies to the local authorities in lieu of the performance of certain duties, or the payment of license fees or charges imposed in favor of such city, borough or township, by the charters of the respective companies, or by general law or ordinance for the appointment, by the local authorities, of a certain number of persons to act as directors of such company, in conjunction with the directors elected by the stockholders of such company; and, further, may provide for the ultimate acquisition by the local authorities, upon terms mutually satisfactory, of the leaseholds, property and franchises of the contracting companies."—The house has also passed a bill prohibiting a railroad corporation from purchasing or guaranteeing the stocks, bonds or other securities of, or leasing or purchasing the franchises of, any street passenger railway owning or controlling a parallel or competing line. Violation of the act is made a misdemeanor and the officers

or directors of an offending corporation may be fined \$5,000 and imprisoned for three years.—The house has passed on second reading the Homsher bill, giving to electric railway companies the right to carry light freight and express. An amendment to make the carrying of freight mandatory on the companies was defeated and a substitute adopted which provides that the transportation of freight and express matter shall be subject to such reasonable regulations as shall be prescribed by the local authorities.

Rhode Island.—A bill has been introduced in the house of representatives by Representative Rattey, of Central Falls, which provides that it shall be unlawful for any electric railway company operating cars in this state to operate them from October 15 to May 1 without vestibules so constructed as fully to inclose the platform of said cars, and any railway company violating these provisions will be deemed guilty of a misdemeanor and fined not more than \$200 nor less than \$50 for each offense. This bill is now before the judiciary committee of the house.—Another bill now before the judiciary committee considers the cities of Pawtucket and Central Falls, and the towns of Cumberland and Lincoln as one town or city transfer zone and permits a passenger to ride between points in this district on the cars operated by the same corporation for a 5-cent fare.

South Dakota.—The legislature has passed a law allowing the extensions of charters of street railways for a period of 30 years in cities of 10,000 or more population, if authorized by three-fifths of the voters of the city. The normal charter life under the laws of the state is 20 years.

Annual Inspection Trip of Purdue Engineering Students.—Junior students of the various engineering departments of Purdue university made a trip of inspection to Chicago and vicinity on March 26 to 28.

Canadian Society of Civil Engineers.—At the meeting of the electrical division of the Canadian Society of Civil Engineers, on March 14, a paper on "Effect of Armature Reaction in Synchronous Motors and Rotary Converters" was presented by B. T. McCormick.

Philadelphia Traction Situation.—The Fahey bill, which will enable the city of Philadelphia to contract with the Philadelphia Rapid Transit Company, was reconsidered by the house of representatives of the Pennsylvania legislature on March 26, and was finally passed by a vote of 143 to 30.

Noiseless Car Wheels to be Tested in Detroit.—F. W. Brooks, general manager of the Detroit United Railway, writes that the reports that this company is making a test of paper car wheels in the endeavor to eliminate noise are erroneous. The company has arranged to make a test of the Hogeland car wheel, patented by George H. Bryant and manufactured by the Hogeland Noiseless Wheel Company, Chicago. The wheel is made either steel or cast, and between the center and the tire is placed a layer of felt, which it is claimed will lessen noise.

Indianapolis Merchants to Cease Refunding Fares.—The Indianapolis Merchants' Association has decided to discontinue the custom of refunding railroad fares to out-of-town customers who purchase \$25 worth of goods or more. In 1900, when the association adopted the plan of rebating railroad fares in order to advertise the city there was only one interurban line entering the city. Now there are 10 interurban lines and 19 steam lines entering the city and the plan of refunding railroad fare to purchasers of \$25 worth of goods has become so burdensome that the association will discontinue the plan and will seek to advertise the city in some other way.

Chicago City Railway Offers Wage Increase if Ordinances Pass.—President T. E. Mitten of the Chicago City Railway Company has issued a notice to all trainmen of the company promising a substantial increase of wages immediately after the ratification of the settlement ordinances, to be passed on by a referendum vote at the city election on April 2. The present scale is 19 cents per hour for the first six months' service, 24 for the following six months and 25 cents thereafter. The new scale, to be effective on April 1, is 23 cents, 25 cents and 27 cents. The notice states that the management makes the announcement at this time in order to contradict statements now being circulated to the effect that a reduction in wages would follow the ratification of the ordinances at the polls.

Increases in Wages.—The Seattle Electric Company has granted its conductors, motormen and gripmen an increase of wages of approximately 10 per cent, effective on April 1. This will make an increase of nearly 25 per cent over the wages paid a year ago. According to the new scale the men will receive from 25 to 22 cents an hour, according to length of service.—The Sacramento Electric Gas & Railway Company has increased the wages of its conductors and motormen three cents an hour, effective on April 1. The men will thus receive from 27 to 30 cents an hour, according to length of service.—The Pittsburg Railways Company has announced an increase of wages of 2 cents an hour for motormen and conductors, effective on April 1. The new scale is from 25 to 27 cents an hour, according to length of service.—T. M. Ellis, general manager of the Rockford & Interurban Railway, Rockford, Ill., has announced an increase in the wages of conductors and motormen of one cent an hour, effective on May 1. The company increased the wages of its employes last October. Prospects of good business the coming summer and appreciation of the increased cost of living are given as the reasons for the addition to the scale. The men now receive from 16 to 20 cents per hour according to length of service. Employes on Interurban runs receive 20 cents.

Construction News

FRANCHISES.

Buffalo, N. Y.—An amended franchise for the extension of the Elmwood avenue line of the International Railway has been passed by the council correcting the description of the route in the franchise recently granted calling for the widening of a portion of the Elmwood avenue line, and other minor changes. The franchise is for 25 years.

Canyon City, Colo.—Permission to use several of the streets of this city for its proposed line has been granted to the Canyon City & Royal Gorge Electric Railway, which will build an interurban line from Canyon City to outlying points in Fremont county.

Eveleth, Minn.—Application has been made by the Mesaba Traction Company for a franchise to build its line through Eveleth. The road as proposed will be built from Biwabik to Hibbing, Minn., about 40 miles, with possibly an extension later to Duluth. A franchise already has been granted in Virginia, Minn., and it is planned to construct the line between Eveleth and Virginia this summer. F. B. Myers, Biwabik, is president.

Galion, O.—The Galion Southern Electric Railway has been granted a franchise by the council for the construction of its proposed passenger and freight line through Galion. The length of the line from Galion to Mt. Vernon, O., will be about 35 miles, and it is said that negotiations for the financing of the road are well under way.

Hamilton, N. Y.—The franchise applied for several weeks ago by the Utica & Southern Railway for the construction of its line through Madison and Broad streets has been granted. It is stated that right of way along practically the entire route has been secured and that work on the road will be started this spring.

Indianapolis, Ind.—The state board of forestry has granted to the Indianapolis & Louisville Traction Company right of way through the state forestry reservation near Henryville. The grant, which gives the company about three and a quarter acres, will not be effective until the signatures of the attorney-general, auditor of state and the governor have been obtained.

Ligonier, Ind.—T. A. Redmond, Kendallville, Ind., representing the Kendallville & Goshen Traction Company, has obtained a franchise to operate a line in the city limits. This is a part of the Toledo & Chicago Interurban Railway which will extend its line from Kendallville to Goshen. Work on this road's extensions both east and west is to be pushed as early as possible and when completed a through service between Goshen and Bryan will have been established. F. E. Perkins, Kendallville, Ind., general manager.

Michigan City, Ind.—A franchise was granted on March 25 to the Chicago Lake Shore & South Bend Railway which is building an electric line from South Bend to this city, to enter Michigan City with its interurban line.

Mineola, L. I.—The Mineola Roslyn & Port Washington Traction Company has been granted a franchise to build an electric line through Roslyn, Mineola and Port Washington, L. I. The company which will build the line is composed of Cleveland capitalists. Work on the line will commence in a few weeks and be pushed as rapidly as possible. The New York & Long Island Traction Company's petition for a franchise was not passed.

Port Jefferson, N. Y.—The highway commissioners have granted a franchise to the Suffolk Traction Company for a line from Ft. Jefferson to Patchogue, and work is to begin immediately.

Portland, Ore.—The franchise granted some weeks ago by the city council to the Portland & Mt. Hood Railway and recently vetoed by the mayor, was passed over his veto on March 21. It is stated that much of the material is on hand and that work will be started about April 1.

Sapulpa, I. T.—A franchise has been granted to Tulsa capitalists for an electric railway from Sapulpa to the oil fields, about eight miles. The road will touch Keifer and the Glenn oil pool.

South Bend, Ind.—The Goshen South Bend & Chicago Railway is seeking entrance into South Bend on Main street, and has applied for a 25-year franchise. It is stated that the line is financed and that enough material is on hand for the construction of 25 miles of road. Several miles of line out of La Porte already have been completed.

South Bend, Ind.—The Kalamazoo Elkhart & South Bend Traction Company has been granted an amended franchise for its line through the city. It provides for the construction of the road within two years with the deposit of a \$5,000 bond and \$2,000 in cash to guarantee its construction within the specified time.

Sulphur, I. T.—W. Lyle Dickey of Tulsa, I. T., representing an eastern syndicate, has secured a franchise to build and operate a street railway system in Sulphur. It is stated that this will be part of an extensive interurban system covering Oklahoma and Kansas.

Toronto, Can.—The Hamilton Grimsby & Beamsville Electric Railway, in a bill brought before the railway committee of the Canadian legislature, has asked for a 5-year extension of its

franchise in order to complete its line from Beamsville to St. Catherines. Action on the bill has been deferred.

Troy, N. Y.—The United Traction Company has been granted a franchise for an extension of its street railway system in Troy.

Waterloo, Ind.—The Toledo & Chicago Interurban Railway has applied for a franchise in Waterloo. It is stated that work will commence on this extension about the middle of April or the first of May. F. B. Perkins, Kendallville, Ind., general manager.

Watsonville, Cal.—The Ocean Shore & Eastern Railway, which proposes to build from Santa Cruz to Watsonville, has obtained a franchise for a single-track line to this city. J. D. Harvey of San Francisco is president.

Winona, Minn.—An amended franchise is now under consideration by the city council in place of the one applied for several weeks ago by the La Crosse Water & Power Company, which proposes to build an extensive interurban system in Minnesota and Wisconsin. The new franchise provides for the operation of that portion of the line between Winona and Galesville by December 1, 1908, with a clause protecting Winona as to rates between Winona, Galesville and La Crosse. The council also is given power to cause the company to build an additional mile of track in Winona for every 2,500 increase in population.

York, Pa.—Since the York Street Railway Company has refused to agree to an amendment advanced by Mayor McCall proposing that the company shall pay to the city three per cent of one-seventh of its gross receipts from its county and interurban business, the ordinances which would have given the company a franchise on several streets of York have been defeated at a special session of the common council. The company, it is said, will make no further move to obtain perpetual franchises until council reorganizes for the fiscal year.

RECENT INCORPORATIONS.

Derry & Goff's Falls Street Railway.—This company has applied for a charter in New Hampshire to build an electric line from Derry to Goff's Falls, N. H., eight miles, connecting at the latter point with the Goff's Falls Litchfield & Hudson Railway. Capital stock, \$50,000. Incorporators: Roswell Annis and James F. Cavanaugh of Manchester; Charles N. Greenough and Frank N. Young of Derry.

Grand Central Traction Company.—Incorporated in Indiana to build, equip, operate, maintain, purchase or lease electric railroads between Indianapolis and Evansville, a distance of 172 miles. The articles provide for the construction and operating of heating, lighting and power plants and the furnishing of heat, light and power to the cities and towns connected by said line; also, for the construction and operation of telegraph and telephone lines to be used in connection with operating the road. The articles provide for the construction of a branch line from a point on the main line east of Bloomington to Terre Haute and intervening towns. Capital stock, \$250,000. Incorporators: Ora W. Blickenstaff, M. P. Carter, W. D. Whitney and D. H. Morgan, all of Indianapolis, where the offices of the company are located.

Hannaford Valley Railway.—This company has filed an application for charter to build an electric line from Tacoma to Centralia, Wash. Preliminary surveys have been made. Capital stock, \$650,000. Incorporators: E. B. Cox, president, Seattle, Wash.; A. W. Mackie, Ballard, Wash.; John Stewart, H. W. Treat, Alexander McLaren and P. H. Smith.

North Dakota Railway.—Incorporated in North Dakota to build an electric railway from the cement plant in Olga township to Edinburg, N. D., connecting with the Great Northern at the latter point. It is stated that all of the stock is held by farmers along the line. The road will handle passengers and freight and it is said that a business of \$30,000 annually is assured by its construction. Capital stock, \$200,000.

Southern Electric Construction Company.—Incorporated in Indiana to build a railway from Washington, Daviess county, to Martinsville, Morgan county; also to construct and operate light and power plants. Capital stock, \$100,000. Incorporators: T. Denoon, Chicago; John F. Noel, South Bend, and Orman H. Gabel and W. H. Clinton, Indianapolis.

Tekoa & St. Mary's River Railway.—Incorporated in Washington to build an electric line from Tekoa to a point on the St. Mary's river, in Idaho, a distance of 50 miles. Capital stock, \$500,000. Incorporators: T. J. Mahony, E. C. Dowell and William Hoare.

Terre Haute Indianapolis & Eastern Traction Company.—This company, incorporated recently with nominal capital stock, has filed amended articles with the secretary of state of Indiana whereby the capital stock is increased from \$4,500 to \$25,000,000. The stock is divided into \$250,000 shares of par value of \$100 each, \$12,500,000 being common stock and \$12,500,000 being preferred stock. By the filing of these amended articles the gigantic traction merger of the Indiana lines controlled by the Dolan-Morgan-McGowan syndicate, was completed. According to the articles, the merger embraces the Indianapolis & Eastern Traction Company, the Richmond Street & Interurban Railway, including the Connersville branch, the Indianapolis & Martinsville Traction Company, Indianapolis & Northwestern Traction Company, Indianapolis & Plainfield Traction Company, Indianapolis & Western Traction Company, and the Indianapolis Coal Traction Company. The amended articles also provide for acquiring other lines and building extensions to the lines already controlled, and the construction of several new lines. The company will also generate

and distribute electricity for heat, light and power purposes to the 130 or more towns and cities connected by this system. The extensions provided for in the articles which the company proposes to build are a line from Sullivan to Vincennes, a line from Terre Haute to Danville, Ill., a line from Terre Haute to Paris, Ill., a line from Martinsville to West Baden via Bloomington, a line from Crawfordsville to Williamsport, a line from Thorntown to Lafayette and a branch line from Bloomington to Terre Haute. When these extensions and the lines now under course of construction are completed, the syndicate will control nearly 400 miles of electric railroad in Indiana. The syndicate has leased for a period of 99 years and assumed control of the Terre Haute Traction & Light Company, including the interurban properties between Terre Haute and Clinton, Terre Haute and Brazil and Terre Haute and Sullivan, together with the local company's lighting equipment. The leasing company assumes all the liabilities of the Terre Haute Traction Company with a guarantee of 6 per cent on \$500,000 preferred stock, assumes a mortgage of \$3,366,000 with 5 per cent bond security and guarantees 2 per cent on \$2,000,000 common stock for three years and 3 per cent for the succeeding years. It is understood that Hugh J. McGowan will be made president of the company. Mr. McGowan states that the holding company contemplates no action relative to a consolidation with the Indiana Union Traction Company, the Ft. Wayne & Wabash Valley Traction Company, nor any of the traction properties recently secured at South Bend and Evansville by the Murdock syndicate. The fee received by the secretary of state for the filing of the amended articles of association was \$25,100, the largest fee ever received by the state for incorporating an interurban system.

Wyandotte & Lawrence Railroad.—Incorporated in Kansas to construct and operate an interurban railway between Lawrence and Kansas City, Kan., through Douglas, Johnson, Leavenworth and Wyandotte counties, about 38 miles. Steam, electricity or gasoline will be used. Capital stock, \$510,000, with \$170,000 preferred and \$340,000 common. Incorporators: Benjamin Schrierle, J. E. Wherrell, F. K. Schuepbach, H. C. Downs and E. Y. Blum, all of Kansas City, Kan.

TRACK AND ROADWAY.

Akron Barberton & Western Railway.—It is reported that this company's line from Barberton to Wadsworth, O., is nearly ready for operation. The overhead work is now being completed.

Altoona & Logan Valley Electric Railway.—It is reported that the East Altoona extension will begin next month, and that the right of way has been secured.

American Electric Railroad.—This company, which proposes to build from Des Moines to Council Bluffs, Ia., has been voted a 5 per cent tax at Greenfield. Work is to begin by July 1 and be completed by March 1, 1909. C. W. Baker of Des Moines, president.

Atlanta & Carolina Railway.—It is reported that early in April construction will begin on this company's proposed line from Atlanta to Conyers, Lithonia and West Point. The capital stock has been increased to \$5,300,000. Franchises and right of way have been secured.

Baton Rouge (La.) Electric & Gas Company.—This company has been purchased by Stone & Webster of Boston, Mass., and General Manager C. H. Kretz recently appeared before the city council and announced that the new owners would immediately begin to reconstruct and improve the entire system. New 6-inch rails are to be laid over the entire system, which amounts to about four miles, and new trolley wire for the entire line has been shipped. Nine new cars are to be placed in operation, which, being longer than the old ones, will necessitate lengthening some of the curves and switches. The rails are to be laid on ties embedded in concrete. As soon as the work of rehabilitation is completed it is the intention to apply for franchises for several important extensions.

Bellingham, Wash.—It is reported that S. L. Shuffleton, engineer of construction for Stone & Webster of Boston, has completed estimates for the construction of the proposed electric line from Bellingham to Skagit county towns.

Canton Youngstown & Akron Railway.—The Collins Construction Company, 92 LaSalle street, Chicago, Ill., is now preparing for active construction work on 65 miles of electric railroad from Canton to Youngstown, Ohio. This contract includes the construction and equipment complete in every detail. The company is now taking bids for all classes of material and equipment needed for the complete construction and equipment of the road, consisting of concrete work, trestle work, drain pipe, steel bridges, ties, steel rails, rail joints, frogs and switches, boilers, turbine generators and accessories, power house building, car barn and shops, poles, brackets, trolley wire, transformers and all accessories for the complete overhead work; passenger coaches, freight motors and motor equipment. The estimated cost is \$2,000,000.

Central Pennsylvania Traction Company.—Material is being distributed for the double-tracking of the Sixth street line from Emerald street to Division street, Harrisburg. The company will also rebuild its line between Steelton and Oberlin, laying a heavier rail.

Chicago Kenosha Milwaukee & Lake Geneva Railway.—Surveyors are now engaged in locating the right of way through Kenosha for the proposed line to Lake Geneva and preparations are being made for beginning condemnation proceedings.

Chicago South Bend & Northern Indiana Railway.—Jeup &

Moore of Indianapolis are making preparations for beginning the survey of the extension from Michigan City, Ind., toward Chicago via Gary. Work is now in progress between Michigan City and South Bend. Samuel Riddle, South Bend, general manager.

Coos Bay Gas & Electric Company.—Seymour H. Bell, treasurer and general manager, Marshfield, Ore., writes that this company, which owns gas and lighting plants in several cities on Coos Bay, is building an electric line from Empire City to Marshfield, Ore., 10 miles, via North Bend. The route has been surveyed and grading has been completed from North Bend to Porter. Grading is now in progress from North Bend to Marshfield, four miles. There will be about two miles of trestle work on the line. The company is in the market for part of the equipment, including cars with mail and express compartment and double-end control. Henry Hewitt, Jr., of Tacoma, president; Ed Rigg of Marshfield, chief engineer.

Covington & Southwestern Traction Company.—A trust deed mortgage has been filed at Crawfordsville and Covington by W. G. Ruhl, president, in favor of the Trust Company of America of New York, and the Union Trust Company of Indianapolis for \$1,250,000. The mortgage covers the property, rights of way, franchises, etc., of an electric line to be constructed by this company between Covington and Crawfordsville, with a short branch line through the Green Creek coal mining district. President Ruhl states that the road will be constructed of heavy steel, so as to carry on the business of transporting coal from the mines in Park county to adjacent markets. The work of constructing the 45 miles of track in the system will begin on April 1.

Dalton & Scranton Railway.—F. W. Day, general manager, has announced that the first 12 miles of the road from Scranton to Lake Mineola, Pa., would be in operation by May 1. The track is nearly all laid and the overhead work is completed.

Davenport, Ia.—A. Hurst of Hurstville, Ia., who is interested in an electric line from Davenport to Dubuque, Ia., 83 miles, writes that the company is not yet organized. Surveys have been completed from Maquoketa to Dubuque, 40 miles, and the section from Davenport to Maquoketa, 43 miles. The route includes De Witt, Delmar, Maquoketa and La Motte.

Denver & Interurban Railroad.—This company, which is building the Colorado & Southern's electric line from Denver to Boulder, Colo., has begun work on the city lines to be built in Ft. Collins, and it is stated that seven miles are to be put in operation this year.

Evansville & Southern Indiana Railway.—Manager R. R. Smith has agreed after a conference with the Evansville (Ind.) board of public works to relay the tracks on Main street when the city is ready to repave the street. Seventy-pound rails will be used, laid on a concrete foundation, with a special paving brick.

Ft. Dodge Des Moines & Southern Electric Railway.—Grading has been resumed on this company's line from Ft. Dodge to Des Moines, Ia. About 20 miles at the northern end remains to be graded. The work on the southern end is nearly completed, although no wire has been strung, and construction trains are now in operation from Fraser to Flint Junction, near Des Moines. J. L. Blake of Des Moines, general manager.

Ft. Wayne Toledo & Eastern Railway.—The residents along the right of way of this proposed line between Ft. Wayne, Hicksville and Bryan, O., have been asked to subscribe a bonus of \$30,000 before the bonds can be underwritten.

Holyoke (Mass.) Street Railway.—This company will rebuild the Elmwood and Oakdale lines and substitute groove rails for the ones now used. The company will also double-track the Northampton line from Mountain Park to Smith's Ferry.

Huntington Beach Company.—S. H. Finley, engineer, writes that this company is now securing right of way for an electric line from Santa Ana to Huntington Beach, Cal., 10 miles. The line has been surveyed, although no definite arrangements have been made for beginning construction.

Indianapolis & Cincinnati Traction Company.—President Charles L. Henry of Indianapolis has announced that the proposed line to Cincinnati will run from Connersville by way of Liberty, College Corner and Oxford.

Indianapolis & Western Traction Company.—The W. P. Junclaus Company of Indianapolis has begun the construction of a modern 2-story terminal station for this company at Greencastle, Ind. The tracklaying in the city is almost completed and the overhead work is now being pushed with a view of putting the line in operation as soon as possible.

Iowa & Missouri Traction & Power Company.—J. W. Andrews, Keosauqua, Ia., chief engineer of this company, which has made surveys and proposes to build a line from Fairfield, Ia., to Memphis, Mo., 52 miles, has prepared a comprehensive report as to the feasibility of extending the line north through Jefferson, Kiota, Millersburg and Marengo to Cedar Rapids, with branches from Millersburg to Oskaloosa and from Marengo to Vinton, a total of 178 miles. The report states that the line could be built for \$4,500,000, or about \$25,000 per mile, and includes data on population and probable traffic. The report has been submitted to business men's associations in the various towns. It is stated that the construction of the first section, from Memphis to Fairfield, is assured.

Lancaster & Eastern Street Railway.—Engineers of this company, which is operated by the Conestoga Traction Company of Lancaster, Pa., last week began surveying a line from Christiana to Coatesville, Pa., 12 miles. The company now has a line in

operation from Lancaster to Christiana, 20 miles, and when the link to Coatesville is completed, as it is expected to be by January 1, through connection to Philadelphia will be made possible. H. W. Crawford of Lancaster, chief engineer.

La Porte, Ind.—The report that the Murdock syndicate, which owns the Chicago South Bend & Northern Indiana Traction Company of South Bend, Ind., will build a line south from La Porte to Logansport, has been denied by Samuel T. Murdock of Lafayette, Ind.

Meadville Conneaut Lake & Linesville Electric Railway.—The grading for this line has been completed from Meadville to Harmonsburg, Pa., and the rails are laid to within one mile of that place. It is expected that the road will be in operation by June 1.

Milwaukee Northern Railway.—F. W. Walker, vice-president, Port Washington, Wis., writes that this line will extend from Milwaukee to Sheboygan and Fond du Lac, Wis., 112 miles. The route includes Thiensville, Cedarburg, Grafton, Port Washington, Cedar Grove, Sheboygan, West Bend, Barton, Kaukana, Campbellsport and Fond du Lac. The entire route has been surveyed, and 20 miles from Cedarburg to Milwaukee has been graded. Five miles of track from Cedarburg south toward Milwaukee has been laid this year and grading is in progress between Port Washington and Cedarburg, 10 miles. Overhead work is under construction from Port Washington to Milwaukee, 30 miles. Overhead construction will be of the bracket type on tangents and of the span type on curves. Substations are under construction at Port Washington, Cedarburg, Browdeer and Milwaukee. The power house is under construction at Port Washington. The equipment will consist of three 1,000-kilowatt, 3-phase generators driven by gas engines and producer gas. The substation equipment will consist of two 400-kilowatt rotary converters. The equipment is to be furnished by the Allis-Chalmers Company, the Power Mining Machinery Company, the Westinghouse Electric & Manufacturing Company, the Niles Car & Manufacturing Company, New York Car & Truck Company and the American Locomotive Company. All bridges on the line will be of steel with concrete abutments, and the road will be built on private right of way with no grade crossings of railroads. Seventy-pound T-rails will be used, except in Milwaukee, where 95-pound T-rails will be used. W. A. Comstock of Alpena, Mich., is president and F. W. Walker of Port Washington is vice-president and chief engineer.

Milner, Idaho.—Maj. Fred R. Reed is said to be interested in a company to build a large power plant at this place and an electric railway from Milner to Gooding, about 50 miles, at a cost of about \$1,000,000.

Newark Martinsburg & Mt. Vernon Traction Company.—Actual construction work on this line has begun and President Chilcote says that cars will be running next fall. The line will connect Newark with Martinsburg, Gambier, Mt. Vernon, Londonville and Wooster, where it will connect with the Cleveland Southwestern & Columbus, and give a direct line to Cleveland from Columbus by way of Newark.

Ocean Shore Railway.—John B. Rogers, chief engineer, San Francisco, Cal., writes that this company is now building an electric interurban line following the coast line of the Pacific Ocean from San Francisco to Santa Cruz, a distance of 80 miles. The road is being built for both freight and passenger service and will be double-tracked and of the highest type of construction throughout. It is expected to have the first section of the road from San Francisco to Half Moon Bay ready for operation by June 1. About 70 per cent of the grading on the entire line is now completed and 85 per cent of the bridge work. About 20 miles of track have been laid between San Francisco and Mussel Rock and from Santa Cruz to Davenport. Contracts for building the line have been let to the Rialto Construction Company from San Francisco to Ocean View, eight miles; to Willitt & Burr, the Ransome Construction Company and Mahoney Brothers from Ocean View to Mussel Rock, 4½ miles; to the Ransome Construction Company, Lewis Moring and Antonelli & Bandman from Mussel Rock to San Pedro Mountain, eight miles; to the Ransome Construction Company from San Pedro Mountain to Wadse Beach, 41 miles, and to Shattuck & Desmond and Pratcher & Chadwick from Wadse Beach to Santa Cruz, 21 miles. Within city limits the road occupies almost entirely private right of way, with overhead or subgrade crossings at the principal intersecting streets. The maximum grade is 2 per cent except in a few instances, which will be eliminated later. The maximum curvature is 16 degrees except the entrance to the San Francisco terminal, which is 20 degrees. Seventy-pound rails are used. There are no bridges on the line of importance except the viaducts in San Francisco and Santa Cruz. Nearly all of the cross drainage is handled through semi-circular tunnels, running under and around high fills. The largest of these fills contains 220,000 cubic yards of material, the highest fill is 93 feet. Grading around San Pedro Mountain will cost \$160,000 per mile. The overhead construction will be of the center-pole catenary type. The power house is now under construction and General Electric equipment of 7,000-kilowatt capacity will be installed. Franchises and land for terminals have been secured at both terminal cities. J. Downey Harvey, president, San Francisco, Cal.

Ocean Shore & Eastern Railway.—E. V. Kenfall of San Francisco, auditor, writes that surveys are being made for an electric railway from Santa Cruz to Watsonville, Cal., via Soquel, Aptos, Pleasant Valley and Freedom, a distance of 19 miles, parallel to the Pacific shore line. Construction is to begin in 90 days. The company is allied with the Ocean Shore Railway, which is now constructing a line from San Francisco to Santa Cruz. J. Downey Harvey, president; J. B. Rogers, chief engineer, both of 52 Eleventh street, San Francisco, where the offices of the company are located.

Oneonta & Mohawk Valley Railroad.—It is reported that this company is considering the extension of its line from Richfield Springs to Springfield Center, N. Y., at the head of Otsego Lake, a distance of about nine miles.

Oregon Electric Railway.—Surveyors in the employ of W. S. Barsto & Co. of Portland, Ore., are now locating the line from Garden Home to Forest Grove, Ore., a branch from the proposed Portland-Salem line.

Pacific Electric Railway, Los Angeles, Cal.—It is reported that the survey for the extension of the new Covina line to Pomona, Cal., has been ordered. The Covina line, which is 22 miles long, is expected to be in operation in six weeks.

Pacific Traction Company.—Several carloads of rails have arrived for the line from South Tacoma to Steilacoom and American lakes and the work is to be rushed to completion this spring. B. T. Felt, general manager, Tacoma, Wash.

Pasadena La Canyada & Los Angeles Railway.—It is reported that this company will soon make application to the city council of Pasadena, Cal., for a franchise for an electric railway, which is to connect the three cities named in the title. The company was incorporated last year with a capital stock of \$100,000, and it has the following officers: George E. Smith of Pasadena is president; C. G. Compton, Long Beach, Cal., first vice-president; A. H. Green, Los Angeles, second vice-president; H. M. Orr, Los Angeles, secretary and treasurer.

Portland, Ore.—It is reported that the Harriman interests, who recently purchased the Corvallis & Eastern Railroad, propose to construct an electric instead of a steam road from Portland into Clackamas county.

Reno, Nevada.—It is stated that surveys are being made for an electric line from Reno south to Steamboat Springs, 12 miles. Colonel Hopkins of Reno, who is promoting the road, states it will be completed in four months, and will be extended later on to Carson City.

Rochester Corning & Elmira Traction Company.—The New York railroad commission, acting under an order from the appellate division of the supreme court, has granted a certificate of public convenience and necessity for building the proposed line from Rochester to Elmira.

Selma (Ala.) Street & Suburban Railroad.—It is stated that this company has bought a tract of land on Oakmulgee Creek, 10 miles from the city, upon which to erect a power plant. It is also stated that the city lines will be extended to this point and thence to Summerfield, 10 miles.

Sparta-Melrose Electric Railway & Power Company.—This company, recently incorporated to build an electric railway from Sparta to Melrose, Wis., 28 miles, has elected the following officers: President, G. S. Cromwell; vice-president, James A. Cole; secretary, Howard Teasdale; treasurer, W. A. Sholes, all of Sparta, Wis. It is stated that construction will begin May 1.

Tampa & Sulphur Springs Traction Company.—The material is on the ground for the \$30,000 bridge which is to be built across the Hillsborough river connecting Tampa and West Tampa, Fla., by the Virginia Iron & Bridge Company. The company is building a line from Tampa to Sulphur Springs.

Tennessee-Georgia Interurban Railway.—Samuel D. Divine states that financial arrangements have been made for building this road from Chattanooga to Chickamauga Park, and that surveys will be started immediately.

Texas Traction Company.—This company, which is building a line from Dallas to Sherman, Tex., has ordered 9,000 tons of rails.

Toledo Wabash & St. Louis Railway.—It is reported that a syndicate of Toledo capitalists have formed a company with \$6,000,000 capital stock to build an electric line from Toledo to St. Louis. It is stated that the company has been financed and that the road will pass through Defiance, Ft. Wayne, Indianapolis and Terre Haute, Ind. A power plant at Miami has been purchased which will furnish power to operate the line between Toledo and Defiance. The first section from Toledo to Defiance is to be finished within nine months. The right of way has been secured. The second section will be from Defiance to Ft. Wayne and the third from Ft. Wayne to Indianapolis by way of Muncie. The fourth section will be from Indianapolis to St. Louis. Construction is to be of the highest class throughout and 70-pound rails are to be laid. The officers are: C. D. Whitney, president; George G. Metzger, vice-president; J. P. McAfee, treasurer, and F. L. McAfee, secretary.

Tri-City Railway.—This company has begun work on the extension of its double-track line on Brady street, Davenport, Ia., from Central Park to the city limits.

West Penn Railways, Connellsville, Pa.—W. E. Moore, general manager, writes that the rumor that this company would build an extension from McKeesport to Glassport, Pa., is unfounded, as the company has never considered such an extension.

POWER HOUSES AND SUBSTATIONS.

Metropolitan Street Railway, Kansas City, Mo.—A contract has been awarded to Turner Brothers of Kansas City for constructing a 1-story brick substation, 62 by 105 feet, for a power plant at Electric Park. Estimated cost \$9,000. C. N. Black, general manager.

Personal Mention

Mr. Charles Johns has resigned as manager of the St. Thomas Street Railway, which is owned and operated by the municipality of St. Thomas, Ont.

Mr. Fred H. Heckler, master mechanic of the Lake Shore Electric Railway at Fremont, O., has been appointed chief engineer in place of Mr. F. B. Matthews, resigned.

Mr. J. T. Mooney, chief of the construction department of the Pottsville Union Traction Company, Pottsville, Pa., has been appointed assistant manager of transportation, and Mr. H. O. Ellis has been appointed chief of construction.

Mr. E. L. Greene, formerly foreman of the general repair and equipment shops of the New York City Railway Company, has accepted a position with the engineering department of the Westinghouse Electric & Manufacturing Company.

Mr. A. E. Weist, Jr., formerly general manager of the Indianapolis Huntington Columbia City & Northwestern Railway, which is building a line from Syracuse to Goshen, Ind., has resigned his position and will leave shortly for Texas where he is interested in a proposed interurban line.

Mr. Oral A. Stevens has resigned as division superintendent of the Boston & Northern Street Railway. He is succeeded by Mr. W. E. Maloney, who for the past five years has held the office of the superintendent of the Manchester Street Railway, Manchester, N. H. Mr. Maloney began his railway career at the age of 18, in the offices of the Worcester Consolidated Company, and remained with that company for 12 years, until he was appointed superintendent of the Manchester company.

Mr. Charles H. Armatage, who, as announced in the Electric Railway Review of March 23, has been appointed traffic manager of the United Traction Company and the Hudson Valley Railway Company, controlled by the Delaware & Hudson

Company, with office at Albany, N. Y., has been connected with the street railways of that city for the past six months as superintendent of the express department of the United Traction Company. Mr. Armatage was born in Albany on January 30, 1857, and has lived there all his life, having occupied several important public offices. He received his education at the Albany Boys' Academy and after leaving school entered the railway service. He was for several years assistant superintendent of the Buffalo division of the West Shore Railroad under D. B. McCoy, now assistant general manager of the New York Central & Hudson River Railroad.

He left that position to enter the mercantile business in Albany, and during 1894 and 1895 was president of the common council. His present appointment became effective on March 14, 1907. The duties of traffic manager, heretofore, have been combined with those of the operating department of the companies, but on account of the expansion of the passenger and freight business it was deemed advisable to separate the two departments.

Mr. J. T. Harmer of Boston has been elected to the newly created position of comptroller of the Worcester Railways & Investment Company of Worcester, Mass., the holding company of the Worcester Consolidated Street Railway Company. A new treasurer of the company also has been elected in the person of Mr. Leverett Candee of Boston, who succeeds Mr. E. E. Foye. Mr. A. George Bullock of Worcester was elected president and Mr. Francis H. Dewey of Worcester, president of the Worcester Consolidated Street Railway Company, vice-president. Mr. B. W. Warren of Boston was elected secretary.

Mr. E. E. Lillie, whose appointment as superintendent of the Spokane & Inland division of the Spokane & Inland Empire Railroad was noted in the Electric Railway Review of March 16, has been associated in various capacities with the railway systems of the United States and Canada for a number of years. He was born in Galt, Ontario, in 1869, and began his railroad career as telegraph operator on the Canadian Pacific Railway at Winnipeg, Manitoba, in 1884, where he remained four years. In 1888 he accepted a position at Superior, Wis., with the Eastern Minnesota Railway (now a part of the Great Northern system) as timekeeper and shop clerk, later becoming chief clerk to the master mechanic. In 1892 he again entered the telegraph service as operator in the general office of the Great Northern at St. Paul, later serving as train dispatcher, chief train dispatcher and assistant superintendent on the various divisions of the road. In 1902 he resigned to accept a position with the Choctaw Oklahoma & Gulf Railway at Little Rock, Ark. In 1903 Mr. Lillie again



Charles H. Armatage.

Financial News

entered the service of the Great Northern as assistant to the general superintendent of transportation at St. Paul and later became chief dispatcher at the company's Spokane office, where he remained until his recent appointment as superintendent of the Spokane & Inland Empire Railroad of that city.

Mr. E. P. Wetmore has been appointed general manager of the Augusta (Ga.) Railway & Electric Company, with headquarters at Augusta; effective at once. The duties of this office formerly were combined with those of Mr. James U. Jackson, vice-president, but on account of extensions and improvements planned by the company it was decided to create a separate head for the operating department in order that Mr. Jackson's time might be given to larger matters. The office of general superintendent, which has been vacant since the resignation of Mr. Charles Furbay, has been abolished and its duties incorporated with those of the general manager. Mr. Wetmore formerly was connected with the electric street railway systems of Liverpool, England, and other European cities, and more recently with some of the larger systems of this country.

Mr. R. E. Danforth, vice-president and general manager of the Rochester (N. Y.) Railway Company, has resigned to become general manager of the Public Service Corporation of New Jersey, succeeding Mr. Albert H. Stanley, who resigned recently to become general manager of the London Underground Electric Railways. For the past four years Mr. Danforth has been connected with the Rochester Railway Company, first as assistant manager and later, on the resignation of Mr. T. J. Nichol, as general manager of the company. He was formerly in charge of the International Railway Company's lines in Buffalo, resigning his position there to become connected with the Lake Shore Electric Railway when that system was being organized. In April, 1902, he severed his connection with this company to become identified with the Rochester Railway, where he has remained until his present appointment.

Mr. W. C. Smith, whose portrait we present herewith, was recently appointed general superintendent of the Mahoning & Shenango Valley Railway & Light Company, with headquarters at Youngstown, O., as reported in the Electric Railway Review of March 2, 1907, succeeding Mr. T. C. Armstrong, resigned. Mr. Smith was born near Saxon Station, Butler county, Pa. He was associated with the street railway companies of Pittsburg for 20 years, having been assistant superintendent of the Citizens' Traction Company when it was a cable line, and later having served as general superintendent of the Central Traction Company. When that line was absorbed by the Consolidated Traction Company in 1896 he was appointed superintendent of transportation of that company. In February, 1902, Mr. Smith was appointed assistant general manager of the Pennsylvania & Mahoning Valley Railway at Youngstown, O., and in November of that year he was promoted to the position of general manager. In May, 1904, he was made manager of the Youngstown division of that company and in October resigned to go to Pittsburg. He now returns to Youngstown with the Mahoning & Shenango Railway & Light Company, which controls the Pennsylvania & Mahoning Valley Company.



W. C. Smith.

Mr. C. A. Alderman, for the past two years chief engineer of the Cincinnati Northern Traction Company, has resigned to become associated with J. G. White & Co., of New York, effective on April 1. Mr. Alderman's experience in railway construction has been obtained by years of service with prominent construction and railway companies of the middle west, both steam and electric. Before entering the electric railway business he was connected with the engineering departments of the Southern Pacific and the Duluth South Shore & Atlantic railroads and at one time was city engineer of Eau Claire, Wis. During 1905 he was general superintendent of the Appleyard lines between Dayton and Columbus and for eight years previous was manager and chief engineer of the Great Northern Construction Company, which built the Appleyard lines in Wisconsin and Ohio, as well as a portion of the Tucker-Anthony lines in the latter state. Two years ago he entered the service of the Cincinnati Northern Traction Company, with full charge of its extensive plans for reconstructing, straightening and the placing on private right of way of its line between Cincinnati and Dayton. It was under his supervision that the 26-mile line of the Lima & Toledo Traction Company from Lima to Lelapsic, O., was built last year.

Obituary.

A. F. Ramsey of Crawfordsville, Ind., president of the Indianapolis Crawfordsville & Western Traction Company, died on March 13.

Amherst (Mass.) & Sunderland Street Railway.—It is reported that the control of this company has been sold to William S. Loomis, president of the Holyoke (Mass.) Street Railway Company, and others.

Coney Island & Brooklyn Railroad.—Stockholders have voted to increase the stock from \$2,000,000 to \$3,500,000.

Easton (Pa.) Transit Company.—This company has called for payment on April 1, at 103 and interest, its \$300,000 first mortgage 5 per cent bonds.

Georgia Railway & Electric Company, Atlanta, Ga.—At a meeting of stockholders on March 26 the authorized common stock was increased from \$6,000,000 to \$8,500,000. Of the increase \$2,000,000 will be issued as a stock dividend to common shareholders and the remaining \$500,000 will be held in the treasury to be sold from time to time for extensions and improvements. When the \$2,000,000 stock is issued the dividend rate will be reduced from 8 to 6 per cent.

Havana (Cuba) Electric Railway.—The earnings for the year ended December 31, 1906, compare as follows:

	1906	1905	Increase
Total receipts	\$1,662,073	\$1,542,870	\$119,203
Operating expenses and taxes....	1,031,374	776,052	255,322
Net earnings	\$ 630,699	\$ 766,818	*\$136,119
Interest funded debt	398,314	395,897	2,417
Balance	\$ 232,385	\$ 370,921	*\$138,536
Other charges	100,000	.....	100,000
Surplus	\$ 132,385	\$ 370,921	*\$238,536
Dividends	200,000	.....	200,000
Deficit	\$ 67,615	†\$370,921	\$438,536

*Decrease. †Surplus.

Indianapolis & Northwestern Traction Company.—This company has filed amended articles of incorporation with the secretary of state whereby the capital stock is increased \$3,550,000. The money procured from the sale of this stock is to be used in building extensions from Crawfordsville to Williamsport, the taking over of the Lebanon-Thorntown Traction Company and building an extension from Clarksville to Lafayette.

Interborough Rapid Transit Company, New York City.—The company has made public its income account for the year 1906. Gross earnings increased 14.8 per cent over 1905 and operating expenses increased 6.65 per cent. The gain in net earnings was 21.55 per cent. The final surplus increased 41.57 per cent. The earnings, with comparisons, are as follows:

	1906	1905	Increase
Gross earnings	\$20,916,147	\$18,218,266	\$2,697,881
Operating expenses	8,793,486	8,245,004	548,482
Net earnings	\$12,122,660	\$ 9,973,261	\$2,149,398
Other income	673,598	701,660	*28,061
Gross income	\$12,796,259	\$10,674,922	\$2,121,336
Interest on bonds	3,961,991	3,018,166	943,825
Taxes	1,341,074	1,288,613	52,461
Total interest and taxes....	\$ 5,303,066	\$ 4,306,780	\$ 996,286
Net income	7,493,192	6,368,142	1,125,050
7 per cent on Manhattan Railway Company stock	3,948,000	3,864,000	84,000
Surplus	\$3,545,192	\$ 2,504,142	\$1,041,050
Operating expenses—per cent of gross earnings	42.04	45.26	*3.22
Passengers carried	420,302,389	366,174,479	54,127,910

*Decrease.

Lewiston (N. Y.) & Youngstown Frontier Railway.—It is reported that this road will be acquired by the Niagara Gorge Railroad Company, Niagara Falls, N. Y.

North Alabama Traction Company, New Decatur, Ala.—The capital stock of this company will be increased from \$150,000 to \$300,000.

United Railways Company, St. Louis.—The statement for February shows an increase in gross earnings as compared with the previous year, but a final deficit after the payment of fixed charges. The St. Louis & Suburban system was taken over as of January 1. The figures for February, with a comparison, are as follows:

	1907	1906	Increase
Gross earnings and other income....	\$764,680	\$713,664	\$51,016
Expenses, taxes and depreciation....	548,479	463,041	85,438
February net earnings	\$216,201	\$250,623	*\$34,422
Charges	231,324	231,991	*667
February deficit	\$15,123	†\$18,632	\$33,755

*Decrease. †Surplus.

West Chester (Pa.) Street Railway Company.—This company will acquire the property of the Coatesville Traction Company, which is now controlled by the West Chester Company. The Coatesville Company owns a road extending from Coatesville to Downingtown, Pa.

Manufactures and Supplies

ROLLING STOCK.

Lexington Railway, Lexington, Ky., is reported to have ordered six new cars.

Alabama City Gadsden & Attalla Railway, Gadsden, Ala., is figuring on one double-truck car.

Buffalo Lockport & Rochester Railway, Buffalo, N. Y., is asking prices on equipment for 17 cars.

New Berlin & Winfield Railroad, New Berlin, Pa., is in the market for one passenger and baggage car.

Elgin & Belvidere Electric Company, Chicago, is reported to have placed an order for 10 new interurban cars.

Philadelphia Rapid Transit Company has ordered 60 passenger cars for elevated service from the Pressed Steel Car Company for November delivery.

Dayton Covington & Piqua Traction Company, Dayton, O., has ordered two 15-bench open cars for summer service from the Wason Manufacturing Company.

Oakland Transit Company, Oakland, Cal., is building in its shops 20 large city cars, each with a seating capacity of 56 passengers. The estimated weight of these cars is 36,000 pounds each.

Winnipeg Electric Railway, Winnipeg, Can., has placed an order with the Ottawa Car Company for 20 double-truck cars, 40 feet in length over all, and has ordered 20 similar cars from its own shops.

Coos Bay Gas & Electric Company, which is building an electric line from Empire City to Marshfield, Ore., is in the market for a number of combination passenger and mail cars, to be equipped with a controller on each end of the car. Seymour H. Bell, general manager, Marshfield, Ore.

SHOPS AND BUILDINGS.

Denver Interurban Railway.—Contracts have been awarded for the construction of a car barn, 100 by 140 feet, of brick and steel construction, at Ft. Collins, Colo., in connection with the street railway to be built in that city. The building will contain a machine shop, blacksmith shop and tool rooms and will have a capacity of 12 cars. The construction is in charge of C. H. Harpman, mechanical engineer of the Colorado & Southern Railroad, of which the Denver Interurban is a subsidiary company, organized to build its electric lines.

Evansville & Southern Indiana Traction Company.—This company has ordered plans and will soon ask for bids for the erection of a 2-story brick passenger and freight station, also a large car barn, at Princeton, Ind.

Indiana Union Traction Company.—Bids are being asked by George H. Penrose, quartermaster U. S. A., at Ft. Benjamin Harrison, near Indianapolis, for the construction and equipment of a terminal station on the government grounds for the use of the traction company. It is understood that it is the plan of the government to own all the buildings and the railroad track laid upon the government grounds.

Syracuse Rapid Transit Company.—This company will erect a car barn and machine shop, to cost about \$150,000, on Wolf street, Syracuse, N. Y. C. Loomis Allen, general manager.

TRADE NOTES.

H. B. Smith Machine Company, Smithville, N. J., will soon remove its Chicago office from 110 and 12 North Canal street to 105-109 Clinton street.

J. H. Burwell, with offices in the Fisher building, Chicago, has been appointed sales agent in the middle west for the Automatic Ventilator Company of New York.

Arthur D. Newton, manager electrical department of the Boston branch of the H. W. Johns-Manville Company, New York, died on Wednesday, March 13, from an attack of la grippe.

Kilby Frog & Switch Company, Birmingham, Ala., has increased its capital stock to \$130,000 for the purpose of enlarging the capacity of the plant and for which new machinery is now being installed.

E. L. Greene, formerly foreman of the general repair and new equipment shops of the New York Central Railway, has accepted a position with the engineering department of the Westinghouse Electric & Manufacturing Company.

Standard Railway Equipment Company, St. Louis, Mo., dealer in Monarch pneumatic tools, Murphy inside and outside metal roofs, draft rigging, etc., has opened an office in suite 359-361 Frick building annex, Pittsburg, Pa.

Electric Storage Battery Company, Philadelphia, at its annual meeting elected H. H. Vreeland a director of the company to succeed Thomas F. Ryan. Mr. Vreeland has for a number of years been president of the Metropolitan Street Railway of New York. All of the retiring board of directors were re-elected. The annual report of the year ending December 31, 1906, showed gross

sales of \$1,331,800, an increase of \$135,687. The surplus for the year, after deducting dividends, amounted to \$246,923. The total surplus is now \$3,754,452 and the total assets of the company are placed at \$22,225,209, an increase of \$351,866. Of the total assets \$13,661,625 represent patents, etc.

Dossert & Co., 244 West Forty-first street, New York, manufacturers of solderless connectors, have received an order for 1,000 Dossert clamp joints from the Union Gas & Electric Company, Cincinnati, O. These joints are to be used for connecting No. 6 wire or ½-inch pipe in the grounding of transformers.

American Hoist & Derrick Company, St. Paul, Minn., is erecting a foundry building, 460 by 180 feet, with stone foundation, brick walls and steel roof. The foundation is well under way and it is expected the building will be completed in August. The cost of the building will be about \$100,000.

Westinghouse Lamp Company, New York, is the new name by which the Sawyer-Man Electric Company will be known on and after April 1. It has been generally understood for a number of years that the Sawyer-Man Electric Company was a Westinghouse interest, and the change of name is but a logical result of changed conditions.

Wason Manufacturing Company, Springfield, Mass., as reported in the Electric Railway Review of March 16, has announced purchase of its car building plant by The J. G. Brill Company, Philadelphia, effective on April 1. This is one of the oldest plants of its kind in the United States and has an annual capacity of about 150 steam railway passenger cars and 125 electric cars.

J. H. Wagenhorst & Co., Youngstown, O., report a partial list of their automatic electric blue printing machines as follows: Westmoreland Coal Company, Irwin, Pa.; Casey & Hedges Company, Chattanooga, Tenn.; Norton Company, Worcester, Mass.; Eugene Dietzgen Company, San Francisco, Cal.; U. G. Charles, Wichita, Kan.; Yawman & Erbe, Rochester, N. Y.; H. E. Ahrens & Brother, Lewiston, Pa.

Invincible Rail Joint Company, Youngstown, Wash., has been incorporated in the state of Washington with an authorized capital of \$2,000,000 for the purpose of manufacturing a patent nut and bolt lock and a rail joint. For this purpose the company proposes to erect a plant at a cost of \$25,000. The officers of the company are: President, A. McPhaden; vice-president, C. R. Arnold, and secretary and treasurer, A. C. Shaw.

Philip Carey Manufacturing Company, Lockland, O., is just starting excavation work in preparation for the construction of two very large brick and concrete factory buildings, 80 feet wide by 400 feet long, which it expects to have ready for operation by September 1. We are informed all orders for building and equipment have been placed. These two immense additions to its plant are occasioned by the phenomenal increase in its business.

Northern Engineering Works, Detroit, Mich., manufacturer of electric traveling cranes of all kinds, is completing extensions and improvements to its plant that will materially increase its output capacity and enable the company to make more prompt delivery of its products. The additions include an electric building for electric crane trolleys, 50 by 110 feet, one story high and equipped by a 10-ton electric traveling Northern crane; a 2-story tool room of brick and steel construction, with saw-tooth roofs, to be 30 by 50 feet.

George W. Jackson, Incorporated, has taken over the business of Jackson & Corbett Bridge & Steel Works, Interlocking Steel Sheeting Company and George W. Jackson, consulting engineer. The new organization will continue the business of the former companies as contractor for bridges, structural steel, subways, tunnels and heavy foundations. The present location of the offices is on the tenth floor of Borland building, Chicago. About May 1 permanent offices and warehouse will be open at 169-179 West Jackson boulevard and 179-190 Quincy street.

Cincinnati Iron Store Company, Cincinnati, O., is about to erect a new addition, 113 by 116 feet, to its present warehouse. The company represents the following companies in and surrounding Cincinnati: Quincy, Manchester, Sargent Company, Case Manufacturing Company, Long & Allstatter and the Hamilton Machine Tool Company. The machinery and equipment department of this company is enjoying a prosperous growth and preparations are being made to enlarge its facilities. Among the recent contracts recently received for power punching and shearing machinery is the equipping of the new plant of the Cincinnati Frog & Switch Company.

C. H. Whall, Boston, Mass., who was the pioneer in the use of fiber for the insulation of rail joints for track circuits, has had his fiber adopted as the standard for rail-joint insulation on a number of the large railway systems. The first application of fiber as insulation in a patented rail joint was made by Mr. Whall about 1885. Since that time C. H. Whall & Co. have made a special study of this method of insulation and the Whall fiber is now in extensive use. It is claimed that about 90 per cent of the fiber used for insulation of track circuits is sold by C. H. Whall & Co., of which C. H. Whall is president and F. R. Whall general manager. The company also manufactures fuses.

Western Wire Sales Company, Chicago, has been incorporated under the laws of Illinois to take over the business, good-will, assets, agencies, etc., of J. Allen Haines, Incorporated, 324 Dearborn street, Chicago. The new company has taken over all the agencies recently handled by Mr. Haines, and in addition has added several new agencies and will represent in the western territory a large eastern manufacturer of German silver, nickel wire, resistance wire, etc., and the Tipless Lamp Company of New

York. The company is publishing weekly a market letter which it will be glad to send to parties interested. The offices of the new company will remain at their present location.

Keystone Equipment Company, recently organized and incorporated under New York state laws, has taken offices on the sixth floor in the new West Street building, 90 West street, New York. Mr. Leonard R. Winters is president and Mr. John J. McDonald is secretary and treasurer. The company will represent the Keystone Powder Manufacturing Company of Emporium, Pa., manufacturers of high explosives, and will act as agents for railroad and contractors' equipment, new and second hand. A bureau of information will be at the disposal of contractors and buyers visiting New York desiring to purchase supplies of all description, where mail can be sent and letters written and every facility provided for their use and convenience.

ADVERTISING LITERATURE.

Railway Steel-Spring Company, 71 Broadway, New York.—This company has issued a catalogue in the interests of its steel tired wheel department showing the various styles of wheels manufactured by it.

Association of American Portland Cement Manufacturers, Land Title Building, Philadelphia, Pa.—Bulletin No. 13 is entitled "Forms for Concrete Construction." The paper of which it is a reprint was presented by Sanford E. Thompson, M. Am. Soc. C. E., before the third annual convention of the National Association of Cement Users.

Lane & Bodley Company, Cincinnati, O.—Bulletin No. 101 describes the four-valve shaft governor engine which is manufactured by this company. This engine was designed to fill the demand for an engine with high rotative speeds, and economy in the use of steam comparable with releasing gear engines of slow rotative speed.

Century Cement Machine Company, Rochester, N. Y.—A splendidly printed and well bound catalogue has been issued by this company in the interests of those concerned with the manufacture of concrete stone. It describes the Hercules cement stone machine and the method of its operation. The publication is illustrated with a large number of engravings from photographs.

Expanded Metal & Corrugated Bar Company, St. Louis, Mo.—"Tests of Bond Between Concrete and Steel" is the subject of a reinforced concrete bulletin No. 1 issued by this company. It includes a report of tests made at Lewis Institute, Chicago, by Professor DePuy. The paper was originally read before the Western Society of Engineers, at Chicago, December 5, 1906, by T. L. Condron.

Niles-Bement-Pond Company, 111 Broadway, New York.—List No. 13 of second-hand metal-working machinery has been issued. It includes railroad machinery, screw cutting lathes, speed lathes, brass finishers' lathes, chucking lathes, screw machines, planers, shapers, drills, multiple spindle drills, bolt and nut machinery, milling machines, punch presses and shears, etc., and a number of other classes of machinery.

Samson Cordage Works, 88 Broad St., Boston, Mass.—A convenient pocket catalogue designated as No. 12 lists the products of this company, which include solid braided cord, sash cord, clothes lines, signal cords, trolley cords, arc lamp cords, rope couplings and other cord appliances. The company has had about thirty-five years' experience in the manufacture of solid braided cord and its output is favorably known.

Arthur Koppel Company, 66-68 Broad Street, New York.—This company's new works at Koppel, Beaver county, Pennsylvania, are now turning out their first orders. The opening of the plant is announced in a small folder illustrating the new plant and incidentally calling attention to the stock on hand of industrial, narrow and standard gauge railway materials. The plant affords facilities for the manufacture of cars of any description and gauge up to 30 tons capacity. This company issues a useful notebook for 1907, having a detachable cover and containing leaves partly subdivided for each day of the year and partly blank for miscellaneous. There are also a few pages devoted to useful information and a few others describing some items of shop and contractors' cars which the company manufactures at its new plant at Koppel. The book will be sent on application.

Dayton Manufacturing Company, Dayton, O.—Catalogue No. 139 is devoted to the Silvey storage batteries which are made in various types suited to all sorts of requirements. Those having to do with railway train lighting will be interested in the car lighting storage battery with armored type plates. This company also manufactures portable storage batteries for railway block signal service which are designed so that the elements retain their capacity for a long period of time without loss of power due to the local action in the cells.

B. F. Sturtevant Company, Boston, Mass.—The revised edition of bulletin No. 125 describes the line of vertical forced-lubrication enclosed engines which this company manufactures in eighteen different sizes, ranging from 5 by 5 to 12 by 10 inches. A sectional view shows the method designed to effect positive lubrication. Generating sets with compound engines are subjects of Bulletin No. 142. The generating sets manufactured by this company consist of vertical compound engines directly connected to generators of eight and ten-pole types and are specially designed

to fill the rigid specifications of the United States navy department.

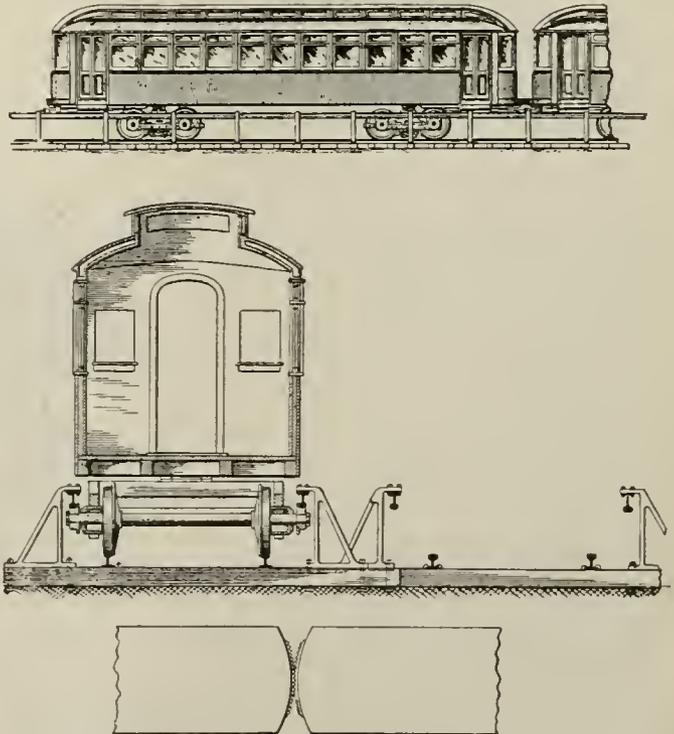
American Locomotive Company, 11 Broadway, New York.—A pamphlet recently issued by this company illustrates and describes locomotives, both steam and compressed air, adapted for the use of contractors, mines, logging roads, plantations and industrial plants and for a wide range of service on light rails and poor road bed. The pamphlet is a complete record of the production by this company of locomotives of light power.

Ferro-Concrete Construction Company, Cincinnati, O.—This company, which is engineer and contractor for ferro-concrete construction has issued index No. 2, designed to put before the architect, engineer, or owner, a list which will show what has been done in the modern form of ferro-concrete fireproof construction. The index bulletin furnishes an alphabetical list of owners with the names of the architects for whom the Ferro-Concrete Construction Company has done work. The nature of the work is briefly outlined, the number is given of the bulletin describing the work in detail and the subjects of the photographs which can be obtained of the same work.

General Electric Company, Schenectady, N. Y.—Bulletin No. 4487 describes small plant continuous current switchboard panels. It is an eight page publication. Bulletin No. 4488 is devoted to the Thomson recording wattmeter, and supersedes Bulletin No. 4415. Portable gasoline engine and generator outfits are the subjects of Bulletin No. 4485. Crane wiring supplies are described in Bulletin No. 4489 and a brief description of a portable air compressor set is presented in Bulletin No. 4490. Controllers for power and mining service are described and illustrated in Bulletin No. 4491. Bulletin No. 4492 describes small plant alternating current switchboards for 1,150 and 2,300 volts. An index to the bulletins, published by the General Electric Company, has been published for the convenience of those who make it a practice to file the various publications of the company.

A Method for Preventing the Derailment of Railway Trains.

The number of serious accidents which have taken place of late have generally been attributed to the derailment of one or more cars on curves. And especially several derailments which have taken place in the subways throughout the country have



Device to Prevent Derailment of Trains—Side Elevation and Transverse Sectional View of Guard Rails.

called attention to the disastrous effects which would probably result should one of the trains in the New York subway be derailed on a curve at high speed.

The thought of what the result of such a derailment would be has led to the designing and invention of the number of devices which would prevent the trains from being completely demolished and from tearing down the columns of the subway which support the roof above.

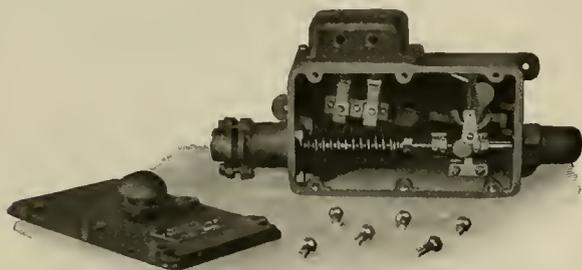
There is presented herewith a transverse cross section of the Van Dorn patent guard rail, manufactured by the W. T. Van Dorn Company, 1074 Paulina street, Chicago, which, it is stated by the inventor, will absolutely prevent the derailment of trains and permit the rounding of curves at the highest speed with perfect safety. As it will be seen by the illustration, the invention consists

of T-rails which are inverted and supported by a heavy iron bracket securely bolted to the end of the ties, which are made unusually long expressly for this purpose. On the end of the axle are mounted small wheels, which engage with the guard rails when there is the least tendency for the wheels to jump or climb the rail or the inner wheel to leave the track. The inventor claims, and no doubt rightfully so, that the axle is the only proper place at which to apply a force which is to keep the wheels from jumping or climbing the rails. These rails, of course, could easily be so insulated that they would at the same time serve in place of the usual contact rail, and therefore, the additional expense of providing this safeguard would, for electric lines at least, be far less than the safety assured would warrant.

On steam roads or roads where the contact rail is already installed—and it would entail considerable expense to make an installation of the guard rails the entire length of the lines—the guard rail need only be placed on curves where the danger of derailment is unusually great. The attention of managers and companies operating incline and scenic railways is particularly desired for, as is well known, the danger of derailment and the frequency of serious accidents on these light tracks makes the installation of some device of the nature of that herein described absolutely necessary.

PORTABLE MOTOR-DRIVEN AIR COMPRESSORS.

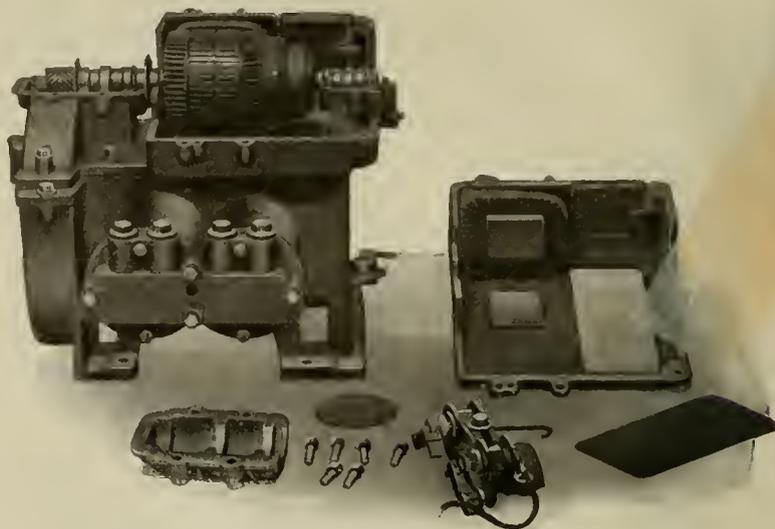
There is probably no field of industry which is extending so rapidly as the application of compressed air for commercial and industrial purposes. This is especially true of the application of compressed air in small quantities in the electric railway field,



Portable Air Compressor—Figure 3—Governor Open for Inspection.

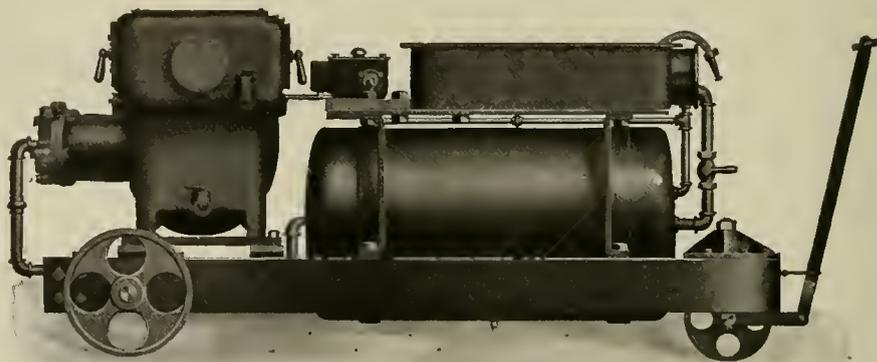
where the sphere of usefulness of a small compressor, especially of the portable or semi-portable type, is almost unlimited. In the power house a small motor-driven portable air compressor is of great value for blowing out armatures and fields for running small compressed air tools, such as drills, riveters, chippers and pneumatic hammers, pneumatic lifts, etc., the usefulness of which in emergency repair jobs would, as a rule, make the cost of such an outfit insignificant. In the car house the portable air compressor is indispensable for blowing out the motors, operating pneumatic tools and especially for the cleaning of cars by the use of compressed air, which is now acknowledged to be the only efficient, sanitary and economical method of performing this service. Another use to which stationary air compressors with water-cooled cylinders can be efficiently applied, is to raise water from deep artesian wells, as they furnish an abundant supply of water with the expenditure of comparatively little energy and are far more reliable than deep well plunger pumps. An interesting demand for small motor-driven portable air compressors has developed as the result of the widely known reliability and compactness of the small air compressors used in the air brake service of electric cars. The result of this great demand for these remarkable little compressors led the National Brake & Electric Company of Milwaukee, Wis., to build a complete line of portable and stationary air compressors in which are embodied all the improvements and superior quality of material and workmanship which are so prominent in the air brake compressors and have established their well-known reputation for high efficiency, compactness and ability to withstand hard, continuous service and the unusual amount of hard treatment which is the lot of all railway machinery. In Figure 1 is presented an assembled view of one of these portable air compressors, mounted on a strong cast-iron base, which also carries the storage tank governor, pressure gauge, relief valve and tank in which 100 feet or more of air hose can be neatly coiled so that it is always ready for use and protected, which insures the longest life possible. A particular point to which attention is called in these outfits is the overall width, which has been kept down to but 29½ inches, which permits it to be taken through doors and openings in shops and factories which are far smaller in size than the average. The air compressor is of the 2-cylinder, single-acting, trunk-piston variety, having the cylinders horizontal and an enclosed crank pit which readily permits of splash lubrication and also protects the cylinder, piston and crank pins from dust and grit. The connecting rods, in place of being of the ordinary marine end type, are constructed with a hinged cap, thus permitting adjustment with one bolt, which makes the adjustment

by inexperienced workmen a simple matter when it becomes necessary. The connecting rod bolts are fitted with lock nuts and split pins and there is absolutely no danger of their working loose in operation. The clearances can therefore be reduced to a minimum, which assures a high efficiency of the compressor,



Portable Air Compressor—Figure 2—Open for Inspection.

and to prevent leakage the pistons are fitted with Dunbar piston rings, which this company has employed for over eight years and found to its entire satisfaction. The crank shaft, which is of forged steel, is slotted out to form the crank pins, which are set 150 degrees apart. A feature in the design which is worthy of special attention is the center bearing which is provided between the crank pins, thus supporting the shaft at its weakest point and preventing the danger of fracture. The bearings are all oiled by the splash of the connecting rod, which keeps them constantly flooded with an abundant supply of clean oil, as the bearings throughout the machine are entirely protected from dust and moisture. Another feature which is of great importance is the design of the gearing, which is of the Herringbone type, with fine pitch and constructed of a medium steel, which insures long life and quiet operation. The gear case is cast integral with



Portable Air Compressor—Figure 1—Assembled View.

the cylinders and crank pit, thus making both a light and substantial construction, which is oil tight and permits opening the crank case without having to remove all the oil. The motor, which is mounted directly above the air compressor, is of the standard 4-pole type adapted for air brake air compressors.

There are two field magnet coils, which are form wound and heavily insulated. A unique feature in the construction of the field magnet is the manner in which it is divided to afford access to the armature and bearings. This is clearly seen in Figure 2, which shows the upper portion of the field magnet and the brush holder removed from the motor. The heavy insulating and large insulating surfaces on the brush holder can be easily seen and assure safe operation and little difficulty from broken down insulating bushings. The armature, which is of the drum type, has form-wound coils and a commutator of ample size to insure sparkless operation. The compressor is controlled by a governor shown in Figure 3, which shows its substantial and simple construction. A particular feature, which is worthy of attention, is the large diameter of the spring and the short travel of the actuating piston, which insures reliability and certainty of action.

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Rehabilitation of the Chicago traction properties, as planned in the ordinances approved by voters on April 2, will involve an estimated expenditure of \$40,000,000.

Traction Improvements in Chicago. The work of rehabilitation will be conducted under the direction of the board of supervising engineers, of which the companies will appoint one member and

the city another. Bion J. Arnold is appointed in the ordinances as the third member. The detailed specifications to which the improvements must conform are published in this issue of the Electric Railway Review. The effect of the ordinances will be to give Chicago a system of electric railways designed to meet the increasing needs of the community for several years. Whether the growth of the city will render the lines inadequate to accommodate the traffic and the final result will be the construction of a subway to relieve the congestion in the central district, only the future will determine.

In designing the new light-weight motor cars of the Denver City Tramway Company, as described elsewhere in this issue,

Light Cars as a Good Investment. It was desired to obtain a substantial type of rolling stock equipment which could carry 48 passengers and have the lowest weight consistent with strength and rigidity.

The ever-present question of maintenance was well kept in mind and the saving in weight made by trimming only those parts which experience had shown to be heavier than absolute necessity demanded. The new cars, as described, are of the California type, seat 48 passengers, have two 50-horsepower motors, straight air brakes, and weigh, ready to run, 28,000 pounds. This is a total weight of 583 pounds per unit of seating capacity. The desirability of having cars of consistently low weight is obvious. It has been shown by extensive series of wattmeter readings that the new cars consume less power by 1.5 kilowatts per car mile, measured at the switchboard, than the four-motor type of the same system, weighing 38,000 pounds. With current costing 0.66 cents per unit at the power house, this difference represents the desirable saving of approximately one cent per car mile. There are other

economies, due to light-weight cars, such as decreased wear on track work and reduced expense for wheel and brakeshoe renewals, which, when combined with the remarkable saving in power consumption, open an avenue leading to a possible reduction in total operating costs that is worthy of attention from street railway organizations maintaining and operating heavy city equipments.

While there is apparently no end to the number of auxiliary appliances which can be installed in a power house, experience in actual operation shows that there is

Motor-Driven Steam Valves. a limit beyond which it is undesirable to go in the failure to make use of well-tryed devices designed to promote economy of

fuel consumption or to forestall the effects of accidents. The motor-driven steam valve stands in the latter class of apparatus; it has made a good record in the few plants where it has been installed, and on the score of convenience and flexibility its results in service are far beyond the possibilities of hand operation. Yet on account of the cost of installing electrically-driven valves, or perhaps from an inert appreciation of their advantages, their use has not extended very rapidly in railway service, but now and then operating experience shows the importance of such control of at least the high pressure steam lines. A case in point occurred recently in a power plant supplying the car service of a city of considerably over 100,000 inhabitants. In the early evening a tube burst in one of the boiler batteries, a large quantity of water was at once let loose on the fires and the boiler room filled with dense steam. It was impossible to enter the room to cut off the injured boiler from the rest and start the fires beneath the others; there was a complete shut down of the generating units, and for about an hour every car on the system was at a standstill. The loss of earnings during this hour based on the average hourly income of the system from passenger traffic was something in excess of \$200, leaving out any consideration of wages and fixed charges, and the direct cost of the damage to the boiler room equipment. Matters were remedied by smashing in the skylights in the roof of the station,

which allowed the steam to escape and made the boiler room habitable again so that the damaged boiler could be shut off and fires started on cold water in the others. If a small, rugged induction motor had been attached to the valve between each boiler and the main header with remote control in both boiler and engine rooms, the trouble would probably have lasted but a few moments.

NEW YORK AND ITS PUBLIC UTILITIES.

To those who examine critically the provisions of the so-called "Public Utilities" bill now pending before the legislature of the state of New York, it must seem that in the form of a law it would go far toward the establishment of the principle of government ownership, even though such is claimed to be foreign to the intention of its chief promoter. The intention of Governor Hughes is doubtless laudable, and under the control of an always level-headed executive it is probable that most of the corporations directly affected would welcome the degree of supervision contemplated in the bill. Those, however, who are responsible for the affairs of a corporation for a longer period than that embraced by the ordinary tenure of office of a state executive are apt to look with some trepidation upon the power which the passage of a law in such terms would place in the hands of a single individual. In fact, the objections which have been made by those who have already put in an appearance in opposition to the passage of the present bill make this point perfectly clear. It is not especially to the terms of the bill in respect to the abuses which it is designed to correct that objection is taken. It is to the general principle of the establishment of a commission, responsible to the one man who may happen at any time to hold the position of chief executive of the state and whose acts in this particular respect are sought to be withheld from the ordinary supervision of the courts, that objection lies. It must be acknowledged, in view of the ordinary possibilities of political vicissitudes in the state of New York, that the objectors have some grounds for opposing hasty action of so far-reaching a character.

Most of the objections thus far urged against the bill in question relate each to a single feature which seems of vital importance to the interest concerned. As undercurrents to the general tide which developed at Albany at the first public hearing on the bill on March 27, the direction and force of which could be discerned by the various amendments proposed, lines of opposition were developed relating to the following features:

The absence of any provision for a judicial review of the acts of the proposed commissions;

Proposed salaries of members of the commission inadequate to secure men whose motives and intelligence could be relied upon as unimpeachable;

The absolute power of the chief executive of the state as to appointment and dismissal;

The minuteness of the bill in its provisions as to operating methods, schedules and rates;

The requirements as to the purchase of new equipment and the improvement of existing service coupled with a withdrawal of power to raise additional capital or acquire the stocks and bonds of existing corporations;

And, on the part of the city of New York, the proposition to remove from the financial department of the city the control of the expenditure of the city's money and vest it in the hands of a commission responsible to the governor alone and not to the authorities of the city.

Such, in brief, are some of the objections which have been opposed to the passage of the bill. Another objection that is very important to the city of New York is that the passage of the bill would at once remove from its position the present rapid transit commission, which has

fairly earned the respect of its constituency by its efforts to solve the urban transportation problem, and that at a moment when the pressure of an immediate solution was never more fully appreciated and its possibilities never more promising. Presumably, the magnitude of the interests concerned in securing the retention of this one item of supervision in the hands of a tried body rather than again reducing its control to the realms of experiment, is paramount to that of any other single item of control involved. It may be safer, therefore, at the present time, to seek the middle of the road.

It is unfortunate that the ardent supporters of the bill, including the governor himself, whose intentions, as before intimated, are beyond reproach, should contend as strenuously as they do against the insertion in the bill of a provision for court review.

PUBLIC OWNERSHIP REPUDIATED AT CHICAGO.

The result of the city election in Chicago on April 2 was the severest setback which the socialistic propaganda for public ownership and operation of public utilities has ever sustained in the United States. Both the candidates for municipal offices who supported the ordinances to empower the present traction companies to go ahead and run and reconstruct the street car system, and the ordinances themselves, received substantial majorities. That the issue of the election was an even more emphatic repudiation of the principle of public ownership than of the Dunne city administration is indicated by the fact that while E. F. Dunne, the democratic candidate for mayor, who opposed the ordinances, was defeated by F. A. Busse, the republican candidate, who favored their adoption, by a plurality of only about 13,000, the ordinances were endorsed by a majority of more than 33,000.

The result of the city election in Chicago in 1905 was hailed by persons of socialistic propensities as a triumph for their cause. The people of the city have since had a good opportunity to study the question of public ownership and they have taken advantage of it. Mr. Dalrymple, the traction expert whom Mayor Dunne imported from Glasgow immediately after his election, taught the voters one of their most effective lessons. Mr. Dalrymple, being the manager of a municipally operated tramway system, was invited to this country with the expectation that out of the fullness of his experience he would give many useful suggestions regarding the best means for securing the adoption and successful carrying out of the policy of municipal ownership. This canny Scotchman decided, however, after studying the conditions of government in American cities, that it would be extremely unwise for Chicago to attempt to own and operate its traction system. His statements of his conclusions did not change the views of those who were committed to the advocacy of public ownership, regardless of municipal conditions or of the results that it probably would produce. It did, however, cause thousands of voters to decide that they had placed entirely too much dependence on the rosy predictions which had been made concerning the great improvements which would be brought to pass by the socialization of public utilities—predictions which had been made chiefly by persons who never had had any practical experience of the actual workings of municipal socialism.

Revelations regarding the bad conditions which have been brought to pass in London under a policy of municipal socialism, and the complete overthrow at the recent election in the British metropolis of those responsible for those conditions, also exerted some influence upon the result of the election in Chicago. These and other developments, combined with a study of the results of public ownership, both where it has been tried in Chicago and in other cities, combined to convince the people that the dangers of the adop-

tion of this policy were greater than any possible benefits which it reasonably could be expected to confer.

While the terms of the ordinances are not so favorable to the companies as they were justified in demanding, their adoption gives the companies an opportunity to redeem the bad name which the traction service of Chicago long has borne; and upon the service which shall be given in the reconstruction and operation of the lines probably will depend largely the decision of the people as to whether they shall adopt ultimately a policy of private or of public ownership. Of course, nobody believes that the radical advocates of public ownership will be convinced that they are wrong, no matter what kind of service may be given; but the majority of the people are more open to conviction. What the great majority of the people want is good service. The rehabilitation of the traction system has been brought much nearer by the vote in favor of the ordinances. The opponents of the ordinances asked the people, in effect, to vote for a lawsuit; and if it had been decided to attempt to oust the private companies from the streets by proceedings in the courts, the reconstruction of the lines would have been postponed for years. Meantime, the people would have had to tolerate even worse service than that which has caused such loud complaints for several years.

The issue of the election in Chicago should exert influence upon public opinion in other American cities. This is one of the few occasions on which the voters of any populous community in the United States have expressed themselves intelligently regarding the question of public ownership. The fact that the people of Chicago, after mature consideration, have rejected the policy of municipal socialism should cause those of other cities, large and small, to hesitate long and study carefully before committing themselves to that policy.

CAR DISPATCHING IN LARGE CITIES.

The control of car movements on large city systems is one of the most important problems bearing directly upon the efficiency and profits of the service. Transportation expenses are such a large percentage of the total cost of operation that it is particularly desirable to study the organization of the employes' work and hours from every point of view in order to reduce delays, idle time and lost motion of all kinds to the minimum. The maintenance of proper discipline in the car service, the adjustment of timetables to meet the ever-shifting demands of the traffic, the insuring of prompt departure and arrival of cars at time points and terminals, the checking of register readings and oversight of platform earnings all require constant attention.

On all systems, large and small, the movement of cars must be controlled by some central authority if the best results are to be secured. The exact form which this control should take is a matter of special interest as the conditions of the service vary, but in every case, from the four-car country road to the urban system operating from 1,000 to 2,000 cars at a given moment, positive and authoritative superintendence is essential. Starting with the small road, some form of telephone dispatching seems to meet the executive requirements better than an extensive subdivision of authority, but as systems grow in size toward the complication of perhaps several hundred miles of track, thousands of employes and hundreds of cars it is a question how far telephone dispatching can be profitably carried. In the Electric Railway Review of March 2 Mr. S. W. Cantril showed how a telephone dispatching system is applied successfully to the lines of the Denver City Tramway Company, serving a population of not far from 150,000. The central location of the dispatcher's office, the facility with which cars are started from the ends of routes, extras thrown into service at times of heavy riding and withdrawn when the traffic is light, the

close touch with weather conditions, fires and other emergencies all contribute to a flexibility of car movement which could scarcely be improved under the conditions prevailing in Denver.

In cities where great congestion of traffic, or more properly speaking, slow movement, is enforced by the narrowness of the streets and the high density of population, existence of crowded waterways, drawbridges, severe grades and sharp curves, and particularly where the transportation systems require an extensive divisional organization with scores of motormen and conductors to be directed at each main car house, it is doubtful if anything less than the usual organization of division superintendents and starters will meet the conditions. There are several reasons for this. Under the close headway which prevails on many routes in such systems, even the time required for the conductor to telephone his arrival at the end of the line to the dispatcher becomes a matter of considerable expense to the company; and as it must virtually be added to the setback allowance ordinarily made for the car to complete its schedule, the multiplied time for perhaps hundreds of car crews to communicate with headquarters, with due allowance for busy reports on the telephone lines, may easily amount to a considerable sum annually, and also require more cars for maintaining a given schedule.

It is also a difficult matter to enforce proper discipline over a mere telephone wire when a large body of assembled trainmen are to be held together for punctual starting on trips. On systems where starters are employed, if the organization is what it should be, the starter's time is likely to be pretty well filled from morning until night, picking out regular and spare men for different runs, taking register records, checking mileage, filling gaps in the intervals between cars, and in general adjusting the rolling stock movement to the traffic conditions. Some of this work can be done by the dispatchers, but the larger the number of men employed at any single car house, the more essential personal direction becomes by an official on the spot. Where telephone reports are relied upon it is not always easy to obtain a check upon the leaving time of cars and the registers, although inspection of schedule maintenance along the different routes tends to correct any abuses.

The cost of installing a telephone system which will bring all parts of a large urban street railway into common touch is seldom to be weighed against the increased convenience of operation thus afforded. Certainly there should always be some means of turning emergency calls at any hour of the day or night to the proper official of the road. Wherever the operating headquarters of the road are located, whether at a dispatching office, at the general manager's office or at the company's private branch telephone exchange, the operating rules should provide for the prompt reception and transmission of all information and orders relating to the service.

Device for Protection of Passengers in Denver.

Mr. John Crosby, shop foreman of the Denver City Tramway, has developed and patented an ingenious device for the protection of passengers, which is now being given a trial on the company's cars. The device consists of the application of contact points to the safety tread on the lower step of the cars, so that when a passenger stands on this step a circuit is closed and a buzzer is caused to ring either in the motorman's cab or at the middle of the car, where the conductor can hear it. Favorable results as regards accidents and the saving of the conductor's time are expected. The Denver City Tramway Company also expects to equip all its motor cars with mirrors attached so that the motorman can conveniently watch the car door and steps.

CHICAGO TRACTION ORDINANCES ASSURE IMPROVEMENTS ON A VAST SCALE.

The approval by the voters of Chicago on April 2 of the Chicago City Railway Company and the Chicago Railways Company (Union Traction) ordinances paves the way for complete rehabilitation of the properties. The ordinances provide that the companies must proceed at once to reconstruct portions of their track and roadbed and put their entire system, plant and equipment in first-class condition. The aggregate of expenditures which the companies must make within three years is estimated at \$40,000,000.

The ordinances give the following general specifications covering the materials and equipment which the companies must furnish:

Rails.

All new track construction hereafter laid in streets or public ways shall be laid with modern improved rails of the grooved type, weighing not less than 129 pounds per yard, which shall in all respects conform to the specifications for grooved rails as contained in section 1944 of the revised municipal code of Chicago, as amended by ordinance of the city council passed October 8, 1906; provided, that all rail used in the tunnels and on their approaches, and in the subways and on their approaches may be T-rail weighing not less than 80 pounds per yard.

Joints.

All rail joints shall be either cast welded, electrically welded or of a type which will give an equally smooth and even joint, except that the joint used must be one which will provide a carrying capacity for the electric current equivalent to the carrying capacity of the rail.

Track Substructure.

The rails shall be laid upon concrete beams, wooden ties, steel ties or cast-iron chairs or in some other form of first-class modern approved street railway track construction. The foundation shall be either of concrete, crushed stone or other ballast material which in the judgment of the board of supervising engineers shall best suit the conditions of soil and drainage. Said foundation to be brought to the proper height to serve as a suitable foundation for the pavement.

Bonding.

In case the rails are joined by any other form of joint than a cast welded or electrically welded joint, there shall be some form of bond used which will connect the ends of the rails in such manner that the conductivity of the joints shall be equivalent to the carrying capacity of the rail. The rails of each single track and the inside rails of the double track of all tracks shall be connected by cross bonds of No. 2-0 (B. & S. gauge) copper wire spaced not more than 1,000 feet apart, and properly secured to the rails in such manner that the full conducting effect of the wire may be utilized. The rails shall be so bonded or joined and such return circuits and other necessary devices installed as to prevent damage from electrolysis as effectually as possible.

Special Work.

At all points of intersection of the tracks of the companies with their own tracks or with the tracks of other companies, there shall be provided suitable steel special work of ample strength and weight to correspond with the structure to which it connects. The frogs, switches and mates shall be provided with wearing plates of hardened steel. All special work and curves shall be laid in the same general manner required for straight-line track.

Poles and Wires.

All new overhead construction shall consist of one trolley wire suspended over each track by span wires attached to poles set at the curb line or suspended from brackets attached to poles. The design of poles hereafter erected shall be subject to approval of the board of engineers, and shall be of iron or steel, weighing approximately 900 pounds each, set in concrete and kept thoroughly painted. They shall be spaced on an average of from 100 to 115 feet apart for straight track, except at street intersections, and so as not to obstruct cross streets, alleys or private driveways. The location of poles shall be subject to the approval of the commissioner of public works. All material used in the overhead construction shall be of the most modern type and shall be capable of sustaining all the weights and strains that come upon it under normal conditions of operation and from wind, sleet and ordinary accidents. The trolley wire shall be not less than No. 2-0 (B. & S. gauge) hard-drawn copper, unless the board

of supervising engineers shall approve other sizes for specific cases. Phosphor bronze, silicon bronze or other material equal in strength may also be used. Trolley wires shall be suspended not less than 18½ feet above the rails, except when such wires are suspended under viaducts, bridges and other structures. There shall be at least two insulations between the trolley wire and the supporting pole. Span wires shall be galvanized iron or steel or silicon bronze.

Feeders and Transmission Wires.

All feeder and transmission wires in certain portions of the city shall be laid underground. To this end authority is conferred upon the companies to enter upon, excavate for, and construct a system of conduits in the streets, alleys and other public ways of the city of sufficient capacity to carry the said wires. All feeder wires in any other territory shall be similarly placed underground whenever the city shall require all other overhead public service wires (except trolley wires) in such territory to be placed underground. All transmission wires used by the companies within the city limits, carrying a pressure of 1,000 volts or more, shall be placed underground. Feeder and transmission wires, not required to be placed underground, shall be suspended by insulators upon said poles supporting said trolley wires or upon poles placed at the side of streets, alleys or other public ways in locations to be approved by the commissioner of public works. These wires and poles shall be so situated that the companies may conveniently make all the connections authorized by said ordinances and the exhibits thereto. The said trolley wires, feeder wires and all other wires authorized by said ordinances to be installed by the companies, where located in streets, alleys or other public or private ways in, along or across which are located railroads elevated above the surface of the streets, may be strung upon or from the structures of such railroads, with the consent of the company owning or operating the same. Said wires shall be attached to said structures and maintained under the supervision of the city electrician.

Conduits.

Underground conduits to carry any of the wires authorized by said ordinances, to be installed by the companies, shall not exceed 4 feet in width and 3 feet in depth, and shall be of tile, cement, iron or other material impervious to moisture and not subject to decay. All transmission and feeder wires and cables laid underground shall be covered with lead or other impervious material. Before any cable containing such wires shall be put in use it shall be tested by an alternating current of twice the working voltage of the cable. All forms of cable used by the companies containing more than one conductor shall be tested in like manner.

City Conduits.

If at any time the city shall desire to place conduits and manholes in streets or public ways wherein the companies are then about to place conduits and manholes, a single trench may be used for both conduits, but the manholes of the companies shall be kept separate and distinct from those of the city. The expense in such case shall be divided between the companies and the city according to the space used by each.

Conductors.

All wires and conductors for the transmission of electricity in and along any street, alley or public way (whether under or above ground) shall be installed in a substantial and workmanlike manner, so as to interfere as little as possible with the other uses of said public places; and all electric work of every kind and character shall comply strictly with the ordinances of the city applicable thereto.

Maintenance of Streets.

The companies, as respects filling, grading, paving, keeping in repair, sweeping, sprinkling, keeping clean, or otherwise improving the streets or parts of streets occupied by their railways, shall fill, grade, pave, keep in repair, sweep, sprinkle and keep clean and free from snow 8 feet in width of all streets and public ways, or portions thereof, occupied by them with a single-track railway, and 16 feet in width of all streets and public ways, or portions thereof, occupied by them with a double-track railway.

Pavement.

The companies, upon the order of the commissioner of public works, and approval of the board of supervising engineers, shall pave, repave or repair the portions of the streets and public ways which by this grant they are required to keep paved and in repair, whenever and as often as the same shall reasonably require paving, repaving or repairing, and shall at all times keep the surface of all of the paving at least up to the top of the rail. The pavement which the companies shall be required to lay down and keep in repair

in the portion of any street or way which they are required to pave and keep in repair shall be of the following kinds, to wit: 1. In all streets or ways in which the companies have in place, at the date of the passage of this ordinance, a good serviceable pavement, they shall repair and maintain the same while serviceable under the direction of the commissioner of public works. 2. Whenever any existing pavement of the companies, in any paved street or way, can no longer be made serviceable by repair; and whenever the portions of any street or public way outside of the strip herein required to be paved by the companies are newly paved or repaved, with asphalt, granite, brick, creosoted block or other similar material, and the pavement of the companies therein does not comply with the following specifications; and whenever the companies relay their rails in any such paved street or public way in which the pavement does not comply with the following specifications, then, and in any of such events, the companies shall pave or repave the portion of any such street or public way, which they are required to keep paved, with granite paving blocks having a uniform grain and texture, without lamination or stratification, and free from an excess of mica or feldspar. Said blocks shall measure from $3\frac{1}{2}$ to $5\frac{1}{2}$ inches in width, from 7 to 11 inches in length (except that shorter stones may be used to break joints), and not less than 5 inches in depth. They shall be so dressed as to have substantially rectangular plane surfaces, so that when in place the joints at the ends and sides shall average $\frac{1}{4}$ inch in width. Soft or weather-worn stones, obtained from the surface of the quarry, and stones which wear to a polish under traffic shall not be used. All blocks shall be laid in uniform courses across the roadway; and the space between the blocks, when in place, shall in no case be less than $\frac{1}{8}$ of an inch nor more than $\frac{3}{8}$ of an inch in width. Each course shall consist of blocks of the same width. They shall be so laid that all longitudinal joints shall be broken by a lap of approximately 3 inches. The spaces shall be immediately filled to within 2 inches of the top of the blocks with dry gravel free from loam or dirt, and the blocks rammed to a true surface and firm bed with a 75-pound rammer of approved shape. No cracked or chipped blocks shall remain in the pavement. After ramming the spaces between the blocks shall be completely filled with a paving pitch made by the distillation of "straight run" coal tar and of such quality and consistency as shall be approved by the commissioner of public works. The pitch shall be used at a temperature of not less than 280 degrees F. and be spread in such quantity as to apply 2 gallons to each square yard of pavement. The spreading shall be done in sections if the commissioner of public works so directs. Provided, that, in any ordinance providing for the paving of such streets the companies may be required to pave in like manner and with like material as specified for other contiguous portions of said streets, except that when asphalt is used a layer of granite blocks shall be put in next to and on both sides of each rail. 3. Whenever any existing pavement of the companies, in any unpaved street, or public way, can no longer be made serviceable by repairs; and whenever the companies lay down any track or tracks in any unpaved street or public way, then, and in either of such events, the companies shall pave or repave the portions of any such street or public way, which they are required to keep paved or repaved, with good serviceable granite blocks. 4. In each case whereby the companies are authorized and required to change a single track to a double track in any street or part of a street, if the roadway therein be not at least 38 feet in width, the companies shall, at their own cost (such cost to be charged to capital account), widen said roadway to said width, and shall rebuild the catchbasins and their connections and curb and pave said street, as may be required by the city council; provided, that the companies shall not be required to pave, in addition to the part of the street occupied by their double-track street railway more than 8 feet in width of such roadway, nor to acquire private property in order to secure the necessary width for such roadway.

Power Houses, Buildings.

The companies shall build such power houses and auxiliary buildings, together with the necessary machinery and appurtenances, as may be determined upon by said companies with the approval of the board of supervising engineers to supply whatever electric power may be required (in addition to such power as the companies may acquire by lease or contract with such approval from sources other than its own plants) to enable the companies to operate at all times their street railway systems efficiently and continuously. In the construction of power plants, substations and other buildings, the companies shall comply with all general ordinances of the city in regard to buildings and to the installation of machinery, boilers and smoke-consuming appliances. The buildings of said power plants shall be substantially fireproof and supplied with smokestacks sufficient to carry off all

gases emitted, and the foundations for the machinery therein shall be constructed in a solid and substantial manner. The machinery and apparatus employed shall be selected and installed with a view of affording uninterrupted operation of the cars upon said railways, and to attain this end the machinery shall be so arranged that a stoppage of one machine shall not prevent the operation of the remaining machines, and reserve machinery shall always be ready to be thrown into service. All boilers, piping, valves, fittings, steam engines, turbines, generators, switchboard apparatus and other appliances used shall be of the latest and most approved design and constructed and installed in accordance with the best engineering practice. In all dynamos and connections where a high voltage current is produced or used approved methods for the protection of human life shall be employed. The high tension switches shall be entirely inclosed in fire-proof material, and shall be operated by levers compressed air, auxiliary currents or by such other means as will, as far as practicable, prevent personal contact with high tension current. All feeders leading out of power plants and substations shall be provided with some form of safety switches or automatic circuit breakers designed to instantaneously open the circuit in case of a short circuit occurring on the feeder or on the trolley which it feeds. All the foregoing specifications regarding modern and approved apparatus, protection from fire, and provisions for the protection of human life, shall apply with equal force to the substations in case a system of transmission involving the use of substations is adopted. In case it is found desirable to secure power from any other source than the companies' own power plants no contract for supplying such power shall be entered into by the companies without the consent of the board of supervising engineers.

Car Shops and Machinery.

It is contemplated that the present car shops and machinery contained therein will remain as at present installed, with such additions thereto as may be necessary, and located as follows: Complete plant east of West Fortieth avenue, extending from Washington boulevard to the Chicago & Northwestern Railway for the Chicago Railways Company. Complete plant fronting on Vincennes road at the corner of Seventy-eighth street, extending from Vincennes road to Wentworth avenue, for the Chicago City Railway Company.

Cars.

Within one year from the passage of the ordinances the Chicago City Railway Company must acquire and place in operation 150 new cars, subject to delay by strikes or other causes; and the Chicago Railways Company at least 225 cars. These cars shall be of the best and most approved finish; they shall have center aisles; they shall be without running footboards along the sides, and shall be equipped with sufficient motor capacity. Cross seats facing forward shall be used, but longitudinal seats, each seating not more than four passengers, may be used at the ends of the cars. All closed cars shall be vestibuled. All new cars hereafter put in service shall be of the type known as double-truck cars, seating from 40 to 50 passengers. The cars shall be equipped with electric bells, connections and push buttons; fenders, headlights and sand boxes; two sets of brakes, "one of which shall be a hand brake and the other an efficient power brake of modern approved type;" the cars shall be kept heated at 50 degrees F., as nearly as practicable, and shall contain standard thermometers; the cars shall be kept well lighted by electric light or other illuminants approved by the board of supervising engineers; signs to indicate by day, and, through illumination, by night the destination of each car shall be provided; the companies may operate funeral cars, and special cars for mail; every electric car, after one year, must be operated singly. The Chicago City Railway Company may retain in operation until the board of supervising engineers directs otherwise, 251 of the present single-truck cars now in service. The Chicago Railways Company may retain in operation until the board of supervising engineers otherwise directs, 486 closed and 564 open cars of the present single-truck cars now in service. All the above cars shall be equipped with sufficient motor capacity to properly operate the cars at the schedule speed required by the service over the particular lines that they may be operated upon. Electric or hot water heaters or heaters of other types approved by the board of supervising engineers, of sufficient capacity to heat the above cars as stipulated in the accompanying ordinance, shall be used. Every passenger car used by the companies which is not now equipped with a power brake shall, on or before nine months after the passage of the ordinance, be equipped with a power brake of a type approved by the board of supervising engineers. Every passenger car used by said companies which is not now vestibuled shall, on or before nine months after the passage of the

ordinance, be vested in such manner as may be approved by the board of supervising engineers.

Rolling Stock.

The companies shall provide all necessary snowplows, sweepers, repair cars, work cars, etc., to properly take care of their systems and maintain them in first-class working condition.

Unnecessary Property.

The companies, subject to the approval of the board of supervising engineers, may sell unnecessary property. They must remove all tracks which are not expressly authorized.

Vote on the Ordinances.

The vote in favor of the ordinances was greater than that cast for the republican candidate for mayor, Fred A. Busse, whose platform had for its principal plank the final settlement, through approval of the ordinances, of the 10-year traction problem. The vote on the traction ordinances stood as follows:

Total voting	292,272
For the ordinances	165,846
Against the ordinances	132,720

Majority

Mr. Busse secured 12,725 more votes than his opponent, E. F. Dunne, the present mayor.

Statement from Mr. Arnold.

Bion J. Arnold, who, by the terms of the ordinances is appointed a member of the board of supervising engineers, made the following statement:

The work to be done within the first three years from the date of the passage of the ordinances is as follows:

To remove from the streets all the present cable tracks, slots and conduits and substitute therefor electric tracks of the type described in the ordinances. This will involve the reconstruction of 34 miles of cable track and 60 miles of electric track of the Chicago City Railway system, and 48 miles of cable track and 90 miles of electric track of the north and west side systems.

Also to construct the necessary system of distribution, involving the construction of all necessary conduits, pole lines, etc., with their transmission wires, for carrying the electrical energy from the power stations to the various substations located in different parts of the city for the proper distribution of energy to the trams.

Also the furnishing of 800 new cars for the south side and 1,200 new cars for the north and west side systems of the new type now in use upon the Chicago City Railway Company's lines.

In addition to the above work a decision soon will be made as to whether it will be necessary to build new power houses, and, in case the companies are unable to purchase power at advantageous figures, the decision will be made to build these power houses. The cost of these power houses will be approximately \$10,000,000.

In this period of rehabilitation the public should understand that there will be more or less inconvenience, owing to the tracks being torn up in places. But the construction work will be done with as little of this as practicable in order to keep the cost of construction within suitable limits.

Union Traction Reorganization.

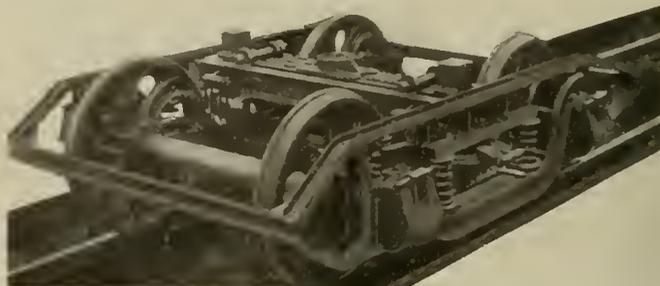
Every effort will be made to reorganize the Chicago Union Traction Company so that the new corporation, the Chicago Railways Company, which has been formed to acquire the Union Traction lines, may accept the ordinance before July 1. The plan of reorganization is under consideration and will be completed soon. While the reorganization is being effected the reconstruction of the lines of the Chicago City Railway Company will be begun.

It is possible that by agreement between the companies some of the through routes provided in the ordinances may be established within a short time.

T. E. Mitten, president of the Chicago City Railway Company, has called a meeting of the board of directors for April 8, when plans will be considered for the purchase of new equipment, reconstruction of the old cable car tracks, etc. The advisability of building power houses or of purchasing power from outside companies will be decided upon.

NEW 14-TON MOTOR CARS, DENVER CITY TRAMWAY.

There are now being put into service on the lines of the Denver City Tramway Company 30 new 2-motor cars which have an especially low weight per unit of seating capacity. In general the design and appearance of these cars is similar to the standard 4-motor cars which this company has operated for some years, but a remarkable difference exists between



New Light Motor Cars, Denver—Truck with Channel Section Members.

the total weights of the two types. The new cars, each equipped with two 50-horsepower motors and seating 48 passengers, weigh less than 28,000 pounds, while the standard 4-motor cars, as operated with four 37.5-horsepower motors, weigh 38,000 pounds. The actual weight of the first one of the new cars to be operated, which was put into service on March 6, 1907, was 27,850 pounds.

It is not thought that the design of this car, even though it may be much lighter, is less substantial than that of many cars of like capacity which weigh much more. With such substantiality and the low weight, the advantages are obvious.



New Light Motor Cars, Denver—Interior View Showing Types of Seats.

The extreme lightness of the car has not been obtained by sacrificing a good factor of safety for any important structural members, but rather by judiciously trimming all useless material so that there remains a mechanical structure, of accepted design necessary for carrying the desired number of passengers, with the lowest possible weight of equipment per passenger.

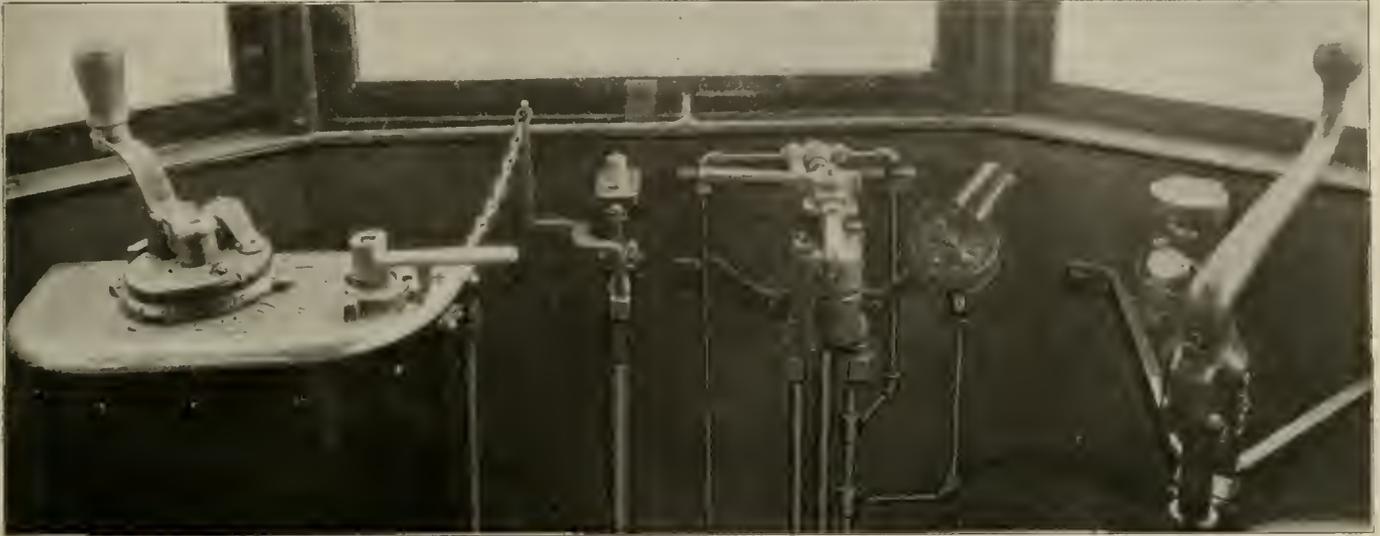
Car Body.

The accompanying engravings reproduced from line drawings and photographs illustrate clearly the general appearance

and type of construction of the new motor cars. It will be noted that the company's California-type standards have been observed.

The car body is 40 feet 3½ inches long, over all, and 8 feet 4 inches wide at the belt. A bulkhead divides the body into halves, one of which, the smoking compartment, has ash seats and the other, the main compartment, rattan covered seats. In all, there are seats provided for 48 passengers. The

car the conductor is never more than one-half the car's length from the entering and leaving passengers. He is at this extreme distance only momentarily. With the center entrance, the load divides, part taking seats in each half of the car. In unloading, the movement of passengers is the opposite, and thus it is seen that the passengers at the extreme ends of the cars are but one-half a car length from the door. The conductor's position is near the door, and with the center en-



New Light Motor Cars, Denver—Interior of Cab Showing Control and Automatic Attachments.

arrangement of the seats is shown in the accompanying plan. An aisle 23 inches wide extends the full length of the car, the cross seats being 32 inches long. The height of the car body from the bottom of the sills to the top of trolley board is 9 feet 10 inches.

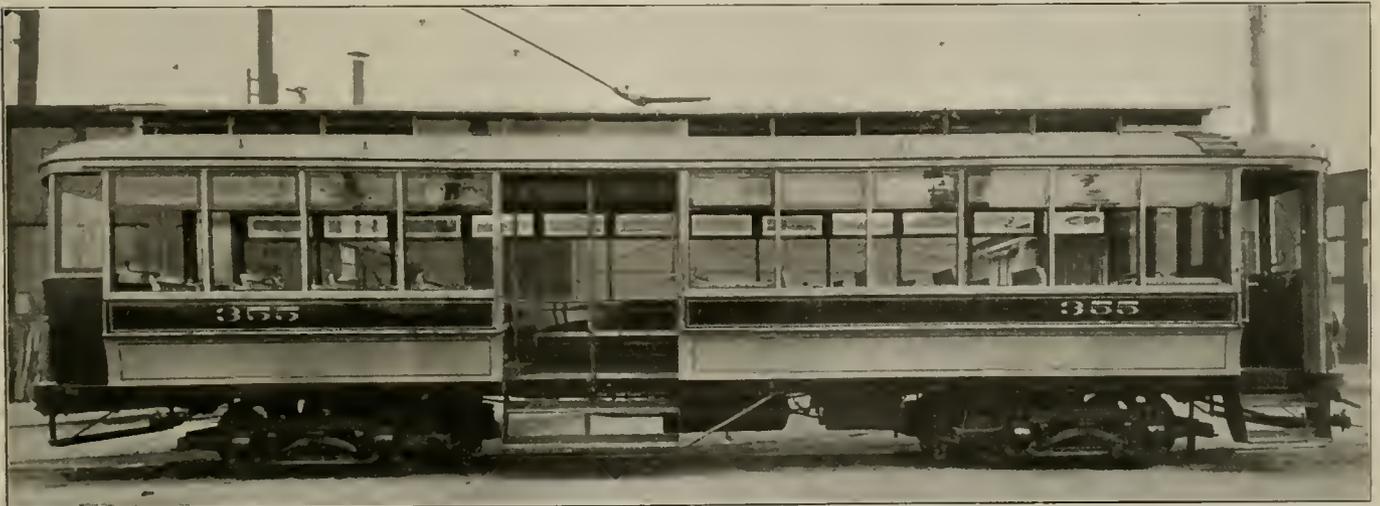
The climate of Denver warrants the use of a car that is practically open most of the time. For this reason the windows of the new cars were made as large as possible. The sashes are built to drop in pockets having covers. The distance from the top of these covers to the car floor is less than usual.

trance he can maintain this position and yet be the shortest possible average distance from all his passengers.

This car body, complete with electric heaters, drawbars and carriers, hand-brake rigging, seats for 48 passengers and the other necessary fittings, ready to be run, weighs 10,150 pounds. This is a net weight per unit seating capacity of 211.5 pounds. The Woeber Carriage Company of Denver is building these car bodies.

Trucks and Equipment.

The trucks on which the new cars are mounted are of an



New Light Motor Cars, Denver—Exterior of New Type of Car.

It is 27 inches, at which height it affords a convenient arm rest.

The front vestibule is provided with a door on one side. Normally this door is closed. It is used very infrequently and then only by the crew. The one other door, which affords entrance and exit for all passengers, is 5 feet 2 inches wide, located at the center of the car.

The value of a center side entrance for city cars is quite generally recognized. With the steps at the center of the

entirely new design, evolved in the engineering department of the Tramway company. It will be noted from the accompanying engraving that the principal members are built of channel sections. All the parts of the trucks are being constructed from the raw materials in the shops of the Denver City Tramway Company. The design has been carefully considered with a view to an extreme lightness consistent with the necessary strength to support the car body and the motors. The wheel base of the trucks is 4 feet 10 inches and

the cast-iron wheels are 33 inches in diameter, weighing 475 pounds. The driver axles are 4½ inches and the idler axles 4 inches in diameter. Without motors the two trucks complete with wheels and fittings, ready to run, weigh 9,400 pounds or 4,700 pounds each.

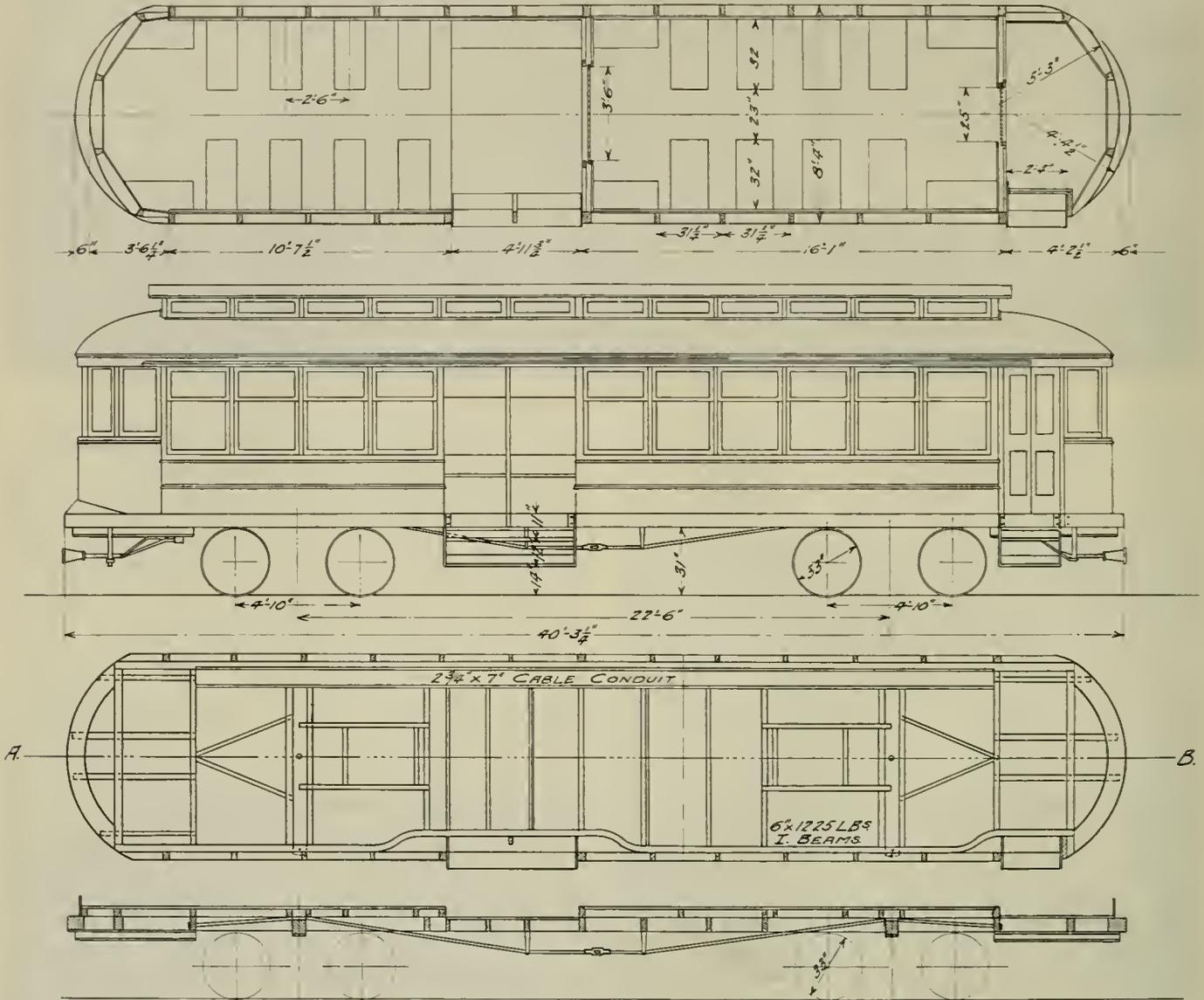
Each truck carries one General Electric No. 53 motor, rated at 50 horsepower. The motors are outside hung, mounted on the No. 2 and No. 3 axles. This 2-motor equipment, including two controllers, resistance and wiring for double-end operation, weighs 7,300 pounds.

The air brake equipment is of the Christensen AAI type, with inside-hung brakeshoes. This is a straight air equip-

made for possible discrepancy in the weight of other equipments from the particular one which was weighed, this type of car complete, seating 48 passengers, weighs 14 tons. This is a weight of equipment of 583 pounds per unit of seating capacity.

Operating Features.

By reference to the view of the interior of motorman's cab the arrangement of the control apparatus will be seen. On the right is the hand-brake handle, and near it a fixed watch pocket, also the air pressure gauge. Small incandescent lamps with reflectors are provided for illuminating the watch pocket and air gauge. As a part of the handle of the



SECTION THRO' A-B.
New Light Motor Cars, Denver—Floor Plan, Elevation and Section Through Floor Framing.

ment installed for single-end operation. These particular equipments are being transferred from an older type of 4-motor car which is used for train operation and on which the Westinghouse SME type brake equipments are now being installed. The straight-air brake equipments as installed on the new 2-motor cars weigh complete 1,000 pounds.

To reconsider the weights of the parts of this light-weight car, there appears the following:

	Pounds.
Car body	10,150
Double trucks	9,400
Two motors and control.....	7,300
Air brakes	1,000

Total 27,850
It is thus seen that when an allowance of 150 pounds is

engineer's valve for the air brakes will be noted a rib cast on the surface opposite the handle proper. The valve of the air-sanding apparatus is so designed and located that when the brake valve is thrown to emergency position, this rib or boss comes in contact with the sanding valve and thus automatically sands the track.

The drop fender is used on all of the cars of this system and to lessen the movements necessary on the part of the motorman a chain connects the tipping trigger of the fender with the reverse handle on the controller top. The length of the chain is such that it can be hooked to the reverse handle only when the handle is in the "ahead" position. Thus, at the time of an accident, when the motorman reverses his motors, he also automatically drops the fender.

TESTIMONY AT INVESTIGATION OF WISCONSIN COMMISSION INTO MILWAUKEE SERVICE.

The testimony of John I. Beggs, president of the Milwaukee Electric Railway & Light Company, and other officials of that company, and of electric railway officials from other cities during the investigation of the Milwaukee service by the Wisconsin railroad commission, has brought out many features of the operation and management of large properties. The summary of the testimony which follows supplements the previous articles in the issues of the Electric Railway Review of March 2, 23 and 30.

In his testimony on March 18 Mr. Beggs explained the methods that are employed to meet the estimated increased travel by companies which make a conscientious effort to anticipate the need for transportation facilities. Two years ago, looking forward to increased business, the company ordered 100 of its standard city cars, of which 50 were to be delivered during the latter part of 1905, and 50 during the latter part of last year. In order further to provide cars, and if possible to allay adverse criticism, Mr. Beggs, in January, 1906, increased the allotment of new cars for the year 1906 from 50 to 75. The earliest of these cars to be received were put in service on September 17, 1906, and the last on January 23, 1907.

Before the investigation was started Mr. Beggs reduced the headway on the Wells street line from 5 to 4 minutes. In stating this fact to the commission Mr. Beggs said that while the reduction in headway on that line was 20 per cent, it required an increase in equipment of 25 per cent. Even with the greatest care, he added, it is not always possible to anticipate needs and to have new equipment before the actual necessity for it arises.

Work of Transportation Department.

Mr. Beggs outlined the duty of the transportation department, which is held strictly accountable for the handling of traffic. In this department, of which W. B. Tarkington is general superintendent, and George Kuemmerlein, Jr., assistant superintendent, there are six division foremen, who have charge of the six divisions of the city and of the car houses. It is their duty primarily to see that the men in their divisions are carefully trained and properly disciplined under broad general orders, and that the public is cared for properly. These foremen patrol their divisions, and are assisted by six supervisors, who spend their time on street corners and at the points of congestion. The supervisors are assisted by three men who patrol the lines and see that the cars are properly operated, and help to relieve congestion.

After describing how the company tries to keep informed of the wants of the traveling public, Mr. Beggs stated that public needs change radically from day to day. It is not possible at all times, he said, to get equipment to the spot where it is needed at just the moment when it is required. If a shower comes at 5:30 p. m. it diverts immediately to the cars crowds of people who would otherwise walk a mile or a mile and a quarter to their homes. It was because of the service in just such an emergency as this that the company was notified to defend itself before the state railroad commission.

An Ideal System.

In describing what new lines should be undertaken to make an ideal system for the developing city, Mr. Beggs said that the conflicting interests which must be considered make the problem of extensions difficult to solve. If an attempt is made to build a line in one street, protests result and mass-meetings are held to denounce the company; while if an attempt is made to withdraw a line after it has been in service, there is a riot.

Mr. Beggs would include in the ideal street railway system four large car houses at outlying points, and the large central car house, which is a part of the company's present public service building. He believes these car houses would make the handling of cars much more effective. The construction of shops where the company will build its own equipment will be a step toward the ideal system. It is Mr. Beggs' idea to build at least one car a week in these shops.

In reply to questions of the city attorney, John T. Kelly, Mr. Beggs stated that the service is not better than when the complaint was filed with the state railroad commission, but conditions have changed in that the sun sets later and rises earlier. The greatest difficulty in meeting the congestion is experienced during the short days of the latter part of November and during December. Mr. Beggs added:

Growth of Traffic and Population.

"We have to spend large amounts of money, but the expenditure of this money was one of my methods of trying

to save this bankrupt property when it was thought the property could not be saved. Our business has grown on an average from 9 to 10 per cent per annum—far in excess of the growth of population, which has been at the rate of only 4 per cent. The reason of that is the greatly improved service year by year. It demonstrates what I said 20 years ago in discussing the advisability of investing the large amounts of money that have to be invested to establish electric railways over this country, that I believed you could provoke the public to ride. For 10 years we have had a regular increase in passengers of 10 per cent per annum, compounded each year, and yet our earnings here have been the lowest per capita of any large city in the United States. The growth in traffic has been partially taken care of by slight increases in the speed of cars, in order that the cars may make more trips, and by increases in the size of the cars from time to time. We have to make a great many miles to cover a very short distance. Instead of cutting across the two points of the horseshoe, as an engineer would do, we have got to go around the horseshoe."

Proceeds of Bond Sale Smaller.

In referring to the financial conditions prevailing at present Mr. Beggs continued: "Twelve months ago we sold \$3,000,000 of a new issue of 30-year 4½ per cent bonds at 97 and accrued interest. To reimburse us for the expenditures made last year, we sold within 30 days \$1,000,000 of these bonds at 90. You ask me what we will do in the future. The important point is the raising of the capital; and if there is to be this constant stirring up of the public with false statements and misrepresentations, it will be impossible to raise the capital."

In two years the company will have reached its capacity in power, and plans are now being made for a power house probably of 100,000 kilowatts capacity.

The Transfer Question.

Mr. Beggs declared that the company cannot reopen the question of giving transfers on transfers. He said that thousands of fares are lost every day now through the dishonesty of people who take transfers and hand them to others to use. To give transfers on transfers, Mr. Beggs insisted, would train the public in dishonesty, because people cannot realize that it is petty larceny to take advantage of the company. It is a rule that passengers who want transfers must ask for them when the fares are paid. This rule, inaugurated by Mr. Beggs, has been adopted in cities throughout the country. Mr. Beggs regards it as one of the duties of passengers to see that their transfers are accurately punched. He concluded his testimony on the subject of transfers by saying: "There is nothing that is the subject of so much abuse on a street railway line as the transfer slip. Therefore we protect the transfers with every condition that can reasonably be enforced, simply to try to reduce to some extent the fraudulent use of them."

Complaints.

In the 10 years that Mr. Beggs has been at the head of the Milwaukee company no complaint of the service has failed to reach him personally. He has made it a rule that when a person takes the time and trouble to write a letter, the company must take the time and trouble to investigate and to find whether the complaint is well founded.

In response to a question as to the rules of the company with regard to the cleaning of cars it was stated that conductors are instructed to sweep out their cars at the end of the run. Mr. Beggs said he would admit that since the inquiry began some of the conductors had been disciplined because they would spend their time idly at the end of the line and would not begin sweeping until their cars started on the return trip. The cars are thoroughly swept every night, and scrubbed thoroughly as often as is necessary. If there has not been sufficient fire in the cars sometimes, as testified by witnesses for the city, it is due, Mr. Beggs said, to the carelessness of conductors. The question of heating was brought up and he maintained that the use of electricity for heating was, from a financial standpoint, absolutely impracticable. He also spoke of the great difficulty of ventilating cars to the satisfaction of every one.

Air Brakes Versus Hand Brakes.

Testifying on the subject of brakes, Mr. Beggs said that the hand brake used on the Milwaukee cars, if all circumstances are considered, is infinitely superior to any air brake that can be applied on a city car. He considers an air brake absolutely unnecessary in Milwaukee, on account of the low grades and the light weight of the cars. The cars weigh from about 37,000 pounds to 40,000 pounds. The present standard car weighs about 40,000 pounds. If air brakes should be placed on the Milwaukee cars Mr. Beggs believes that inside of 24 hours 20 per cent of the cars would have to be placed

in the shops because the air brakes would be out of order. The company purchases its wheels under a guarantee of 40,000 running miles, barring flat wheels. On the wheels removed in December because they were flat only 20,081 miles, average, had been secured; and in January the mileage made by removed wheels was 17,591, average.

Air brakes are used on the cars of the United Railways of St. Louis. Mr. Beggs continued, because the company there was forced to use them. He said, however, that the St. Louis cars are much heavier than Milwaukee cars and are longer, and that climatic conditions in the two cities are very different. The most severe grade on the Milwaukee lines is 7.3 feet, and it is only for a distance of 371 feet.

To equip the Milwaukee cars with air brakes would cost, Mr. Beggs estimated, between \$300 and \$400 a car, while there would be an additional expense, he testified, of at least \$150 per annum a car. The greatest disadvantage, Mr. Beggs thought, would result from the inability to use the cars on account of the repairs which the air brakes would necessitate. The city cars are not expected to run at a maximum speed exceeding from 12 to 15 miles an hour at any point. The average is slightly less than nine miles an hour. Under these cars is the slowest speed gear that can be operated under them and still clear the cobblestones. If air brakes were used, Mr. Beggs believes, there would be five accidents by collision where there is one now. He said that the management which permitted the installation of air brakes in St. Louis ran the company into bankruptcy. The storage system is used in St. Louis, which, in Mr. Beggs' judgment, is less liable to derangement than the other air brake systems. In St. Louis two minutes is lost in taking air on each trip.

Difficulty of Getting Men.

In speaking of the difficulty of getting men who are competent to handle air brakes, Mr. Beggs said that wages have been advanced in the last two years in order to enable the company to command the services of men of a higher degree of intelligence. When he was asked whether anything had been done to lessen the damage to wheels caused by sliding, Mr. Beggs replied that steel wheels have been tried, and while they may not be injured as much as the present wheels, a flat place, or, to a certain extent, a curve in the rail might be caused. The company is putting on some of the higher speed cars steel wheels costing between \$20 and \$30 apiece. These have not to the present time, Mr. Beggs stated, proved entirely satisfactory nor durable. The company is experimenting constantly with wheels, and buys, he testified, the highest grade of chilled car wheels made. These weigh slightly in excess of 500 pounds and the price now is about \$1.85 a hundred pounds.

When Mr. Beggs was asked if the rattle of the trucks on old cars could be reduced he said that as time goes on the bolts and bolt holes will wear a little, the bolts will give out and increasing rattle is inevitable. In order to reduce the rattle the company reams out the hole and puts in larger bolts and keeps those renewed.

Traffic Arrangements.

The company sends special cars to every manufactory in the city when the factory employes are through work for the day; and it is a general rule, if knowledge of a special entertainment is secured, to send cars to accommodate the people. Several years ago Mr. Beggs prevailed upon the managers of the theaters to let the electric railway company place switches on their switchboards back of the stage and run a special line to posts where signal lights could be installed. Five minutes before the final curtain drops the theater management is requested to turn the switch which lights the red lamp. When the lamp is lighted trainmen are instructed to hold their cars until the crowd arrives. Mr. Beggs said that the theatrical managers do not realize that they are rendering more comfortable their own patrons if they give the signal which holds the cars, but take the stand that they do not see why they should help the business of the electric railway company.

Accident Record.

The accident record of the Milwaukee company, Mr. Beggs stated, is the best in the United States. The cost of accidents has not reached quite 3 per cent of gross earnings, on an average, for 10 years. This percentage includes all expense incident to injuries and damage. This cost, Mr. Beggs said, is the lowest of any metropolitan property in the United States.

Chicago and Milwaukee Compared.

C. N. Duffy, comptroller of the company, brought up in his evidence the question of depreciation of the plant and the amortization of the investment. The franchise of the company will expire on December 31, 1934. Mr. Duffy said

he was impressed by the fact that the representatives of the city of Milwaukee, in seeking expert information on the traction problem, sent to Chicago "as the fountain of knowledge in the street railway business." He made the point that the Chicago City Railway Company, of which he was secretary and auditor from 1899 till 1906, had three through streets downtown on which its cars could be operated, although the feeling of the management was that the company was very much cramped for room; but the Milwaukee company is obliged to operate all the cars of its system over tracks in streets that are practically crowded within a quarter of a mile. All of the east and west cars have to run on Wisconsin street and Grand avenue; all of the north and south cars on East Water street, West Water street and Third street. The Chicago City Railway had 220 miles of single track and the Milwaukee company 120 miles.

Mr. Duffy said that the greatest congestion of which he has knowledge is at Broadway and Thirty-fourth street, New York city. Oren Root, Jr., vice-president and general manager of the New York City Railway, had told Mr. Duffy that he would not undertake to operate more than three cars a minute each way, over a double crossing. Allowing for north and south bound cars on Broadway and east and west bound on Thirty-fourth street, this would make 12 cars a minute over that crossing, whereas the Milwaukee company operates nearly one-half that number of cars now over the crossing at Third and Grand avenues, with the turning in and out of cars three ways in addition.

Regular Meetings are Held.

Mr. Duffy explained that the Milwaukee company holds every Sunday morning a meeting at which the heads of departments, and in many instances the assistants and subordinates also, are present. No one is obliged to attend the meeting. Any one who wants the day for himself or for religious duties is not required to attend the meeting. At these meetings complaints, letters, newspaper articles, happenings in other cities, trouble with the cars, power or light, etc., are considered. Mr. Duffy said that Mr. Beggs takes the position that the company is serving the public, and that no matter how unreasonable people may be, the departments are held accountable to the highest degree; and that Mr. Beggs emphasizes to all those who attend the meetings that they are just as responsible as he is, and he is responsible not only to the owners of the property, but to the public.

In 1906, Mr. Duffy said, 86.3 per cent of the total passengers carried rode on tickets and the balance paid five cents cash. The company sells 25 tickets for \$1.00, or 6 tickets for 25 cents.

W. D. Tarkington, general superintendent of transportation, said that when extra men earn less than \$50 a month they leave the service. In the last 15 days, he testified, 30 men quit for that reason. Large numbers of men leave, Mr. Tarkington testified, because they will not submit to discipline. In 1906 of 546 men who were employed 356 resigned and 67 were discharged.

Evidence of Charles N. Black.

Charles N. Black, general manager of the Metropolitan Street Railroad Company of Kansas City, Mo., said that draw-bridges and grade crossings of steam railway tracks would naturally tend to derange the schedule of street railways. The Kansas City system has a total of 225 miles of single track, of which, approximately, 215 miles are within the city limits of Kansas City, Mo., Kansas City, Kan., Rosedale and Argentina, two towns contiguous to Kansas City, Kan. From 515 to 525 cars are operated at the maximum. The minimum is 315 cars at noon.

William O. Wood's Testimony.

William O. Wood, assistant general superintendent of the Brooklyn Rapid Transit Company, was cross-examined by Mr. Kelly, who endeavored to make him admit that a riotous condition of affairs prevailed on the line of his company for several days. Mr. Wood denied Mr. Kelly's insinuation that the company had to call out the police department to assist in operating the line. He said that the paid employes of the New York Journal and the New York World caused the trouble. Not 1 per cent of the regular people riding on the cars caused trouble and the ejections were very largely of the paid employes of the newspapers, who sometimes appeared in carloads.

Mr. Wood said that until 3½ years ago the hand brake was used on the Brooklyn Rapid Transit lines exclusively. The company placed the air brake on 451 cars that were purchased. After giving it a trial and noting what happened in the way of accidents the company discarded it as a standard. Mr. Wood said that the company has some cars equipped with air brakes and hand brakes and some cars

with hand brakes alone. The air brake is used on the large heavy cars weighing about 48,000 pounds convertible for summer and winter purposes.

John T. Funk on Brakes.

John T. Funk, general superintendent of the Louisville (Ky.) Railway Company, said that in Louisville the hand brake is used on twelve of the lines and the air brake on five. He added:

"The agents for these air brakes are the slickest men that you ever came in contact with; they came to Louisville and we believed the air brake was a panacea for all ailments and that we would just stop hurting people, running over wagons, horses, cattle, etc., and that we would simply be kept out of the courthouse. But the experience has been just the reverse. The amount of money, saying nothing of the suffering, that we paid out in the month of December, which is only one of our average winter months, and in January was more than double that of any other month or months in the history of the road."

Mr. Funk said he had asked 50 to 100 people what kind of a railway system they had in Milwaukee; that he was a stranger and would like to know. In every case the person said the system was excellent. One man said that the newspapers and politicians had caused all the trouble.

The arguments in the case are to be heard by the commission at Madison, Wis., on April 23.

THE LEBLANC CONDENSER.

An account is given in l'Eclairage Electrique for December 1 of a new jet condenser invented by M. Maurice Leblanc, and constructed by the French Westinghouse Company. As shown in the figures, the main feature is the use of a re-

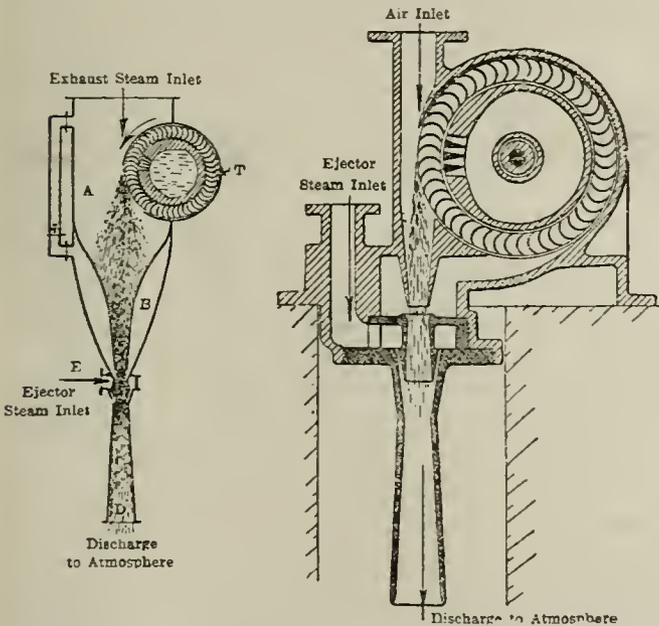


Figure 1.

The Leblanc Condenser.

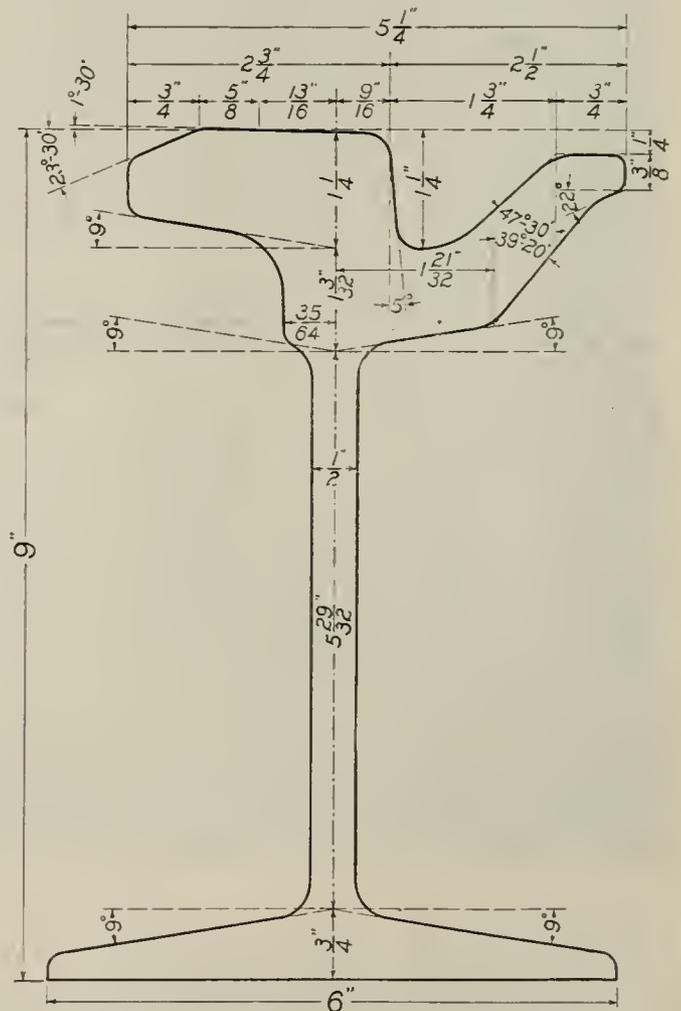
Figure 2.

versed turbine to drive a spreading jet of water into a cone, sweeping out the air and water vapor, compressing them into the convergent cone and allowing them to expand in the divergent cone, where the velocity is checked and the pressure increased so that the whole is discharged against the pressure of the atmosphere. In Figure 1 a simple jet condenser is shown; A is the condensing chamber, B the convergent cone, C the divergent cone, T the turbine pump, and E the inlet for steam, which is used to start the action of the apparatus. If the water is supplied under a slight head, the condenser starts without the use of a steam jet. With this condenser, a vacuum of 98 per cent of the absolute value can be obtained, using 25 pounds of water per pound of steam and with an expenditure of power to drive the turbine amounting to from 2½ to 3 per cent of the power of the steam engine. There are no valves at all, and the cost of upkeep is trifling. Figure 2 shows a dry-air pump on this system,

which takes less power than reciprocating pumps; it is proposed to use this in conjunction with a centrifugal pump for extracting the water of condensation. This device used with existing surface condensers has allowed of an increased vacuum with less mechanical loss. It has also been employed with a centrifugal pump keyed on the turbine shaft, and enclosed in the same cover; the pump extracts the water, while the Leblanc pump deals with the gaseous products. The exhaust steam enters a conical chamber into which the injection water is squirted through a number of holes round the periphery. With this apparatus, under good conditions, it is said to be possible to reduce the back pressure even below that of water vapor at the temperature of the exhaust steam.—The Electrical Review, London.

STANDARD RAIL FOR CHICAGO.

The accompanying illustration shows the rail section which has been specified in the traction ordinances as the standard for new street railway construction in Chicago. This



Standard Rail for Chicago—129 Pounds per Yard.

section weighs 129 pounds per yard and was adopted on the recommendation of the companies' engineers after the city had determined that 120 pounds should be the minimum weight of rail for the rehabilitated Chicago lines.

The losses due to faulty drainage or leaky drain-cocks are often a great deal larger than is imagined. Experiments on a 200-horsepower triple-expansion engine at Charlottenburg showed that faulty closing of drain-cocks resulted in losses amounting to 5.8 per cent of the total steam consumption.

THE ENGINEERING SOCIETIES BUILDING.

The Engineering Societies building in New York, which has been built as a home for several of the national technical associations and which will contain the general offices of the American Street and Interurban Railway Association, is now completed and, as previously announced, will be dedicated on April 16 and 17, 1907. The building was made possible by the gift on February 14, 1903, by Andrew Carnegie of one million dollars, to which he subsequently added \$500,000, for the purpose of erecting a building which should be a home for the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the American Institute of Mining Engineers and the Engineers' Club. The only limitation connected with the gift was that it should be devoted to

\$1,050,000 to the Engineering Societies building and \$450,000 to the club building.

The site for the Engineering Societies building is on West Thirty-ninth street, between Fifth and Sixth avenues. The frontage covers five city lots, the total front being 125 feet. The area occupied by the building itself is 115 feet by 90 feet. In order that there should be no obstruction in the matter of light and air the committee purchased for its protection a large four-story private house of restricted height adjacent to the site on the east. In the preparation of the plans six architects of high reputation were invited to participate. The unanimous choice of the committee awarded the work of preparing the plans to Herbert D. Hale of Boston and Henry G. Morse of New York. The contract for the construction of the building was awarded to Wells Brothers Company on



Engineering Societies Building—Entrance Hall.

the erecting of a building, the associations interested purchasing the land.

At first it was proposed to erect one building on Fortieth street, where the Engineers' Club had already purchased the site, which should serve the purposes of all the organizations interested. Owing to difficulties involved in the purchase of such land as would be necessary and in combining under one roof the social and technical functions exercised by these organizations, it was decided to erect two separate buildings, one for the club on Fortieth street and one for the three professional societies on Thirty-ninth street, with means of connection between the two. A joint committee of the several associations was given in charge the acceptance of the gift and the erection of the buildings, and that committee with some changes has remained in active existence up to the present time. The gift was divided by the allotment of

July 17, 1905, and the cornerstone was laid by Mrs. Carnegie on May 8, 1906. The offices were ready for occupancy on December 15, 1906.

In the construction of the building advantage has been taken of the limitation prescribed by the building laws of the city of New York, that only 85 per cent of the lot area shall be occupied by the structure, to give the building a monumental appearance. All four sides are finished. The exterior is of limestone up to the auditorium floor and of gray mottled brick and terra cotta above. The building rises to a height of 218 feet 6½ inches, comprising 13½ stories above the sidewalk.

In excavating for the foundations rock was found at from 27 to 67 feet below the curb line and the building rests upon 46 concrete piers which descend to the solid rock. All steel work in the building is covered with from 2 to 4 inches of

semi-porous terra cotta. The floors are built of terra cotta, covered with five inches of cinder concrete. The woodwork in the building has been reduced to a minimum. The large window frames are built of cast iron and other window frames of wood, covered with kalamined iron, with only a small molding in place of the usual wide trim and casing. The doors are similarly protected and all the woodwork has been fireproofed. The windows up to a height of 100 feet are glazed with wire glass except on the Thirty-ninth street front. All the walls and ceilings are painted in neutral tint and the decoration is simple though carefully studied, with an idea to later development in the way of mural paintings.

The basement is occupied by the boiler room, 22 feet below the curb, and an engine room 16 feet below. There is also ample coal storage. The entire basement and boiler room

designed with reference to the uses of the various societies which will occupy the building.

One of the most interesting features of the building is the system of lighting, which, however, can be only briefly described. The central space in the entrance hall is lighted by means of individual lamps placed in recesses and concealed by panes of ground glass in the ceiling. The result of this arrangement here and elsewhere is to afford ample illumination without glare. In the halls above the fourth floor glass globes have been provided for screening the lamps. The lighting of the main auditorium is most effective. The architects provided a space of about 15 inches between the ceiling of the auditorium and the beams of the floor above. A glass septum was substituted for plaster panels in the ceiling. The lamps occupy this space and the general effect is very satis-



Engineering Societies Building—Auditorium.

up to the level of the curb have been made thoroughly waterproof. Steam is used for heating and ventilating purposes, and is generated at low pressure by three boilers of Babcock & Wilcox manufacture, with an aggregate of 5,226 square feet of heating surface. The heating is by low-pressure steam circulating through radiators beneath the windows. All radiators are controlled automatically by the Johnson system of heat regulation. An extensive blower system has been installed for ventilation purposes. This comprises four Sturtevant blowers located in the basement and driven by C. & C. electric motors.

The electric current supply for the building is derived from the New York Edison Company and the United Electric Light & Power Company. Space has, however, been provided so that an electric generating plant may be installed at any time. The electric system is unusually complete and well-

factory. The general illumination of the library is obtained by similar means, although light for reading is obtained by means of standard fixtures placed upon the tables.

The building is provided with two Otis passenger elevators and one freight elevator. The latter is of sufficient capacity for use in hoisting safes and the like.

The floor plans have been so arranged as to provide suitably for the seating of gatherings of different sizes in rooms suited to the number of persons expected. Ample accommodation is made for meetings of from 100 to 1,000 persons. The main auditorium has a seating capacity for 1,000 and is surrounded on all sides by corridors, giving easy access to every point and assisting to maintain quiet within the hall. There are in addition seven lecture rooms occupying the next two floors immediately above the main auditorium. All of these rooms have facilities for water, electrical connections, etc., for dem-

onstrations and experiments. Each of the three founder societies occupies a floor laid out in accordance with its own plans. These are devoted entirely to administrative and



Engineering Societies Building—Entrance.

executive work, and the libraries of the three societies are concentrated in the two upper floors of the building.

Report on Fire-Killed Timber and Effect of Soaking on Drying.

Tests recently completed at the timber-testing laboratory at the University of Washington, show the comparative values of green and fire-killed timber. In the states of Colorado, Montana, Nevada, Utah, and Wyoming it is estimated that nearly one billion feet of dead timber is to be found in the national forests, and this has led to the study of the problem of saving this vast quantity of wood for some practical use, instead of allowing it to go to waste or furnish fuel for conflagrations.

The results of the tests indicate that the killing of timber by fire is not in itself injurious, and that if it is cut in time may simply be regarded as seasoned timber, entirely fit for lumber. If allowed to stand too long, however,— a year is a safe limit—the wood is marred by the opening up of cracks, called “checks” by the lumbermen, which lessen its value for lumber. For such purposes as railroad ties, for which checks are not so important, timber may prove satisfactory after having been dead 50 years.

The timber used in the tests was white fir from the Pecos River National Forest in New Mexico, and the work was done under the direction of the Forest Service, which has one of its testing laboratories at the University.

A moot question highly important in the matter of seasoning wood has just been settled after a long period of uncertainty and many careful experiments. It is found that the process of seasoning wood can not be materially hastened by first soaking it. Up to this time opinion has been divided, and there were many supporters of the contrary view, that if suffered to lie in water for a certain period green timber underwent some change from the action of the water which facilitated its drying when afterward removed and placed in the yard or in the kiln.

In reaching the conclusion that soaking has no appreciable effect in preparing wood for seasoning, the Forest Service worked up a large amount of data secured from the seasoning experiments which it has been conducting upon loblolly pine crossarms, chestnut telephone poles, and hemlock and tamarack railroad ties. Incidentally it was brought out that it doubtless pays to keep wood in water to prevent damage from checking and insects until it can be manufactured.

THE NEW YORK PUBLIC UTILITIES BILL.

The Page-Merritt bill, which has been introduced into both branches of the New York state legislature, and known as the “Public Service Commissions,” or popularly as the “Public Utilities” bill, has been the subject of much discussion by its supporters and opponents. This bill is the outcome of the recommendation made by Governor Hughes in his inaugural address, extracts from which were published in the *Electric Railway Review* on January 5, 1907. The principal provisions of the bill contemplate the abolition of the present railroad commission and of the rapid transit commission of the city of New York, as well as of a similar board having control of gas and electric service in Greater New York and the substitution therefor of two commissions, one representing the city alone and the other representing the state outside of the city, and to have supervision and control over all of the various utilities named. There have been several hearings at Albany, at which various amendments were proposed to the original bill.

Provisions of the Bill.

In substance the bill is to provide for two public service districts, to be known as the first district, embracing the counties of New York, Kings, Queens and Richmond, and the second district, including all other counties in the state. The commission in each case is to consist of five members, to be appointed by the governor by and with the advice and consent of the senate, but subject to removal at the will of the governor. The term of office is to be five years. The jurisdiction of the commission for the first district is to be (1) over railroads and street railroads lying exclusively within that district; (2) over street railroads, a portion of whose lines lie within that district, except that the commission for the second district shall have jurisdiction over such portion of the lines of said street railroads as lie within the second district so far as concerns the construction, maintenance, equipment, terminal facilities and local transportation facilities of said street railroads within the second district; (3) over such portion of the lines of any railroad as lie within that district, so far as concerns the construction, maintenance of equipment, terminal facilities and local transportation facilities within the district; (5) over any common carrier operating or doing business within the district; and (6) over the manufacture, sale and distribution of gas and electricity for light, heat and power in the district. Also the commission in the first district is to have and exercise (7) all powers heretofore conferred upon the board of rapid transit commissioners.

All jurisdiction under the act that is not specifically granted to the commission for the first district is to be exercised by the commission for the second district; the jurisdiction of the commission for the second district also includes the regulation and control of “interdistrict commerce” on any railroad other than a street railroad, subject to grant (4) to the other commission.

The bill provides for an annual salary of \$10,000 for each commissioner, and for counsel to the commission, and for a salary of \$6,000 to the secretary of the commission. It is provided that in all investigations or hearings the commission or a commissioner or the secretary shall not be bound by the technical rules of evidence and that no person shall be excused from testifying or producing books or papers on the ground that such testifying may tend to incriminate or subject him to penalty or forfeiture.

Article II of the proposed bill relates especially to railroads, street railroads and common carriers, and in defining the scope of the article it is specified that the provisions of the article apply (1) to the transportation of oil or other commodity, except water or natural or artificial gas, by means of pipe lines or other means of transportation from one point to another within the state under a franchise obtained from the state or any subdivision thereof, and (2) to the transportation of passengers, freight or property from one point to another within the state and to any common carrier performing such service. The bill gives to the commission authority over the class of service and facilities for the transportation of passengers, freight and property, all charges made or demanded by such corporation, switch and sidetrack connections and the determination of what switch and sidetrack connections may be considered necessary, the publication of schedules showing rates and charges, following in this respect largely the terms of the act of congress approved on June 29, 1906. The bill requires that no changes in rates or charges be made except upon 30 days' notice to the commission and publication for 30 days, the establishment of joint or through rates for the transportation of passengers,

freight or property and that every carrier shall file with the commission sworn statements of every contract with any other common carrier relating in any way to such transportation. Provisions similar to those of the interstate commerce act relating to discrimination are also included in the bill. The provisions in relation to the issuance of passes prescribe that no pass shall be issued for free transportation except that passes may be issued to any officer of the state or any division thereof to whom a provision of statute directs such issuance, to a necessary care-taker of live stock, poultry, etc., during its transportation, to a person actually an officer, attorney, agent or employe of the company issuing the transportation and to various other classes of people, such as employes of express, sleeping car, news companies or those engaged in the United States mail, customs or immigration service and to the military forces of the state or of the United States.

Under the head of distribution of cars the bill provides that every common carrier shall furnish to all persons and corporations that may apply therefor, suitable cars for the transportation of freight and shall have sufficient cars and motive power to meet all requirements. The commission also is given power to make reasonable regulations for furnishing and distributing freight cars to shippers, for switching, loading, unloading, etc. In the case of any franchise to be exercised in both districts the approval of both commissions shall be required. No franchise nor any right under any franchise in reference to a railroad or street railroad shall be assigned or leased, nor is any agreement with reference to such franchise valid unless approved by the proper commission. The bill says further:

"No railroad corporation or street railroad corporation, domestic or foreign, shall hereafter purchase or acquire, take or hold, any part of the capital stock of any railroad corporation or street railroad corporation organized or existing under or by virtue of the laws of this state, unless authorized to do so by the commission empowered by this act to give such consent; and save where stock shall be transferred or held for the purpose of collateral security only with the consent of the commission empowered by this act to give such consent, no stock corporation of any description, domestic or foreign, shall purchase or acquire, take or hold, more than 10 per centum of the total capital stock issued by any railroad corporation or street railroad corporation organized or existing under or by virtue of the laws of this state. Nothing herein contained shall be construed to prevent the holding of stock heretofore lawfully acquired. Every contract, assignment, transfer or agreement for transfer of any stock by or through any person or corporation to any corporation, in violation of any provision of this act, shall be void and of no effect, and no such transfer or assignment shall be made upon the books of any such railroad corporation or street railroad corporation, or shall be recognized as effective for any purpose. The power conferred by this section to approve or disapprove a transaction relating to franchises, rights or stock of any railroad corporation or street railroad corporation, shall be exercised by the commission which is authorized by this act to approve the issue of stock by such railroad corporation or street railroad corporation."

Article III further defines the power of the commissions in respect to common carriers relative to the power of the commission to examine into the capitalization, franchises, the manner in which the lines controlled or operated are managed, not only with respect to the adequacy, security and accommodation afforded by their service, but also with respect to their compliance with all provisions of the law. Each commission is required to prescribe the form of annual reports of the common carriers and may require such corporations to file monthly reports of earnings and expenses. Failure to provide any such report within 30 days from the time required will subject the corporation to forfeit to the state the sum of \$100 for each day it is in default. Any corporation operating a line of railroad partly within the second district and partly within the first district shall report to the commission for the second district, but the commission for the first district may upon reasonable notice require a special report. Similarly a street railroad corporation operating a line partly within the first district and partly within the second shall report to the commission for the first district, but the commission for the second district may require a special report.

Power is given to the commission to investigate the cause of accidents on any railroad or street railroad and every such corporation is required to give immediate notice by telephone or telegram and letter to the commission of every accident happening upon its lines. Complaint may be made to the proper commission by any person or corporation in regard to any act done or omitted to be done and upon investigation the commission shall take such action as it deems proper. The commissions are empowered to order repairs or changes to any tracks, switches, terminal facilities, motive power or

any other property or device used. Changes may be made in time schedules or the running of additional cars or trains required. Each commission is empowered to make rules and regulations concerning the number and efficiency of employes and may prescribe tests to establish the competency of such employes. They may require the establishment of a uniform system of accounts to be used by railroad and street railroad corporations or other common carriers and when such forms have been prescribed it shall be unlawful for them to keep any other accounts, records or memoranda. The penalty for failure to comply with any order made by the commission is a forfeit of \$5,000 for every offense and every day's continuance of such violation is considered a separate and distinct offense. Every officer, agent or employe of any common carrier who violates the orders of the commission shall be guilty of misdemeanor. Similar regulations and penalties apply to corporations other than common carriers.

Article IV of the bill relates to the powers of the commissions in respect to the manufacture and furnishing of gas for light, heat or power, including natural gas, and the generation, furnishing and transmission of electricity for light, heat or power. Under this head they are given authority to investigate and ascertain the quality of gas, the standard of illuminating power, the purity of gas and the efficiency of electric lights, to appoint inspectors of gas and electric meters, etc.

Article V provides for the abolition of the existing boards as above referred to, the abolition of the offices of inspectors of gas meters, for the repeal of certain acts and parts of acts in conflict with the present proposed act and for the appropriation of \$150,000 for the use of the commission of the second district under the terms of the act.

Suggested Amendments.

At a hearing upon the bill held in Albany on March 27 a large number of railroad and other corporations were represented. Among these were the Pennsylvania, New York Central, Erie and Baltimore & Ohio railroads, Adams Express Company, Brooklyn Rapid Transit Company, Brooklyn Union Gas Company and Richmond Light & Power Company. In favor of the bill appeared representatives of various political clubs and citizens' unions from various cities in the state. Various objections have been urged to the bill—in general, that the act would be more stringent than the federal interstate commerce act—and attention was particularly directed to the following points upon which amendments were desired:

A judicial review of all actions of the proposed public service commissions, both as to facts which may be in dispute and as to the law involved.

The appointment of high-class men at a larger salary than that proposed in the measure.

The independence of the commissions of the political powers to be insured by taking from the governor the power of absolute dismissal.

Omission of the clause in the present bill that would prohibit traction companies from acquiring the stock of other traction corporations to the extent that would render a merger possible.

Omission of that portion which would give the proposed commissions absolute control in the matter of capitalization and stock issues by public service corporations.

A general toning down of those portions of the proposed law dealing with the financial supervision of the traction companies, as well as with the supervision of their operating methods, schedules, and rates.

One of the principal arguments made in favor of amending the bill was that by Paul D. Cravath, representing the Interborough Rapid Transit Company. Mr. Cravath said that any amendments which his principal had to suggest were not intended to defeat any purposes which the framers of the bill have in view. On the contrary, they welcomed legislative action, conferring upon proper public authorities power to deal with the difficult problem of providing adequate traffic facilities for the city of New York. He said that the corporations had quite as much to gain as the public from intelligent supervision. It was useless, he said, to ignore the fact that traffic conditions in Greater New York are unsatisfactory to all concerned and that for some time they have been growing worse instead of better. He said that the new commission would not accomplish its purpose if its power was given only to restrict the public service corporations, and that the most serious difficulties in providing for the traffic

requirements of New York were in the limitations which laws of recent years had imposed upon the public authorities and the dangers which attend the investment of capital in public enterprises under these conditions. The last thing which the commission should do was to hamper corporations so that they would be unable to do their share toward bringing the needed relief. He said it was impossible for these corporations to increase their facilities, buy new equipment and improve the service upon existing lines, much less build new lines, without additional capital. They could not raise additional capital without issuing new securities and offering the investors a fair chance of return. Under this bill he said the principal company engaged in transportation in the city of New York would be tied hand and foot. It could not acquire the balance of the stock of the corporations, a majority of which it already controls. It could not buy or guarantee further issues of the stocks and bonds of these corporations. It could not acquire the stocks and bonds of other corporations which it might be necessary to organize to operate connecting lines or extensions.

Mayor McClellan of New York endorsed the general policy involved, but condemned the provision for the metropolitan commission on the ground that the power was entirely in the hands of the governor of the state to appoint the commission, while the city would be compelled to bear the entire expenses. He thought the power of appointment should be with the mayor. Although the city of New York would be forced to pay all the expenses of the commission for the first district out of its own funds, it would also be compelled to contribute heavily toward the expenses of the commission of the second district. He could hardly imagine a more vicious example of double taxation. The passage of the bill would negative the work done by the rapid transit commission, under which a successful system of rapid transit has been inaugurated and is now in operation and the commissioners would be supplanted by officers over whom the city has no control.

In defense of the bill in an address made at Utica on April 1, Governor Hughes explained that federal regulation is not a substitute for state regulation and that where congress has complete authority over interstate commerce the state cannot interfere with the exercise of its powers and that on the other hand over local and domestic commerce congress has no power to exert control. It is proper that the state in the exercise of its authority should take account of the wise legislation of congress, but that any state which should set a high standard in its legislative supervision would contribute powerfully toward similar action in other jurisdictions and to the establishment throughout the country of proper administrative standards. He then answered the question why there should be a public service commission by the explanation that every power that a corporation has is derived from the legislature which creates it. The corporation is constantly subject to legislative control and questions calling for investigations must be examined and a suitable flexibility of action be provided. The legislatures are in session but a portion of the year and must have some agent in whose hands such powers may be placed. The function of such a commission is administrative.

In answer to some of the objections previously referred to, relating to the broad powers granted to the commissions and referring to their relation to the courts, Governor Hughes said:

It has been urged that the granting of such broad powers is incompatible with the maintenance of the freedom of management said to be incident to the property rights of the corporations. Such an objection has a certain plausibility, but will not stand critical examination. The legislature, in safeguarding the public interest, has the power to require such equipment and facilities, and such manner of operations, as will secure good service. It will hardly be claimed that the existence of this power is inconsistent with property rights. The property of a public service corporation has been acquired subject to this power. And the power conferred upon the commission is conferred for the purpose of securing the perform-

ance of obligations to which the right of property is subordinate.

Another question is, What is the relation of the courts to such a commission? As has been said, the commission is an administrative body. It would not be proper for the legislature to confer these powers upon the appellate division of the supreme court. It is not in accordance with the theory of our government that an attempt should be made to convert the court into an administrative board. It is not the proper function of the courts to fix rates or to make orders as to the facilities which should be supplied or the safety appliances which should be used. This is the function of the legislature, or of the administrative board which it may create to aid in securing the performance of the duties it has imposed. It would be most unfortunate if, with the necessary extension of state supervision of public service, our courts should have cast upon them such burdens of administration.

The power of the legislature and of the commission it creates is not, however, without limits. And where the legislature goes beyond its constitutional powers, or where the administrative board exceeds its authority or passes its constitutional limits, the matter falls within the jurisdiction of the courts, who will declare such action null and void and prevent any attempt to enforce the provisions of the obnoxious statute or order.

Both the state and federal constitutions prohibit the depriving of any person of property without due process of law, and the taking of private property for public use without just compensation. Nor can a state deny to any person within its jurisdiction the equal protection of the laws. Neither the legislature nor the commission can escape these salutary checks upon their authority. So that if it be claimed that the action of the legislature or of a commission in fixing a rate operates as such a deprivation of property, a judicial question is presented and the courts will take jurisdiction and determine that question.

It thus appears that there is of necessity a court review where such questions are presented. This court review the legislature cannot curtail.

To provide a right of appeal to the courts from every order of the commission not only invites delay and an unnecessary multiplicity of proceedings, but has for its object the substitution of the judgment of the court for the action of the commission.

What is needed is a commission of dignity, of force, of ability, representing the best intelligence of the state available for the purpose and proceeding in a responsible manner. It should have such an equipment and such technical assistance as will enable it to deal with the matters before it thoroughly and expertly. With the highest respect for the courts, I believe that such a commission can best deal with the matters which properly fall within its province, and we may be sure, as has already been stated, that in cases where any doubt can exist as to whether there is an invasion of property rights or whether the matter does not lie within the province of the commission, the courts will be called upon to exercise their admitted jurisdiction.

The power to issue stock and bonds and to invest in the securities of other corporations is a power derived from the legislature and subject to such conditions as it may impose. No consolidation or merger of interests can take place except pursuant to legislative authority. Evils that have resulted from an abuse of the freedom which has been enjoyed under our corporate laws are patent to all. It is not simply or primarily the question of protection to the investor. The paramount demand is that through the improper issue of securities there shall not be provided a motive for crippling the public service or a basis for demanding extortionate returns. The power of the state should be exercised to compel respect for the public interest.

A further hearing upon the bill was had on April 3, in which special attention was given to lighting interests.

Protective Device for New York Subway.

According to a London newspaper dispatch from Vienna, plans have for some time past been under consideration for the future introduction of electric traction for the Alpine railways. For the section of line on the Aalberg Railway between Innsbruck and Bregenz, two large hydraulic powers have been acquired on the Ache in the Oetzthal and on the River Inn, at Landeck, of which the first will probably be selected for operation. In addition to this, supplementary power may possibly be obtained in the Vorarlberg district. In the northern districts of the Alps many sources of water power are being surveyed for the above purposes.

THE MARION BLUFFTON & EASTERN RAILWAY.

The railway recently completed by the Marion Bluffton & Eastern Traction Company is an important line among the many important interurban roads that are operating in the north central part of Indiana. This line is 31.57 miles in length and reaches, besides the terminal cities of Marion and Bluffton, the towns of Liberty Center, Warren, Van Buren and



Marion Bluffton & Eastern Traction Company—Map of Route.

Landessville. The population served for each mile of track is 1,820.

At Marion, the western terminus, connection is made with the north and south lines of the Indiana Union Traction Company and with the line of the Kokomo Marion & Western Traction Company, which extends west from Marion to Kokomo, Ind. At Bluffton, the eastern terminus, connection is made with the Bluffton branch of the Ft. Wayne & Wabash



Marion Bluffton & Eastern Traction Company—Six-Mile Tangent Near Warren, Ind.

Valley Traction Company and with the old Muncie Hartford & Ft. Wayne Railway, which is now leased by the Indiana Union Traction Company. Between the terminals the line parallels the Toledo St. Louis & Western, a steam railway.

The electric line is operated on a 2-cent mileage basis and charges for the ride between Marion and Bluffton 60 cents for a ticket one way or \$1.05 for a round-trip ticket.

It is expected to derive a large business during the summer months from the traffic between Marion and Goldthwait Park, located on the line of the Marion Bluffton & Eastern



Marion Bluffton & Eastern Traction Company—Culvert in Fill Near Marion, Ind.

about 1 mile from Marion and near the Mississenawa river. This is a large new park to be opened for the first time this year, containing 34 acres of ground especially suited for park purposes. The park will contain an especially complete "White City," provided with all the usual amusement resort features. The railway company has signed a contract with the park management agreeing to furnish a 15-minute service between Marion and the park from June 15 to September 15. Round-trip tickets, including admission to the park, will be sold for 10 cents.

The officials of the Marion Bluffton & Eastern Traction



Marion Bluffton & Eastern Traction Company—Culvert Between Warren and Van Buren, Ind., with Square Top.

Company gave particular attention to the substantial construction of track and roadway in order that they might operate cars at a high rate of speed. The cars are now operated on an hourly schedule and the running time between terminals is 1 hour and 20 minutes. As soon as the tracks have settled and the final work is done on the roadbed, the running time will be reduced 10 or 15 minutes.

Track and Roadway.

The track is built on private right of way 40 feet in width, with a maximum grade outside of the towns of 1.5 per

cent. There is one short-radius curve in the track at Warren where the road enters the bridge across the Salimonia river; but, with this exception, long-radius curves prevail. In the 31 miles of track there are two 6-mile and two 5-mile tangents.

In order to retain the low grades and long radius curves it was necessary, during construction, to make extensive cuts



Marion Bluffton & Eastern Traction Company—Underground Passage Near Marion, Ind.

and fills at several points on the line. Just east of Marion the largest fill and the largest cut, 20 feet each, were made.

The railway has three steel bridges of the deck-plate girder type. They span the Mississenewa and the Salimonia rivers and Rock creek. The bridge abutments are of concrete construction. There are several concrete waterways and cattle-passes, which are substantially built. The bridges were erected by the Indiana Bridge Company. The track and roadway were built under contract by the Moore-Mansfield Construction Company of Indianapolis. The engineers were the



Marion Bluffton & Eastern Traction Company—Bridge Over Mississenawa River.

Riggs & Sherman Company of Toledo, O., who were represented by J. S. Worley.

The track is laid with standard white oak ties, 70-pound steel rails in 33-foot lengths, 4 and 6 bolt splice bars, and is bonded with the Ohio Brass Company's solder bonds. Two thousand cubic yards of gravel per mile was used in ballasting the track.

Power.

The power for operating the line is rented from the Marion Heat & Light Company. Sixty-cycle, 3-phase current is carried on No. 4 copper cables at a line pressure of 22,000 volts from the power house at Marion to the substations at Van Buren and Liberty Center. In providing 60-cycle current instead of 25-cycle current the company has departed from



Marion Bluffton & Eastern Traction Company—Liberty Center Substation.

the prevailing custom in railway operation. This was done because the company expects to secure a large lighting business in the towns through which the lines pass.

The transmission lines are supported on Western Electric triple-peticoat porcelain insulators spaced 2½ feet apart on a single 9-foot cross arm located at the top of the poles. The pole line is composed of 40-foot Idaho cedar poles. A copper feeder 250,000 circular mils in cross section, which is tapped into the trolley every 1,300 feet, runs the length of the road. The trolley wire is No. 000 round copper and is

supported on 9-foot tubular brackets at a height of 20 feet above the rails. The overhead work was built by C. O. Scott of Kokomo, Ind.

Substations.

The Van Buren substation is located 10 miles east of Marion. The building is a 2-story brick structure 22 by 100 feet. A space 55 feet long at the rear of the building is used

for the substation equipment and the balance of the ground floor is fitted up for an office and waiting room. The second story is used as a living room by the station attendant. The electrical equipment of this station consists of two 300-kilowatt, 60-cycle, 3-phase Westinghouse rotary converters, six 100-kilowatt, 22,000-400-volt, oil-cooled transformers, and a 6-panel switchboard with recording and other necessary in-

are provided under each of the four tracks entering the building. The superstructure of the building is of brick and the roof is of frame construction.

Equipment.

The car equipment consists of five passenger cars, one work car and one express car. Four of the passenger cars are of the combination single-end type and the other is of the two-compartment interurban type. They are 45 feet in length, weigh about 30 tons each, are mounted on Taylor trucks and are equipped with four Westinghouse 93-A motors, K-14 controllers, straight air brakes and have steel-tired wheels. The cars are geared to run 50 miles an hour.

Personnel.

The Marion Bluffton & Eastern Traction Company was organized in 1905. Four-fifths of the stock issued is owned by residents of Bluffton. The officers of the company are: L. C. Davenport, president; R. F. Cummins, secretary and general manager; W. A. Kunkel, treasurer. The board of directors is composed of the president, the secretary and treasurer and H. C. Arnold, C. Max Hofman, James W. Sale and W. W. Edwards. C. W. Clark is operating superintendent and electrical engineer. The operating office is located at Bluffton.

High-Speed Electric Line in Italy.

Consul James E. Dunning, in a report from Milan, says: "The Mediterranean Line, one of the two trunk systems of steam railway in Italy, is seriously at work on the plans for the continuation of the electric road now running from Milan north to Varese and Porto Ceresio, about 50 miles, to Laveno, on Lake Maggiore, via Ponte Tresa, on the Lake of Lugano. At Laveno this extension, which will be operated with the same high-speed express electric service now in use between Milan and Varese and Porto Ceresio, will connect with the existing steam branch to points north, including Luino and Bellinzona on the St. Gothard main line; while at Ponte Tresa another line, now projected, will start direct



Marion Bluffton & Eastern Traction Company—Combination Car.

struments. In addition to these railway units there will be installed for lighting purposes in Van Buren two 37½-kilowatt, 60-cycle, 22,000-2,200-volt transformers, and a 25-light constant-current arc regulator, with two additional panels to the switchboard, one for the arc light line and the other for commercial lighting.

The substation at Liberty Center is built of concrete blocks. The equipment is identical with that provided for the Van Buren station. The high-tension wires are carried



Marion Bluffton & Eastern Traction Company—Car House, Near Bluffton, Ind.

direct from the pole line through 12-inch wall insulators to the apparatus in the rotary room.

Car House.

The car barns are located just west of the city limits of Bluffton. The main building, 70 by 125 feet in floor area, is divided into a repair shop, 24 feet wide, and a car storage house. The machine shop, in which the lathes, drills and other tools needed for car repairing are installed, is located at the rear of the bay set aside for repair work. Concrete pits

for Lugano, to connect there with the main line over the St. Gothard pass. If the plan goes according to present indications, the new line—Milan, Varese, Ponte Tresa-Lugano—will be in operation by the end of 1908, thus affording another direct route to Lugano and tapping the richest industrial section of Lombardy."

The Knoxville Railway & Light Company is now equipping its cars with fenders as fast as the work can be done.

CLEVELAND TRACTION SITUATION.

The prospects of a settlement of the Cleveland street railway controversy under the holding company plan, by which it is proposed to lease the Cleveland Electric Railway to the Municipal Traction Company on the basis of an agreed valuation of the property, have not brightened materially during the past week. Since President Andrews of the Cleveland Electric Railway and President Du Pont of the Municipal Traction Company submitted their estimates of the valuation of the property to the city council on March 25, naming \$105 and \$45.10 respectively as the value of the company's shares, neither side has been willing to make any change in the method of computing the valuation, and both have charged each other with bad faith in conducting the negotiations. The city council on Tuesday of this week voted to fix a price of \$60 per share for the stock and the matter will remain undecided until the Cleveland Electric directors have voted on that proposition.

At the public meeting of the city council on March 30 it became evident that Mr. Andrews and Mr. Du Pont were very far apart in their ideas as to the valuation of the Cleveland electric property, and that they could not agree as to the methods to be followed in determining that valuation. Mr. Andrews submitted a reply to Mr. Du Pont's communication to the council on March 27, in which he explained the principles on which he had calculated the value of the physical property and franchises, saying that he had followed the plan laid down by Mr. Du Pont at the beginning of the negotiations. He charged Mr. Du Pont with bad faith in not having followed the principles agreed upon. He said that in determining the value of the physical property he had followed the "Chicago plan" of adding to the cost of labor and material 20 per cent for the legal and engineering expenses incidental to construction, whereas Mr. Du Pont's figures omitted all such items. He said that in computing the franchise values he had estimated the value of the outlying franchises on the basis of average earnings per mile for the entire system. Mr. Du Pont had estimated franchise values according to the earnings of each line and had allowed no value for the outlying franchises after the franchises on the more central connecting lines had expired.

Mr. Andrews also submitted in writing answers to a list of 16 questions propounded by City Solicitor Baker at the meeting on March 27, in which he explained in detail many of the principles on which the valuation was based. The remainder of the meeting was principally taken up by a debate between Mayor Johnson, City Solicitor Baker and Presidents Andrews and Du Pont in regard to the methods used in fixing the valuation. The mayor asked Mr. Andrews to set a price on the property, but Mr. Andrews declined, saying that he had supposed that they were going to determine the real valuation of the property, instead of attempting to name an arbitrary price. The mayor then wished to inform the council as to the data used in calculating the valuation in order that it might set a price, but Mr. Andrews objected to having the data made public as they had been given to Mr. Du Pont in confidence.

At the mayor's suggestion it was then decided that the special committee of five appointed on March 27 to formulate a plan of arbitration meet on Monday afternoon to agree upon a price which could be recommended for the Cleveland Electric stock on the holding plan basis.

The committee met in secret sessions on Monday and Tuesday, April 1 and 2, and at a public meeting of the council on Tuesday morning submitted a report. The committee recommended a price of \$60 a share for the stock, to be redeemable at a 10 per cent increase, interest to be paid at the rate of 3 per cent for the first year, 4 per cent for the second year, 5 per cent for the third year and 6 per cent thereafter; that the company must accept the offer by May 1 or lose two points monthly on the valuation thereafter until the date of acceptance; that a security franchise be given to the Cleve-

land Electric Company, based on seven tickets for a quarter. The council adopted the report by a vote of 30 to 1.

Mr. Andrews then said that he wished to submit the proposition to his directors at once and asked if the holding company would guarantee a 3-cent fare within the city limits and a 5-cent fare outside, with a provision for the reversion of the franchise to the Cleveland Electric Company in case of failure. Mayor Johnson said he would make no such guarantees to the old company, but that any contract as to rate of fare would be between the city and the holding company. He said that he was willing to submit both the committee's proposition and the Cleveland Electric Company's original proposition to a vote of the people.

Mr. Andrews then agreed to submit the new proposition to the directors as soon as possible and promised to inform the mayor as soon as he was ready to give an answer.

TRAMWAYS IN FRANCE.

Consul-General R. P. Skinner forwards the following report on the electrical transit system of Marseille:

When the city of Marseille contracted with the Compagnie Générale Française de Tramways, for the construction of a complete electrical transit system, the terms of the concession attracted wide attention, as they provided for: First, 2-cent fares (10 centimes); second, an annual minimum payment to the city of \$19,300 plus 1 per cent of the annual receipts when such receipts should exceed \$1,930,000, this percentage to increase with each \$1,000,000 of additional receipts until the total receipts would amount to \$2,316,000, at which time the city's share should remain stationary at 3 per cent; third, reversion to the state of all rights and full proprietorship as to tracks, wires, and other material occupying the public thoroughfares, at the expiration of the concessionary period of 50 years.

The company possesses similar concessions at Marseille, Nancy, Havre, Orleans and Tunis, but the Marseille system is by far the most important. The company, which was capitalized at \$4,825,000 in 1891, has now increased its capital to \$8,106,000, divided into 84,000 shares of \$96.50 each, and has also issued \$6,967,300 in 4 per cent bonds and \$205,641 in 3 per cent bonds. The 4 per cent bonds are now worth in the open market \$95.44 and the 3 per cent bonds \$81.44. The shares have paid interest regularly for the past seven years as follows: 1900, \$3.86; 1901, \$4.34; 1902, \$4.34; 1903, \$4.82; 1904, \$5.31; 1905, \$5.31, and 1906, \$5.31. There is now some talk of a \$5.79 dividend for 1907, but this is hardly likely. The shares are now quoted in the open market at \$123.52, which shows that the enterprise has been entirely satisfactory from the investors' point of view.

The results to the public have been these: The city enjoys the use of a street railway system which is probably as complete as any in Europe. The rolling stock is by no means as elegant as in many American cities, but the cars are substantially constructed and answer all practical purposes. The tracks reach out in every direction and converge into the heart of the business district. While no transfers are allowed, the fares are uniformly two cents, with the exception of one circular excursion route along the sea front, upon which three cents is collected. Very general use is made of the service, and, owing to the low fares, cars are taken for distances so short that otherwise they would be covered on foot. Electricity replaced horse cars and omnibuses in 1900, but the new system was not completed until 1902. I supply below a table of statistics showing the exact situation since 1900, when the 2-cent service was partially inaugurated:

Year.	Length of lines in exploitation.	Number of employees.	Mileage traveled.	Number of passengers.	Gross receipts.
1900	.....*44.98	2,196	5,845,152	42,243,060	\$ 876,055
1901	.....*50.39	2,125	6,730,243	48,581,585	1,019,539
1902	.....*62.91	2,047	7,875,289	61,180,191	1,240,995
1903	.....*64.70	1,763	8,387,623	64,605,692	1,317,869
1904	.....*65.56	2,170	9,309,421	70,782,479	1,430,959
1905	.....*73.00	2,400	10,664,306	77,176,908	1,550,183
1906	.....*76.56	2,400	12,016,661	88,943,150	1,781,994

*Miles.

PIPING AND POWER STATION SYSTEMS.—XXXVI.

BY W. L. MORRIS, M. E.

Though this saving is conspicuous in the larger sizes, it is doubtful whether there are any advantages attending the use of dry vacuum pumps on condensers smaller than 16 inch diameter of exhaust. The service to which this class of machinery is subjected is rather severe because of the high temperature of the air resulting from compression and the large quantity of oil entering the cylinder. The oil burns on the valves due to the high temperature and therefore requires considerable care and attention on the part of the attendant to keep the pump in a working condition. The smaller sizes of condensers, such as would be operated with out air pumps, may require more steam for the circulating pump, but as the air pump also requires steam to operate it

and an expenditure for oil, repairs, attendance, interest on investment, etc., the saving is too slight to justify the use of additional apparatus.

There is a special design of elevated jet condenser which employs two tail pipes, one being restricted in size and designed for a high water velocity to eject the air and discharge it into the hot well. The other tail pipe, which is of sufficient size to carry away all the water which the ejection pipe will not discharge, has its opening from the condenser bowl at a higher elevation than the ejection pipe opening. A condenser designed on this principle is shown in Fig. 269 (J 1-1) and it has been claimed that a vacuum of 26 and 27 inches has been maintained with a high temperature of the water in the hot well, and no other means provided for removing the air other than the air ejection tail pipe. This being the case, but very little additional machinery and apparatus is required with this condensing arrangement, the circulating pump being any one of the standard low pressure designs, the one which is most flexible and efficient being a direct connected engine type

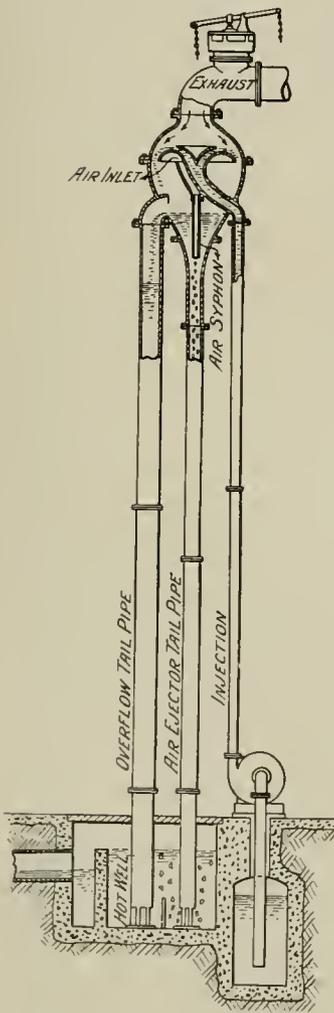


Figure 269—(J1-1).

centrifugal pump, the exhaust of which is piped to the feed water heater.

A motor driven pump is quite attractive to operating engineers on account of its simplicity and reliability, but it is much less efficient than an engine driven pump, the exhaust of which is used for feed heating. A difficulty which is experienced with motor-driven centrifugal pumps is that of starting the condenser without a dry vacuum pump, as the water must then be raised to about twice its normal elevation, as the water in the tail pipe is not there to balance a column of equivalent height in the injection pipe. The speed of the motor being fixed, and the centrifugal pump not being capable of raising water much above the head for which it was designed, it is necessary to have the motor constantly driving a high lift pump for low lift service. In the case of engine

driven pumps, however, it is possible to temporarily increase the speed of the engine sufficiently to start the condenser operating and establish the vacuum, after which the speed may be reduced to the operating conditions determined by the amount of water required.

An engine for this service should be economical in steam consumption, a vertical compound engine being employed if the condenser is of large size. By using auxiliaries which are economical in the use of steam, it is possible to run all the auxiliaries non-condensing and use the auxiliary exhaust steam for heating the feed water. If a dry-air pump is employed, it should also be steam-driven either directly or combined with the circulating pump.

A geared motor driven pump is quite unsatisfactory as a power station auxiliary for any service, unless possibly the small air compressor used for blowing out armatures, etc. This machine is, however, not essential for continuous operation and a motor drive with an automatic controlling switch has been found entirely satisfactory, the outfit being generally such as is used for the air brake system on electric cars. Feed pumps, and circulating and air pumps should be driven from a source of power the speed of which can easily be varied. The motor drive is objectionable because it is not easily adapted to variations in speed and the continuous rumbling noise of the gearing is very annoying. To insure the best results from the station operator it is quite necessary that the plant be as quiet as possible so that he can easily hear any unusual sound and locate the difficulty.

The dry vacuum pump is not wholly necessary with surface condensers, but unlike the elevated jet condenser some provision must be made for removing the air with a pump, either of the wet or dry vacuum type. Air that accumulates in a surface condenser is in the compartment together with the condensation and in no way comes in contact with the circulating water. The movements of the condensations are comparatively slow and not sufficient to remove the air. The air may be taken together with the water, or separately, as shown in Figures 28 and 29, Chapter 4. The wet vacuum pump is that most generally used and is so termed because it handles the air together with the condensation. This class of pump is also used for the suction type jet condensers to remove the air and condensation, and when so used is generally styled an "air pump." The class of service is practically the same for both condensers, the jet condenser having approximately thirty times as much water to handle and a correspondingly greater amount of air. The action of this combined air and

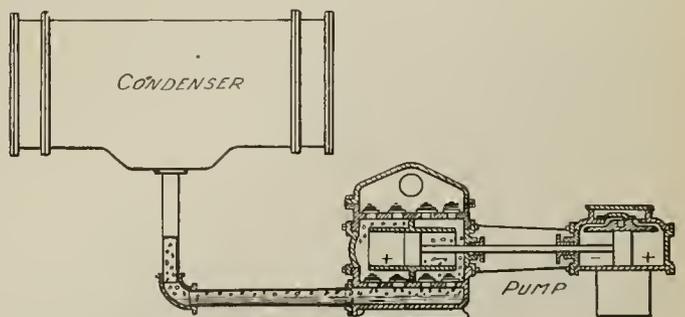


Figure 270—(J1-2).

water vacuum pump is somewhat peculiar, its jerky motion not being generally understood. Figure 270 (J 1-2) shows the wet vacuum pump attached to a condenser. When the pump is in regular operation, but little condensation is being handled, and that is well down in the suction pipe. When the pump is discharging the contents of the water end, one side is under pressure marked + and the other side is at the same pressure as the condenser and is marked -. The pressure behind the steam cylinder is also under pressure marked +, this pressure being maintained sufficiently high to overcome

the pressure on the water end marked +. The work performed in compressing the contents in the water cylinder marked + is similar to compressing a spring. The air contained in the water cylinder being the elastic body, as soon as the steam valve has crossed over the port and allowed the exhaust port to communicate with the end of the cylinder that has been under compression, the support in the steam cylinder is taken from the end of the piston rod, and the compressed air in the water end marked + is free to expand, thus causing the quick recoil so conspicuous in this class of machinery. The recoil movement will reach almost the full stroke when the pump is running above speed, and when there is no recoil the pump is taking only water, the air in this case accumulating in the condenser and by keeping the steam from the condensing surfaces, reduces its capacity and as the capacity becomes less than that required to condense the steam delivered to the condenser, the vacuum drops.

The amount of air that is being handled can easily be judged by the amount of recoil. The amount of recoil necessary for successful operation can only be determined by observing the vacuum, as the volume of air is largely dependent upon the tightness of the piping, stuffing boxes, etc. When the amount of recoil of the pump piston reaches nearly the full stroke, it is an indication that there are air leaks which should be located at once and made air tight. This is in many cases a very difficult operation, both the locating of the leak as well as to close them after they have been found. One of the most positive methods of showing up the leaks is to fill the vacuum system with water and put a slight pressure on it, about 10 pounds to the square inch, and while the pipes are filled with water make a careful inspection of the entire system, marking or drawing up all joints and stuffing boxes where leaks are found. In case the exhaust pipes are large, it may be necessary to place posts under the pipe to support the additional weight, as 10 feet of 24-inch pipe will contain about 3,000 pounds of water. Another method of locating leaks in the system is to create a low vacuum on the system, say five pounds, and with a small pointed brush, shellac the joints, observing carefully where the shellac is drawn in. Many of the small leaks can be closed in this manner, but where large leaks are found it may be necessary to make a new joint. Another method, but quite crude, is to give all the joints a heavy coat of pitch, while the vacuum is maintained on the system, trusting that the pitch will fill up the cracks and stop the leaks.

If gas is obtainable at the plant the entire piping system can be filled with gas and leaks located by a candle passed around the joints. The quantity of gas necessary would not be expensive, a thousand cubic feet being sufficient to fill a large system, say 140 feet of pipe 3 feet in diameter. To fill a line with gas, it is of course necessary to fill it with steam and then close up the system, and as the steam condenses allow gas to fill the pipe.

(To be Continued.)

Electric Railway Statistics of Canada.

According to the annual report of the Department of Railways and Canals of Canada, there were in operation at the close of the fiscal year ended on June 30, 1906, 814 miles of electric railway, 195 miles being double-tracked. The paid-up capital amounted to \$63,857,970. The gross earnings aggregated \$10,966,872, an increase of \$1,609,747, and the working expenses \$6,675,038, an increase of \$756,844, leaving the net earnings \$4,291,834, an increase of \$852,903. The number of passengers carried was 237,655,074, an increase of 34,187,757, and the freight carried amounted to 506,024 tons, a decrease of 4,326 tons. The car mileage was 50,618,836, an increase of 4,659,735 miles. The accident returns show a total of 47 persons killed during the year and 1,653 persons injured. Power was supplied in 15 cases by water, and in 41 cases by steam. Ontario has 441 miles, Quebec 198, New Brunswick 16, Nova Scotia 54, Manitoba 32, and British Columbia 72 miles. Returns were received from 47 companies.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. ROSENBERGER, LL. B.

Rails and Fastenings Not Fixtures.

The landowners from whom a right of way was obtained for a suburban electric railway, the supreme court of Georgia holds, *Georgia Railroad & Banking Company vs. Haas*, 56 Southeastern Reporter, 313, could not successfully claim the rails and fastenings laid solely for the purpose of operating the road as being fixtures forming part of the land itself, and not movable therefrom.

Passenger Carried Beyond Destination Leaping from Car.

It is certainly true as a general proposition, the supreme court of appeals of Virginia says, *Newport News & Old Point Railway & Electric Company vs. McCormick*, 56 Southeastern Reporter, 281, that the misconduct of the conductor in carrying a passenger beyond his destination can afford no sufficient justification for his hazarding life or limb in jumping from a moving car. If, however, he should negligently persist in doing so and suffers injury, he is to be regarded as the author of his own misfortune, and his right to recover is barred, upon the principle that the negligence of the company in failing to stop the car was the remote, while the negligence of the plaintiff in leaping from the car while in motion was the proximate, cause of the injury.

When One Car Meets Another Stopped on Adjacent Track.

When a car has been stopped at the usual place for discharging passengers, the court of appeals of Kentucky holds, *Louisville City Railway Company v. Hudgins*, 98 Southwestern Reporter, 275, it is the duty of those in charge of an approaching car on the other track to have it under such control that it may be stopped at a moment's notice, so that persons who have alighted may cross the track safely. It is manifestly dangerous, while passengers are alighting from a car, to permit another car, not under perfect control, to run by it on the adjacent track, as the motorman cannot discover the peril of the person attempting to cross the track in time to prevent injury, and it must be anticipated that persons who have alighted from a standing car at a street crossing may cross the street immediately behind it. It is said that it is the duty of the passenger after alighting from a street car to stand in the street until the car has gone a sufficient distance to enable him to see an approaching car, and to allow persons in charge of the approaching car to discover them; in other words, that it is the duty of passengers to exercise ordinary care for their own safety. That is true, but the passenger is not to be charged with negligence because he fails to anticipate that the company from whose car he has just alighted will place him in imminent peril from another car before he has had opportunity to reach a place of safety. The duty that persons operating street cars owe to passengers does not end immediately when the passenger has stepped safely to the ground. They are required to, and should, exercise ordinary care to prevent injury by their cars to persons who have left the car while they are attempting to reach the street or a place of safety.

Highest Court on Paving Requirement.

The supreme court of the United States says that the case of the *Fair Haven & Westville Railroad Company v. City of New Haven*, 27 Supreme Court Reporter, 74, involved the validity of an assessment of \$36,879, against the company, for the cost of paving between its tracks and for 1 foot on each side thereof, and it affirms a judgment approving of the assessment with a deduction of \$3,590.85 for the cost of repair. It says that by its original charter, granted in 1862, the company was required to keep the street between its tracks, with a space of 2 feet on each side of the tracks, in good and sufficient repair. It was also provided that the act might be altered, amended, or repealed at the pleasure of

the general assembly. In the amendment of the charter in 1864 this obligation was retained, and also in the public acts of 1893. In the act of 1895 the duty of paving and repaving was imposed on all railway companies. The court assumes, for the purpose of its discussion, that the duty to repair did not include the duty to pave and repave, although much can be said and cases can be cited against the assumption. Did the change and increase of burden upon the company come within the limitations upon the reserved power of the state? Had it no proper relation to the objects of the grant to the company or any of the public rights of the state? Could it be said to be exercised in mere oppression and wrong? All of these questions must be answered in the negative. The company was given the right to occupy the streets. It exercised this right first with a single track, and afterwards with a double track. Before granting this right the state certainly could have, and reasonably could have, put upon the company the duty of paving as well as of repairing. Such requirement would have been consistent with the object of the grant. It is yet consistent with the object of the grant. It is not imposed in sheer oppression and wrong, and the good faith of the state cannot be questioned. It is imposed in the exercise of one of the public rights of the state,—the establishment, maintenance, and care of its highways. The extent of this right is illustrated by *West Chicago Street Railroad Company v. Illinois*, 201 United States Reports, 506, and cases cited.

Need Not Transfer to Leased Elevated or Steam Lines.

Section 78 of article 3 of the New York railroad law provides that "any railroad corporation or any corporation owning or operating any railroad or railroad route within this state, may contract with any other such corporation for the use of their respective roads or routes, or any part thereof, and thereafter use the same in such manner and for such time as may be prescribed in such contract." The court of appeals of New York says, *People v. Brooklyn Heights Railroad Company*, 79 Northeastern Reporter, 838, that, as it understands the phrase "any railroad corporation," etc., it refers to every railroad incorporated under the provisions of the act. Such corporation "may contract with any other such corporation." No limitation is apparent. A steam railroad corporation can lease another steam surface railroad, a street surface railroad or an elevated railroad. So with a street surface railroad. It may lease another street surface railroad or steam surface railroad or an elevated road; but when one railroad corporation undertakes to lease and operate another road, it assumes all the duties, obligations, and requirements imposed by the statute and the character of such railroad. Such duties and obligations in the operation of steam surface railroads are in many respects different from those imposed in the operation of street surface roads, and in the operation of elevated roads there are still other obligations assumed which are materially different.

The court thinks it apparent, therefore, that when the legislature authorized the defendant to lease and operate the elevated and steam surface roads here in question, it not only became empowered and authorized, but it was also its duty, to operate such roads in accordance with the requirements of their respective characters. Having had cast upon it the duty and obligation to operate such roads in accordance with the requirements of their charters and the statute applicable thereto, as such lessee, it became entitled to all of the privileges and benefits authorized by their charter and the statute, unless such roads were brought within the meaning of the sections in article 4 in which the defendant is limited to the charge of but one fare. The court thinks that they are not. As the court construes those sections, they have reference to street surface railroads and no others.

Nor does the court think that the defendant, in dispensing with steam as a motive power and substituting electricity,

affected the situation or changed its right so far as the question of fares was concerned. Such change has been authorized under general laws, and, by complying with the requirements of the statute with reference thereto, it may be lawfully made.

Duty of Motorman Seeing Person on Trestle.

Where a woman was walking on the trestle or unfloored bridge of an interurban electric railway, near the city limits, the court of civil appeals of Texas holds, *Northern Texas Traction Company vs. Mullins*, 99 Southwestern Reporter, 433, that, after the discovery of her perilous position, it was the duty of the motorman to use "the greatest precaution to avoid injuring" her. In other words, as supported by numerous authorities, in such cases, the law, as well as the dictates of humanity, imposed upon him the duty of using every means then reasonably within his power, consistent with safety to himself and others on the car, to avoid running the woman down. Such duty certainly demanded of the motorman prompt rejection of any merely speculative chance that the woman would "get off" the track in time.

Name Does Not Make Extension—After Grant Ends.

The use of the tracks of a line for a short distance by an alleged branch, the supreme court of the United States holds, in *Cleveland Electric Railway Company vs. City of Cleveland and Forest City Railway Company*, 27 Supreme Court Reporter, 202, does not make the latter a mere extension of the former. And because on some occasions it has been called a branch does not alter the weight to be given the facts, or turn the branch into a mere extension where it has been otherwise uniformly treated. The branch road certainly did not become a part of the main road simply because it ran in connection with it, or because it ran over a small portion of the tracks of that road. It remained what it started out as, a road with a separate route and a different term of life. Upon the termination of the grant to such branch the title to the rails, poles and other appliances for operating that road, and then remaining on the various streets, remained in the railway company which had been operating the road. Another company could not avail itself of an ordinance, so far as taking possession of such property was concerned.

Right Speed Cannot be Shown by Experts or Ordinances.

In a case where an electric car struck a pedestrian walking near the outer edge of the track, the court of appeals of Kentucky holds, *Ford's Administrator vs. Paducah City Railway*, 99 Southwestern Reporter, 355, that there was no error in refusing to permit a witness to testify as to what would be a reasonable rate of speed, for the reason that what might be negligence in the speed of a car in one portion of a city might not be negligence in another portion thereof; in fact, what would be negligence in the speed of a car in one square of a street might not be negligence in the next square. So it is impossible to fix an arbitrary rate of speed at which it would be safe to operate a car within the city limits. It has been held that to move a car at all is per se (by itself) dangerous. The danger is not confined alone to the speed with which the car is moved, but to the manner in which it is operated as well, and, when the jury is told how fast the particular car in question was moving, the condition of the track over which it was moving, and the use to which the street was put over which it was moving, they must judge for themselves as to whether or not the rate of speed, under the circumstances and conditions shown to exist, was excessive. Nor does the court think that there was error in a refusal to permit to be introduced in evidence an ordinance of the city requiring street cars to move in the business sections of the city at a rate of speed not exceeding eight miles an hour, and elsewhere at a rate not exceeding 10 miles an hour. The court says that the violation of a city ordinance is no more evidence of negligence than obedience to its provisions would be evidence of due care.

News of the Week

Central Electric Railway Association.

President H. A. Nicholl of the Central Electric Railway Association has appointed a supply men's committee, composed of the following members: John F. Ohmer, chairman, Dayton, O.; L. J. Drake, treasurer, Indianapolis, Ind.; S. D. Hutchins, Columbus, O.; William Bloss, Indianapolis, Ind.; R. W. Palmer, Cincinnati, O.

North Jersey Street Railway Company Indicted.

The grand jury of Essex county, New Jersey, on March 30 returned indictments against the North Jersey Street Railway Company, a subsidiary of the Public Service Corporation of New Jersey, charging overcrowding, poor equipment, with inadequate fenders, and unsanitary condition of cars.

Chief Justice William Gummere of the supreme court on March 27 had addressed the grand jury, which had been investigating street railway conditions in the county, and cautioned them against yielding to "public clamor." Justice Gummere said:

"It makes no difference whether fenders on the cars are of the latest, up-to-date model, so long as they are fenders that will save any obstacle from going beneath the wheels and are fenders approved in general by companies throughout the country.

"In the matter of sanitation, the company is only expected to have the cars cleaned at regular intervals. The company cannot be expected, owing to the extent of its service, to have the cars immaculate. The amount of dust brought in by the public on rainy and stormy days makes it a very hard task for the company to keep the vehicles cleaned.

"Those are matters that are left to the common sense of the jurors as to whether they are severe enough to menace the public health and warrant an indictment. But it is not fair for the jury or the bench to swerve one iota from the performance of a sworn duty because of the clamor of the public or the influences of the moment.

"No man can serve the public no matter how honestly and fail to escape criticism by those who do not appreciate the importance of doing the right thing for the public without regard to appearances. The grand jury is just as much derelict in the performance of its duty when it yields to the public clamor and indicts an innocent man as it is when it fails to indict a man who is guilty."

Memphis Court Sustains Low-Fare Ordinance.

Judge Pittman of Memphis, Tenn., has decided in favor of the plaintiff in the case of William G. Byrne against the Memphis Street Railway Company in which the plaintiff seeks damages because the company refused to sell him six tickets for 25 cents, as provided in a city ordinance. The company based its refusal on its franchise ordinance, which provides for a 5-cent fare. The court holds that this ordinance is invalid and does not constitute a contract for the reason that the legislature of the state of Tennessee had expressly and unequivocally declared that no taxing district should make any contract of any description, except in writing, to be signed by a majority of the fire and police commissioners and a majority of the board of public works.

Isidore Newman & Sons of New Orleans, who control the Memphis Street Railway, have given out the following statement:

"Before we became interested in the company our attorneys reported favorably on the franchise. The franchise provides for a 5-cent fare for a continuous ride but reserves the right to the city to request the company to sell 11 tickets for 50 cents. The ordinance stipulating 6 tickets for 25 cents was passed some months ago during the political turmoil which existed between the two factions in the management of the city. When the ordinance was first introduced we were advised by counsel that the city could not enforce the sale of tickets except as provided in the franchise. Though the city council passed the ticket ordinance, no attempt was made to enforce it by the city.

"After the passage of the ordinance, a citizen was ejected from the car for refusal to pay his fare because the conductor would not sell him tickets. This citizen brought suit against the company for damages. The case was tried in a lower court and a preliminary decision was rendered today. The company will appeal this decision. We are most confident that the higher courts will sustain the rate of fare provided in the franchise, for the franchise constitutes a contract between the company and the city.

"We are advised that no other question as to the franchise is involved in this decision."

Legislation Affecting Electric Railways.

Iowa.—The Meredith bill to encourage the establishment of automobile railroads in Iowa has been passed by the house. The bill declares that any railroad operated over any track other than steel or iron shall be known as an "automobile railway," and confers on such a road all the rights and privileges now enjoyed by other lines of transportation in Iowa.—The house has also passed by a unanimous vote a bill requiring street railways to permit interurbans to use their tracks and terminal facilities and requiring them to furnish power for the interurbans.

Nebraska.—The senate has passed a bill which requires city railway companies to permit interurban railways to use their tracks, terminals and power facilities.—The bill to permit city railway companies to own interurbans has been indefinitely postponed by the house, at the instance of the sponsors of the bill, because of the large number of restrictions added by amendments.

Pennsylvania.—Senator Brown of Harrisburg has introduced a

bill permitting street railway companies to enter into contracts for the sale of electric power to motor truck, express or parcel carrying companies under such terms as may be agreed upon. The object of the bill is to enable the Philadelphia Rapid Transit Company to enter into a contract with a company which is being organized to run automobile express wagons on its tracks.—The McNicol-Fahey bill to permit the city of Philadelphia to enter into a contract with the Philadelphia Rapid Transit Company has passed both houses and has been sent to the governor. The bill provides: "That it shall and may be lawful for any city, borough or township of the one part and any street passenger railway company, surface, elevated or underground or motor power company leasing and operating the franchises and property of such company within the limits of such cities, boroughs or townships of the other part, to enter into contracts with each other affecting, fixing and regulating the franchises, powers, duties and liabilities of such companies and the regulations and respective rights of the contracting parties. Such contracts may inter alia provide for payments by the companies to the local authorities in lieu of the performance of certain duties or the payment of license fees or charges imposed in favor of such city, borough or township by the charters of the respective companies or by any general law or ordinance for the appointment by the local authorities of a certain number of persons to act as directors of such company, and further may provide for the ultimate acquisition by the local authorities upon terms mutually satisfactory of the leaseholds, property and franchises of the contracting parties."

Wisconsin.—The legislature has ordered engrossed the Elver bill limiting the hours of service for street railway employes to 10 hours a day within a period of 12 consecutive hours.—A bill now before the house places the building of new electric lines or extensions of present lines under the control of the state railway commission. The bill also provides that no steam or electric line shall be built parallel to an existing line within a distance of 30 miles, unless the commission decides that the proposed line is necessary and would prove a profitable investment. The bill also requires all corporations operating in the state to report to the commission on request full lists of their stockholders and the amount of stock held by each.

Rapid Transit Affairs in New York.

The rapid transit commission on April 2 began advertising for bids for the construction and operation of the Lexington avenue, the Seventh avenue, the Eighth avenue and the Jerome avenue subway routes. Bids will be opened on Thursday, April 25, and the board will award the contract within 15 days thereafter. The subways are to be built by sections; in the case of Lexington avenue route there will be 11 sections to bid for. The operating company will have a contract for 20 years, with the privilege of renewal for 20 years more.

The board of estimate on March 28 approved of the form of contract for the Seventh and Eighth avenue routes.

President Shonts and other officials of the Interborough-Metropolitan company held a conference on March 26 with Corporation Counsel Ellison and representatives of various West Side organizations, at which it was agreed that the company would remove its unused tracks on Amsterdam avenue, from Seventy-second to One Hundred and Twenty-ninth streets, and on other streets. A bill is to be introduced in the legislature providing for the removal of the tracks without invalidating the company's franchises.

"The result of the agreement reached at the conference," said Mr. Shonts, "will be the clearing of Amsterdam avenue and other thoroughfares of surplus and discontinued car tracks. All that I asked for was that our franchises should not be taken from us because of the tearing up of the rails. There will be nothing in the bill validating any franchises which may be defective. It will merely provide that if in the future the needs of traffic should require the operation of the roads now out of service the company shall be allowed to relay the tracks under conditions which will be acceptable to the board of estimate or the rapid transit commission, or, if the public utilities bill passes, to the commission which will be appointed under that act.

"It is apparent that we could not consent to take up the tracks without some protection to our interests. For instance, securities have been issued on the strength of the franchises held in the case of these lines, and while we will go on paying the interest on the securities, it would be unfair to the stockholders to agree to any canceling of the franchises. Again, in the case of some other properties, we have merely leased them, and it is not in our power to consent to an extermination of those roads."

There are about 25 miles of disused car tracks in the city, most of them being old horse car lines in the lower part of the city, over which one car a day is run in order to keep the franchises alive.

E. W. Winter, president of the Brooklyn Rapid Transit Company, has refused to grant the petition of patrons of the Brighton Beach division of the Kings County Elevated for transfers to the Montague street cable road, running from Court street to Wall street ferry. Mr. Winter said: "The company has so increased its transfer system that in 1907 it will issue 84 per cent more transfers than it did in 1906. To grant this request for transfers would complicate matters too seriously."

The New York State Board of Tax Commissioners on March 29 reported the special franchise tax assessments for 1907. The assessments on New York city corporations have been increased from \$361,479,300 to \$466,855,000, an increase of \$105,375,700 over 1906. The assessment on the Brooklyn Rapid Transit Company is \$54,645,000, an increase of \$16,166,000; on the Manhattan Elevated Railway the assessment is \$74,900,000, an increase of \$12,200,000; on the Metropolitan Street Railway, \$24,600,000, an increase of \$5,797,000, and on the Interborough Rapid Transit Company, \$24,000,000, an increase of \$6,000,000.

St. Louis Municipal Assembly Defeats 3-Cent Fare Bill.—A bill providing for 3-cent street car fares in St. Louis was defeated in the last hours of the session of the municipal assembly on March 28, after it had been reported unfavorably by the railroad committee, by being referred back to the committee.

Threatens to Forfeit Franchise.—The city council of Kalamazoo, Mich., on March 26 passed a resolution demanding that the Michigan United Railways Company pay within 10 days the sum of \$15,921, said to be due the city for paving between the company's tracks. The resolution states that unless the money is paid within the time stated the company's franchise privileges will be declared forfeited and the city will take possession of the streets and of the company's property as security. The company has offered to pay \$10,000 at once and the rest this summer.

Strike on Michigan United Railways.—The motormen and conductors employed by the Michigan United Railways Company, which operates the city systems of Lansing, Kalamazoo and Battle Creek, Mich., as well as an interurban system connecting those and other cities, struck on the morning of April 3. About 200 men are affected. Several conferences between the men and the officials were held on April 2. The company offered an increase of one cent an hour but the men refused to accept it, demanding 23 cents an hour on the city lines and 25 cents on the interurban lines. They now receive 18, 19 and 20 cents an hour.

Strike at Montgomery, Ala.—The street car service in Montgomery, Ala., has been tied up for several days. On March 27, 125 employes of the Montgomery Traction Company went on a strike because of the refusal of the company to accede to the following demands: Recognition of the union; 9-hour day; straight day work with dinner and night relief; time for meals so that they will not be forced to eat on the cars; 20 cents an hour for men for the first six months' service, and after that 22 cents; 25 cents an hour for overtime for all over 12 hours' work. Some cars have been running during the day, but at night service has been entirely discontinued. The company is importing strike-breakers.

Will Prosecute Dishonest Conductors.—The Cleveland Electric Railway has had considerable trouble of late from embezzlement of fares by conductors, who have failed to register the proper number of fares. The practice in the past has been simply to discharge such offenders when caught, but the company last week had several conductors arrested, who had been caught "knocking down" fares, and will prosecute them. "The company proposes to stamp out dishonesty on the part of conductors if it is possible to do so," said G. L. Radcliffe, general superintendent, last night. "We have come to the conclusion that arrests backed by vigorous prosecution will remedy an evil that discharges do not seem to reach. Dishonest employes are to be prosecuted from now on. The practice of arresting conductors who hold out fares seems to be very successful in raising the standard of honesty on systems in a number of eastern cities. We will now see how it works in Cleveland."

Committee Advises Against Corporation Profit-Sharing Plan.—A commission named by the governor of New Jersey to investigate the feasibility of requiring public utility corporations to share their profits with municipalities in which they operate made its report on March 28. The commission advises against the adoption of such a plan and recommends the continuance of the present plan of requiring those companies to pay a franchise tax based on the gross receipts. Several reasons are given for advising against the profit-sharing plan, among which are the following: 1. That differences in capitalization of these companies would make a profit-sharing tax unequal. 2. That the revenue that would be received would be very small in most instances unless the dividends allowed to stockholders should be placed lower than the dividends received on most investments. 3. That except in populous centers it would discourage the acceptance of franchises under the present law limiting those franchises to 20 years.

President Tuttle on Electric Railways.—Replying to a request that the Boston & Maine Railroad equip its Stoneham branch for electric trains, President Lucius Tuttle has written to Charles H. Hoyt of Winchester as follows: "Your suggestion is an easy one to make, but in the present state of the art the substitution of electricity for steam power on general railroad service has not passed beyond the experimental stage, and is not yet sufficiently in use anywhere to demonstrate its practicability or feasibility. It is true that the New York Central and the New York New Haven & Hartford roads are completing plans for handling their passenger traffic to and from the Grand Central station in New York by electrically equipped trains, but as there is no freight traffic handled by either of these roads to and from the Grand Central station, the problem is not with them as difficult as it would be if they were undertaking to provide electric power for handling all the road's traffic, both passenger and freight. In so far as the matter has yet been worked out the details of operating expenses are necessarily incomplete, but there is good reason for the belief that because of electric operation—as compared with that of steam locomotives—it is very much greater, but how much no one can tell. Again, in the past 15 years the introduction of rapid transit by electric railways, which give greater convenience to suburban travel than can possibly be furnished by steam railroads, has so diminished the volume of steam railroad suburban traffic that it is upon the whole now becoming a question whether there is any profit at all derivable by the steam railroads from the carrying of short distance suburban travel at the existing low rates charged therefor, and not only the Boston & Maine, but railroads carrying similar traffic everywhere, are fast coming to the belief that the surrender of this kind of travel to the street railways and interurban trolley lines will be from every point of view the best solution of the problem."

Construction News

FRANCHISES.

Atlanta, Ga.—The Georgia Railway & Electric Company has secured the consent of the council to lay a double track from the corner of Berne street and South boulevard, along South boulevard to Confederate avenue and on Confederate avenue to Little Switzerland, where a new park now is being built.

Brazil, Ind.—The Indianapolis & Western Traction Company has made application for permission to enter Brazil with its interurban line.

Brunswick, Ga.—F. D. M. Strachan, Brunswick, Ga., and associates have been granted a 40-year franchise for an electric railway system and lighting plant. It is stated that in return for the franchise the grantees have agreed by contract to purchase and turn over to the city the present waterworks plant at an arbitrated value, the city to pay for the plant at the rate of \$10,000 a year.

Fairfield, Ia.—A franchise has been granted by the city council to the Iowa-Missouri Traction & Power Company to operate its line in this city, the exact route to be determined later.

Jamestown, N. Y.—The Jamestown Street Railway Company has applied for permission to run its Lakewood line under the Erie Railroad's tracks near the Crystal ice houses. The crossing will be 17 feet high and 30 feet wide. The application will be acted upon by the railroad commissioners at Albany, N. Y., on April 10.

Kansas City, Mo.—An application for the extension of its Prospect avenue line from Thirty-first street to the Swope Park line, a distance of two miles, has been made by the Metropolitan Street Railway Company. Action has been referred to the committee on streets, alleys and grades.

Kewanee, Ill.—The franchise of the Galesburg & Kewanee Electric Railway, which was declared invalid some time ago by the Wethersfield village board, because the company had not completed its line according to the terms of the original franchise, has been reinstated by action of the board on March 26.

Lincoln, Ill.—The Springfield & Northeastern Traction Company, a line associated with the Illinois Traction System, which will connect Springfield, Bloomington and Mackinaw, has been granted a 50-year franchise for the right to build its line through Lincoln on Chicago street.

Marengo, Ia.—The Marengo & Midland Interurban Railway has been granted a franchise for the use of several streets and alleys in this city.

Milwaukee, Wis.—At a meeting of the council committees on railroads and judiciary favorable action was taken on the application of the Chicago & Milwaukee Electric Railroad to operate its cars on Wells street from Fifth to Second streets, provided that other urban and interurban lines be allowed the use of the tracks upon payment of a reasonable rate for such privileges.

Norwalk, O.—A franchise has been granted by the city council to the Cleveland & Indianapolis Interurban Railway, which will build a line from this city to Bluffton, Ind.

Reading, O.—The Cincinnati Reading & Middletown Street Railway, which is building a line from Cincinnati by way of Saaron to Middletown, O., has applied for a franchise to enter Reading with its interurban line. Guy M. Mallon of Cincinnati is interested.

Roanoke, Va.—The ordinance recently introduced for the extension of the Roanoke Railway & Electric Company's line on Genesee street from Thirty-ninth to Forty-third streets, has been approved.

St. Louis, Mo.—The bill authorizing the St. Louis Electric Terminal Railway Company, owned by the Illinois Traction Company, to lay its tracks on streets in North St. Louis, has been passed by the house of delegates. A charter already has been granted by congress for a bridge across the Mississippi river at Salisbury street and it is stated that with the signing of the franchise bill, work will be started on the line in St. Louis and on the bridge. A large passenger station will be erected at Eleventh street and Lucas avenue. Freight terminals will be erected on the 24 acres of ground purchased by the company in North St. Louis. The St. Louis line is intended to be the terminus of the extensive system of the McKinley interurban lines in Illinois.

Silver Creek, N. Y.—The Buffalo & Lake Erie Traction Company, which is building an interurban line between Buffalo and Erie, has applied for a franchise to lay its tracks through Silver Creek. J. C. Calisch, Buffalo, general manager.

Vincennes, Ind.—The Vincennes Washington & Eastern Traction Company, which is building a line from Vincennes to Loggootee, Ind., has been granted a franchise for its line in this city. It is stated that work will be commenced at once and that the company guarantees to have trains running inside of one year. W. H. Schott of Chicago, president.

Waterloo, Ind.—The Toledo & Chicago Interurban Railway has been granted a franchise to operate its interurban line in this city.

Wheeling (W. Va.) Traction Company.—An ordinance now

before the city council provides that this company may construct a second track and make other improvements. B. W. Peterson, vice-president.

York, Pa.—The application of the York Street Railway for a franchise to operate its line in several streets of the city was denied by the mayor upon the company's refusal to pay 3 per cent of one-seventh of the gross receipts of its interurban business to the city.

Youngstown, O.—A franchise has been granted to the New Castle & New Wilmington Electric Railway to operate its line in this city. This company, which is building an interurban line between New Wilmington, O., and New Castle, Pa., already has secured the site for a terminal at New Castle.

RECENT INCORPORATIONS.

East St. Louis Southeastern Railroad.—Incorporated to build an electric railway between East St. Louis, Freeburg and Mascoutah, Ill. Capital stock, \$2,500. Incorporators: L. C. Haynes, T. W. Gregory, G. C. Pierce, J. A. Farmer and Fred H. Kruger, all connected with the East St. Louis & Suburban Railway.

Ellwood City & Hazel-Dell Railway.—Incorporated in Pennsylvania to build four miles of electric line from Ellwood City, Lawrence township, to other points in the county. Capital stock, \$25,000. C. J. D. Strohecker, Zellenople, Pa., is president.

Greensburg & Western Railway.—Incorporated in Pennsylvania to build and operate an electric railway from Greensburg to Irwin, Pa., about 10 miles. Capital stock, \$60,000. William S. Kuhn, Pittsburg, is president.

Kansas Traction Company.—Incorporated in Kansas to build and operate a standard gauge road, either steam or electric, from Coffeyville to Kansas City, Mo., by way of Topeka, about 260 miles. Capital stock, \$25,000. Incorporators: F. B. Shirley, E. C. Kiddoo, S. D. Frazier and W. C. Hall, all of Coffeyville, Kan.

Lake Erie & Youngstown Railroad.—Incorporated in Ohio to build a gasoline motor line from Conneaut south through Pierpont and Andover, O. Gasoline motor cars only will be used and it is stated that work on laying out the route and securing private right of way will be started at once. Much of the property already has been secured. Capital stock, \$10,000. Incorporators: G. M. Brown, Wilbur F. Stanley, George J. Chapman, Conneaut; Frank J. Cheney, Toledo; John H. Ruhlman, Youngstown; William Ruhlman, North Lima; A. W. Jones, Burg Hill.

Lawrence Electric Transportation Company.—Incorporated in Kansas to build and operate a trackless trolley line in Lawrence. Large automobiles will be used, taking power from an overhead trolley wire. The company has a franchise to operate in Lawrence, and the work of constructing the line will be begun at once. The main line of the system will extend from the Santa Fe depot to the Haskell Institute. A branch line will also be run to the Kansas University. Lawrence has no street cars at present. Capital stock, \$200,000. Incorporators: O. W. Murphy, J. A. Hamlin, W. W. Cleland, F. W. Blackmar, R. M. Ridgeway, W. E. Pitts and Harry Dick, all of Lawrence.

Lincoln (Ill.) Railway & Light Company.—Incorporated in Illinois to operate street railways and light, heat and power plants. Capital stock, \$2,500. Incorporators: Charles R. Scott, M. O. Payne and Thomas Marshall.

Milwaukee & North Shore Railway.—Incorporated in Wisconsin to build and operate an electric interurban line from Milwaukee to Manitowoc, Sheboygan and Fond du Lac, Wis., with headquarters in Milwaukee. William C. Stone of Manitowoc is one of the incorporators.

Missoula-Bitter Root Traction Company.—Incorporated in Montana to build a proposed line from Missoula to Hamilton, Mont. Capital stock, \$40,000, about half of which has been subscribed. Incorporators: J. L. Humble, Corvallis; E. O. Lewis, Stevensville; C. M. Allen, Lo Lo; J. P. Shannon, Hamilton; and P. M. Reilly, Missoula, Mont.

Southern Wisconsin Light & Traction Company.—Incorporated in Wisconsin to operate an electric line in Dane and Rock counties which will be part of an interurban line from Madison to Janesville, Wis. The articles provide for a \$2,000,000 bond issue. F. W. Montgomery, 128 Broadway, New York, is one of the incorporators.

Toledo Wabash & St. Louis Railroad.—Incorporated in Maine to build an electric railway for freight and passenger service from Toledo, O., to St. Louis, Mo., through Defiance, O., and Ft. Wayne, Muncie and Terre Haute, Ind. Present plans include only the construction of the first section from Toledo to Defiance, which will be built under the name of the Toledo & Defiance Railway. Capital stock, \$6,000,000. There are to be no bonds or preferred stock. Officers: Clarence D. Whitney, president and general manager; George C. Metzger, vice-president; J. P. McAfee, treasurer; S. L. McAfee, secretary; all of Toledo. The Riggs & Sherman Company of Toledo has been engaged as engineers and has made the preliminary survey for the first section. President Whitney is quoted as saying that arrangements have been made with Burr Brothers of New York to finance the first section and that construction will begin at an early date. The road will be built on a 1½ per cent grade and 70-pound rails will be used.

Virden & Taylorville Traction Company.—Incorporated in Illinois to construct an electric line from Virden, Macoupin county, to Taylorville, Christian county. This will be the first section of a projected line which will ultimately extend from Quincy, Ill., to Terre Haute, Ind., via Hannibal, Winchester, Roodhouse, Virden,

Taylorville, Findlay, Windsor, Toledo, Casey, Martinsville and Marshall, nearly 300 miles. The line will be built for passenger and freight traffic and will open up some of the best coal and oil districts in Illinois, which at present are without such service. Branch lines will run to Carrollton, Springfield, Sullivan and Shelbyville. Capital stock, \$2,500. Incorporators: H. C. Simon, John Colderm, W. E. Allenson, T. B. Teney, Virden; and E. E. Barclay, Springfield, Ill.

TRACK AND ROADWAY.

Abilene, Tex.—It is stated that local capitalists have arranged to finance the proposed street railway line for this city and that contracts will be let in a short time for the first 3½ miles.

Accomac Traction & Power Company.—This company has been organized to build an electric railway from Onancock to Accomac Court House via Tasley, Va., with a possible extension to Battle Point on Matomkin Bay.

Anderson Traction Company.—Cars are now being operated over the first five miles of the line from Anderson to Belton, S. C., and as soon as the trestle at Broadway creek is completed, as it is expected to be some time this month, cars will run over the entire line.

Asheville, N. C.—Surveys are now being made for an electric line from Asheville to Montreat, N. C., and it is stated that construction will begin this spring.

Buffalo Lockport & Rochester Electric Railway.—It is stated that tracklaying will begin within a week in the town of Gates, N. Y. The line when completed will connect Buffalo, Lockport and Rochester, N. Y. J. G. White & Co. of New York are the contractors.

Calgary, Alta.—The public works committee has reported in favor of building a municipal street railway at a cost of \$250,000.

Cheyenne, Wyo.—Negotiations are in progress for an electric street railway for Cheyenne and Fort Russell to be installed this summer. Work is to be commenced on the power plant and tracks not later than May 1. The line will run from South Cheyenne, through the city to Lake Minnehaha, to Fort Russell, and later to Frontier Park, Sloan's Lake and other resorts.

Chicago & Western Indiana Traction Company.—This company has filed notice with the secretary of state of Indiana that it will increase its capital stock to \$600,000. This company proposes to build a line connecting four of the principal college towns of Indiana—Lafayette, Crawfordsville, Greencastle and Bloomington—and is called the "Educational Route." Edward F. Barrows, secretary and general manager, 610 Traction and Terminal building, Indianapolis, announces that work will begin on the line in a short time.

Columbus (O.) Urbana & Western Railway.—Control of this property has been sold to capitalists, who will organize the Columbus & Northern Traction Company with \$1,400,000 capital stock, of which \$1,000,000 will be common stock and \$400,000 preferred stock. The new owners will extend the line in a northwesterly direction, either to Lima, by way of Dublin, or to Bellefontaine, by way of Hilliards. The new owners of the property are connected with the Columbus Magnetic Springs & Northern Railway, which was incorporated last October to take over the electric line extending from Delaware to Magnetic Springs, and to extend its lines.

Consolidated Railway (New Haven, Conn.)—President C. S. Mellen has announced that this company is ready to build the electric line from Hartford to Middletown, Conn., which has been petitioned for by several towns along the proposed line. Plans have also been announced for building lines from Great Barrington, Conn., to South Egremont and Canaan, Mass.

Findlay-Marion Railway & Light Company.—This company, which proposes to build an electric railway from Findlay to Marion, O., 47 miles, has organized by electing the following officers: President, R. P. Hankey of Detroit; secretary and treasurer, G. W. Meeker of Columbus; general counsel, E. W. Tompkins of Columbus. The right of way has been secured and construction is to begin this summer.

Ft. Dodge Des Moines & Southern Electric Railway.—Manager J. L. Blake, Des Moines, Ia., has let a contract to George M. Kepner of Des Moines for a part of the grading and tracklaying. Mr. Kepner agrees to complete the grading between Ames and Kelly by June 1. Tracklaying is to begin at once.

Ft. Wayne & Wabash Valley Traction Company.—This company has put a large force of men to work straightening the lines between Ft. Wayne and Logansport, where numerous curves now exist. They are also replacing decayed ties and rebalancing the road in many places where the recent floods washed the ballast away.

Illinois Traction Company.—Two parties of surveyors have started from a point about 10 miles south of Mackinaw and will work in both directions toward Mackinaw and toward Lincoln, to locate the line which is to connect the line between Lincoln and East St. Louis with the line from Bloomington to Peoria, and form a part of the proposed through line to Chicago. Much of the right of way has been promised and it is the intention to build the line this summer. The contract for grading the line from Springfield to Jacksonville, 40 miles, and the Springfield belt line has been awarded to Tuttle Brothers of Decatur, the firm that graded the Bloomington-Peoria line and that now has the contract for the Champaign-Decatur line.—It is now announced

that the Bloomington-Peoria line will be opened for traffic on April 15. This line has been in operation between Bloomington and Danvers, since January 1.—Plans have been prepared for the expenditure of about \$5,000,000 in and near St. Louis if the franchise bill recently passed by the St. Louis city council is signed by the mayor. Plans have been prepared by Ralph Modjeska, consulting engineer, for a bridge across the Mississippi river from near Salisbury street, St. Louis, to Venice. The bridge will be 2,365 feet long, of five spans, and will cost about \$2,500,000. The other work planned includes the lines into St. Louis and the erection of passenger and freight terminals, for which land has already been purchased.

Indiana Columbus & Eastern Traction Company.—Contracts have been awarded for the construction of 13 concrete bridges to replace wooden structures along the line of the Columbus & Lake Michigan steam road, in operation between Defiance and Lima, recently purchased by the Schoepf syndicate. Many improvements are about to be made on the line preparatory to its electrification. Contracts have been let for the extension from Lima to Bellefontaine, and work will commence on April 1. This will give a direct line from Defiance to Columbus via Lima and Bellefontaine.

Iowa-Missouri Traction & Power Company.—This company has filed a trust deed to the Knickerbocker Trust Company of New York to secure an issue of \$1,000,000 20-year 5 per cent bonds, to be used in building the line from Fairfield, Ia., to Memphis, Mo. J. W. Andrews of Keosauqua, Ia., is the promoter and chief engineer.

Jackson (Miss.) Electric Railway Light & Power Company.—This company expects to expend about \$200,000 in extensions and improvements this year and is only awaiting the arrival of rails to begin work. A short time since the company announced its intention to build a line on North Jefferson street, and plans are now being considered for another extension in the western suburbs. Instead of extending another line to Duttoville, the plan is now to build south on Gallatin street to Lynch and west on Lynch to the several new subdivisions being opened in the vicinity of Jackson College and Campbell College. Manager F. G. Proutt is confident that he will have the construction work resumed during the early summer, and at least four months will be required for the completion of the extensions, including the double-tracking on North State and West Capitol.

Maynard, Mass.—The Lowell Acton & Maynard Street Railway is reported to have announced that 11 miles of track will be constructed this season.

Metropolitan Street Railway.—This company is relaying its tracks on Grand avenue, Kansas City, with 143-pound rails.

Milwaukee & North Shore Railway.—This company has been organized by W. C. Stone of Watertown, Wis., and others to construct and operate an electric railway from Milwaukee to Fond du Lac by way of Manitowoc and Sheboygan.

Monticello, Ky.—It is reported that an interurban line is to be built from Tateville to Monticello, Ky.

New Jersey & Pennsylvania Traction Company.—Surveys for the line from Princeton to Somerville, N. J., 18 miles, have been completed. Charles Serfass of Yardley, Pa., is chief engineer.

New Roads, La.—It is reported that a movement is now on foot to build an electric railway 32 miles long from New Roads to Glynn, La., along False river, for both freight and passenger service.

Northern Ohio Traction & Light Company.—The Wadsworth extension of the Akron-Barberton line has been completed and work trains have been run over it. Regular passenger service will probably be started on April 6 or 8. Manager Charles Currie, Akron, O., is quoted as saying that surveyors would soon resume the work of locating the line of the proposed extension from Wadsworth to Seville. Three alternate routes are to be surveyed, but the line is not to be built this year.

Northern Texas Traction Company.—This company has let a contract for the poles to be used on the line from Ft. Worth to Cleburne, Tex.

Omaha & Council Bluffs Street Railway.—A large shipment of rails and ties has been received and work is to be rushed on a large amount of tracklaying in Omaha. Work has already started on the Twenty-fourth street line from Vinton street to Leavenworth. The double-tracking on the Bellevue line will be extended north and south, and the Lake street line will be double-tracked from Twenty-fourth to Thirtieth streets. The Ames avenue line will also be extended, and when the above work is completed other extensions will be made as fast as materials can be secured.

Red Lion & Airville Traction Company.—The survey for this proposed line from Red Lion to Airville, Pa., has been completed. The route includes Springvale, entering on South Main street. A. K. Frey and others of York county, Pennsylvania, are interested.

Sandusky Fremont & Southern Railway.—This company, which is building a line from Sandusky to Fremont, O., for the Lake Shore Electric Railway, has let a contract for the construction between Vickery and Fremont to George Kinney of Fremont. According to the terms of the contract the line is to be completed by June 1. Tracklaying between Vickery and Sandusky is now progressing rapidly.

Southwestern Wisconsin Railway.—F. W. Hild of Chicago, who has been promoting a line from Platteville, Wis., to Dubuque, Ia., has given up his offices in Dubuque, and it is stated has abandoned

the project on account of inability to secure necessary franchises.

Tacoma, Wash.—It is reported that the Dupont Powder Company, together with eastern capitalists, has agreed to finance the line from Tacoma to Seattle, which is being promoted by Merle J. Wightman of Tacoma.

Tri-City Railway Company, Davenport, Iowa.—It is announced that this company is rapidly extending its double track on Brady street from Central park to the city limits. The work is being done in two sections. As soon as the Brady street section is completed the track from Locust street to Central park will be laid. The work on the new substation is progressing rapidly and the rotary converters will be installed within the next 10 days.

Utah Light & Railway Company.—A contract for \$50,000 worth of frogs and switches has been let to the William Wharton, Jr., Company of Philadelphia, including the special work for the crossing at Main and South streets, where two double-track lines intersect. As soon as possible this spring work will be started on an extension to be built from the intersection of Fifth North and Second West streets to Fourth West street, thence north on that street to the county road leading to Bountiful, and thence through North Salt Lake to the Oregon Short Line gravel pits. The line will be built primarily for carrying gravel for the reconstruction of the company's downtown lines.

Washington Frederick & Gettysburg Electric Railway.—This company has awarded to Charles Klipp the contract for grading its line on Fourth street, Frederick, Md., along the entire length of which the Frederick end of its line to Thurmont will run. The roadbed has been graded a distance of about three miles out of Frederick, and tracklaying will begin as soon as the grading on Fourth street is completed, so that construction materials for the balance of the line may be hauled out on the company's own cars. A shipment of \$20,000 worth of rails is expected to arrive on April 20.

White Salmon, Wash.—It is reported that a movement is on foot to build an electric railway from White Salmon to Binger, Wash.

Wichita Railroad & Light Company.—The bridge across the Arkansas river near First street in Wichita, Kan., is under construction and is expected to be completed so that cars may run over it some time in May, when Wonderland Park, with which the bridge will connect, is opened.

POWER HOUSES AND SUBSTATIONS.

Alabama City Gadsden & Attalla Railway Company.—It is announced that the new power house of this company is now practically completed and was put in operation on March 25, 1907. The plant, as announced in a previous issue, was tested some time ago, but was not put into regular operation. The power house is of brick, steel and reinforced concrete work, equipped with the latest machinery, at a total cost of about \$125,000. The contract and material for a \$10,000 pumping station and 3,600 feet of 14-inch pipe line have been let, but the work is not yet completed.

Chester Traction Company, Chester, Pa.—Two 300-horsepower Babcock & Wilcox boilers have just been installed in the Penn street power house, at right angles with the original installation of Berry boilers, which have been in use in the plant for some time and will still be continued in service. The installation also includes a smokestack 117 feet high. The boilers are supported on foundations resting on concrete piles driven 28 feet on solid rock. It is rumored that a line will be constructed from Chester to Rockdale, in which case it has been found that it will be necessary to install a 1,000-horsepower engine and generator to furnish the extra power required by this line.

Ft. Wayne & Wabash Valley Traction Company.—During a severe electrical storm on the evening of March 26 the generators in the Ft. Wayne and Huntington power houses were burned out, and the power for operating the lights and electric railway is now transmitted from Lima, O., Bluffton, Ind., and from the Logansport power house of the Indiana Union Traction Company.

Indianapolis & Northwestern Traction Company.—This company is making an improvement to the water cooling tower at its Lebanon power house. The tower has been completely inclosed at the sides and ends and in the sides have been placed four 8-foot draft fans, two on each side. These fans will be operated by a 50-horsepower engine.

Northern Colorado Power Company.—This company is building a new substation about half a mile southwest of the Agricultural college, which will be used to furnish power and light for the electric cars in Ft. Collins. The workmen are progressing rapidly with the line from Longmont to Ft. Collins, and it is expected that with favorable weather the line will be completed within a few days. The cost of the new substation will be about \$15,000.

Northern Ohio Traction & Light Company.—The work on the new Barberton power house is progressing rapidly and the mechanical stokers which are being installed are now practically completed and will soon be put in operation. It is stated that the operation of those which are completed has materially reduced the smoke made by the plant. The boilers in the old Barberton power house have been removed and will be installed at the Cuyahoga power house. These boilers will be put in operation as soon as the new stack which is being built is completed. The old plant at Barberton will simply be used as a rotary converter substation, the old generating machinery having been removed.

Personal Mention

Mr. Frank J. Doyle has been appointed master mechanic of the Schenectady (N. Y.) Railway, succeeding Mr. L. L. Smith, resigned.

Mr. S. L. Vaughan, auditor of the Grand Rapids Grand Haven & Muskegon Railway, Grand Rapids, Mich., has been appointed traffic manager.

Mr. L. R. Gaw has resigned as master mechanic of the Toledo & Indiana Railway to accept a similar position with the Ohio Central Traction Company at Gallon, O.

Mr. R. R. Ray, claim agent of the Northern Indiana Railway at South Bend, Ind., has been appointed superintendent of transportation of the Southern Michigan Railway, South Bend.

Mr. J. A. Killingsworth has been appointed manager of the St. Thomas Street Railway, which is owned and operated by the municipality of St. Thomas, Ont., succeeding Mr. Charles Johns, resigned.

Mr. Alexander K. Cuthbert has been appointed agent of the express department of the United Traction Company, Albany, N. Y., succeeding Mr. Charles H. Armatage, who has been appointed traffic manager.

Mr. W. J. Krotz, superintendent of the local lines of the Illinois Traction Company at Jacksonville, Ill., has been transferred to a similar position at Granite City. He is succeeded at Jacksonville by Mr. A. Hopkins.

Mr. James Bowlsh has been appointed superintendent of the Coeur d'Alene & Spokane division of the Spokane & Inland Empire Railroad, with headquarters at Coeur d'Alene, Idaho. Mr. Bowdish was formerly a trainmaster on the Northern Pacific Railway.

Mr. L. L. Smith, master mechanic of the Schenectady (N. Y.) Railway, has resigned, effective April 10, to accept a similar position with the Chicago & Milwaukee Electric Railroad with headquarters at Highwood, Ill. Mr. Smith has been with the Schenectady Railway since December, 1905.

Mr. Clarence Buckingham has resigned as president of the Northwestern Elevated Railroad of Chicago, and has been elected vice-president, succeeding Mr. Walter B. Smith, resigned. Mr. Smith and Mr. Ledyard Blair have resigned as directors and are succeeded by Mr. Mason B. Starring and Mr. Samuel McRoberts.

Mr. E. J. Davis, heretofore assistant treasurer of the Terre Haute Traction & Light Company, Terre Haute, Ind., has been appointed auditor of that company, which is now known as the Terre Haute division of the Terre Haute Indianapolis & Eastern Traction Company. Mr. C. T. Mordock will be retained as manager.

Mr. Mason B. Starring, vice-president and general manager of the Chicago City Railway Company, has been elected president of the Northwestern Elevated Railroad of Chicago, succeeding Mr. Clarence Buckingham. Mr. Starring was born in Chicago on May 8, 1859, and received his education in the public schools of Chicago. From 1878 to 1885 he was connected with the operating departments of the Burlington and the Pennsylvania lines, subsequently engaging in a general merchandise and banking business in Iowa. In 1888 he became connected with the Chicago City Railway Company as clerk in the office of Mr. C. B. Holmes, president and superintendent, where he remained for three years. Upon the appointment of Judge J. S. Grinnell as general counsel for the company Mr. Starring was placed in charge of the claim department. At this time he resumed the study of law, was admitted to



Mason B. Starring.

practice in the courts of Illinois in February, 1894, and soon after was appointed assistant general counsel of the company, which position he held in connection with his duties as manager of the claim department until his appointment as general solicitor in 1904. On May 12 of that year he succeeded Capt. Robert McCulloch as general manager of the company and in March, 1906, was elected vice-president in addition to his duties as general manager. Mr. Starring's two years of continuous service in the management of an important street railway organization, and his close connection with its operating managers through several successive administrations, should qualify him to manage successfully the affairs of the property of which he has just been elected president.

Mr. C. M. Bange, master mechanic of the Detroit Jackson & Chicago Railway, formerly the Detroit Ypsilanti Ann Arbor & Jackson Railway, has been appointed master mechanic and super-

intendent of motive power of the Northern Ohio Traction & Light Company at Canton, O., succeeding Mr. William E. Ralston, resigned.

Mr. John G. Carrol has been appointed general foreman of the Paterson, South Orange, Dunnellen and Milltown shops of the Public Service Corporation of New Jersey, to succeed Mr. I. R. Nelson, who has resigned to engage in the electrical contracting business. The shop foremen in districts 2 and 3 gave Mr. Nelson a farewell banquet at Newark on March 26.

Mr. Henry C. Page, general manager of the Springfield (Mass.) Street Railway Company, whose election as president of the New England Street Railway Club at its annual meeting on March 28 was announced in last week's issue of the Electric Railway Review, is about 43 years of age. He began his street railway career in August, 1883, as conductor on the old horse-car line of the Lynn & Boston Street Railway, running between Chelsea and Boston, Mass., and after seven years of service with this company, during which time successive promotions had placed him in charge of the schedule arrangement and car dispatching system of the line, he accepted a position with the Newburyport Street Railway Company as superintendent. During his two years' successful management of this road electricity was substituted for horsepower and the line otherwise improved. In October, 1892, he again entered the service of the Lynn & Boston Company. This company previously had taken over the Naumkeag Street Railway and Mr. Page remained as superintendent of its Salem division for nearly two years. In July, 1900, he was appointed general superintendent of the entire Boston & Northern system, comprising 450 miles of track. In 1903 he severed his connection with this company to become general manager of the Berkshire Street Railway Company at Pittsfield, Mass., and later, when this road and the Springfield Street Railway Company's lines were taken over by the Consolidated Railway Company in 1905, Mr. Page, on June 13 of that year, was transferred to Springfield as general manager of the latter company, which position he now holds.



Henry C. Page.

Mr. Francis H. Dewey, president of the Worcester Consolidated Street Railway, has been elected president of the Worcester & Southbridge and Worcester & Blackstone Valley Street Railway companies, controlled by the New York New Haven & Hartford Railroad, succeeding Mr. Charles S. Mellen, resigned. The Worcester & Webster and Webster & Dudley Street Railways have been leased to the Worcester & Southbridge company and will hereafter be operated from Worcester in connection with the Worcester Consolidated Company. Mr. E. G. Connette, general manager of the Worcester Consolidated, will be general manager of the entire property. Mr. A. B. Potter, now superintendent of the Worcester & Webster, Worcester & Southbridge and Webster & Dudley, has been transferred to the Stamford (Conn.) lines of the New Haven's electric system, and Mr. J. W. Anderson, superintendent of the Worcester & Blackstone Valley, has been appointed superintendent of the enlarged Worcester & Southbridge system.

Obituary.

Edward C. Nichols, vice-president of the South Side Elevated Railroad, died at his home in Maywood, Ill., on March 28 of pneumonia, after an illness of two weeks. Mr. Nichols was born at Maywood, Ill., in 1870, and attended the public schools of that village until he entered the University of Michigan, where he graduated in 1892. He later entered the law department of the University of Chicago and after finishing his course there in 1894 he entered the service of the South Side Elevated Railroad as attorney. He held this position for 12 years and at the annual meeting of the company on January 31 of this year was made vice-president, succeeding Mr. T. J. Lefens, resigned.

Henry W. Goode, president of the Portland (Ore.) Railway Light & Power Company and its several subsidiary companies, died at Atlantic City, N. J., on March 31, aged 46 years. For many years he had been prominently identified with the electric traction, light and water-power interests of the country. At one time he was district director of the Westinghouse Electric & Manufacturing Company of Pittsburg, subsequently becoming president and general manager of the Northwest General Electric Company. In 1892 he was elected president of the Portland General Electric Company and later, when the Portland Railway Light & Power Company was formed as a holding company for the Portland Railway, the Portland General Electric and the Oregon Water Power & Railway companies, Mr. Goode was chosen its president. He also was president and director-general of the Lewis and Clark exposition at Portland in 1905, and has the rather unusual distinction of having carried this extensive undertaking through to a successful finish with actual financial profit to stockholders.

Financial News

Amherst (Mass.) & Sunderland Railway Company.—A large majority of the stock of this company has been bought at \$45 a share, par value \$100, by the leading stockholders of the Holyoke (Mass.) Street Railway Company.

Atlantic City (N. J.) & Suburban Traction Company.—At a meeting of stockholders on March 30 the issue of \$300,000 preferred stock was authorized.

Cleveland Southwestern & Columbus, Cleveland.—The following have been elected officers of this company: President, F. T. Pomeroy; first vice-president, A. E. Akins; second vice-president, F. E. Myers; secretary, E. F. Schneider; treasurer, J. O. Wilson; assistant treasurer, H. B. Kavanaugh.

Grand Rapids (Mich.) Railway.—An additional \$465,000 first mortgage 5 per cent bonds has been listed on the New York stock exchange, making a total listed of \$3,157,000. The exchange has also authorized the listing of \$285,000 additional bonds prior to October 1, 1907. The total issue now outstanding has been applied as follows:

Retiring \$1,203,500 Consolidated Street Railway 5 per cent bonds, \$600,000 Street Railway Company of Grand Rapids 6 per cent bonds, \$50,000 North Park Street Railway Company 5 per cent bonds, a floating debt of \$177,283.35, and to provide \$150,000 in cash expended for a new power house, and remaining proceeds for various corporate purposes	\$2,500,000
For 85 per cent of the actual cost of extensions and permanent improvements, consisting of additional track and equipment, real estate, additional power house, machinery, etc.	715,000
Less retired and canceled under sinking fund provision	58,000

The income account of the Grand Rapids Railway for the year 1906, with comparisons, follows:

	1906.	1905.	1904.
Gross	\$910,027	\$820,469	\$760,776
Expenses	447,891	392,579	434,442
Net	\$462,136	\$427,890	\$326,334
Charges, taxes and sinking fund	205,460	196,260	189,345
Surplus	\$256,676	\$231,630	\$136,989
Preferred dividend	75,000	75,000	75,000
Balance	\$181,676	\$156,630	\$ 61,989
Common dividend	40,000	.....	.....
Surplus	\$141,676	.....	.....

Metropolitan West Side Elevated Railway, Chicago.—The annual report for the year ended on February 28, with a comparison, follows:

Earnings.			
	1907.	1906.	
Passenger	\$2,604,366	\$2,360,257	
Advertising	58,365	60,956	
Rent	15,909	14,419	
Miscellaneous	18,598	16,695	
Gross	\$2,697,238	\$2,452,327	
Operating Expenses.			
Structure	\$ 111,430	\$ 114,962	
Equipment	211,216	202,220	
Transportation	792,815	692,317	
General	78,425	76,691	
Loop	118,270	86,239	
Total	\$1,312,156	\$1,172,430	
Net	1,385,082	1,279,897	
Income.			
Net from operation	\$1,385,082	\$1,279,897	
Interest and exchange	3,224	4,998	
Rental of outside property	4,665	3,108	
Other income	1,767	4,530	
Gross income	\$1,394,738	\$1,292,533	
Interest first bonds	399,189	392,150	
Interest extension bonds	120,000	120,000	
Interest collateral loan	34,275	43,635	
Interest equipment notes	5,206	.....
Rental, Illinois Trust & Savings Bank, trustee	4,797	4,797	
Rental, Pennsylvania Company	11,900	11,900	
Rental, Union Consolidated Elevated Railroad	20,351	20,351	
Rental, Union Elevated Railroad (loop)	238,238	222,278	
Taxes, car license and special assessments	156,337	154,790	
Total charges	\$ 990,283	\$ 969,901	
Surplus	404,455	322,632	

Mt. Mansfield Electric Railroad, Stowe, Vt.—On application of the American Trust Company of Boston, trustee under the mortgage securing the 5 per cent bonds due in 1928, Charles E. Burt of Stowe has been appointed receiver of this company. The road extends from Waterbury to Stowe, a distance of 10 miles.

Philadelphia Rapid Transit Company.—The syndicate formed two years ago to underwrite the issue of \$10,000,000 first mortgage 50-year 4 per cent bonds of the Market Street Elevated Railroad Company, a subsidiary of the Philadelphia Rapid Transit, has been dissolved. It is stated that of the entire issue of bonds about two-thirds was sold.

Portland (Ore.) Railway Company.—An additional \$245,000 first refunding mortgage 5 per cent bonds, due in 1930, has been listed on the New York stock exchange, making a total listed of \$6,227,000. The new bonds were issued on account of the following expenditures aggregating \$307,044. Extension and recon-

struction of tracks, including special work, \$134,078; extension of overhead lines, \$12,242; new paving, \$42,091; new electric cars, trucks and motors, \$63,748; additional power house equipment, \$415; additional car shops, \$51,325; additional right of way, \$2,145. In the year ended December 31, 1906, the company's gross earnings were \$1,684,157. After deducting operating expenses the net earnings were \$709,457. Fixed charges and taxes were \$436,832, leaving a balance of \$272,624. After the payment of dividends of 5 per cent on the preferred stock and 2 per cent on the common stock, the surplus was \$65,625.

Milwaukee (Wis.) Electric Railway & Light Company.—The report for the year 1906 compares as follows:

	1906.	1905.	1904.
Gross railway	\$2,973,442	\$2,669,847	\$2,698,641
Lighting, etc.	549,995	556,688	520,054
Gross earnings	\$3,523,438	\$3,226,535	\$3,218,695
Operating expenses	1,734,587	1,551,463	1,592,413
Balance	\$1,788,851	\$1,675,072	\$1,626,282
Other income	155,791	122,161	66,653
Total	\$1,944,642	\$1,797,233	\$1,692,965

From the net earnings in 1906 of \$1,944,642 the sum of \$509,765 was paid for interest, \$211,406 for taxes, \$270,000 for preferred dividends (6 per cent), \$540,000 for common dividends (5 per cent) and \$352,344 was charged up for depreciation, leaving a surplus balance of \$161,127.

The Milwaukee Light, Heat & Traction Company, which is controlled by the Milwaukee Electric Railway & Light Company, reports the following earnings for 1906:

Gross railway	\$605,584
Gross electric light	96,638
Total gross	\$702,222
Expenses, railway and electric light	277,416

Net earnings \$424,806
Other income 30,826

Total	\$455,632
Taxes	\$ 42,133
Depreciation	56,178
Interest	226,194
Balance	\$130,917

Toledo & Western Railway Company, Toledo, O.—Control of this company has been sold to the Toledo Railways & Light Company. The Toledo & Western was acquired last year by a syndicate headed by J. R. Nutt. The road extends from Toledo to Pioneer, O., on the west and to Adrian, Mich., on the north. C. F. Franklin will continue as president and general manager. J. R. Nutt and Edward Kelley have retired as directors and are succeeded by Joseph S. Young and W. R. Hodge.

United Railways Investment Company.—This company, which owns all but directors' qualifying shares of the stock of the United Railroads of San Francisco, and 72.9 per cent of the outstanding stock of the Philadelphia Company of Pittsburg, has made its report for the year 1906. The combined income account of the two companies, as compared with that for the previous year, follows:

	1906.	1905.	Increase.
Gross earnings	\$24,533,603	\$24,229,062	\$304,541
Operating expenses and taxes	12,746,041	12,535,503	210,538
Net earnings	\$11,787,562	\$11,693,559	\$ 94,003
Fixed charges	6,202,315	5,884,100	318,215
Balance	\$ 5,585,247	\$ 5,809,459	*\$224,212
Sinking funds dividend on Philadelphia company preferred and other stocks	647,235	730,189	*\$82,954
Surplus	\$ 4,938,012	\$ 5,079,270	*\$141,258

*Decrease.
This statement includes the business done with the public by every company connected with the Philadelphia Company, but does not include intercompany business, except small transactions, which, if eliminated, would not affect the surplus, as shown. In his report to the stockholders of the United Railways Investment Company, Ernst Thalmann, the president, says: "The policy of reinvesting the large surplus earnings of the two subsidiary companies has given rise to considerable comment by some of the stockholders in the holding corporation, but in relation to this complaint it must be borne in mind that with the rapidly increasing business in Pittsburg and the reconstruction work in San Francisco the cash expenditures necessarily are large, and in view of the present condition of the investment market it becomes necessary for the stockholders to forego cash dividends and to continue to use the cash to pay for betterments out of earnings until the markets permit the sale of securities to refund the treasuries of the respective companies for the amounts expended for betterments, improvements and extensions which they are making. The financial condition of the Investment company is sound, as, after payment on April 4 next for the \$2,400,000 bonds purchased by the syndicate, the floating debt of the Investment company will be less than \$100,000, and it should receive its regular dividends on the Philadelphia Company stock on May 1 and August 1 next, which will amount to, approximately, \$727,200, and the total of its obligations, including interest on its bonds and the balance of its floating debt, is less than this amount. The company then will have invested out of its earnings in the acquisition of new securities during the years 1906 and 1907, approximately, \$1,300,000, and no doubt these expenditures will later on be funded by an increased issue of securities, and the scrip dividends which have been issued will be redeemed."

Manufactures and Supplies

ROLLING STOCK.

Aurora Elgin & Chicago Railway, Chicago, is asking prices on two Interurban cars.

Williamsport Passenger Railway, Williamsport Pa., has recently ordered new equipment.

Camden Interstate Railway, Huntington, W. Va., has ordered five 33-foot closed cars from the Cincinnati Car Company.

Consolidated Railway, Bridgeport, Conn., has placed an order with the Cincinnati Car Company for five 30-foot closed cars.

Pittsburg Railways, Pittsburg, at a meeting of its directors recently authorized the purchase of additional rolling stock and equipment.

City Railway, Dayton, O., is reported to have ordered 11 large double-truck cars from the Barney & Smith Car Company for fall delivery.

Eastern Pennsylvania Railway, Pottsville, Pa., has placed an order with the Cincinnati Car Company for five double-truck semi-convertible cars.

Scioto Valley Traction Company, Columbus, O., at a recent meeting of its board of directors authorized the purchase of three new freight cars.

Union Street Railway, New Bedford, Mass., expects to contract during the present month for six 30-foot double-truck box cars and one box freight car.

Sheboygan Light & Power Company, Sheboygan, Wis., has placed an order with the Cincinnati Car Company for six 18-foot single-truck cars and three 45-foot interurban cars.

Chicago Union Traction Company, Chicago, pending the reorganization of its company, will probably not place orders for new cars for several weeks.

Conneaut & Erie Traction Company, Erie, Pa., has just ordered two combination passenger and express cars from the Wilmington (Del.) plant of the American Car & Foundry Company. These will be 47 feet in length over all.

Trans-St. Mary's Traction Company, Sault Ste. Marie, Mich., has recently purchased from The J. G. Brill Company two 30-foot semi-convertible cars to be equipped with GE-67 motors, Peacock brakes, Consolidated heaters and International registers.

Chicago City Railway, Chicago, we have been officially advised, will hold a meeting of its board of directors the early part of next week, at which time the matter of new cars will be decided upon.

Elgin & Belvidere Electric Company, Chicago, has placed an order with the Niles Car & Manufacturing Company for three interurban cars instead of 10 as previously reported. These will be equipped with Baldwin trucks and GE-74 motors with type M control.

Morris County Traction Company, Morristown, N. J., has ordered six cars from the Wilmington (Del.) plant of the American Car & Foundry Company, to be equipped with Westinghouse motors and air brakes. The company expects to purchase six additional double-truck cars from the same company in the near future.

Interborough Rapid Transit Company, New York, has ordered from the Wason Manufacturing Company 84 cars for elevated service, from the St. Louis Car Company 116 cars for elevated service, and from the American Car Company 50 all steel cars for subway service.

SHOPS AND BUILDINGS.

Galt Preston & Hespeler Street Railway, Galt, Ont.—This company is making preparations for the erection of new car barns at Galt to replace those destroyed by fire last summer. Martin N. Todd of Galt, president and general manager.

Washington Baltimore & Annapolis Railway.—This company is engaged in condemnation proceedings to secure property on North Liberty street, Baltimore, for a large terminal station.

Washington Frederick & Gettysburg Electric Railway.—This company expects to begin shortly the construction of its car barn at Frederick, Md.

TRADE NOTES.

W. A. Hughes, purchasing agent for the Pullman Company, died on March 8.

Charles B. Pear has resigned as secretary and advertising manager of the Albert & J. M. Anderson Manufacturing Company of Boston, Mass.

S. F. Bowser & Co., Ft. Wayne, Ind., have opened an office in Chicago at 210 Fisher building, in charge of James W. Runyan, assistant general manager.

Ball Engine Company, Erie, Pa., has opened a branch office at 1213 Chemical building, St. Louis, Mo., in charge of O. L. Collins. The company has also opened an office in New York at 39 Cortlandt

street under the management of Lancelot Copleston. The company is a builder of automatic and Corliss engines.

Emil Calman & Co., New York, have removed their New York offices from 299 Pearl street to 100 William street, instead of 100 Washington street, as previously reported.

Quincy Manchester Sargent Company on April 1 removed its machinery sales department from Plainfield, N. J., to the new West street building, 90 West street, New York.

Elmer P. Morris Company has recently moved its New York offices and store from 51 Dey street to 72 to 78 Trinity place, where the company has secured about 6,000 feet of floor space.

New Departure Manufacturing Company, Bristol, Conn., has secured the rights to manufacture the Liberty cushion trolley harp formerly owned by the Liberty Bell Company, Bristol, Conn.

Wheeler Condenser & Engineering Company on April 1 removed its New York offices from 42 Broadway to the 10th floor of the West street building, corner West and Cedar streets.

W. D. McMahon, formerly assistant manager of the Michigan Malleable Iron Company, Detroit, Mich., has been appointed to the position of manager of the Belle City Malleable Iron Company of Racine, Wis.

J. H. Wagenhorst & Co., Youngstown, O.—The salient features of the Wagenhorst electric blue print machine are set forth in a pamphlet, which also presents a number of references from users of the machine as to its qualities and serviceability.

Joseph T. Ryerson & Son, Chicago, have been awarded the contract for all the heavy machinery for the new plant of the American Car & Foundry Company at Milton, Pa., including a complete hydraulic equipment, riveting machinery, splitting shears, bevel shears, guillotine shears, punching machinery and other tools.

Brown & Sharpe Manufacturing Company, Providence, R. I., is having plans prepared by Treat & Alschuler, Fisher building, Chicago, for a mercantile building to be erected at the northeast corner of Washington and Desplaines streets, Chicago. It will be 75 by 160 feet, of fireproof reinforced concrete construction and from two to eight stories in height.

Kansas City Railway Foundry Company, Kansas City, Mo., is erecting a plant at that point for the purpose of manufacturing lubricating cups and journal boxes for use on street cars. This device is the patent of John Rogers of Kansas City. The officers of the company are: President, A. F. Reitz; vice-president, O. M. Hunt, and secretary and treasurer, R. H. Webber.

Berger Manufacturing Company, Canton, O., has increased its capital stock from \$1,000,000 to \$1,500,000. The increase, of which \$250,000 of 7 per cent cumulative preferred stock and \$150,000 of common stock has been issued, was authorized at a meeting of the stockholders held in February. The present officers are: President, Edward A. Langenhach; secretary, Charles A. Irwin; treasurer, F. A. Schwertner.

Invincible Rail Joint Company, Youngstown, Wash., whose incorporation was noted in the Electric Railway Review of March 30, has just purchased two acres of land at Edmonds, Wash. It is the intention of the company to commence at once the erection of a manufacturing plant for the purpose of putting upon the market a patented nut and bolt. It is expected the plant will be in operation by the first of May.

Warren Electrical Manufacturing Company, Sandusky, O., has purchased the plant and good-will of the Warren Electric Manufacturing Company of that city, and in addition to manufacturing the well-known Warren alternator, will manufacture a full line of revolving field type generators, also alternating-current and direct-current motors, transformers, etc. The officers of the new company will be Millard H. Nason, president, who is also vice-president of the Brilliant Electric Company, Cleveland, O.; Frank Warren, secretary, who has been secretary of the Warren Electric Manufacturing Company for a number of years; and Norman L. Hayden, general manager, who was president of the Hayden & Derby Manufacturing Company, New York City, for several years, and for the past five years general manager of the N. L. Hayden Manufacturing Company, Columbus, O.

The J. G. Brill Company, Philadelphia, Pa., as previously intimated by reports in these columns, has acquired the car building plant of the Wason Manufacturing Company, at Springfield, Mass. The class of equipment manufactured by the Wason Manufacturing Company will be the same as heretofore and no change in the name of the company is contemplated. The new board of directors of the Wason Manufacturing Company includes James Rawle, Edward Brill, Samuel L. Curwen, H. S. Hyde and Henry Pearson. Mr. Pearson has been elected president to succeed George C. Fisk resigned. The J. G. Brill Company recently increased its capital stock from \$6,000,000 to \$10,000,000, divided into \$5,000,000 of 7 per cent cumulative preferred and \$5,000,000 of common stock; par value of shares \$100. Part of the increase was to provide funds for the purchase of the Wason Manufacturing Company's plant and aside from \$420,000 of preferred stock and about \$100,000 of common stock, which has been held in reserve for the retirement of an existing mortgage on the plant of the John Stephenson Company, the balance of the increase will be used to add to the working capital required in the constantly expanding business of the company. The Commercial and Financial Chronicle states that it is understood that the stock was sold at par, the entire proceeds going into the treasury. The present owners have not only received no money, but have actually increased their interest in the company, while the only commission paid to the bankers was in common stock. It is understood that

the present earnings are sufficient to cover the dividends on the preferred stock and leave a surplus largely in excess of 10 per cent on the common stock. Purchase of the plant of the Wason Manufacturing Company was effective on April 1. The plant has a capacity of about 150 steam railway passenger cars and 125 electric railway cars annually.

B. F. Sturtevant Company of Boston, Mass., has just received from the Interborough Rapid Transit Company an additional order for standard economizers. The previous order was for the equipment of a 26,000-horsepower boiler. The total number of tubes to complete both orders will be 11,200, making up approximately 100 carloads. The Williamsburg plant of the Brooklyn Rapid Transit Company and the Waterside plant of the New York Edison Company are also to be equipped with economizers manufactured by this company.

Knox Engineering Company, Fisher building, Chicago, is the engineer and superintendent for an electric railway which is building a large power house at Guthrie, Okla. Engines, generators and boilers have already been purchased, but considerable additional equipment is yet needed, including building pumps, condensers, piping, etc. The Knox Engineering Company has also been appointed operative engineer of the Peoples Traction Company, Galesburg, Ill., and in this connection it has appointed Howard Alton as superintendent in charge. Mr. Alton was formerly in charge of equipments of divisions three and four, Seventy-seventh street, of the Chicago City Railway. In addition to these the Knox Engineering Company has charge of the Green Bay Gas & Electric Company, Green Bay Traction Company and the Choctaw Railway & Lighting Company of McAlester, Okla.

Alberger Pump Company has been organized to manufacture and sell centrifugal and turbine pumping machinery designed especially to meet the demand for a higher class of work and more economical performance than has heretofore been attained. The management and works of this company are identical with those of the Alberger Condenser Company, whose principal offices are at 95 Liberty street, New York, and branch office at 205 La Salle street, Chicago. In order to provide for the business of the Alberger Pump Company a large addition to the shops of the Alberger Condenser Company is now being made. The equipment will consist of special tools for this particular class of work and elaborate testing apparatus is being installed to insure the highest efficiency of the product before shipping to the purchaser. The company announces that it is prepared to build centrifugal and turbine pumps of all capacities, either steam or electrically driven and for operation against any head. The steam turbine has shown that the principle of dealing directly with rotary motion is applicable for pumping purposes and accordingly it is proposed to build pumps employing this principle for the specific uses to which they will be applied and from new designs of which every point has had mature consideration. Announcement is made that the line of volute centrifugal pumps will undoubtedly be particularly adapted to the requirements of paper mills, sugar houses, steel mills, irrigation and drainage projects, dry docks, filtration plants and to all situations where a low pumping head exists. The feature of construction which will permit of continuous service with minimum attention will be given particular consideration. For higher heads such as mine pumping, boiler feeding, waterworks supply, fire service, etc., improved multi-stage turbine pumps of superior design both in details of construction and general efficiency will be produced. The company is prepared to make surveys of plants and to furnish plans, drawings, specifications and estimates and to contract for centrifugal and turbine pumping machinery for all services. The officers of the Alberger Pump Company, which are identical with those of the Alberger Condenser Company, are as follows: Louis R. Alberger, president; George Q. Palmer, vice-president; B. W. Pierson, secretary and treasurer; Frederick Ray, chief engineer.

ADVERTISING LITERATURE.

Baldwin & Rowland Switch & Signal Company, New Haven, Conn.—A multiple interlocking recording block signal which is handled by this company is the subject of a brief illustrated pamphlet showing the type of the semaphore and indicating the method of operation of the signals.

Allis-Chalmers Company, Milwaukee, Wis.—Miniature bulletins Nos. 4002, 4003 and 4004, on the subjects of "Allis-Chalmers Direct Current Motors and Generators," "Electric Hoists" and "Polyphase Induction Motors," present in condensed form information about some of the features of these machines in a manner designed to attract the reader to more elaborate bulletins published on the same subject.

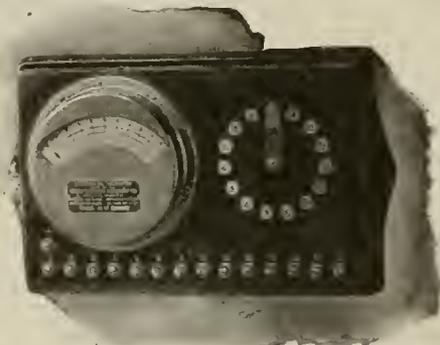
Charles Warner Company, Wilmington, Del.—In the interests of its waterproof concrete and Portland cement lime mortars, this company has issued a pamphlet containing a report of a series of tests made by the Henry S. Spackman Engineering Company of Philadelphia using varying mixtures of hydrated lime and Portland cement. These tests covered the tensile strength and permeability of a number of mixtures, the object being to demonstrate the most economical mixture to be used to meet any particular requirement in building construction.

Wallace-Coates Engineering Company, 355 Dearborn Street, Chicago.—Catalogue No. 2, containing 80 pages, with full descriptions, drawings and photographs of Strauss bridges, has just been issued. Since October 14, 1905, when the Wheeling & Lake Erie bascule bridge at Cleveland was placed in operation, a bridge which is the subject of a number of illustrations in the catalogue, work on eight other Strauss bascule bridges has been commenced. Of these, one for the New Jersey Short Line Railroad near Rahway, N. J., has just been finished and is also the subject of dis-

ussion. Other work which is under way and which is considered is the Baltimore & Ohio bridge at Bodine creek on the New York division and the Missouri Pacific bridge over the Black river, which will be completed this year, and the monumental bridges at Copenhagen and Camden, which are well under way. A contract has recently been received from the Chicago & Northwestern for a double-track, single-leaf Strauss trunnion bascule bridge for the crossing of the Chicago river at Kinzie street, Chicago. The award covers an additional double-track bridge of the same kind to be built adjacent to this structure within five years. Strauss ribbed-concrete bridges are also illustrated and described in the catalogue. The Elgin-Belvidere bridge, successfully completed, near Belvidere, Ill., is given considerable attention. Another structure of the same type is a 1,500-foot concrete viaduct for the city of Spokane, Wash.

WESTON ELECTROPLATERS' VOLTMETER

For many years electroplaters have depended almost entirely upon the experience and judgment of the operators in managing the voltage regulation on the tanks with different quantities of work in the solutions. The result of this has been a great waste of time in the past through imperfect plating, caused either by the burning of the work by too high a current density or too thin a deposit, which would come off under the buffing wheel, and thus necessitate the replating of the work. With various quantities of work in a tank even the most expert plater will misjudge the rate of deposit, thus necessarily resulting in loss of time, if not of the reputation of the plater. The expense of installing separate voltmeters for each tank has been so great that platers have depended upon the old methods in preference to investing such a large sum of money in these instruments. To meet the demand for an instrument having a high degree of accuracy at a low cost,



Weston Electroplaters' Voltmeter.

and for one which can easily be changed from one tank to another to determine the exact voltage, the Weston Electrical Instrument Company, of Waverly Park, Newark, N. J., has placed on the market a highly accurate standard Weston voltmeter, mounted on a small switchboard having 15 binding posts, to one of which the positive terminal of the line is connected. To each of the other 14 posts may be connected leads to any number of tanks, up to the number of binding posts. By means of a multiple point switch, mounted on the instrument board, any one of the tanks may be connected to the voltmeter and its voltage thus easily and accurately determined, assuring uniform and economical results and avoiding the loss of time through imperfect plating. The instrument, which, as has been stated, is of Weston-D'Arsonval standard, is enclosed in a neat airtight waterproof case, which adequately protects the internal mechanism from the action of fumes usually present in the plating room. This instrument will no doubt fulfill the longfelt want in providing electroplaters with a cheap, accurate and convenient instrument.

THE PREVENTION OF SULPHATING IN STORAGE BATTERIES.

One of the most serious complaints which have been brought against storage batteries is the reduction of capacity as the life of the battery is increased. The most universal cause for this falling off in capacity and efficiency is the closing up of the pores in the negative element. This is generally caused by the deposit of sulphate in the pores, which prevents the liquid from reaching the inside surfaces of the plate and thus, by reducing the effective area of the plate, the capacity is materially diminished. A further result of sulphating is the buckling of plates and the shedding of active material, due to the swelling of the active material by the sulphate which has formed in it. This naturally shortens the life of the battery, not only because of reduced effective area, but also because of short circuits which are caused by the buckling and shedding of material.

To overcome these difficulties, Mr. Joseph Bijur of New York invented and patented a process for making the active material of the active plate, no matter how formed, porous, thus increasing the life and capacity of the battery many times. The invention, which is covered by patents, No. 845331—J. Bijur, "Negative Pole Plate," issued on February 26, 1907. The invention which is applicable to Plante and paste plates as well, consists of introducing into the material of the plate a carbonaceous material, preferably in the form of a dilute sugar solution, which will thoroughly

permeate the material of the plate and fill the most minute pores with the liquid, which, upon heating to a temperature of about 240 to 300 degrees C., will completely carbonize the sugar and leave the pores of the material filled with a soft, porous filling of pure carbon, which thus permits the electrolyte to enter the innermost portions of the active material and prevents the formation of sulphate, or, should a slight amount of sulphate form, it counteracts the difficulties which would arise with the small particles of carbon not present in the active material.

The General Storage Battery Company, 42 Broadway, New York City, controls the patents for this process exclusively and has been applying the invention to all the plates which it has manufactured during the past year. No doubt this invention is of the greatest importance and should rank in the electric storage battery history as one of the greatest improvements in storage batteries made since the day of Plante. It may be well to add that the invention also covers a heating device, which protects the grid when the latter contains antimony, which would cause it to melt at a temperature below 300 degrees C.

PATTEN TICKET DESTROYER.

It has been found that frequently when destroying old or used tickets or transfers by the burning process there has been an opportunity for dishonesty of employes which results in loss to the company. Either tickets which can be readily passed again are separated from the others by the employes having the burning in charge and sold or tickets which are incompletely burned are obtained by other persons and used. In order to do away with this possibility a machine was placed on the market by Paul B. Patten, 79 Lafayette street, Salem, Mass., which destroys by cutting. The machine can be set up in the auditing department so as to be operated under the immediate supervision of the auditor and will



The Patten Ticket Destroyer.

completely destroy tickets or transfers. Two rolls do the cutting. The frame of the machine is cast iron; the bearings are babbitted and the cylinders are made of crucible steel. The machine weighs 395 pounds when crated and is strongly built and durable. It occupies only a small space and may be operated by hand power if necessary. The manufacturer recommends, however, that it be operated by a one-horsepower motor or driven by a two-inch belt from some convenient shaft. An accompanying engraving from a photograph shows the design of the machine, which has been placed in service by the auditing departments of the following companies: Boston & Northern Street Railway Company, Old Colony Street Railway Company, Cincinnati Traction Company, Fitchburg & Leominster Street Railway Company, Youngstown & Sharon Street Railway Company.

THE PLANT OF THE DANVILLE CAR COMPANY.

The plant of the Danville Car Company, which has been rapidly nearing completion, was formally dedicated on March 16, there being a large number of electric railway men and others interested in attendance for the ceremonies. The ground was broken for the plant on November 17, 1906, and in the few months between that date and the present time the buildings which provide for 10 distinct departments and cover 160,000 square feet, have been erected. The machinery is now being installed. The buildings include an erecting shop, 150 by 320 feet; freight car shop, 90 by 320 feet; wood working department, 60 by 180 feet; cabinet shop, 60 by 120 feet; varnish and trimming room, 60 by 120 feet; power house, 60 by 120 feet; blacksmith shop, which is entirely of steel construction, 82 by 120 feet; dry kilns, 18 by 160 feet; office building, 130 by 120 feet; truck and machine shops, 120 by 120 feet.

The plant, which is located on the outskirts of Danville, is connected with the tracks of the Wabash, Cleveland Cincinnati Chicago & St. Louis, and of the interurban lines of the Illinois Traction System. Particular attention will be paid to the construction of cars for interurban electric lines. The equipment installed makes it also possible to build cars for steam lines, and attention will be paid to this feature of the car building business,



Plant of the Danville Car Company on March 16, 1907.

as well as to the construction of trucks and freight cars, and particularly to the repair of steel cars.

The president and general manager of the Danville Car Company is H. F. Vogel, who about a year ago severed his connection with the St. Louis Car Company as vice-president and general manager, and in October, 1906, organized the Danville Car Company under the laws of the state of Illinois, with a capital of \$250,000. Mr. Vogel has associated with him E. H. Gorse, formerly secretary of the Missouri Lincoln Trust Company of St. Louis, who holds the office of secretary and treasurer. Mr. W. L. Primm, formerly general manager of the Merchants' Association of St. Louis, will assume the position of purchasing agent and auditor; Mr. E. J. Lawless, formerly with the American Car Company and the John Stephenson Car Company, has been appointed general sales agent; Mr. G. A. Moffat, who has been connected with the Philadelphia Traction Company and the Metropolitan Street Railway Company of New York, has been appointed general superintendent; Mr. John Visser, formerly with the St. Louis Car Company, has been appointed chief draftsman and will have the assistance of Mr. Fred Hussman and Mr. Charles Littell, who were also connected with the St. Louis Car Company. Mr. William Russell, formerly with the Cleveland Electric Railway Company, will have charge of the mechanical and engineering department, with the title of mechanical engineer. The other members of the operating staff are equally well known as successful men in their respective departments.

In an accompanying engraving the plant is shown as it appeared at the time of the dedication on March 16. The buildings were erected by the H. F. Vogel Contracting & Engineering Company, whose offices are in the Rialto building, St. Louis, under the immediate supervision of James O. Gordon, formerly with the Goldie Construction Company of Chicago.

To Give Up Ash-Handling Business.

It is stated that President E. W. Winter of the Brooklyn Rapid Transit Company has informed Comptroller Metz that the American Railway Traffic Company, a subsidiary company, does not intend to bid again for the contract for removing ashes in the borough of Brooklyn. The present contract expires on October 28 and it is stated that the company does not want to renew it because the hauling of ashes over its lines interferes with the passenger traffic. The company's system of handling ashes and street sweepings was described in the Electric Railway Review of February 23, 1907, page 261.

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There are certain conditions under which the cost of condensing apparatus would not be warranted by the gain in economy which might reasonably be expected. It is, therefore, fortunate that electric railway and lighting companies can in many cases develop a very profitable exhaust steam heating business if their power houses are not too far from the business district of a city.

Steam Heating Versus Condensing. There was a time when it was thought that steam could only be sent a few hundred feet without being totally condensed. Such, however, is not the case, as has been proved by a large number of successful heating installations having miles of pipes under the streets, in which it has been found the condensation is not more than 10 per cent in extreme cases. The experience of one company, which found it economical to operate a heating system in conjunction with a railway and lighting plant, was reported recently. The plant is of about 1,000 kilowatts capacity and supplies a small railway and lighting system in a city having a population of about 28,000. Exhaust steam from the engines is distributed to the business district and a small portion of the residential district through about three miles of pipe under a pressure of from one to seven pounds. In small quantities, the exhaust sells for 50 cents per thousand pounds, and on the flat rate contracts based on the radiating surface the return is about 35 cents per thousand pounds. The total income from the heating system was sufficient to pay the entire coal bill of the plant and the cost of repairs and maintenance of the heating system, and to show a balance of about \$1,200. Besides furnishing the heat, power for the electric railway and street lighting was supplied by the steam before it was sold at the rates referred to. It would be difficult to imagine such returns from a condensing plant. As a further evidence of the profit to be derived from steam heating systems, it may be stated that there are small electric plants within the Niagara distribution district which are selling electric light and power at a lower rate than the Niagara companies and are deriving large profits from the investment in the plant and heating systems. Surely no more severe test could be given an enter-

prise of this nature than to operate it in competition with the cheap power from Niagara Falls.

The developments of the last week have disappointed hopes of an early settlement of the Cleveland street railway problem, and it is evident that the controversy between the Cleveland Electric Railway Company and the city of Cleveland, or that part of it which is represented by Mayor Johnson and the Municipal Traction Company, is to be resumed with renewed vigor. In the early stages of the recent negotiations between the presidents of the two companies looking to a lease of the Cleveland Electric property to the Municipal Traction Company through the formation of a holding company it appeared probable that an agreement would be reached which would result in a practical test of 3-cent fares. The 3-cent fare interests, however, fixed a valuation of the Cleveland Electric property, which was so low that the company could not accept it. This valuation was subsequently increased by a committee of the city council, which offered \$60 a share as the basis of a lease to the proposed holding company. In a communication, of which an abstract is presented on another page of this issue of the Electric Railway Review, the company, in reply to the committee, not only refuses to accept any offer which does not provide an adequate valuation of its property, but declines to continue negotiations with either a city administration which has persecuted it for six years or "an irresponsible paper company." Two alternatives have been forced on the company—virtual confiscation of its property as the price of peace or continued warfare with the low-fare companies backed by Mayor Johnson and the city organization. The company has decided to fight. The people of Cleveland also have two alternatives before them—the offer of the Cleveland Electric company of seven tickets for 25 cents, good for a ride over a first-class system covering nearly 200 miles, or the proposition of the Municipal Traction Company to give 3-cent fares on a system which is not yet built. The citizens of

Cleveland Negotiations a Failure.

Cleveland cannot decide until the election next November. In the meantime there will probably be a repetition of last year's warfare, with injunctibns and midnight tracklaying, while the mayor makes a spectacular campaign to attract the savings of the people to investment in his low-fare enterprise.

The average car has so many separate devices in the motorman's cab that it is little wonder he becomes confused and makes mistakes at critical times. As a rule,

Tripping when a quick stop is necessary he must shut off current with one hand, operate the air brake valve with the other, and at the same time by some means he must ring his gong,

Fenders and Sanding Track. open the sand valve, and in many instances drop the fender to the rails. In the shops of the Denver City Tramway Company every effort is encouraged toward devising attachments that will lessen the number of independent movements necessary on the part of the motorman when a quick stop is demanded. As a result, this company has adopted two interesting and valuable attachments, one for tripping the fender and the other for opening the air sander. The fender trip, as used on the Denver cars, has a trigger at the end of the raising shaft in the vestibule. The top of the trigger is about level with the controller top. A 3-16-inch twist chain is attached to the trigger and in turn hooked to the bottom side of the reverse handle of the controller. This chain is of such length that it can only be hooked with the fender raised and the handle in the "ahead" position. This places the chain near by for quick tripping and adds the desirable feature that the very act of reversing the car to make an emergency stop trips the fender. The second "automatic" attachment to relieve the motorman of some of his many duties in times of emergency, comprises the casting of the air brake handle with a projection on its cylindrical part. This projection is of sufficient length and at the proper point on the handle so that when the brake valve is thrown to the emergency position the protrudence on the handle engages the sanding valve placed close by. Thus by these simple devices the motorman is relieved of two separate movements that must be made in times of emergency. While there may be a possibility of getting too many so-called "automatic" parts, the use of such simple expedients as these can in no wise be questioned on that score, and their simplicity and established reliability warrant due consideration.

NEW YORK'S TRANSIT PROBLEM.

The electric traction companies in New York city are now principally concerned with the necessity of providing for the steady increase in traffic flowing toward the Bronx region. The subway is now hauling twice as many passengers as it was intended for, and it is running at as full capacity as its present style of car equipment will permit. The traffic on the Third avenue elevated line is increasing at the rate of one million passengers per month. The surface lines running north and south are overcrowded and uncomfortable. All these lines are operated with a large proportion of the passengers standing in the aisles, which tends to restrict the movement of egress and ingress and to increase the length of stops at stations. At present the capacity of the New York traction lines, carrying passengers to their homes and back, is one and one-half millions in 12 hours.

To provide rapid transit for the abnormal increase in this population, and, if possible, to furnish more comfortable transportation, is the problem which Theodore P. Shonts, the new president of the Interborough-Metropolitan Company, is now trying to solve. As the result of his studies thus far, Mr. Shonts has made a number of suggestions which are published in Harper's Weekly of April 6, 1907. In order to relieve the congestion on surface lines, a reasonable but not

exclusive use of the tracks is desired; and to accomplish this the co-operation of the city authorities is requested so that vexatious delays during the rush hours may be avoided by the proper regulation of the freight traffic hauled by horses. The methods of handling freight and passenger traffic on the streets of large cities is barbaric, but something more than police regulation is necessary to produce any important reform. Real improvement can be accomplished by the work of the engineer in a better design for the construction of the street surface. The extra cost of moving freight by wagon over the rough and irregular surface of Belgian block pavement would soon pay for the cost of a smooth and substantial pavement having much less resistance. The objection to all forms of mineral surfaces for wagon tracks is that it is soon disintegrated by heavy pressure and becomes worn in holes. The drivers of heavy drays always seek the smooth surface of the street car rails because the wheels move easily and require less effort of the horses. Their reluctance to leave such favorable conditions continually delays the street cars and the obvious method of avoiding such delays is to provide a pavement outside of the street car lines which has a smooth surface and low resistance. A number of streets in the downtown district of New York have been paved with creosoted wooden blocks set on a solid foundation of concrete and grouted in cement. On this pavement, wagons and drays heavily loaded can be moved as easily and rapidly as on the street car lines, and if such pavement was built alongside the car lines there would be much less obstruction to the car traffic.

Other improvements suggested for the surface cars relate to the use of wider platforms and doors for the exclusive use of those getting on and others for passengers getting off. Early in the investigation, Mr. Shonts noticed the slow movement of passengers at the subway stations due to the fact that ingress and egress must be through the same doors, and although the engineers are slow to admit that the cars are not properly designed in their door arrangement, it is now believed that side doors at the center will offer a partial solution of the difficulty. In an editorial on the door arrangement of passenger cars in *The Railway Age* of September 1, 1905, it was pointed out that that full benefit of an expensive electric installation, giving high acceleration and speed between stations, will not be realized if the seconds thus gained are wasted in standing at stations, as the result of slow loading and unloading. The benefit of the side doors was there demonstrated by figures relating to the steel suburban cars on the Illinois Central, which have numerous doors along the side, to those on the Boston Elevated, which have a wide door at the center of car, and to the Interborough cars, which at present have only end doors. The times required to handle passengers in and out of these cars in busy hours were relatively as follows: Illinois Central, 1; Boston Elevated, 2½; New York subway, 4. The average time for a number of stops on the Illinois Central is 7 seconds; on the Boston Elevated it is 17 seconds; and in the New York subway 30 seconds. In the latter stops are frequently noticed in rush hours of over a minute at important stations, while the minimum is 10 to 12 seconds. As Mr. Shonts is convinced that the use of side doors on the subway cars would do much to relieve congestion and minimize delays, it is probable that the experiment will be made, and it will be interesting to see how this can be accomplished in the cars having continuous steel side girders as high as the window sills, also the degree of relief obtained from a more rapid movement of passengers.

It is further proposed to add two more tracks to the Second avenue elevated lines and have express trains connect with these lines, thus diverting a great deal of traffic from the subway and Third avenue elevated and relieve the pressure of the Bronx traffic. These additional tracks could be built and the lines operated in two years, while the proposed new subways on the east and west side will require four years for

their construction. The plans for the new subways will be found on another page of this issue.

DEPRECIATION AND RESERVES.

On another page of this issue of the Electric Railway Review will be found some extended extracts from a lecture by Mr. George Wilkinson, C. P. A., on the subject of "Depreciation and Reserves."

The exposition of general principles as applied to machinery and equipment—the inanimate things that move or are moved—is admirable, as are also the brief comments on the need of provision for "Displacement" and the objections to showing accrued depreciation as a reduction of the plant account.

Emphasis should be laid on the fact that the views of Mr. Wilkinson with regard to there being no depreciation of railway tracks refer to steam railways and have but little bearing upon electric railways within municipalities. The lecturer's recommendation seems to be based upon the practice of steam railways rather than upon theory, since by following the same course of reasoning as is followed by Mr. Wilkinson when discussing machinery and equipment, the existence of a depreciation of track not compensated for by current repairs may be shown.

Mr. Wilkinson says that it is neither customary, practicable nor necessary to make any charge specifically for depreciation against earnings arising from the use of piers, docks or wharves, railway tracks, telegraph lines, reservoirs, dams, canals, locks and many other properties of a similar description. This statement, when taken in connection with the premises on which it is based, is doubtless true. The premises are that properties of this nature are permanent and irremovable, and that those portions of such properties as are not really permanent are renewed again and again in the life of the property, and all the replacements paid for out of earnings. As an illustration of a permanent property upon which it is not customary or practicable to compute depreciation, a railway track is taken, and in the discussion it is assumed that all renewals and replacements are paid for out of the current year's earnings and charged to "Maintenance of Permanent Way."

The trouble is that, in the practice followed by electric railways, neither of these premises is generally true. In the majority of states street railway companies can secure only short-term franchises, and in a great many places inter-urban electric lines have been built in public highways under short-term franchise, and these companies, as well as the urban railway companies, are thus in a position where they can never be sure of securing that renewal of franchise grants which is necessary to give their properties even a semblance of permanency in the sense used by Mr. Wilkinson.

In the first part of Mr. Wilkinson's lecture he defines maintenance as meaning repairs, and a depreciation reserve as the fund needed to provide for renewals, and applies these terms to what in railway service would be comprised in equipment. When discussing permanent way he assumes that there is no depreciation because renewals, as well as repairs, are included in maintenance. While a careful reading of Mr. Wilkinson's statement of the problem makes his views clear, we believe that there is needless confusion bound to result from using the term maintenance with different meanings when applying that term to different parts of the same property.

Mr. Wilkinson's statement that a charge for depreciation on track is neither customary nor practicable probably had in view a limited application. The policy of providing a depreciation reserve for railway track is considered both practicable and necessary by the management of the Glasgow Corporation Tramways, which has followed it for years. For the fiscal year ending May 31, 1906, the Glasgow Tramways, besides expending £391 (\$1,905) per mile for ordinary repairs

and upkeep of track, appropriated £500 (\$2,435) per mile of track to the permanent way renewals fund.

The subject of depreciation was discussed editorially by "The Engineer" of London in its issue of March 15 last, and the general attitude of that journal is shown in the following extracts:

Referring to the "great railway companies" it is said: "They never dream of providing a depreciation fund. Repairs and renewals come out of revenue if the company is doing well; if not, they are paid for by the issue of fresh stock."

Criticizing the comments of a contemporary concerning the policy of County of London Electric Supply Company, "The Engineer" says: "Had this [the appropriation of 40,000 pounds sterling for depreciation] been done for the past year the immediate result of no dividend would have been an enormous drop in the value of the company's shares, which would represent a loss that would far outstrip the value of the depreciation fund; and, still worse, it would very effectually ward off all those who might be induced to supply money for the fresh developments of the company's business which appear imminent."

"The Engineer" concludes: "When a company is prosperous, there is always money enough for repairs and renewals available out of revenue. If it be not, the possession or not of a depreciation fund will make little difference in its downward career."

The second of these quotations states the view of the promoter, who is seeking to create an artificial value in order that he may sell and secure his profit, and it is not an argument that the permanent management can use. To the others it is a sufficient answer to say that if a business is not prosperous the owners of it should certainly endeavor to determine the true state of the case.

In a purely private undertaking, such as a manufacturing business, it may be said that aside from the limited number of stockholders who suffer loss, it is a matter of indifference as to how the accounts may be kept, because improper methods do not influence the public. The manufacturer cannot be compelled by statute to sell his products at a price which means a loss to him; moreover the manager of a purely private undertaking is always at liberty to fix the prices of his finished product in accordance with the fluctuations in the cost of raw material, in the price of labor, etc., though limited by the competition which he may have to meet.

It is entirely different in the case of railway companies for transporting passengers. The statutes provide the maximum passenger fares and there is a constant pressure brought to bear to reduce these maxima. Everyone knows of the present agitation in this country to secure lower freight rates and a maximum of two cents a mile for passenger fares on steam railways, and for 4-cent fares, or 3-cent fares, on urban street railways. The rates at present in force on many steam and on nearly all interurban electric lines are below the maxima which may be charged, so that there is opportunity for these companies to increase their rates when it may become necessary; but with street railways this is not possible.

In many cases street railway companies in American cities are now giving more service than they can afford for the fare they are authorized to charge. Doubtless all of them will in time reach the point where, through increase in the density of traffic, the fare received and the cost of the service may be brought into equality, but this point will never be reached if the companies must yield to the constant demands for increased service, reduced fares, contributions for street paving, for street lighting, etc. It is therefore of the utmost importance that the managers and owners of street railway properties should demonstrate to the public that the demands made upon the transportation companies are unreasonable. This they can never hope to do until they cease trying to deceive themselves, and the neglect of accounting for depre-

ciation is one of the most important and far-reaching self deceptions that is practiced.

It is comparatively a small matter that the stockholders in any one enterprise should lose their investment; it merely means that they were unfortunate in undertaking a losing business. But there should be a strong protest against a policy which, if continued, will make it a certainty that every purchaser of stock in street railways will lose his investment because the companies engaged in this business have undertaken to furnish transportation at too low a rate.

ANNUAL REPORTS OF RAILWAYS.

New Orleans Railway & Light Company.

The annual report of the New Orleans Railway & Light Company for 1906 gives the following details of maintenance expenditures on the property which E. C. Foster, the president, believes to have been "sufficient to maintain the property in its present serviceable condition":

Maintenance of track, roadway and paving, \$957.95 per mile for the year.
 Maintenance of electric line, \$261.10 per mile for the year.
 Maintenance of electric cars, \$207.36 per car for the year.
 Maintenance of electric equipment of cars, \$164.14 per car for the year.

Gross earnings averaged \$19,346 per mile of single track. They increased 13.3 per cent over the previous year, while operating expenses increased 15 per cent, due largely, Mr. Foster says, "to an increase of 5 per cent to employes and to the increased volume of business, necessitating more cars and labor to conduct operations; and also to the well-known fact that the cost of material used in making the ordinary repairs to our property and the various equipment has considerably increased over that of the preceding year."

During the year the company expended for construction, betterments and improvements \$2,497,822. Most of this amount was expended on power houses, substations, transformers, motors, cars, equipment and real estate for power purposes. The income account for the year compares as follows:

	Income.		
	1906.	1905.	1904.
Railroad earnings	\$3,724,271.80	\$3,291,960.90	\$3,071,929.10
Electric and gas earnings....	1,875,400.13	1,705,807.36	1,541,575.19
Miscellaneous earnings	173,518.20	95,941.53	60,839.79
Total earnings	\$5,773,190.13	\$5,093,709.79	\$4,674,344.08
	Expenses.		
Railroad operating	\$2,225,580.14	\$1,901,084.56	\$1,753,720.71
Electric and gas operating...	848,434.95	770,375.79	744,802.22
Total operating expenses.	\$3,074,015.09	\$2,671,460.35	\$2,498,522.93
Net earnings from operation.	\$2,699,175.04	\$2,422,249.44	\$2,175,821.15
Interest on funded debt, taxes and miscellaneous....	1,900,900.77	\$1,784,226.24	\$2,149,840.46
Net income	\$ 798,274.27	\$ 638,023.20	\$ 25,980.69
Dividends on preferred stock.	*500,000.00	*125,000.00	.....
Surplus	\$ 298,274.27	\$ 513,023.20	\$ 25,980.69
Operating expenses—percent- age of gross earnings.....	53.2	52.2	53.4

*The dividend, in 1905 was for three months, at the rate of \$1.25 per share of preferred stock, and the dividend in 1906 was for the year, at \$5.00 per share of preferred stock.

The following traffic statistics are given:

	1906.	1905.	1904.
Revenue passengers carried....	73,606,068	65,021,214	60,696,927
Transfers redeemed	7,220,152	6,641,193	5,832,572
Revenue mileage	17,718,107	16,753,874	16,354,145
Eighteen-hour cars	108,637	102,156	99,897

Chicago & Milwaukee Electric Railroad Company.

The annual report of the Chicago & Milwaukee Electric Railroad Company for 1906 shows that the company expended for maintenance \$56,885, but no details of the application of this amount are given. This expenditure is equivalent to 6.4 per cent of gross earnings. Operating expenses were 41 per cent of gross earnings. The report shows earnings and expenses for 1906 as follows:

Earnings.	
Passenger	\$550,351.26
Freight	305,450.77
Express	13,750.82
Miscellaneous	14,653.95
Total	\$884,206.80

Expenses.	
Trainmen	\$ 68,332.86
Power house and substation employes.....	33,368.18
Maintenance	56,885.08
Fuel	64,549.99
General operating expenses*.....	132,046.96
General expenses	11,213.89
Total	366,396.96
Net earnings	\$517,809.84
Other income	31,791.63
Total net income for the year 1906.....	\$549,601.47
Interest on bonds	\$330,000.00
Taxes and insurance	17,996.27
Total	\$347,996.27
Net surplus for 1906.....	\$201,605.20
Surplus from 1905.....	301,333.45
Total	\$502,938.65

Net surplus, December 31, 1906..... \$502,938.65
 In his address the president, A. C. Frost, gives the following information regarding the property, which supplements the information contained in the Electric Railway Review of March 9, 1907, page 339:

Last year the company built a cut-off between Highland Park and Lake Forest, a distance of about two miles, all on private right of way, for 4-track construction, thereby eliminating two bad curves and greatly reducing the time between the two cities. A number of new stations and shelters were built, the capacity of the power plant increased, and 10 large interurban cars added to our equipment. The company also made other improvements along its entire line. A total of \$200,000 was expended out of surplus for permanent improvements.

The Wisconsin division, as far as Racine, was placed in operation on September 2, 1906, and the earnings from this extension have been very gratifying. Nearly all the right of way from Racine to Milwaukee has been acquired and the road constructed to within 15 miles of Milwaukee. It is expected to have the road completed and in operation to Milwaukee about October 1.

Active construction work has been begun on the United States Naval Training Station and 1,000 men will be employed there this year. Already \$2,000,000 has been appropriated and it is expected that a total of \$5,000,000 will be expended on the property. Extensive public and private improvements are being made in all the cities and towns along our line.

The Chicago & Milwaukee Electric Railroad operates in a territory which is unequaled anywhere in this country, connecting Chicago with Milwaukee and 23 other cities and towns along the line, serving a population of 3,000,000, which is rapidly increasing.

Earnings of the property from 1900 to 1906 are as follows:

	Gross earnings.	Operating expenses.	Net earnings.
1900.....	\$140,684.55	\$ 59,515.44	\$ 81,169.11
1901.....	171,171.99	74,015.09	97,156.90
1902.....	190,110.31	79,364.12	110,746.19
1903.....	292,246.76	98,627.07	193,619.69
1904.....	464,655.22	179,037.58	285,617.64
1905.....	594,874.64	244,551.84	350,322.80
1906.....	884,206.80	366,396.96	517,809.84

Weight of New Motor Cars, Denver City Tramway.

The total weight of the first of the new 2-motor cars completed by the Denver City Tramway Company is 29,000 pounds, distributed as follows:

	Pounds.
Car body	11,200
Double trucks	9,500
Two motors and control.....	7,300
Air brakes	1,000
Total	29,000

These cars were described in detail in the Electric Railway Review of April 6, 1907, page 452, and the estimated weight, as given there, was 27,850 pounds.

It is a good plan to have car washers keep some raw linseed oil at hand to touch up all damaged places before washing and so protect the wood till the cars are revarnished. A little touch of putty here and there where it is needed will keep the moisture from penetrating to the inside of panels and other places where it will work mischief. A very small quantity of pulverized pumice stone used with the soap will cut the dirt, but too much will, of course, dull the varnish. Plenty of clean water should be used to rinse off every trace of soap, as any soap that remains on the varnish will surely leave its mark.—Brill's Magazine.

THE AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION TO MEET AT ATLANTIC CITY.

The annual conventions of the American Street and Interurban Railway Association, and the organizations affiliated with it, will be held in Atlantic City, N. J., from October 14 to October 18, 1907, inclusive. The days on which the several associations will hold their meetings have not yet been definitely determined.

At a meeting of the executive committee of the American association, held in New York on January 28 last, it was decided that this year the conventions should be held in the east and preferably on the Atlantic seaboard, and a joint

ness sessions of the several associations. Atlantic City is especially able to meet these requirements: In a circular letter issued by Secretary Swenson on April 9 the following information concerning hotels, exhibit space and convention halls is given.

Hotels.

Practically the only criticism made in connection with the Columbus convention was the inadequacy of the hotel facilities. If any criticism of Atlantic City were made in this particular it would be that there are too many large, first-class and thoroughly modern hotels. Atlantic City can provide without difficulty at least 3,000 rooms in the large beach front hotels, with from 1,200 to 1,500 private baths. In addition, there is an almost unlimited number of rooms in the best grade of



Atlantic City Convention—Steel Pier as Arranged for Exhibits.

committee representing the American association and the Manufacturers' association was appointed to consider the matter further. The selection of Atlantic City as the place for the 1907 convention was made after a careful investigation by this committee, which reported that in view of its instructions only two points could be considered, Norfolk (Jamestown Exposition) and Atlantic City. While each of these places had its particular advantages the opinion of the committee was that Atlantic City would be the more desirable location, and its recommendations have been approved by the executive committee.

In choosing the convention city three points are very important: there must be adequate hotel accommodations of the first class, a sufficient space for the manufacturers' exhibits and suitable assembly rooms in which to hold the busi-

side street hotels, many of which are provided with private baths. The rates which have been obtained from 35 of the largest hotels, of which 13 are on the ocean front, are the same as the rates guaranteed for the conventions of the Master Mechanics' and Master Car Builders' associations, which will be held in June of this year. The rates for one person on the American plan vary from \$2.00 to \$4.00 per day without bath, and from \$3.00 to \$6.00 with bath. For two persons occupying the same room on the American plan, the rates are from \$4.00 to \$8.00 per day without bath, and from \$6.00 to \$10 (in some instances slightly higher) with bath.

Exhibit of the Manufacturers' Association.

The exhibit of the Manufacturers' association has become a very important feature of the annual conventions. The 1907 exhibit will be located on the Steel Pier, which is within a few minutes' walk from the various beach hotels. It is expected that the Manufacturers' association will have a

larger and more attractive exhibit than that at the Columbus convention last year.

Convention Halls.

A large convention hall, with a seating capacity of 800 people, will be provided on the Steel Pier for the opening of the American association convention and smaller meeting rooms will be available for the various sectional meetings of the American, the Accountants', the Engineering and the Claim Agents' associations.

Additional information in regard to the hotel and railroad facilities, the convention halls and the arrangements made for the manufacturers' exhibits will be issued from time to time from Mr. Swenson's office.

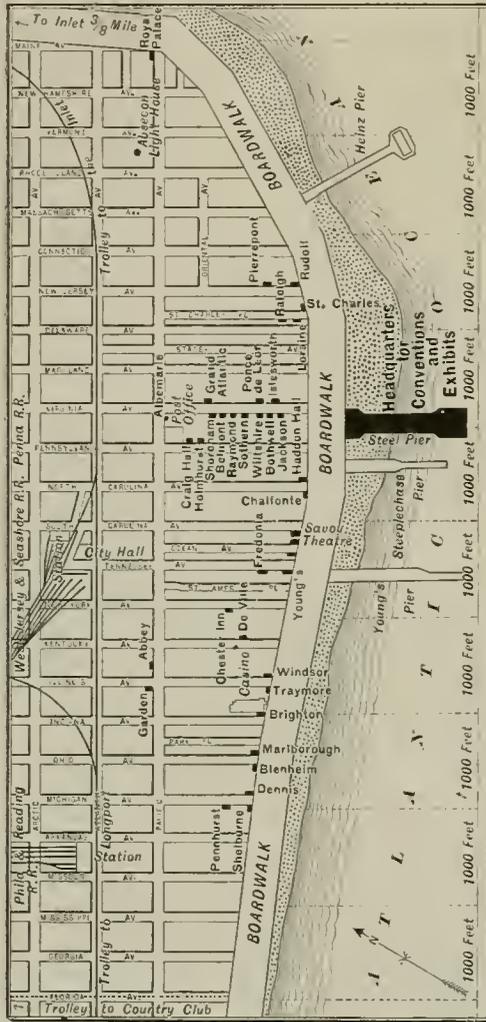
Reference to the map herewith shows the relative location of the railroad stations, the principal hotels and the Steel

PROBLEMS WHICH CONFRONT THE PUBLIC SERVICE CORPORATION.

Thomas N. McCarter of Newark, N. J., president of the Public Service Corporation of New Jersey, delivered an address before the board of trade of Plainfield, N. J., on February 12 on "Public Utilities in New Jersey." In explaining the situation which led to the formation of the Public Service Corporation, Mr. McCarter discussed the subject of overcapitalization, the prevailing sentiment against public service corporations, and the problems which now confront the company of which he is the president. He said in part:

For the past two years, during the peak—as we say in the electrical business—of the public feeling against corporations in general, and quasi-public corporations in particular, I have conceived it to be wiser, in the performance of my duty as president of the Public Service Corporation, to refrain from speechmaking, and devote my entire energy to the routine and arduous duties of my position. The public, rightly or wrongly, has not been in a receptive frame of mind, and anything that I, or one similarly situated might have said, would have had little, if any, effect. The pendulum has swung so far, however, that the thinking men of the country are beginning to appreciate the gravity of the situation, and therefore it seemed to me, when I received the courteous invitation of my friend, your mayor, to come here and speak on this subject, that perhaps the time was ripe for me to frankly discuss the problems which confront me as the head of the large corporation over which I preside, and affect us all as citizens of New Jersey.

I was educated as a lawyer, and I pursued my profession until the formation of the Public Service Corporation and my election to its presidency in 1903. The few years prior to 1903 had been formative or constructive years of the underlying companies now in the Public Service Corporation, and in my professional work I had been considerably employed in doing the legal work involved. In several instances I invested money in the enterprises which I was conducting legally, out of one or two of which I made money, out of others not. My point is, that I was not one of the gentlemen concerned in the original exploitation of these various enterprises. Not that I am casting any reflection upon those who were; that work was done by some of the strongest men this state has produced. It was a strenuous undertaking, and undoubtedly shortened the lives of Vice-President Hobart and the late B. M. Shanley of Newark. There is much to admire in the work of these gentlemen and their associates. They quickened the growth and development of our state, they gave employment to thousands of people, and they made living more comfortable. But from the present standpoint it is clear that they made mistakes, too, in that they overdiscounted the future, and overcapitalized some of the great properties they constructed. This was all done, however, in the open, under due forms of law, and without public hostility at the time; in fact, those who were given an opportunity to "come in" were regarded as highly fortunate. In the course of a short period these securities became widely scattered for value, in the hands of the investing public. It is not too much to say that they passed into the possession of the rich and the poor, the corporation and the individual, the husband and the widow. While we all, I think, disapprove now of the extent to which this overcapitalization was carried on, we must remember that the theory on which it was based was justified at the time, both by law and public sentiment, and that without the expectation on the part of the promoters of some profit above the ordinary interest return, these properties with their resultant benefits would not have been constructed.



Atlantic City Convention—Map of Atlantic City, Showing Location of Principal Points.

pier which is to be the headquarters for the convention and the exhibits. The accompanying halftone engraving shows the Steel pier as arranged for the convention exhibits and gives an excellent idea of the pleasing and artistic manner in which it is possible to arrange and decorate the booths.

The Utica & Mohawk Valley Railway Company has for some time been making experiments to determine the adaptability of the hot water system of heating to the small single-truck cars in use on some of its lines. Such a system has been in operation on the interurban cars and has worked very satisfactorily. In the interurbans the heater is located in the motorman's vestibule. In the small cars there is no space for it in the vestibule and the experiments were to determine the feasibility of locating it in the corner of the passengers' section. A heater was recently installed in a car that has been running in Utica much of the time and it has worked satisfactorily.

Obligations Could Not be Met.

But time was passing on, and it gradually became apparent that, while in the main, gas and electric properties were profitable, and justified expectations, the street railroads did not. By the winter of 1902-1903 it was evident to those at all in touch with the situation, that without new capital for necessary improvements, and for the restoration of impaired credit, the railroads could not go on. Just at this time a horrible catastrophe occurred. A carload full of school children collided at a dangerous crossing in Newark, with a Lackawanna train, resulting in much loss of life, great personal injury, and filling the whole country with consternation. This was the last straw, which, it was quickly seen, would break the camel's back. Something had to be done, and that quickly, or a great financial panic stared New Jersey in the face. The railroads could not meet their accruing obligations. This was becoming generally known, and I knew it professionally, as well as a matter of general information. While the securities were held broadcast, the policy of the constituent companies was shaped by a comparatively small

number of men. To these gentlemen I suggested, as the solution of the problem, the formation of a new company, with a large cash capital, which should acquire, upon fair terms, all the constituent properties, good and bad, represented by them, the theory being that during the critical period the strong and prosperous should carry the financially and physically weak properties.

Thus the Public Service Corporation was formed, with a cash capital of \$10,000,000, fully paid up, without one dollar of water. It shortly acquired all of its gas, and many of its electric, properties by lease. The stocks of the financially embarrassed railroads, and of the United Electric Company of New Jersey, which served Essex, Hudson and a part of Union counties electrically, and which was also in a struggling condition, were exchanged for the obligations—not the cash—of the new company, but in the doing of it approximately \$60,000,000 of stock obligation was transformed into approximately \$20,000,000 of new obligations. This transaction was certainly free from the injection of water.

At this juncture the gentlemen put up to me, as the suggestor of the enterprise, its successful consummation as a going concern, and I withdrew from my profession to accept its presidency. This fact is only of importance as showing the untrammelled point of view with which I approached my duties. At the commencement of my administration I had, and I still have, three and only three objects in view.

1. The making good of every dollar of all these underlying bonds and securities by whomsoever held, and the prevention of the financial panic that would have ensued, and, gentlemen, unless socialism and confiscation are to prevail in this country, which they are not, that object has been attained beyond peradventure.

2. The giving of efficient and economical service to the people of this state in the three great public utilities of gas, electricity and street railway transportation.

3. The assurance of an ultimate fair return to the stockholders who have invested their money in the stock of this company at par, first to the extent of \$10,000,000, subsequently increased by \$2,500,000, now making \$12,500,000 in all, thus far without a cent of return thereon.

These, then, have been the three objects before me. The first, that of safeguarding the underlying securities, has, happily, as I say, been accomplished. What of the second—the giving of efficient and economical service to the people? Let us bear in mind that the company operates all the important gas, electric and street railway properties in the state, as far south as Camden, with the exception of the gas property in and about Elizabeth and the street railway system in Trenton. This is a vast undertaking, and that it is not done with entire satisfaction to the public or to ourselves, no one knows so well as I. Remember, if you please, that the Public Service Corporation came into possession over night, as it were, of a vast number of properties of different kinds, in all stages of efficiency and decomposition, and this was only four years ago.

Rebuilding the Railways.

In the railway department alone we are in process of amalgamating into one homogeneous whole nine different systems of railroads that previously had no interdependence. Many of them were in a state of physical as well as financial collapse, and have had to be rebuilt. This work is progressing, but it will take several years to complete. We have in these four years already spent upwards of \$26,000,000 in the improvement, extension and rehabilitation of the properties, and have appropriated over \$6,000,000 additional for similar expenditure this year. This money, over and above the \$12,500,000 of capital stock, has been raised by the sale of securities. We have built and rebuilt over 110 miles of track. We have purchased 568 new cars; we have built new power stations. The community is growing so rapidly that it is difficult to keep pace with it, let alone to improve conditions. Nevertheless, they are being improved; each year there is a substantial improvement, and this will continue if present administrative policies prevail, until the time will surely come when this company will give as satisfactory service as the nature of the business will permit. It will never be perfect; it is not perfect anywhere.

The troubles of street railway operation are legion, and in winter time are always with us. They are caused by difficulties too numerous to mention, over many of which the company has no control, such as snow, vehicular traffic, blocking of cars, etc. Of course we are not free from blame. No concern handling over 10,000 employes in work of this character is free from error, from the president down to the humblest employe. All we can do is to do the best we can, and that is the honest purpose of my administration.

As to the second branch of the subject of which I am treating, viz., the economy of service, I am proud of what we have accomplished and are doing for the people of the state. To summarize briefly, a complete transfer system has been

put into effect between the nine railroad systems at all connecting points, where none formerly existed, and the 5-cent fare zone has been extended to the limits of reason, it being now possible to ride over 15 miles for a nickel in certain localities.

While all this reduction has been going on, the price of nearly everything else has been going up, taxes, labor, coal, oil, manufactured products of every character all advancing, while the cost of the finished product—gas, electricity or transportation, as the case may be—has been coming down. This state of affairs, with its attendant results, if carried to extremes, was commented on with great force by Samuel Spencer, the late president of the Southern Railway, in a public address shortly before his death. The public should realize that there is a point beyond which these opposing forces must not go, if conflict is to be avoided.

Extensions Demand Capital.

All this is of the very greatest importance. It has a direct bearing on the ability of corporations to raise the necessary capital to properly extend. If rates are to be put below the point where fair earnings on obligations can be secured, fresh capital cannot be secured, and stagnation of enterprise will result. It takes, and will continue to take, for some years, if not indefinitely, about \$4,000,000 annually of new money to finance the new business and extensions of the Public Service Corporation. This does not include a mile of extended railroad track. In these troublous times, even this comparatively small sum of money is not easily acquired. This situation, so far as new extensions are concerned, is accentuated by the passage, in response to a well-defined but, in my opinion, mistaken public sentiment of the so-called limited franchise law, restricting the period for which franchises may be granted to 20 years, except where by vote of the people the period is lengthened to 40 years. This does not affect the Public Service Corporation to any extent, for I am entirely satisfied that we have enough to do to develop the properties we now have, without further substantial extension. In a sense, it is a direct benefit to the Public Service Corporation, for it prevents others from obtaining what the Public Service Corporation already has. But it will, in my judgment, retard the development of the rural sections of the state. In these times it is utterly futile to consider the financing of rural country lines upon any such limited basis, and we are not attempting it. This is not the manifestation of any dog in the manger policy, but simply a recognition of conditions.

Stock-Watering and Overcapitalization.

The third aim of the Public Service Corporation is to earn a fair return to stockholders upon their investment. We have been going four years. In 1906, for the first time, we earned a little over 5 per cent on our stock, and that on a gross business of \$21,000,000 and a stock capital of \$12,500,000. I think that all will agree that this is as close a margin as any legitimate business should be conducted upon. But with the enormous increase in the company's business each year, unless all conditions change, within a reasonable time the earnings will substantially increase. At least this is our hope and belief. How then shall these earnings be distributed? The day of stock-watering and overcapitalization of properties of this character is over, and properly so. Governor Stokes in his annual message of 1906 strongly inveighed against this evil, and recommended legislation to prevent it. In compliance therewith the legislature of last year passed a very drastic act, with which I do not think the public are very familiar, but which positively forbids public utility companies from issuing their obligations for less than par, except a reasonable banker's commission, and forbids the issuance of all stock, except for par. Heavy penalties are attached, including the rendering of the securities invalid. The governor will bear me out, I think, that because of my familiarity with the subject, I, at his request, prepared this bill, and I am in hearty sympathy with his provisions.

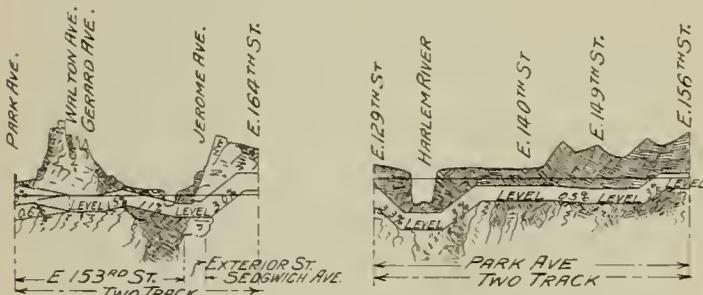
I believe that we should recognize conditions as they are, without any attempt to undermine values or confiscate securities heretofore issued under forms of law; that we should, as above, prevent all further watering; that stockholders of existing companies should be allowed to receive 10 per cent annually—a fair business profit—upon their investment before there is any further restriction placed upon these companies by taxation or otherwise. Until such time comes, the companies are taxed sufficient in all conscience.

The Indianapolis & Cincinnati Traction Company, which recently opened its Shelbyville and Greensburg division, has instituted freight service on this division a month sooner than anticipated to meet the general demand upon the part of the citizens for an interurban freight service.

THE LEXINGTON AVENUE SUBWAY, NEW YORK.

Bids for the construction of the new Lexington avenue subway in New York were advertised for on April 2, by the Board of Rapid Transit Railroad Commissioners. The plans which are shown herewith, and for which we are indebted to Mr. George S. Rice, chief engineer of the commission, show that the new line is intended to extend from the Battery to One Hundred and Sixty-fourth street, the Bronx. The line from the Battery to the vicinity of Forty-second street follows somewhat closely the line of the existing subway, but at a short distance to the west.

Beginning from Battery Park the line follows Church street to Vesey, where it turns to the right to Broadway, under which it proceeds to Twenty-fifth street, whence it deflects and passes under Fifth avenue to Thirty-fifth and Thirty-sixth streets, under which streets are to be two lines which turn three blocks east to Lexington avenue. From Thirty-sixth street the line proceeds directly under Lexington avenue as



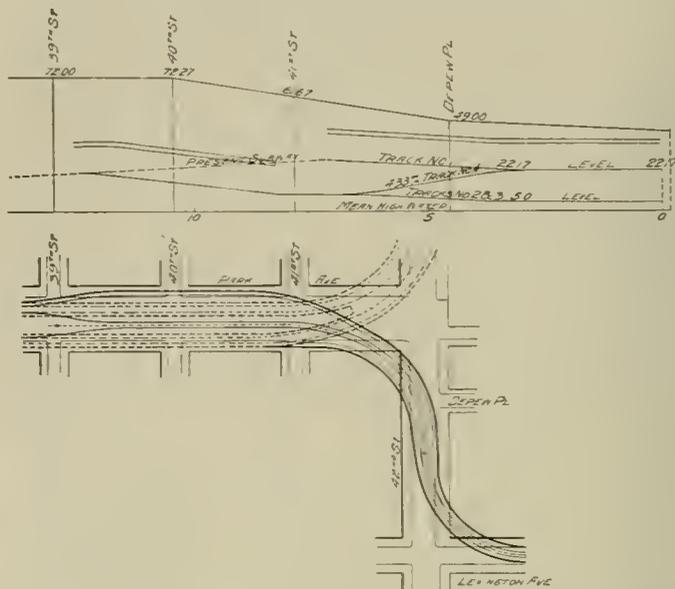
Lexington Avenue Subway, New York—Longitudinal Cross-sections.

far as the Harlem river. Passing under the river the line continues under Park avenue, crossing underneath the present subway at East One Hundred and Forty-ninth street, whence it turns to the west along the line of One Hundred and Fifty-third street to One Hundred and Sixty-fourth street.

From a point between Thirty-eighth and Forty-first streets, where a junction can conveniently be made with the existing subway north to One Hundred and Twenty-ninth street, the road will consist of four tracks. From One Hundred and Twenty-ninth street north there will be two tracks and the

maximum width of 15 feet for each track, except at stations, where the width is increased. The roof and sides of the tunnels will be of iron or steel and masonry, and the roof will be as near the surface of the street as street conditions and grades will permit, but the track will be depressed wherever necessary to avoid grade crossings and at the approach to the Harlem river.

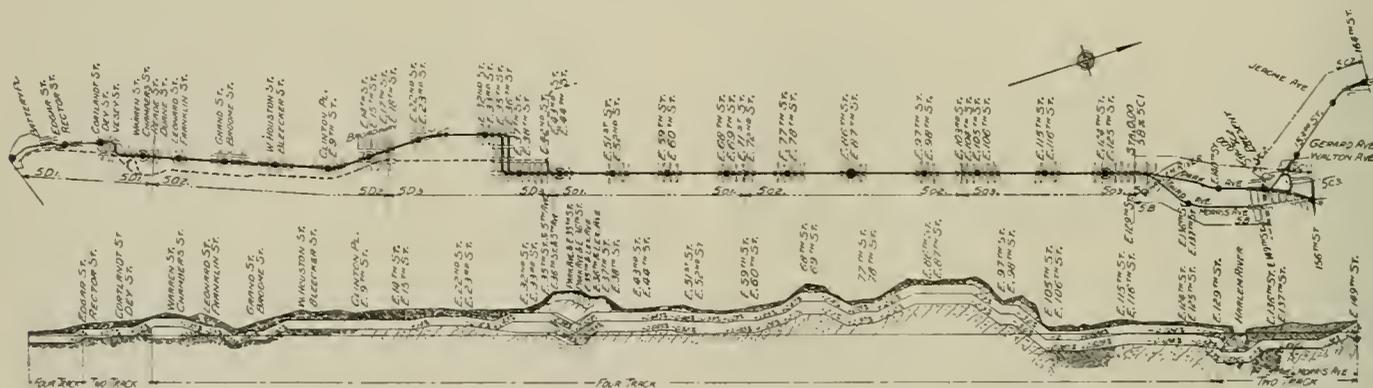
In some features the plans provide for a different construction than that which prevails in the case of the existing



Lexington Avenue Subway, New York—Skeleton Elevation of Rapid Transit, Metropolitan and Lexington Avenue Subways.

subway. Entrances to stations will in general be placed within private property, and stations are in general located midway between the lines of two streets. Construction generally will be carried on by means of tunneling or excavation under cover, except in cases in which express permission for an open cut may be obtained from the board. Contracts for the work will be let in seven different sections, which cover the entire line from Battery Park to One Hundred and Sixty-fourth street.

At Chambers street, which is assumed to be the southerly



Lexington Avenue Subway, New York—Route and Longitudinal Cross-section.

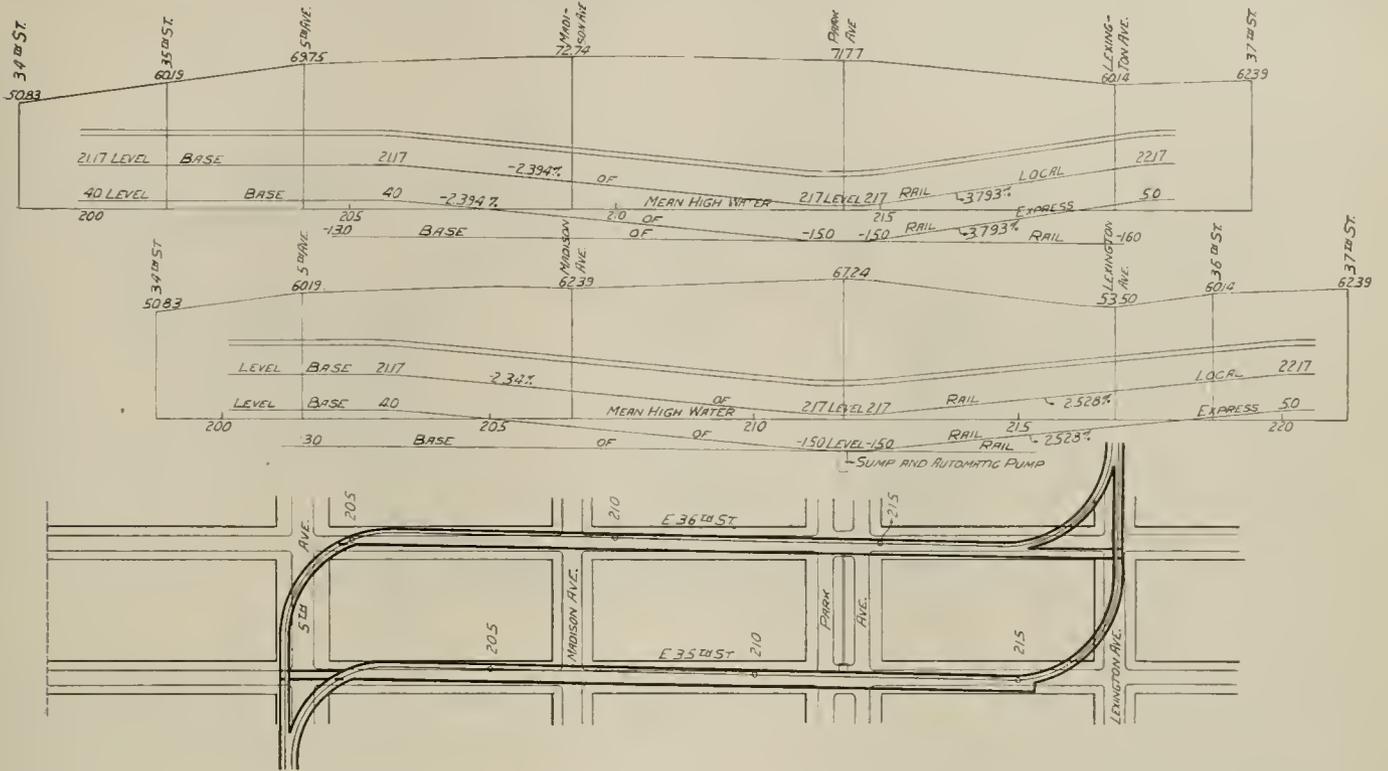
loop at Park avenue between One Hundred and Fifty-first and One Hundred and Fifty-second streets will be one track. Including the two lines at Thirty-fifth and Thirty-sixth streets there will be four tracks at this point, and the four tracks will be continued as far south as Chambers street. From this point south to Battery Park there will be two tracks exclusive of the additional tracks required for terminal purposes under Battery Place and Battery Park.

It is provided in the specifications that the tunnels are to have a height of not less than 13 feet in the clear and a

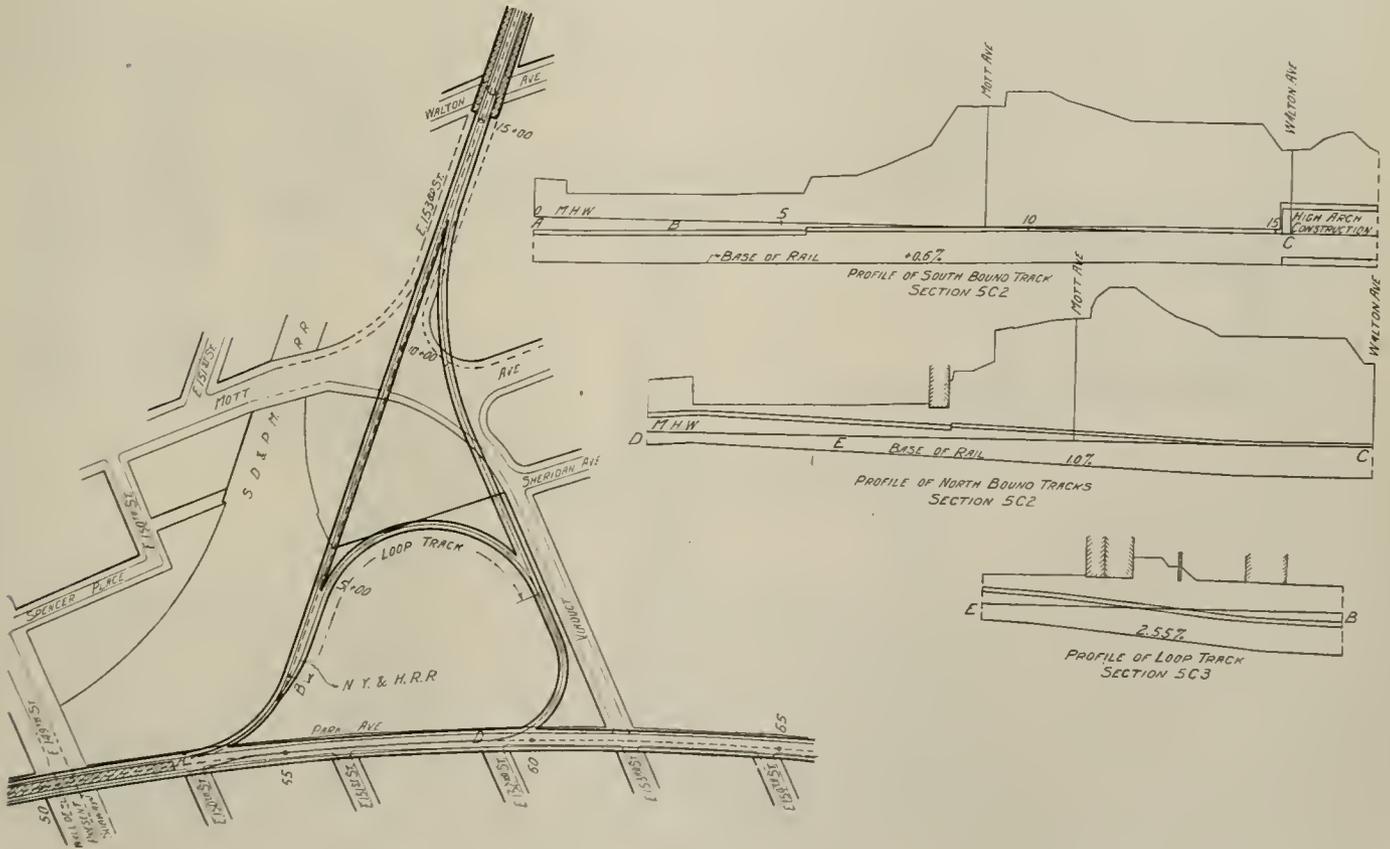
limit of express service, there will be located a station accommodating four tracks, in the form of a double-deck structure. The two upper tracks will be for express service north of Chambers street and will be the continuation of the tracks which come north from Battery Park. The two lower tracks in the station will be for the accommodation of local trains coming from and going to the north of Chambers street. These two tracks will be extended south under Broadway to provide sidings for the housing and care of local trains. From Chambers street north the four tracks continue under Broad-

way, coming to substantially the same level at a point 700 or 800 feet north of the station. They will then continue along Broadway as near the surface as practicable to and

Thirty-first street. The local tracks will then converge and come together over the express tracks at the south end of the station, between Thirty-second and Thirty-third streets,



Lexington Avenue Subway, New York—Plan and Skeleton Elevation of Route on Thirty-fifth and Thirty-sixth Streets.



Lexington Avenue Subway, New York—Plan and Elevation of Mott Haven Loop.

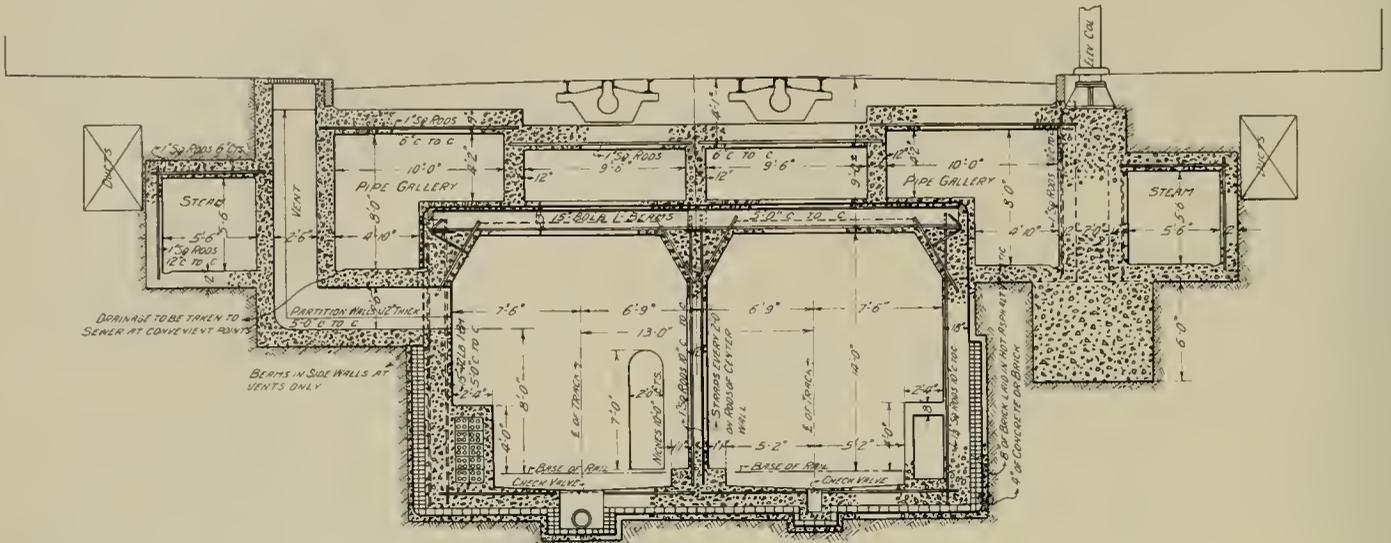
under Union square and Broadway to Fifth avenue, and thence to a point between Twenty-seventh and Twenty-eighth streets, where the center or express tracks will begin to descend and the outer or local tracks will rise to about the center line of

which will be built in the form of a double-deck structure. Just beyond the station the northbound tracks turn to the east and pass under Thirty-fifth street under the present subway at Park avenue, rising again as they approach Lexington

avenue. The southbound tracks from Fifth avenue, at a point between Thirty-fourth and Thirty-fifth streets, separate from the northbound and turn east under Thirty-sixth street under the present subway at Park avenue and to Lexington avenue, where they join the southbound tracks as above described. At the point of junction the four tracks will be carried as a

street, where connection can conveniently be made with the present subway. The two upper tracks continue under the Harlem, passing under the present subway at One Hundred and Forty-ninth street and to a terminal station at One Hundred and Fifty-sixth street.

At One Hundred and Forty-ninth street station one track

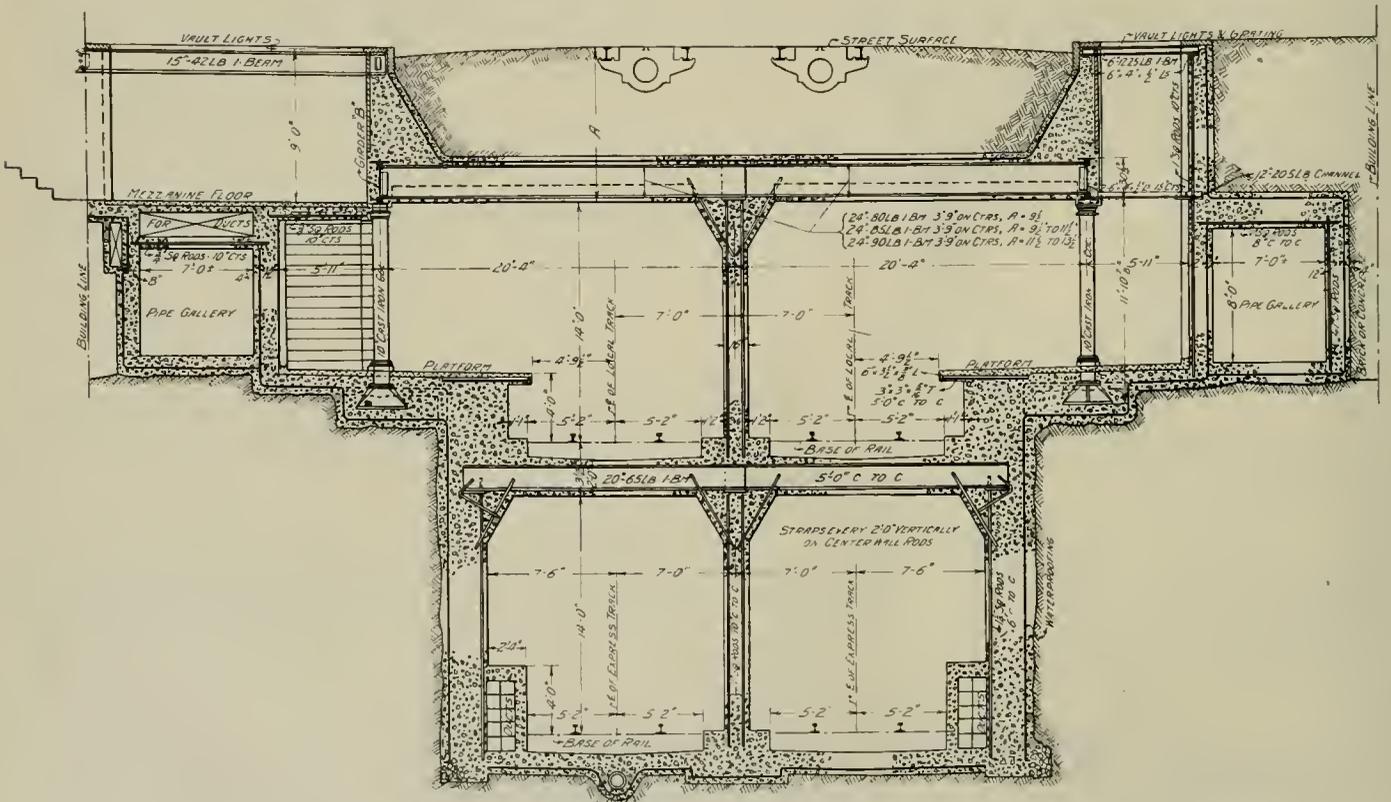


Lexington Avenue Subway, New York—Section Through Subway Showing Ventilating Shaft.

double-deck structure, with the local tracks on the upper level.

The double-deck structure is continued as far as the end of the station at One Hundred and Twenty-fifth street. From the north end of this station the two upper tracks will con-

will rise and come to a higher level than the tracks which lead to the terminus. It will then curve to the west, pass over the southbound track leading from the terminal under the tracks of the New York Central Railroad and under One Hundred and Fifty-third street to a point between Mott and



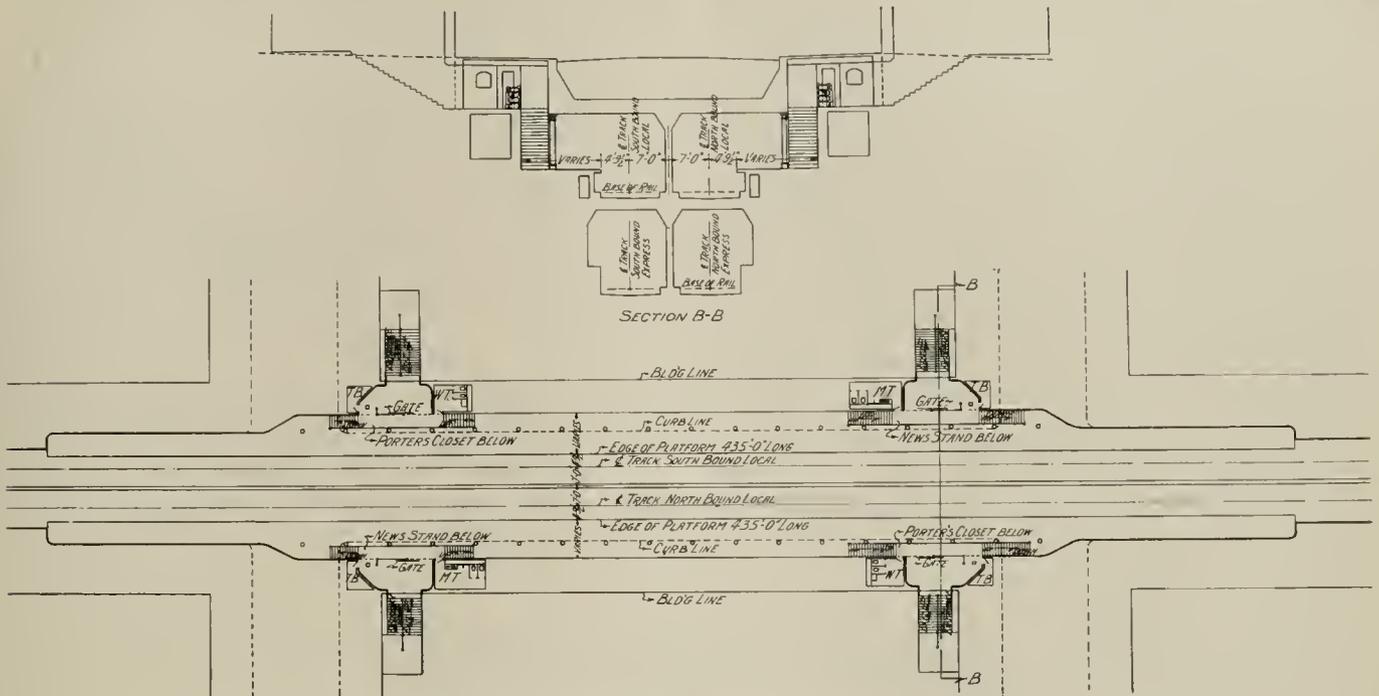
Lexington Avenue Subway, New York—Section Through Subways, Showing Double-deck Arrangement at Stations.

tinue north on substantially the same level to about One Hundred and Twenty-ninth street, and the two lower tracks will branch in order to provide connections which will be described hereafter. These two tracks will pass under the Harlem river and Morris avenue to One Hundred and Forty-eighth

Walton avenues, where it is joined by the southbound track, which has been carried farther to the north before diverging from the lines leading to the terminal. A loop at this point connects the south and north bound tracks. This loop will be entirely under private property and under the tracks of

the New York Central. The location and arrangement of these tracks, as well as the connections described at Thirty-fifth and Thirty-sixth streets, will be clearly understood by reference to the accompanying engravings, showing the gen-

eration of these devices shall be built two between every two stations, one on each side of the track. Free air will be secured through gratings in the sidewalks in the roof of the ventilating



Lexington Avenue Subway, New York—Plan and Section of Station.

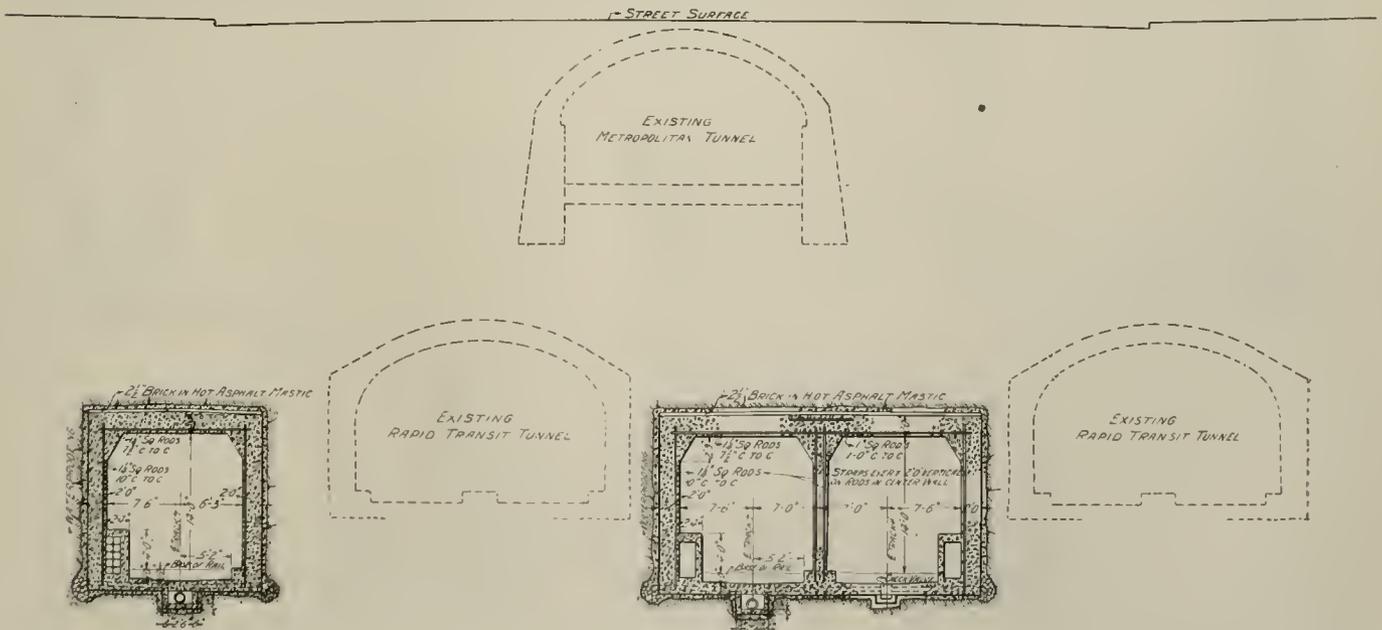
eral plan of the entire line, and these two portions in considerable detail.

As indicated in the foregoing description, on parts of the road which have four tracks on substantially the same level, the inside tracks will be used for express purposes. When the form of construction provides a double-deck structure, the two lower tracks will be used for express service.

In view of the difficulty which has been experienced in

chambers. Also, in the construction of the walls suitable provision is required to be made for the piping of the various services which may occupy the ground below the street level.

The fact that Lexington avenue is largely a residential street, and is comparatively narrow, has been the occasion for determining to make the structure of double-deck character. This condition is also taken into account in the provision that the contractor must be required to maintain free



Lexington Avenue Subway, New York—Section Through Subways Under Park Avenue and Forty-second Street.

connection with the ventilation of the present subway, provision is made in the present plans for the installation of necessary apparatus for ventilation at the sides of the roadway to be constructed in connection with the construction of

access to entrances of all buildings during the progress of the work.

In the construction of the stations, the feature which has been found so desirable in the present subway, that is, making

DEPRECIATION AND RESERVES.*

BY GEORGE WILKINSON,† C. P. A.

The accountant, in his investigation of the accounts, must be careful to determine what amount has been expended on maintenance and current repairs of building and machinery, and what, if anything, has been charged against the earnings with respect to "Depreciation." If the amount so charged is, in his opinion, insufficient to properly provide for the replacement of the machinery, by the time it is estimated such machinery will be useless, it is his duty to make a specific allowance for depreciation in addition to what the books may show, before stating the net profits. In such an investigation the accountant should not content himself by stating the profits "before charging depreciation."

The investigating accountant should also carefully examine the accounts to determine what amount has been expended on renewals and to what accounts charged. If he finds that any considerable sum has been charged against the earnings for machinery, to replace that which has become worn out or obsolete, he must surely take such amount into consideration as a deduction from the amount he would otherwise charge as "Depreciation."

The science of bookkeeping has been gradually evolved for the purpose of recording permanently, by the combined use of words and figures, the history of a business undertaking.

Fundamentally, the receipt and payment of money form the basis of commercial transactions, money being the means of interchange between different members of the same community, between the producer and the consumer. But there are certain facts to be recorded, in the history of a manufacturing enterprise, which do not affect anyone but the proprietor of the business, and among these comes the matter of depreciation. Ultimately even this matter resolves itself into a cash transaction, because some day the property, upon which the depreciation is today computed, will become worn out and have to be renewed, and then money must be spent to renew it.

The question of "Depreciation," if taken as a whole, is so vast, that a lecture of one hour's duration must either deal with the subject superficially (which is never convincing) or else its scope must be narrowed down to dealing with a few subjects, so that these can be carefully considered and the application of certain rules determined. The latter is the object sought for this evening's lecture.

No one, to my knowledge, was ever bold enough to lay down fixed rates at which depreciation ought to be charged under all conditions. On the contrary, all agree that considerable diversity of opinion exists, even among those best informed on the subject. Further, that, as no two cases are exactly alike, fixed rules cannot be made to apply. It is also fully agreed that the question of depreciation comes within the realm of opinion and that the special conditions under which each property is operated must be carefully taken into consideration.

"Depreciation" may be defined as the loss in value of some destructible property over and above current repairs. The loss which arises with respect to breakage and which can be replaced by repairs has nothing to do with depreciation.

If any part of a machine breaks or becomes worn out, there is a loss. The loss to the machine may be readily replaced by a new part and the machine is said to be "as good as new." This results in an expense to the owner of the machine, which is commonly called "Repairs," or, more technically, "Maintenance." The loss that arises through "Depreciation" is of a different nature. It is not accidental, but slow, gradual, inevitable. If the owner of a machine repairs it ever so well there inevitably comes a day when it can no longer be kept in serviceable condition. Its usefulness is gone. It cumbereth the shop. It is thrown on the scrap heap or sold to the junkman. Its owner is then face to face with the loss of its value. This results in a loss of "Capital," or a loss of "Revenue," according to the manner in which it is dealt with. If the necessity to make proper provision for depreciation out of earnings is neglected (as it often is) it will ultimately assert itself, to the most serious embarrassment of the owner, as a loss of capital.

If the business is a temporary one, or if the process the machine was bought for is at an end, then the loss is part of the capital of the owner, and he may be quite content to see it thrown on the scrap pile. But this is very seldom the case. In a vast majority of instances the owner wishes to

continue in business and finds himself compelled to replace the defunct machine, generally with a better one. Modern development lies in the direction of constantly increasing the efficiency of the machinery employed in all classes of manufacture, and it is seldom that a worn-out machine is replaced by another its exact equal.

Now, if he has been wise, the manufacturer will have provided for the replacement of the worn-out machine out of the profits it has earned for him during its life of usefulness.

Just as a portion of the proceeds of his finished product is paid to the mechanic for his labor, so a portion of those proceeds should be set aside to replace the machine that aids the mechanic when it shall be worn out.

It may be that the machine may never be replaced with another of its own kind, but if the same process is continued another machine—possibly ten times more costly—will eventually be purchased to replace or displace the old. It matters little whether we spell the word replacement or displacement—nothing lasts—either a machine is replaced with another of its kind, or it is displaced by a different machine of much greater capacity. This principle applies to any inanimate thing that moves or is moved, be it a windmill, or a traction engine that pulls the machine it drives and drives the machine it pulls.

Now, if we have successfully argued that the proprietor of a manufacturing business must provide, out of its earnings, for the replacement of the machine he uses, if he wishes to continue in business, let us see how this may be accomplished. It is impossible for him to know for a certainty how long a machine will last, or how much finished product it will turn out during its lifetime. The best he can do is to estimate how long a machine will continue in active service. If, having estimated how long the machine will last, he finds that it will have to be thrown out of use in a given number of years and sold for scrap, he will know that he must spread the cost of that machine over its estimated life, on a per cent basis, setting aside a certain amount of his profits each year, to provide for the replacement of the machine.

A common, and I believe mistaken, view of depreciation is that it is simply a loss that the business of a manufacturer suffers from, which should be written off, just as a bad debt is written off. Under this method the amount which the proprietor or the directors determine to charge against the earnings is credited to the asset account and its value thereby reduced. This method makes an annual charge for depreciation a detestable subject, a particularly bitter pill for the management to swallow; whereas, in reality, a reservation of a portion of the profit is merely a wise and conservative provision for the future.

There are other objections to the method of writing down the asset account. In the event of the destruction of the plant by fire, when it comes to making an adjustment of the loss, the diminished amount shown in "Plant Account" will certainly be considered by the adjusters in arriving at the basis of valuation. Or again, if the proprietor of the business wishes to sell his property, the diminished value of the plant and machinery, as shown by the books, will surely be urged by the purchaser. In vain shall it then be said that the machinery had really been kept up as good as new, and that no such depreciation as has been recorded on the books had really been suffered. On the method preferred, which we will call the "Reserve Method," it is easy to explain that the amount to the credit of the "Depreciation Reserve" represents the accumulation of sums which the directors had thought fit to set aside, out of the profits, to provide for replacement of the plant at some future time, and did not necessarily represent the measure of the deterioration of the property.

When the proprietor of the business determines to set aside a certain portion of the profits for the purpose of replacing the plant, the official historian (whom we call the bookkeeper) is called upon to record the fact on the official record of the business, namely, the books of account—and an entry is made charging "Profit and Loss Account" and crediting an account entitled "Reserve to Provide for Replacement of Plant."

Now it may be urged that this is merely a piece of bookkeeping, sometimes disrespectfully called "red tape." Not so. Something more than bookkeeping has been accomplished. The official historian of the business has recorded the fact that the proprietor, or, if it be a company, the directors of the company (those men who have been chosen to govern the affairs of the company), have officially decided to set aside a certain portion of the earnings, ear-marked, so to speak, to provide for the replacement of the plant. Bear in mind that it is not the making of an entry on the books, but the action of the board of directors, that gives validity to this transaction. Thus we know that, although no sum of money has been taken out of the business, a portion of the earnings has surely been set aside for the specific purpose required.

We have seen (1) that wherever profits are earned by

*Abstract of a lecture delivered at the Evening School of Accounts and Finance held in connection with the Wharton School of Finance and Commerce.

†Of the firm of Wilkinson, Reckitt, Williams & Co., Certified Public Accountants.

a manufacturing business the use of machinery is involved; (2) that machinery will last only a limited time; (3) that a sufficient portion of the profits, earned by the use of such machinery, should be conserved for the specific purpose of replacing the same; (4) how to give effect to these principles.

In a paper on the subject of "Depreciation of Water Works Plants," Mr. John W. Alvord, consulting engineer, of Chicago, gives an interesting table showing the history of 32 horizontal tubular boilers used in water pumping stations in Illinois, Iowa and Michigan. The active life of these 32 boilers was found to have varied from 6 years for two boilers at Sterling, Ill., where artesian water was used, to 23 years for two boilers at Oskaloosa, Ia., where river water was used, the latter boilers being still in service. The average life of this group of 32 boilers was 15 years.

These data would seem to indicate that the rate of depreciation charged on the diminishing value of the boilers should be 20 per cent where artesian water is used, 10 per cent where lake water is used and 5 per cent where soft river water is used, other factors being equal. These rates may be subject to revision in view of the success with which boiler compounds are used; also, in respect of the duties the boilers are called upon to perform and whether they are running easy, with ample time for repairs and cleaning, or whether they are crowded beyond their proper capacity.

When an accountant comes upon the scene and persuades the proprietor to begin making a provision for the replacement of the machinery, after the plant has been several years in use, and the value has been reduced by service, on what basis will the accountant compute the rate of depreciation?

This is and will remain a somewhat perplexing problem. It would manifestly be unfair to divide the entire cost of the half-worn-out boiler over the few remaining years it has to live. The effort of the accountant, if acting as auditor, should be exerted in the direction of having a liberal amount charged off each remaining year, so that when the plant has actually to be replaced, the amount then to be written off as the cost of replacement shall be reduced as much as possible.

If the accountant is acting in the capacity of special examiner, with the object of stating the profits of a manufacturer for a given number of years, he may content himself making a charge for depreciation, computed at what it would have been had proper principles been followed through the life of the plant. That is to say, he should calculate what the charge should have been in each of the preceding years, and base his charge for the period examined on the diminished value.

It is not always necessary or desirable to continue charging depreciation after a sufficient amount has been accumulated to the credit of "Reserve for Replacement of Plant," to substantially replace the plant and machinery. In actual practice this point is seldom reached, but it has come plainly in sight to some of us, with the result that we have recommended a gradual reduction of the rates charged, and ultimately we shall recommend that a further charge will be unnecessary.

Of course, such a state of affairs indicates that the charge made in the early years was excessive; but if the earnings arising from the use of the property, during the early years, have warranted the charge, the owner is just that much to the good, and can enjoy the profits of the later years, without deduction in respect of depreciation, albeit the property may still be declining in value.

This brings me, logically enough, to another and not less interesting phase of this many-sided subject of depreciation—its negative aspect—when and where not to charge depreciation.

It is seldom nowadays that we come across a manufacturing business where a specific charge for depreciation on machinery ought not to be made.

In the old days, say 15 years ago, when the great wave of company promotion first swept over this country, and public accountants were employed to examine the accounts of manufacturing companies, with the view of establishing the average net profit earned during a period of years, it was no uncommon thing to find that the value of new machinery, bought during the period and improperly charged against the earnings, was sufficient to cover a reasonable depreciation charge. In these cases the accountant's certificate stated that the plant had been adequately maintained, but no specific charge was made for depreciation.

This was particularly the case in manufactories where skilled mechanics were extensively employed. It was customary, under the primitive bookkeeping methods in use 10 or 15 years ago, to charge all materials, including lumber, iron, steel, castings, hardware, tool steel, and similar, to "Material Account," without keeping any record of the use same was put to. It was also quite customary to charge all wages, including machinists, carpenters, painters and all, to "Labor Account," irrespective of the nature of their employment.

In those days it was extremely difficult, and in some cases absolutely impossible, to determine, from the books of account, how much had been spent for "Maintenance and Repairs" and how much for "New Machinery and Betterments to Plant." In such cases we had to "make a stab at it." We would go carefully all over the plant with the superintendent, who pointed out new machines and improvements made during the period, the cost of which had been charged against the earnings. We were perforce obliged to be content with that.

The refinement of modern bookkeeping methods of today has changed all that. If a pound of nails is used to repair a break in the fence, "Maintenance Account" is surely charged. If a new machine, however small, is bought or made in the machine shop, the actual cost, including the freight and labor and incidental expenses of installation, is all charged most religiously to "Improvement Account." All this makes it more than ever necessary to be sure to make a proper charge for depreciation.

During the first year of the life of a new plant it is inadvisable to make any charge for depreciation, except as hereinafter noted. The reasons for this view are: (1) While the business is new and struggling to get on its feet, it cannot afford to put aside any portion of its profits for the purpose of rebuilding the plant; (2) there are always a large number of expensive things occurring in the infancy of a business—the machinery doesn't run right and requires adjusting, causing a loss of time; a great deal of the time of the proprietor or the superintendent must be given to supervising the installation of machinery, no charge for which is made; correspondence, telegrams, and other expenses incidental to the installation of the plant, run high during the infancy of a manufacturing business. When these disappear and the plant gets down to a regular working basis, say during its second year, it will be time enough to begin charging depreciation. New machinery added to the plant should only enter into the calculation of depreciation for half of the first year.

The exception is when an operating company steps into a ready-made business and into the possession of a ready-to-operate plant, with average earnings from the very first. Then the charge for depreciation should begin at once at the full rate.

As has been said before, theoretically there is depreciation on everything that comes under the head of property, except cash investments and land. But there are many classes of property upon which there is no practical way in which the depreciation can be handled, their nature making it necessary to maintain them in a state of perfect preservation. Let us look at some of these and see how this principle applies.

It is neither customary, practicable, nor necessary to make any charge specifically for depreciation against the earnings arising from the use of piers, docks, wharves, railway tracks, telegraph lines, reservoirs, dams, canals, locks and many other properties of a similar description.

These properties are permanent and irremovable. Their maintenance is a constant source of expense and must be paid for out of the earnings they yield. The nature of the properties demands that they be kept practically in a state of perfect preservation. What portions of these properties are not really permanent are renewed again and again in the life of the property, and all these replacements must be paid for out of the earnings.

In examining the accounts of companies owning any of the above-mentioned properties, the accountant must see to it that no amounts expended for materials or labor usable for repairs are charged to capital accounts, unless they represent absolutely new work, involving an extension of the earning power of the property. It will be possible, in this lecture, to refer to only three of these properties, which may fairly be considered indicative of the principles governing the others, though the detailed considerations herein suggested will not apply in each case.

Another illustration of a permanent property, upon which it is not customary or practicable to compute depreciation, is a railway property.

[In a letter to the editors, Mr. Wilkinson says that this statement refers particularly to steam railway tracks and has little bearing upon electric railways within municipalities.—Eds.]

A railway track, in all its parts, is irremovable. It is a permanent structure and as such must be maintained in the highest state of efficiency in order to be effective. This is such a paramount necessity that any railway company which does not spend generous sums upon maintenance of the permanent roadway, and upon improvements thereof, will soon find the operation of the road unduly expensive and dangerous.

First, let us look at the roadway itself. From the very first day that operation begins there must be spent large sums for strengthening the roadbed. Heavy rains, melting

snow and sliding banks necessitate large expenditures for additional culverts, for larger drains, for ditching and for stone retaining walls, while the expense of heavy rock ballasting appears to be almost without end. There is always something to be done in straightening out curves, reducing grades, filling in soft places, draining the right of way and oftentimes part of the surrounding country, all of which must be paid for out of the earnings.

Then the bridges and trestles, hastily built in construction days, require strengthening with additional timbers as well as new sills, caps, posts and stringers for replacement of rotten or defective materials. Even if a wooden bridge is entirely rebuilt, the cost must be paid out of the earnings.

In five years or less, the ties, especially those that lie low in the sand, are found to be rotten or cut with the chafing of the rails, and have to be replaced a few at a time. It is not long before the rails on the curves and gradients show wear and have to be renewed, the old rails being retired to service on sidetracks. Switches, frogs, track fastenings, anglebars and all the rest don't last long and must be gradually replaced.

The cost of all these renewals and replacements must be paid for out of the current year's earnings and charged up to "maintenance of permanent way." This charge is likely to include much that is really in the nature of a betterment of the property, and it is right that it should. If this is done—and it is done on all properly managed railroads—the question of depreciation on permanent way does not arise. On the contrary, the railway is in better physical condition each year as a result of use and of experience paid for out of the earnings. Nothing should be added to property account, as an improvement to the permanent way, unless it represents actually more trackage. Under this method there is absolutely no depreciation whatever, the real value of the property being enhanced every year.

In time it will be found economical, in order to reduce operating expenses, to replace wooden bridges with steel spans, or when possible with permanent stone structures. Retaining walls and fills will take the place of many a trestle. Conservative management would permit the cost of these steel spans or stone bridges, which displace wooden structures, to be carried in a separate account, or preferably in an individual account for each structure, and would permit the cost to be spread over a period of years in equal instalments; so that in 10 years, or even 20 years for very heavy improvements, the cost of these betterments would have been paid out of the earnings of the road, the book value of the property as a whole being left intact at the original cost.

On the other hand, it would be wrong to add the entire cost of these improvements to property account as additional cost of the permanent way, although this is frequently done. There is, however, much to be said in favor of charging at least a portion of the cost of such permanent improvements as steel bridges and stone walls to property, on the ground that the value of the road has been increased and the cost of maintenance and of operation reduced.

Actually the value of the road has been enhanced to the extent of the difference in cost between the new structure and the old, and it would be no more than fair to add this difference to the property account, if same could be ascertained. The trouble is that in a majority of cases it is impossible to determine just what the original structure cost, especially where the railway company purchased the entire road as a going concern, or had the railway built for it by a construction company at a flat price per mile.

The "Depreciation Reserve" is sometimes called "Reserve for Replacement of Plant," or "Reserve for Replacement of Machinery." The more definite the title the better. A credit balance to this account represents a portion of the earned profits set aside to provide for the replacement of the plant. At the time of setting aside these profits the charge was made against the earnings as "Depreciation." This feature of the subject has been fully discussed in the early part of this lecture. It remains only to repeat that profits set aside for this purpose and carried to "Depreciation Reserve" are not available for any other use.

It has been urged, as an objection to this method, that directors have been known to use profits, which had been reserved for replacement of plant, for other purposes within their business. Such a course is certainly bad business, but it is no argument that the so-called "Reserve Method" is not the best. What the directors have done they can undo. I have in mind a case where the board of directors, by a series of resolutions, reconsidered all the previously made charges for depreciation, and set up substantially the same aggregate amount on an entirely different basis.

Conditions may arise in the history of a business under which the profits of prior years, reserved at the time for the replacement of plant and machinery, can be used to far greater advantage for some more necessary purpose.

The balance of "Depreciation Reserve" should not be shown on the balance sheet as a liability, but should be deducted from the assets affected, so that "Plant Account," while it remains at the total gross cost on the books, will appear on the balance sheet at its depreciated value.

The cost of machinery, specifically purchased to replace that which has become worn out or obsolete, may legitimately be charged to "Depreciation Reserve Account," but in actual practice it is found very difficult to do this intelligently, and it is regarded as a better plan to keep both the cost of machinery and the amount reserved out of the profits for the replacement thereof intact. The effect on the balance sheet is the same.

CENTRAL ELECTRIC ACCOUNTING CONFERENCE.

The next meeting of the Central Electric Accounting Conference will be held in Indianapolis on June 1. This conference was organized at Dayton, O., on March 2, 1907, for the purpose of enabling the accounting officers of electric railways in the central states to meet from time to time and discuss matters of interest. It may result in the adoption of a uniform method of accounting.

The following officers were elected:

Chairman—M. W. Glover, auditor Indiana Columbus & Eastern Traction Company, Cincinnati, O.

Secretary—C. S. Baker, auditor Western Ohio Railway Company, Lima, O.

Executive Committee—Walter Sbroyer, acting auditor Indiana Union Traction Company, Anderson, Ind.; A. F. Elkins, auditor Columbus Delaware & Marion Railway, Marion, O.; A. C. Henry, auditor Lake Shore Electric Railway, Norwalk, O.

COMMUNICATION.

The Future of the Steam Boiler.

To the Editors:

When I returned to St. Louis, Mo., I found on my desk a copy of your paper of the date of March 23, containing an editorial on and an abstract from Professor Breckenridge's paper before the Western Society of Engineers, read on March 20, 1907, entitled: "A Review of the United States Geological Survey's Fuel Tests Under Steam Boilers." The editorial gives the impression that the efficiency of a boiler as a heat absorber is constant when reckoned on all of the heat actually generated. This is nearly true, but the exact statement is that the efficiency is constant, or very nearly constant, when reckoned on the heat available to the boiler, counting as available that heat which remains from the heat generated after deducting out the heat required to raise all of the gases passing through the boiler from atmospheric temperature to steam temperature. As an illustration, it is easy to see that if a boiler were infinitely long, thus having a true boiler efficiency of 100 per cent, even then it could never cool the gases below its own steam temperature. The boiler should not be blamed for not absorbing this remnant of heat which is required to heat the gases of combustion from atmospheric temperature to steam temperature.

We wish the public distinctly to understand that this idea of constant boiler efficiency is as yet only tentative, and I believe Mr. John Perry so considered it. The fact remains that as yet we have found nothing to contradict it and dozens of facts and experiments to substantiate it.

Also please state in the description under Fig. 1, on page 397, the fourth line should read "No. 2, CO₂ in flue gases" instead of CO; the subscript 2 has evidently dropped out.

WALTER T. RAY,

Assistant Engineer, Boiler Division, St. Louis, Mo.
St. Louis, Mo., April 8, 1907.

Statistics show that between the years of 1895 and 1905 the steam railroads of Massachusetts decreased their mileage on main and branch lines 9 miles, while electric railways increased their mileage by 1,550 miles. The electric railways, it might be mentioned, are still reaching out their lines to better accommodate the great traveling public.

TRAINMEN AID IN INSPECTION AT DUBUQUE, IA.

The Union Electric Company of Dubuque, Ia., has adopted a very unique method of inspection which, in the absence of regularly employed inspectors on the system, materially aids in the operation and maintenance of the railway property.

Each conductor on the various divisions is required to fill out daily a report blank. These reports contain the following instructions:

Delays: Report all delays during the day, stating place and length of time of each delay, including time held on turn-outs (names of conductors and motormen causing delay), failure of power, derailment or disability of cars, delays at railroad crossings, fires and any other causes of unusual interest.

Accidents: State briefly all accidents occurring on or about your car; also state fully any trouble you may have had with passengers, and all disturbances, of whatever nature, that may have happened on your car during the day.

Track: Report all defects in track.

Cars: Report anything that is out of order about your car. Motormen will also report in a book provided at the barn. Urgent matters must be reported at the end of your trip to the office, in person or by telephone.

Running Past Meeting Points: This is positively forbidden under any circumstances other than those stated in the rules and regulations; report under this heading all such circumstances.

Overhead Line: Report all defects in overhead line.

Found Articles: Should be reported; also state when and where found.

Miscellaneous: Report all information, not classified elsewhere, that you think the company should have.

When these blanks, properly filled out and signed, are turned in to the superintendent's office, written orders are issued by the superintendent for the repair of all defects in equipment, tracks or lines, as reported. As soon as the required repairs have been made the man in charge of the work places his O. K. on the order and returns it to the superintendent. From these reports and order slips the superintendent's daily report, which is kept as an office record, is prepared.

The superintendent's report, which is known as the railway daily operating report, is printed in blank on the obverse side, on a good grade of paper, 4½ by 12 inches in size. On the reverse side of the paper the following instructions are printed:

Report fully by route the cause of all delays.

Report briefly by route all accidents. Report fully all disturbances.

Report defects in track, overhead lines and other property of the company. State if the same have or have not been reported to the person in charge, and, if reported, the date and time of the report.

Report defects in cars and car equipments. State whether same have or have not been reported to person in charge, and, if reported, date and time of such report.

Report fully cases of running past turn-out switches, stating route, time, place and cause of same, and names of men in charge of the car so doing.

Report the names of all employes discharged or laid off and the reason for the same.

Report by route the length of time power is off, giving the time of day of the same.

Report troubles with overhead lines; also time same were reported to the repairmen and time repairs were completed.

Report the purpose and length of time extra cars are operated during the day.

Report all articles found and turned into the office, stating the time, route and name of conductor who found the article.

Report the names of men employed and place of last employment; and state what work they are to do.

Report all extra teams and help employed and extra work ordered done.

Report all miscellaneous matters of interest to the company.

This system of reporting all defects observed in the company's property has developed a very thorough system of inspection without extra expense to the company. The trainmen have willingly obtained and reported unusual occurrences and unusual conditions; and incidentally they furnish to the company much valuable information. To increase the effectiveness of the daily reports the operating superintendent,

Mr. G. E. Miller, holds informal conferences with the employes once a month, and encourages them to discuss the operating features of the railway and to present their ideas as to the best methods of meeting unusual conditions that may arise.

CHICAGO CITY RAILWAY ACCEPTS NEW ORDINANCE.

Directors of the Chicago City Railway Company and of a new controlled company, the Chicago City Railroad Company, voted on April 12 to accept the ordinance which was approved on April 2 by the voters of Chicago. The formal acceptance, it was announced officially, will be filed with the city clerk on April 15. Under the terms of the ordinance the company is allowed 90 days from April 2 in which to file its acceptance and a bond for \$100,000 to indemnify the city against damages which may be suffered by reason of the privileges granted in the ordinance. This early acceptance will facilitate the improvements contemplated.

The subsidiary company, the Chicago City Railroad Company, was formed in January of this year in anticipation of the approval of the ordinances at the April election. The company was formed in accordance with a clause which provides that the obligations of the Chicago City Railway Company to construct, reconstruct, equip, re-equip and operate street railways, tunnels and subways may be discharged either by the company itself, or at its election, either in whole or in part, through the agency of the Chicago City Railroad Company. The Railroad company assumes all the obligations, assumed or imposed, as to street railways, tunnels and subways within the north and west divisions of the city; and under this clause will be responsible for the operation of the through routes of the Chicago City Railway Company cars in those two sections of the city.

Plan to Consolidate Companies.

The Chicago traction ordinances will lead to a financial readjustment of the Chicago City Railway Company. Those who are now in control of this company propose to authorize an issue of \$50,000,000 first mortgage 5 per cent bonds.

When the syndicate offered to pay \$200 cash for the \$18,000,000 outstanding stock of the Chicago City Railway Company, it acquired about 90 per cent of the stock. In the intervening period, while the outcome of the negotiations with the city has been in doubt, the stock has sold considerably below this figure, and it is stated on good authority that the syndicate now owns nearly all of the stock. While the plan of readjustment has not been officially announced, it is said by members of the syndicate to be substantially as follows: For each share of stock, par value \$100, the stockholders of the Chicago City Railway Company will receive \$100 in the new bonds and \$100 in stock of the Chicago Railways Company. The Chicago Railways Company will later acquire the properties of the Chicago Union Traction Company and under this plan will then control the systems in the three divisions of the city. The new bonds will mature in 20 years.

The City Railway ordinance stipulates that the property of the company shall be taken as worth \$21,000,000, as of June 30, 1906. The company has outstanding \$3,000,000 in notes, which will be redeemed, but as these represent additions to the property, the company would be entitled to pay 5 per cent on \$24,000,000 before there is any division of net profits with the city. The view of the syndicate is that these bonds, representing the agreed purchase price, should the city buy the property, will in effect be guaranteed by the city of Chicago.

Assuming that \$18,000,000 will be required by the Chicago City Railway Company for rehabilitation additional bonds to that amount will be sold, leaving \$8,000,000 which can be used for additional construction. The city, under the ordinance, agrees, if it purchases, to pay the cost of new improvements, which are charged to capital account. The City Railway Company also will be entitled to profits of 10 per cent

on construction and of 5 per cent for brokerage on the sales of securities. On the estimated expenditure of \$18,000,000 this will be \$2,700,000 which, the syndicate figures, the company will be able to capitalize and issue to shareholders as a bonus.

New York holders of a majority of the outstanding stock of the Union Traction Company have united in a declaration of trust, appointing five custodians of the franchises, which are to be deposited with the Central Trust Company of Illinois. The custodians are: Chauncey Keep, Charles G. Dawes, A. C. Bartlett, Charles H. Hulburt and A. A. Sprague, Sr. Henry A. Blair, one of the receivers for the Union Traction Company, believes that the affairs of the company will be in such shape within a month that contracts for improvements can be entered into.

Board of Engineers.

Bion J. Arnold is taking preliminary steps which will facilitate the work of the board of supervising engineers when the other two members are appointed. It is understood that the engineer who is to be nominated by the railway companies will be named very shortly after the Chicago City Railway Company formally accepts its ordinance. The first step will be the organization of the working force. The first matter to be decided upon by the engineers will be the form of track construction which is essential in order that the necessary materials may be ordered.

In their work the engineers will have in mind the probability that subways will be constructed eventually to lessen the congestion in the central district. These subways will be so planned that they will permit important extensions in the north, the south and the west divisions of the city.

New Substation.

The Chicago City Railway Company has let contracts for a new substation, which will be built at Wabash avenue and Forty-second streets. The substation will have a capacity of 6,000 kilowatts.

Contracts for Cars and Rails.

The Chicago City Railway Company has let contracts to the Lorain Steel Company for 5,000 tons of rails of the section illustrated in the Electric Railway Review of April 6, 1907, page 457, and to The J. G. Brill Company for 300 cars. These cars are substantially of the company's standard type, but the seats will have steel pedestals instead of cast-iron pedestals, and the gear cases will be of sheet steel instead of malleable iron, as in the old cars. Ventilators will be installed in the transoms at the ends of the cars.

The Chicago Union Traction Company has ordered 10,000 tons of rails from the Lorain Steel Company. This company received on March 30 the first two cars of 103 cars which are under construction by the St. Louis Car Company.

The Non-Partisan Association.

The success of the traction ordinances was due in large part to the campaign which was conducted by the Citizens' Non-Partisan Traction Settlement Association. This association represented 88 non-partisan organizations of the city with an aggregate membership of more than 100,000 persons who were pledged to vote for the ordinances.

The association conducted its campaign largely through circulars which were mailed under a 1-cent permit. The last circular contained on its face a picture of an electric car running out of a ballot-box. A large hand was shown dropping a slip marked "yes" into the ballot-box. The association sent with this circular a map showing the 21 through routes provided in the ordinances. This circular said: "One of the through routes will give us for five cents the longest car ride in the world without changing cars, viz., from Jackson park on the south side to the city limits (Howard avenue) on the extreme north side. For one fare and by transferring once you can ride 21½ miles in one direction."

In a statement to voters which was made public on March 30 the association emphasized that the ordinances are not

"snap" ordinances in any sense of the word, but are the product of the best legal and professional advice the city of Chicago has been able to secure. The association said that the ordinances conceded to each interest all that is due such interest in law, and at one stroke they clarified a situation which, if the courts were resorted to, would require years of litigation to settle.

Frederick A. Bode, president of the association, in a statement said: "We are gratified because we feel that we have lifted the traction problem to a plane above that of party politics. The victory shows that the power of the non-partisan organization far exceeds that of one political party, provided the movement is in the right direction."

IMPROVEMENTS ON THE METROPOLITAN ELEVATED, CHICAGO.

In the annual report for the year ended on February 28, 1907, the figures for which were given in the Electric Railway Review of April 6, 1907, H. G. Hetzler, the president, speaks of the following improvements:

Rotary converters were installed and ready for use at the Robey street and Forty-sixth avenue substations during October. Since that time power has been purchased from the Commonwealth Electric Company, making it possible to handle the heavy loads of the morning and evening rush hours in an efficient manner, and at the same time relieving the power house during the night hours and allowing necessary repairs to be made without interfering with the service.

Arc lights have been installed at the intersection of our structure with public streets, in accordance with the city requirements.

A sidetrack connection has been built between the tracks of the Aurora Elgin & Chicago Railroad and the Chicago Terminal Transfer Railroad, a short distance west of Fifty-second avenue, enabling your company to effect quite a saving and convenience in the handling of material in carload lots.

A loop has been installed at Desplains avenue, and the handling of trains at that point greatly facilitated. Fifth avenue trains on the Garfield park branch are now running through to Desplains avenue during the morning and evening rush hours, and an all-night schedule is maintained on this part of the system.

On account of the elevation of the Chicago Burlington & Quincy, the Chicago & Northwestern and the Chicago Terminal Transfer railways at Sixteenth street, on the Douglas park branch, the tracks of your company have been raised approximately 14 feet without interruption to the service.

The extension of the Douglas park branch to the Western Electric Company, at Forty-sixth avenue, has been practically completed and will be ready for operation about May 1, 1907.

The elevated storage yard at Forty-sixth avenue, Garfield park branch, has been abandoned and a new yard of greater capacity has been built on the surface at Fifty-second avenue.

The increased earnings and satisfactory physical condition, together with a healthy growth in the volume of business, warranted your directors at their January meeting in placing your preferred capital stock on a 3 per cent dividend basis.

The equipment, structure, track and buildings have been maintained in good condition and all requirements for safety have received careful attention.

Shop Practice for Motormen at Cedar Rapids, Ia.

The Cedar Rapids & Iowa City Railway & Light Company requires its motormen to spend four weeks out of each year in the company's shops at Cedar Rapids. This service is divided into periods of two weeks each and the motormen are allowed the wages usually earned while engaged in their regular work at the front end of the car. This method of keeping the motormen familiar with the car equipments was introduced several years ago and has proved very gratifying in the operation of cars. After having once been employed in the shops the men become familiar with the work required of them and render valuable assistance in the work of repairing cars.

The Detroit Jackson & Chicago Railway is installing nine new switches between Ann Arbor and Detroit, Mich., and will operate a half-hour schedule beginning on May 1.

CAR HOUSE AND SHOPS AT KNOXVILLE, TENN.

Finding it necessary to provide new quarters in which to repair and house its rolling stock the Knoxville Railway & Light Company has recently constructed new buildings at the corner of Magnolia avenues and Jasmine street, Knoxville,



Car House and Shops at Knoxville—Locker Room.

ville, Tenn., that are in keeping with the very interesting railway system in operation in that city. The new repair shops and car houses were occupied early in the summer of 1906 but were not entirely completed until fall.

In designing the new buildings an effort was made to use construction materials of such composition that the buildings were made as nearly fireproof as was possible. The foundation of the buildings is of concrete, the superstructure is of brick, and the roof design, which in the shop is of the saw-tooth type, is of lattice-truss and purlin construction. Kinnear steel rolling doors are used throughout.

The structure is not elaborate in design, though ample

Each one of these is separated from the others by corrugated iron partitions and all open directly into the pit room.

Brass Furnace.

The blacksmith shop is one of the interesting sections of the building. In the space provided for this department is located a motor-driven air-furnace, a brass and babbling fur-



Car House and Shops at Knoxville—Brass Furnace.

nace and a cabinet for the storage of the castings made at the shops.

The brass furnace, shown in one of the illustrations, is of 100 pounds capacity. It is used in melting scrap metal for casting gongs, trolley wheels, journal bearings and car fittings of every description. Up to this time the company has limited the runs to the amount of scrap metal accumulated, but later it is expected that all new fittings will be made here.

The furnace is fired up every two weeks. The moulding sand is kept, when not in use, in a large bin located at one side of the shops. The patterns are made in the carpenter shop and are stored in cabinets in the paint shop. The mould-



Car House and Shops at Knoxville—Exterior View, Showing Saw-tooth Roof.

room is provided for storing and repairing the entire number of cars owned by the company. The space occupied by the shops and the car repair shops is 178 feet 4 inches by 95 feet 6 inches in area. The first bay, 27 feet wide, on the west side of the structure is set off for the blacksmith and machine shops and the armature, wash and store rooms.

ing work is superintended by a moulder, who at times when not engaged in his regular work acts as helper to the blacksmith. The furnace used in heating babbitt for journal bearings is also shown in one of the illustrations.

In making its bearings this company has obtained very satisfactory results from the babbling device furnished by

the Frank Ridlon Company which, it is claimed, imparts a desirable temper to the wearing surface of the babbitt and does away with the necessity of reaming out the metal after it has been cast.

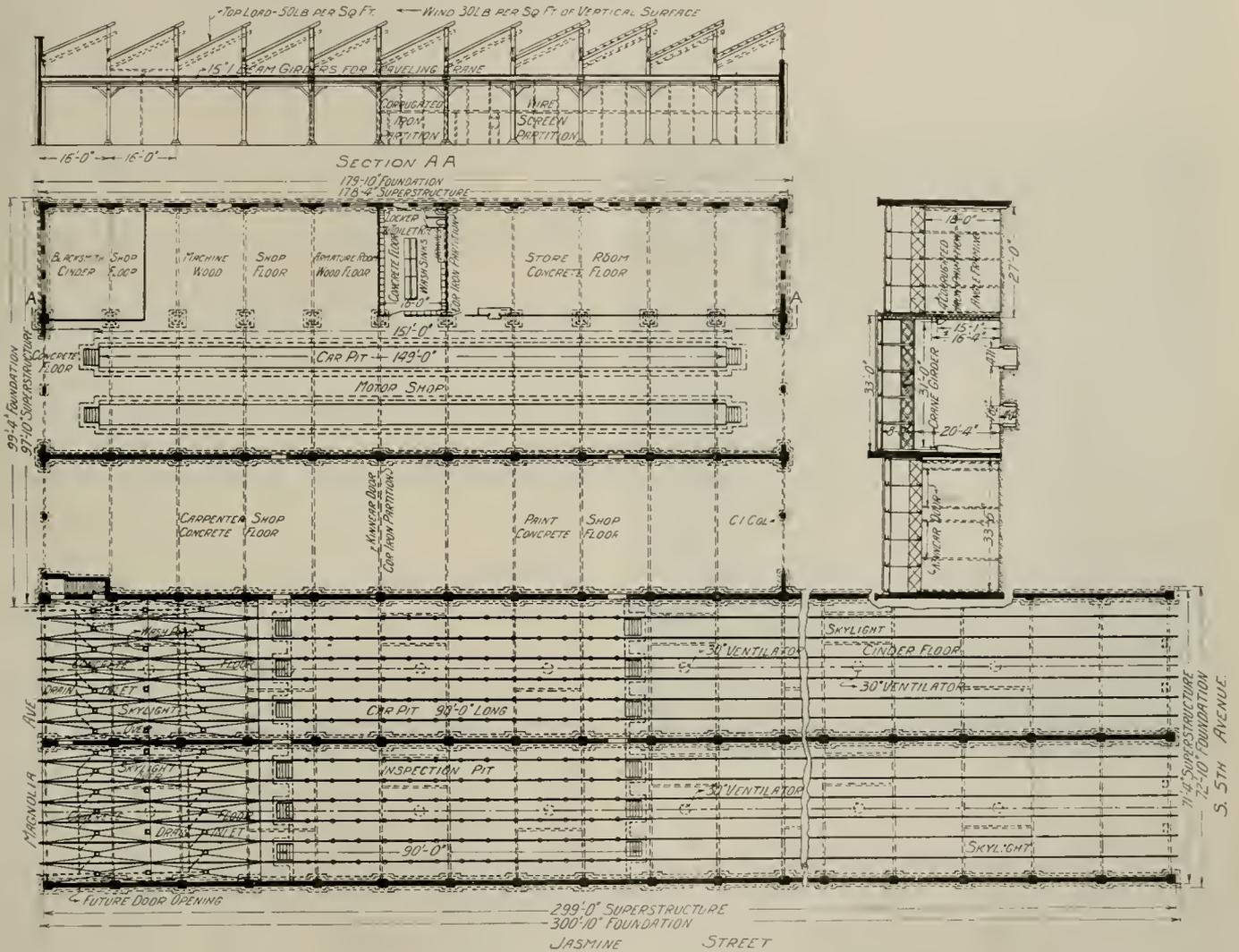
Machine Shop and Tools.

A space 27 by 40 feet is set aside for the tools in the machine shop, located just north of the blacksmith shop. The tools installed here are a 40-inch boring mill, 100-ton wheel press, 24-inch drill press, McCabe double lathe (24 and 40-inch swings), engine lathe with a 16-inch swing, a power saw, 18-inch shaper and an emery grinder. These tools are operated by line shafts driven by a 10-horsepower General Electric motor. In the armature winding room, adjoining the machine shop, is located a 22-inch lathe which is used in

copies the north wall of the room. The board is 6 by 8 feet in size and contains 220 incandescent lamps of 32 candle-power each. Switches located at the bottom of the board make it possible to cut in any resistance desired for testing purposes. In addition to these board switches there are located on a panel, stationed to the west of the test board, several knife-blade switches which are so connected with the feeder wires that the electricians can cut in as resistance all the lamps on the lighting circuit throughout the building. The test board as shown herewith is used in testing armatures, field coils and car wiring in the railway department and transformers in the lighting department.

Store Room.

The store room, 27 feet by 79 feet 6 inches in area, oc-



Car House and Shops at Knoxville—Plan of Car House.

banding armatures. The winding room is served by an overhead track on which triplex hoists are used.

The Knoxville Railway & Light Company operates 27 cars on its winter schedule and has in storage 30 other reserve and summer motor cars and 14 trailer cars. The armature winding is done at the shops, but the company has not found it advisable to make its own coils. Though it is believed this work can be done economically, nevertheless the number of motor equipments operated and the amount of motor troubles, are not sufficiently great to warrant the installation of the apparatus necessary to undertake this work. The armature winding is done by one man who also looks after the transformers and other apparatus for the electrical department.

A testing board with a capacity of over 200 amperes oc-

cupies the northwest corner of the shop, from which it is separated by a wire screen partition. The interior of this room is arranged conveniently with cabinets, boxes and drawers so that the various parts of like equipments can be kept in the same tier of shelves. In addition to four cabinets extending lengthwise of the room additional storage capacity is obtained on a mezzanine floor at the rear and on galleries arranged along the side walls. Supplies for both the railway and the lighting departments of the company are stored here. The office of the purchasing agent and storekeeper is located at the south end of the room. A shop employes' room, in which are located toilets, wash stands and lockers is situated between the store room and the armature winding room.

Motor and Pit Room.

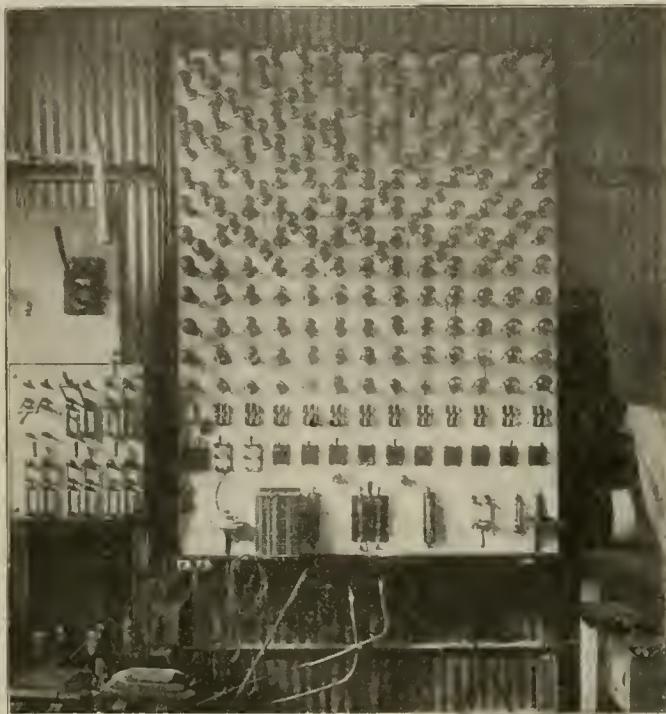
The motor and pit room which occupies the second bay

of the building has a frontage of 33 feet on Magnolia avenue and extends to the rear of the building. Two tracks with 14-foot centers pass through this bay. Pits 3 feet 11½ inches deep, starting at a point 13 feet from the front walls extend under each track a distance of 149 feet. Two traveling cranes each of 16,000 pounds lifting capacity have been installed in this department. The girders on which the cranes travel are composed of 15-inch I-beams which are supported by I-beam braces, steel angle knees and lattice steel columns.

The paint and carpenter shops occupy the third bay. These are respectively 33 feet 6 inches by 79½ feet and 36 by 95½ feet in area and are separated from the pit room on the west and from the car-storage house on the east by brick partition walls. The floor of this bay is of concrete. Both of these departments are conveniently arranged and are equipped for properly handling the repair work on the car bodies.

Car House.

The car house, divided longitudinally into two parts, has a floor space 64 feet 4 inches by 299 feet 4 inches. Three



Car House and Shops at Knoxville—Testing Board.

tracks enter each bay and a pit 90 feet long beginning at a point 22 feet from the front of the building is built under each track. The space at the front of the pits has a sloping concrete floor which is reinforced by strips of expanded metal. This part of the building is provided with drains leading to the sewer and serves as a car-washing floor. Back of the concrete construction a floor of cinders has been laid.

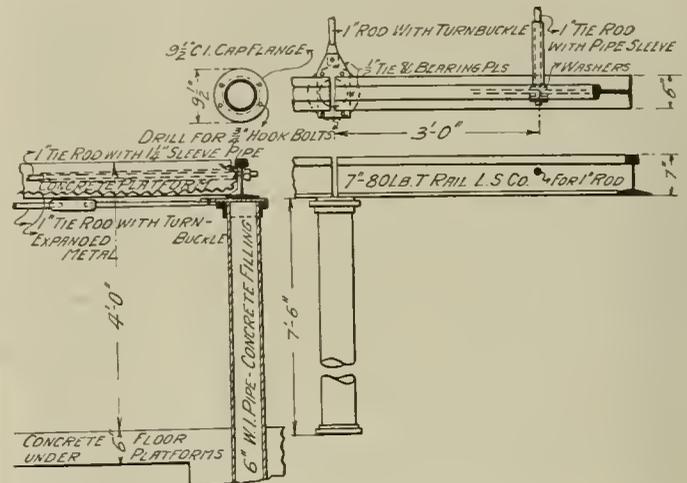
On the second floor and at the front of the car house building a conductors' and motormen's room 16 feet 10 inches by 32 feet 2 inches is provided. This room has lockers and other furnishings for the comfort of the trainmen.

Pit Details.

In developing the pit details for the shop and car house two kinds of construction were found advisable. In the shops where the heavy inspection work is performed concrete pillars spaced 8 feet apart and faced with channel-iron columns are used. The iron facings are grouted and also made secure by two anchor bolts which extend into the pillars. The columns are supported on 6 by 18 by ½-inch wrought-iron plates which rest on the concrete floor of the pits. On the tops of the iron columns are wrought-iron plates to which the rails

and the columns are bolted. In this way the center of each rail is directly over the center line of the supporting pillar. The pillars are designed to support safely a weight of 12,000 pounds each.

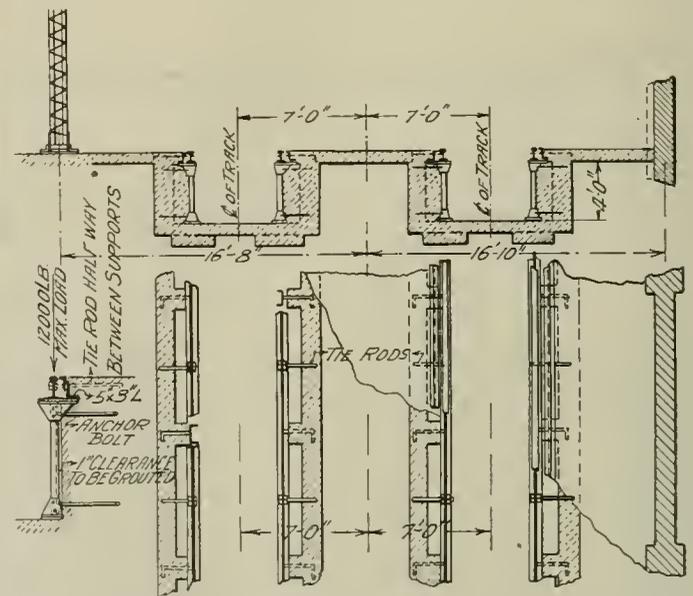
The method of laying the concrete floor where it joins the rails of the shop pits is novel. The concrete is only brought up to the base of the rail. The edges of the concrete



Car House and Shops at Knoxville—Details of Track Pits.

are faced with two single irons bolted together to make a Z-shaped retaining strip of sufficient height to reach the ball of the rail. These angle plates are bolted to the face of the plates on the tops of the wrought-iron columns. This type of construction is designed to allow for future renewal of the steel without interfering with the platform between the pits.

In the car house the rail supports under the pits are composed of 6-inch wrought-iron pipes set three feet deep in concrete and filled with concrete. The upper ends of the pipes



Car House and Shops at Knoxville—Plan and Section of Track Pits.

are capped by flange collars and rail-plates, through which bolts pass and anchor the rails to the pipes. The supports are spaced 6 feet apart and are anchored underneath the concrete platforms by 1-inch tie rods which are provided with turn-buckles to allow for future adjustment. No tie rods are provided in the pits. This form of pit construction has been used on several of the other southern car houses and shops, designed by Ford, Bacon & Davis.

The shops and offices throughout the buildings are heated by an Evans-Almirall hot-water heating system which re-

cently has been installed. The offices of the master mechanic and the train dispatcher are located in a brick structure near the car houses and shops.

Personnel.

The Knoxville Railway & Light Company is one of the companies whose stock is controlled by the American Cities Railway & Light Company. The officers of the Knoxville company are: C. H. Harvey, president and general manager; W. S. Shields, vice-president; Leon Fender, secretary; H. T. Bunn, treasurer and auditor; P. E. Mitchell, general superintendent; T. C. Kelly, superintendent; J. H. Drake, chief engineer; J. M. Kington, master mechanic. Ford, Bacon & Davis are engineers in charge of construction work, with J. H. Drake as resident engineer. The above work was constructed under the supervision of W. F. Kelly, formerly resident engineer at Knoxville, and now resident engineer for the same firm at Birmingham, Ala.

CLEVELAND ELECTRIC RAILWAY REJECTS HOLDING COMPANY PLAN.

A crucial moment in the long-standing controversy between the Cleveland Electric Railway Company and the city administration of Cleveland was reached on Friday morning, April 5, at a public meeting of the city council called for the purpose of receiving the reply of the company to the resolution of the council passed at the meeting on April 2, recommending that the company lease its property to the Municipal Traction Company on the basis of a value of \$60 per share for the stock. The reply of the Cleveland Electric company, after the council's proposition had been considered in two meetings of the directors on Wednesday and Thursday, was expressed in the form of a communication from the board of directors, in which they flatly refused to accept the council's offer and declined to consider any offer to lease the company's property to an "irresponsible lessee." The directors also took occasion to arraign Mayor Johnson and the city administration severely for their persecution of the company and to call attention to the unfairness of the municipal warfare which has been waged against the company.

The communication of the Cleveland Electric Railway to the city council was in part as follows:

The proposition, which we assume you make, acting upon the advice of the mayor, briefly stated, is this:

1. That we lease the property of the company to a so-called holding corporation, upon the agreement of such corporation to pay as rental, for the first year 3 per cent, the second year 4 per cent, the third year 5 per cent, and thereafter at the rate of 6 per cent per year, upon a valuation of the property of the company equal to \$60 per share of its present stock.

2. That you will grant a franchise to the company for 25 years, authorizing the rate of fare of seven tickets for 25 cents.

3. That the lease shall give to the city an option to buy the entire property of the company for a price equivalent to \$66 per share for its present stock.

4. Your proposition does not require the holding company to operate at three cents, and, under your offer, such holding company may charge the same rate of fare now charged by this company.

This offer we respectfully decline, and now decline to consider any offer to lease the property of this company to an irresponsible lessee; and it seems to the board of directors appropriate in this connection to state to you, and the citizens of Cleveland, its reason for so doing, and to call attention to the unfairness of the proposition and of the municipal warfare which, under the present mayor, has been waged against this investment of Cleveland capital for the past six years.

The communication then goes on to state that the property of the company is largely owned by citizens of Cleveland, that it has been an important factor in the development of the city, that its service is first-class, and that such an investment should receive from the city administration the same fair treatment and protection that are accorded to other investments of Cleveland citizens, but that for the past six years the company has been persecuted by the mayor, using the entire power of the city government, and the company's officers and directors have been criticized and maligned.

It has been charged that the company has been operating

under grants that authorized an unreasonable rate of fare and that its system could be operated at a 3-cent fare; and the mayor has caused to be organized and has become financially interested in a company which has offered to lease the property and operate it at a 3-cent fare. The Cleveland Electric company has at all times maintained that its system could not be operated for a 3-cent fare, and in 1904 made, at the solicitation of the mayor, a two weeks' practical test at that rate, which cost the company about \$25,000 and which showed practically no stimulation of traffic, as the mayor had claimed would result from low fare. The mayor has refused to acknowledge the fact publicly and has been insistent upon the holding company plan. The directors, to test the fairness of the mayor's pretensions, have entered into negotiations for the purpose of arriving at an agreed valuation of the company's property and have followed the basis fixed for determining the valuation laid down by Mr. du Pont. As soon as it became evident that the valuation would exceed the price publicly stated by Mr. Johnson as the maximum at which the holding company arrangement could be made, the methods prescribed by Mr. du Pont were repudiated and Mr. du Pont reported a valuation which could not be justified on the principles as laid down by him. The original offer of the holding company was to operate the system with a 3-cent fare, but when the Cleveland Electric proposed to incorporate such a requirement in the lease to the holding company, the mayor refused to agree, and had admitted that it was not proposed to operate the entire system at three cents, but to charge five cents beyond the city limits. At the last meeting of the city council the mayor was asked by President Andrews:

"Will you incorporate in your lease a provision that the rate of fare charged by the holding company shall be a 3-cent fare inside of the city and five cents out of it, and that, if it charges more than that, the franchise can revert to us?"

To which he replied that he did not think it was any of Mr. Andrews' or his company's business, and that, so far as he was concerned, he would not put it in.

In regard to the rate of fare upon which the property of the company can be operated the communication says that after conducting an experiment since January 1 with 5-cent cash fares and seven tickets for 25 cents, the company is entirely satisfied that the system cannot be operated and maintained and good service rendered, allowing reasonable interest upon the value of the physical property at a less rate, and that this is fully corroborated by a report made by a committee of the chamber of commerce after an impartial investigation and an examination of the books of the company. The company is willing to have a thorough investigation made at any time by impartial experts and will abide by the result obtained. Operation thus far under this rate of fare has shown a decrease in gross receipts approximating 20 per cent as compared with the rate of fare authorized by the company's franchises. However, the company has been anxious to meet more than half way any reasonable demand of the public, and, relying on the future growth of the city, has made to the council a proposition for a 20-year franchise at the present rate, namely, five cents cash and seven tickets for a quarter.

The reason heretofore given for refusing a franchise under these terms has been the mayor's offer to operate the property at a 3-cent fare and to pay a rental of 6 per cent, and now the mayor having made an arbitrary valuation, as the highest at which he thinks it can be operated at three cents, refuses to bind his holding company to operate at three cents.

To lease the company's property to an irresponsible company would give no assurance to the public that it would be better operated than now and, moreover, would put it in a position to be mismanaged and run down.

The company's proposition is to surrender its present franchises permitting a 5-cent fare and 11 tickets for 50 cents and to give the public at once the benefit of reduced fare in return for a new franchise which would amply protect the rights of the city. The company desires to meet the demands of the public for good service, and its offer includes an obligation to provide such service. To do so would require the expenditure of from \$3,000,000 to \$5,000,000 within the next two years and \$1,000,000 each year thereafter. Any company managing the property must be placed in a position to guarantee that such new money may be safely invested by its stockholders or others, and that such investment will receive such adequate return as will invite its being made by conservative investors, and it is not believed that the irresponsible holding company proposed can either itself adequately finance and develop the property to meet the city's needs or give to this company any assurance that will enable it to do so.

In conclusion the communication says:

"It is evident from the experience of the past few years

that this company cannot expect fair treatment in negotiation so long as the domination of the mayor is permitted to impose upon the council and the public his impossible suggestions. We are now offered the alternative of submitting to what is a virtual confiscation of a large part of our property or to further persecution and to disruption of the system which has taken years of patient endeavor and millions of money to develop, all that one man's political success may be obtained. The mayor forces this company into the position of having to return to the legal rate of fare, much as it regrets the necessity therefor.

"If there can be pointed out to us any legal way by which the city and ourselves can submit the rate of fare to be fixed in a franchise to us to impartial and experienced arbitrators, or any legal way in which a referendum concerning our proposition can be made that would be binding, we shall be very glad to take action along either of those lines.

No action was taken by the council. Mayor Johnson said that he would reply to the communication later, but attempted to explain his position on the proposition to include in the lease a provision for a reversion of the property to the old company in case the holding company failed to operate at a 3-cent fare in the city and a 5-cent fare outside the city.

"I'm entirely willing to recommend the limitation asked by the company if it be framed in reasonable words," he said, "that the lease should be forfeited to the company if the holding company raise the price over three cents within the city and five cents outside the city. I came here today prepared to yield if all other things were agreeable, and I will be entirely willing that the city put into the lease that the franchise shall be forfeited if a higher rate of fare be charged save under abnormal conditions."

Councilman Haserodt then asked Mr. Andrews if his company would be willing to consider the holding company plan with this stipulation in the lease or whether its reply was final.

"The answer of the communication is final," Mr. Andrews replied. "The rate of interest for the first five years is not satisfactory; the price is not satisfactory. The refusal to consider the holding company offer must be considered final."

Immediately following the close of the meeting the Cleveland Electric company issued an order stopping the sale of the seven-for-a-quarter tickets, and returned to the old rate of 5 cents cash and 11 tickets for 50 cents, except on the Central avenue and Quincy street lines, which are operated at a 3-cent fare under a special license.

Another public meeting of the council was held on Monday morning, April 8. The special council committee presented a communication in reply to the communication of the Cleveland Electric Railway, in which the charges of persecution by the city authorities are mildly denied, and it is stated that the council has never harassed the company but has always shown a disposition to deal fairly with it. The committee's conclusion is that the company's refusal is in reality based on a disagreement as to price, and it is ready to confer with the representatives of the company and will protect fully its legal rights; the council should continue to grant the right to construct necessary street railroads to those who will perform the public service required at the lowest cost and with the largest reservation of power in the hands of the council. The committee concludes by stating that the council has already expressed its willingness to submit the best offer of the company and the best proposition that can be got from any other company to a referendum vote, provided all parties could agree to be bound by the results.

From the general tone of the committee's communication it is evident that it does not consider the company's refusal as final.

Mayor Appeals to People.

Mayor Johnson, however, followed with a statement which indicates that he and the 3-cent fare interests recognize that a renewal of the fight is imminent. After a brief general reply to the Cleveland Electric communication, which he affected to consider as a personal attack, he concluded by a direct appeal for aid in financing the low-fare movement. He said that about \$10,000,000 would be required for building

the street railway system and he asked that it be subscribed by the people, promising 6 per cent interest on the investment. It is generally understood that the low-fare interests have failed in several efforts to enlist capital in their enterprise among financiers. The mayor announced that a committee would be organized to carry on the campaign and that plans would be made for a series of mass meetings, beginning about the last of this week.

At the regular meeting of the council on Monday night four ordinances were introduced, all having an important bearing on the controversy. The first seeks to establish a transfer point at Superior avenue and West Ninth street, and provides that the Cleveland Electric must exchange transfers with the Municipal Traction Company. In three ordinances the Low Fare Railway Company asks franchises over two lines now occupied by the Cleveland Electric under grants expiring next February, and over a crosstown line on which the Cleveland Electric's grant does not expire for several years.

Preliminary steps in the campaign for financing extensions of the low-fare system were taken on Tuesday afternoon, when the mayor and others interested in the movement met in the offices of the Municipal Traction Company and formulated plans. The mayor also made a public address on the subject that evening at a ward club, in which he announced that subscriptions to the stock of the Forest City Railway Company would be received in amounts from \$10 up.

An indication of the campaign methods the mayor intends to follow was given at a meeting of the Sycamore Club on Wednesday night, when the mayor made another speech asking for popular support for his company. As it was ladies' night at the club, he addressed his remarks especially to the ladies, saying that this new campaign is one in which they should take part. At this meeting Municipal Traction Company subscription blanks were publicly distributed for the first time. The form circulated contains an agreement to subscribe for a certain number of shares at par, for which the subscriber agrees to pay in weekly or monthly instalments.

H. J. Davies, secretary of the Cleveland Electric company, and A. B. du Pont, president of the Municipal Traction Company, agreed to hold a meeting on Thursday morning to take up the question of the sum which the Cleveland Electric owes the city for use of the Central and Quincy lines since the expiration of the franchises. Meetings of the Cleveland Electric directors were held on Wednesday and Thursday afternoons, but nothing was given out.

DENIES BRIBERY AT SAN FRANCISCO.

In his annual report as president of the United Railways Investment Company, which controls the United Railroads of San Francisco and the Philadelphia Company of Pittsburg, Ernst Thalmann makes the following denial regarding the charges of bribery at San Francisco:

Interests identified with the United Railways Investment Company state that they have the most positive assurance from the officials of the United Railroads of San Francisco that no bribery was resorted to in order to obtain the permit to replace their cable roads with overhead trolley. In connection with this, it is important to bear in mind that prior to the earthquake the Merchants' association of San Francisco had employed William Barclay Parsons to advise its members as to what form of motive power was best in the interests of the city of San Francisco.

Mr. Parsons reported strongly in favor of the overhead trolley system, and his report carried such weight that the directors of the Merchants' association, who had been bitterly opposed to overhead trolley operation, became practically unanimous in its favor. This action was followed by a practically unanimous vote of the real estate board, another important organization in San Francisco, and the action of these and other important associations had the effect of creating a public opinion, prior to the earthquake, decidedly in favor of the overhead trolley permit. It is claimed that even if no earthquake and fire had occurred, the permit would have been granted, as public opinion was greatly in its favor.

News of the Week

Iowa Associations to Meet in Convention.

Everything will be in readiness at Clinton, Ia., Tuesday night for the opening of the annual convention of the Iowa Electrical Association and the Iowa Street and Interurban Railway Association. The electrical association will convene Wednesday morning and have a continued session Thursday, and the railway association will convene Thursday and close Friday evening. Many of the manufacturers' exhibits have already been placed in the exhibit halls at the new Lafayette Inn, where the headquarters of the two associations have been established.

Michigan Strike Settled.

The strike of 200 employees of the Michigan United Railways on the city lines in Kalamazoo, Lansing and Battle Creek, Mich., as well as the interurban lines between those cities, was declared off on April 9, after the demands of the men and the offer of the company had been arbitrated by a committee of the Kalamazoo Commercial Club. The strike was declared on April 3 and the service was greatly demoralized, although some cars were run. The agreement was reached on a basis of 21, 22 and 23 cents an hour on city lines and 24 and 25 cents on the interurban lines, which was practically what the men had demanded, but with no recognition of the union. The company also agrees to establish a mutual grievance committee. The men formerly received 18, 19 and 20 cents an hour.

Ambassador Bryce on Municipal Ownership.

In addressing the Commercial Club of Chicago on April 6 Ambassador Bryce of Great Britain spoke of municipal ownership. He said in part:

"The precondition of municipal ownership of public utilities should be the presence in office of honest and capable public servants. We in England, where municipal ownership is sometimes found, do not experience the difficulties which might be found elsewhere. Our city administrations are uniformly honest and efficient. Politics, that is, specific party issues, enter very little into municipal elections. But in American cities I have noticed that the moral condition of municipal administrations is less stable and reliable.

"American cities seem to be subject at times to spasms of virtue in which the ill-intentioned are swept out of office, but those periods of reform are too often followed by relapses. Civic virtue is indispensable to the economic and efficient administration of the business of public service corporations."

Further Hearing on New York Central Wreck.

The New York state railroad commission on April 9 took further testimony in its investigation of the wreck which occurred on the New York Central electric division on February 16. The commission listened to an account of the experience of the motorman, Beale, who described the sensation experienced in going over the track on the train preceding the one that was wrecked. After this trip he had reported the track as very rough and needing attention. Mr. Beale said the engine made a lurch from one side to the other and then straightened up. He made a jump for the brake valve, but had no occasion to use it. At the close of the session the commission requested records regarding superelevation of the track at the curve, taken for as many years back as possible, and was informed that the company had compiled since the wreck statistics of this nature covering a period as far back as 1895, and had verified them. Mr. Hedges of the commission expressed the opinion that due to wear and weather conditions the regular superelevation of 4½ inches might settle to 4 inches unless carefully watched.

Growth of Electric Railways.

Charles N. Wilson, president of the American Engineering Company of Indianapolis has an article in The Tradesman for April 1 entitled "Electric Railway Construction in the Central States," which describes the wonderful progress of the electric railway industry in those states. Mr. Wilson points out that:

"On January 12, 10 years ago, the first electric car was operated in Indiana, and in the same month and year the first electric car was started in operation in Ohio; since that time 1,650 miles of modern electric railroads have been constructed and put in operation in Indiana, and 2,240 miles in Ohio. In addition to this there is now building in the two states 2,000 miles of new road and an equal mileage is being promoted.

"As soon as the gap of 30 miles is built between Crawfordsville, Ind., and Danville, Ill., and another small gap between Ft. Wayne, Ind., and Bryan, O., it will be possible to take a car at St. Louis, and by continuous electric road travel to Indianapolis, Louisville, Cincinnati, Dayton, Toledo, Detroit, Cleveland, Erie, Pa., and Buffalo, N. Y., and at no distant day to Pittsburg. All this will probably be a reality within another year."

In conclusion the writer points out that interurbans build up small towns, enhance the value of farm lands and agricultural products, increase the attractiveness of farm and suburban life, tend to solve the help problem in rural communities, etc.

Test in Connection with Woodlawn Wreck.

On April 4 the New York Central sent a test train over the electric zone, under conditions of weight and speed similar to that which was wrecked at Woodlawn on February 16. The train was made up of two electric locomotives and five old wooden coaches similar to those which were in the wreck. The train was in charge of W. C. Brown, senior vice-president, and on board were other local operating officers of the road. The state railroad com-

mission was represented by J. E. Hedges, counsel, and Charles Barnes, electrical expert. W. J. Wilgus represented the railroad's electric commission, W. E. Hoyt the American Locomotive Company and W. B. Potter the General Electric Company. E. R. Rogers, who operated the wrecked train, was in the cab of the test train directing the operation of the speed controllers so as to duplicate, as far as possible, the wreck conditions. A number of invited guests were on the train and the total weight required was supplied by bags of sand. The locomotives were provided with instruments for measuring and recording the speed and the usual electric meters. On the first run the train approached the Woodlawn curve at a speed of 56 miles per hour, went on the curve at 53 miles per hour, and was running 43 miles per hour at the apex. In the second run the curve was approached at 60 miles per hour and the apex was rounded at 56 miles per hour. The test was expected to throw some light on the cause of the wreck, but it failed to reveal any cause for the former train leaving the track.

Report on Pittsburg Subways.

The executive committee of the rapid transit commission of the Pittsburg city council on April 5 submitted its report in regard to the construction of a subway system for the city. The committee recommends that the subway be built by a private company and its recommendations are included in the provisions of an ordinance giving a franchise to the Pittsburg Subway Company, whose application has been pending before the council for several months.

The ordinance provides for a sub-surface line with a downtown loop; option of purchase by the city after 25 years; universal transfers; maximum fare of 5 cents and a graduated payment to the city for the franchise. It is provided that the franchise shall be limited to 50 years. After 25 years the city may purchase the subway by paying the original cost, plus 25 per cent, and giving the officials of the subway one year's notice. No charge is to be made for the franchise during the first five years. The second period of five years the city is to be paid 2 per cent of the gross receipts, this to be increased one-half of 1 per cent each period of five years, making for the last period 6 per cent. It is proposed that the subway shall carry cars of any other subway company and give transfers.

Considerable discussion arose over whether the committee should commit itself wholly to a subway, rather than an elevated, and a clause was inserted declaring public sentiment to be against elevated lines.

Overcapitalization is to be prevented by a clause which says that no dividend shall be paid exceeding 2 per cent of the price fixed at which the city may purchase the roads.

The commission decided to take final action on the report at its meeting on April 15.

Legislation Affecting Electric Railways.

Illinois.—The house on April 5 passed a bill limiting the hours of labor for street railway conductors to 10 hours a day, to be performed within 12 consecutive hours.—A bill was also passed on the same day which provides for modern air brakes and vestibules on all cars, and closed vestibules from November to March, inclusive; also for heating apparatus that will keep the temperature at a minimum of 50 degrees. The bill also provides that each car shall have center aisles and fenders and that all cars over 30 feet long shall be double-trucked. Side running boards are prohibited.

Iowa.—The bill now before the legislature in regard to vestibuling the front platforms of electric cars requires that the platforms be enclosed on all four sides, instead of on three sides, as reported in the Electric Railway Review of March 30, 1907. The present law requires that three sides be enclosed.

Michigan.—Senator Cady has introduced a bill which permits an electric railway company to acquire the property of another company on the consent of a majority of the stockholders of the company to be acquired, instead of two-thirds of the stockholders, as provided by the present law.

Minnesota.—The house has passed the bill introduced by O. F. Christensen of St. Paul placing the regulation of electric railways in the hands of the state railroad and warehouse commission. As amended by the committee on express, telegraph and electric lines the bill provides that it shall not take away any powers of regulation now vested in city councils, but shall give the commission power in cases where the city council does not act.

Montana.—The legislature has passed a law requiring street railway companies to equip their cars with closed vestibules for the protection of the motormen, between November 1 and April 1. The law goes into effect on November 1 of this year.

New York.—Senator Saxe has introduced a bill to amend the rapid transit act, Section 36, by changing the word "weeks" to "months," so that the contracts for the new subways must be advertised for three months instead of three weeks. The rapid transit commission has already begun advertising the Lexington avenue and Seventh and Eighth avenue subway lines and it is feared that these most important subways will be gone before the public utilities law is in effect unless such a bill as this is passed. Senator Saxe said in explanation of the bill: "Friends of the public utilities bill are of the opinion that if contracts for the new subways in Manhattan are permitted to be consummated before the enactment of the proposed public service commission law, the new commission for the city of New York, to be appointed by the governor, will be seriously hampered in planning a comprehensive rapid transit system for the city. Frankly, the object of the proposed bill is to extend the time for the advertising of contracts now offered by present rapid transit commission so that the new commission will have a chance to consider such proposals in connection with a general plan of improvement of the service."

Pennsylvania.—The house on April 4 passed by a unanimous

vote the Homsher bill, conferring on electric railway companies the right to carry light freight and express matter. Local authorities are empowered to make reasonable regulations for this traffic; questions of reasonableness to be decided by the common pleas courts. An amendment to make the carrying of freight mandatory was defeated.—The Fahey bill, which requires companies proposing to build new lines or extensions to file with the secretary of state copies of all franchises and right of way grants before a charter shall be granted, was defeated in the house on April 9.—A bill introduced by Representative Kennedy prohibits a fare of more than 5 cents for a ride within the limits of a municipality.—The Homsher eminent domain bill has passed the second reading in the house, with an amendment which provides that all companies availing themselves of the act shall be common carriers.—Governor Stuart is to give a public hearing to the trades organizations of Philadelphia opposed to the plan of the Retail Merchants' Association for giving the city representation on the board of directors of the Philadelphia Rapid Transit Company, before signing the McNichol-Fahey bill, which is intended to make the plan legal.

Wisconsin.—The house has passed a bill limiting the time of service for street railway employes to 10 hours within 12 consecutive hours.

Municipal Street Railway for Berlin, Ont.—The citizens of Berlin, Ont., on April 4 decided by a vote of 863 to 114 to purchase the Berlin & Waterloo Street Railway, which operated about five miles of track. The town will pay \$75,200 for the property and \$1,000 for supplies on hand, and will operate the line.

Meeting of New York State Association.—The Street Railway Association of the state of New York has decided to hold its annual meeting at Bluff Point, on Lake Champlain, on June 25 and 26. Requests for hotel reservations should be made to E. S. Fassett, general manager United Traction Company, Albany, N. Y. J. H. Pardee, secretary, announces that no spring meeting will be held.

Address at Worcester Polytechnic Institute.—Dr. George R. Olshausen of Cornell University addressed the Worcester Polytechnic Institute branch of the American Institute of Electrical Engineers at the institute on March 25, his subject being "The Power Plant of the Omaha & Council Bluffs Street Railway Company." The lecture was illustrated by stereopticon views. Dr. Olshausen was the engineer of construction.

American Institute of Electrical Engineers.—The board of directors of the American Institute of Electrical Engineers has selected the following nominees for the forthcoming annual election: President, Henry G. Stott, New York; vice-presidents, L. A. Ferguson, Chicago, W. C. L. Eglin, Philadelphia, J. G. White, New York; managers, Percy H. Thomas, New York, B. G. Lamme, Pittsburgh, H. W. Buck, New York, Morgan Brooks, Urbana, Ill.; treasurer, George A. Hamilton, New York; secretary, Ralph W. Pope, New York.

Detroit Service Ordinance Passed.—The Detroit city council on April 9 passed Mayor Thompson's ordinance providing for increased service by the Detroit United Railway. The ordinance provides that the company shall furnish enough cars during rush hours so that no car shall carry a greater number of passengers than the seating capacity of the car, plus one-half. It is also provided that no car shall pass by passengers without stopping, unless there is another car following within a distance of 200 feet. These provisions are not to apply on lines where the cars are operated at a 20-second headway.

Express Company Contracts with Electric Lines.—What is considered the first really important alliance between steam and electric lines will become effective on May 1, when the Pacific Express Company will begin service on several electric lines in western Ohio. Contracts have been executed with the Dayton & Troy, the Springfield Troy & Piqua, the Western Ohio and the Toledo Urban & Interurban companies. This gives a continuous service through western Ohio on about 250 miles of new line for the Pacific Express, making a direct line from Toledo to Dayton and other important towns. Fostoria, Wapakoneta, Shelby, Bowling Green and Sidney being reached, in addition to those mentioned above.

Fire Destroys New York City Car Barns.—Fire broke out about 2:30 a. m. on April 8 in the plant of the New York City Railway Company at One Hundred and Forty-sixth street and Lenox avenue, Manhattan, used as a power house, car barn and repair shop, causing almost complete destruction, entailing a loss which Oren Root, general manager, estimates at \$1,500,000, and causing the death of a fire captain and injuries to seven others. The north and west wings of the plant, occupying the entire block between One Hundred and Forty-sixth and One Hundred and Forty-seventh streets, Lenox and Seventh avenues, with the exception of a 100-foot strip on Seventh avenue, were completely wrecked, with their contents, including about 300 cars used on Lenox avenue and Broadway divisions of the system. The fire is believed by officials of the company to have been started by an electric light wire having defective insulation. The fire started in the pits where men were engaged in repairing cars and which covered 14 tracks. The floors above were used for storage, carpenter and paint shop. South of this was the converting station, with six converters, where alternating current from the Kingsbridge station was converted into direct current for surface cars north of One Hundred and Twenty-fifth street. The partition wall, of vitrified brick, crumbled, and, though the power plant was not destroyed, it was deemed advisable to shut off the current. It is stated that the fire will cause only a brief delay and the company has a considerable surplus of equipment.

Construction News

FRANCHISES.

Buffalo, N. Y.—Mayor Adam has approved the Elmwood avenue franchise recently granted to the International Railway Company, after an agreement by President H. J. Pierce to discontinue certiorari proceedings to secure a reduction of \$51,000 in the company's franchise tax assessment. President Pierce has announced that work will begin on the new line as soon as the rails can be secured.

Cicero, Ill.—The town board on April 8 granted the Metropolitan West Side Elevated Railroad the right to extend its Garfield Park branch through the limits of Cicero.

Frankfort, Ind.—The Frankfort Delphi & Northern Traction Company has been granted a franchise to construct and operate an interurban line through Frankfort, the road to connect with Delphi on the north, passing through Rossville. The franchise is for 35 years and the road is to be completed and in operation by January 1, 1909. While the franchise is granted to W. H. Cohee and others of Frankfort, it is known that Indianapolis parties are back of the proposed road and it is claimed that the line has already been financed and that the work of construction will begin at once on the right of way that was secured some time ago.

Index, Wash.—The Puget Sound Skyhomish & Eastern Railway, which is building an interurban line between Index and Galena, Wash., about 10 miles, has secured a franchise to build its line from Index to a point about 1½ miles from that place. Work must begin within 30 days and be completed within six months.

Kansas City, Mo.—The application of the Metropolitan Street Railway to extend its Prospect avenue line to Thirty-ninth street before next December has been granted by the upper house of the council. During 1908 the line is to be extended to connect with the Swope park car line.

Lincoln, Neb.—The Citizens' Railway has been granted a franchise to build its line on Holdrege street, from Nineteenth to Twenty-seventh streets. It is stated that preparations are being made for its immediate construction. A question had arisen as to the validity of the grant because of the fact that franchises previously had been granted to other companies. As these include the Home Street Railway, North Lincoln Street Railway, Lincoln Electric Company, Capital Heights Company and the Lincoln Rapid Transit Company, whose franchises had reverted to the city when the properties of these companies were seized to satisfy judgments for taxes, the opinion is now held that the present grant unquestionably is valid.

Laurens, S. C.—A 50-year franchise has been granted to N. B. Dial of Laurens, S. C., to build an electric railway in and around Laurens. Work must begin within one year and be completed within 18 months from the date of the franchise. It is stated that a company soon will be organized with a capital stock of \$50,000.

Mt. Vernon, O.—A 25-year renewal of its franchise was granted to the Mt. Vernon Electric Railway on April 2. This provides for additional extensions on High and other streets of the city.

Morrisville, Pa.—The borough council has granted permission to the New Jersey & Pennsylvania Traction Company to extend its tracks west on Bridge street to Fallsington, about four miles. A condition of the franchise is that the company shall build a wagon and foot bridge over the canal and pave Bridge street, the cost to be about \$25,000. It is stated that the employes of the Pennsylvania Railroad will use the line in going to and from their work at the West Morrisville yards.

Nauvoo, Ill.—The Mississippi Valley Electric Railway Company, which proposes to build an electric interurban line from Nauvoo to Carthage, Ill., 22 miles, and to Keokuk, Ia., 14 miles, has been granted a franchise in this city. The site for a power house in Nauvoo also is included in the franchise, and the city is to take \$5,000 in bonds for every mile of road built between Nauvoo and Niota, about 12 miles. With the completion of this section the line will be extended to Carthage and later to Beardstown, Ill. Another route will extend to Keokuk, Ia. W. A. Calhoun, chief engineer, Buffalo.

Sandusky, O.—The Lake Shore Electric Railway has been granted permission to lay a double-track line on Water street from Columbus avenue to Jackson and from Fulton to Lawrence streets in order to care for the increased traffic which it is expected will be handled by the company this summer. The street between Jackson and Fulton will have only a single-track line. It is stated that work on this improvement will begin at once.

St. Louis, Mo.—The bill recently passed by the house of delegates authorizing the St. Louis Electric Terminal Railway to operate a line from its bridge across the Mississippi river to Salisbury street, has been signed by the mayor. The line will run from the foot of Salisbury street, west to Ninth street, over a private right of way between Farrar and Salisbury streets, south on Ninth street to Branch street, west to Twelfth street and south on Twelfth street to Lucas avenue, where the terminus of the road will be located. It is stated that contracts for the construction of the bridge, stations and terminal properties are under consideration. Under the franchise granted by the municipal assembly of St. Louis the road must carry express at freight rates and must reduce the prevailing freight charges 40 per cent. A 5-cent fare across its bridge to Granite City will be charged, with a 3-cent fare for foot

passengers. The city is to receive \$5,000 annually for the first five years of the franchise, \$7,500 annually for the next 10 years and \$10,000 annually for the remaining 35 years of the grant.

Winona, Minn.—The 50-year amended franchise of the La Crosse Water & Power Company, which has been under consideration for some time, has been granted by the city council. An electric line from Winona by way of La Crosse to Galesville, Wis., must be built at once by the company. A. V. Schroeder, La Crosse, Wis., is general manager.

RECENT INCORPORATIONS.

Abilene (Tex.) Street Railway.—Incorporated in Texas to build an electric street railway system in Abilene. Capital stock, \$100,000. Incorporators: J. M. Wagstaff, Austin; George L. Paxton, W. C. Swenson, E. S. Hughes and J. M. Cunningham.

Chicago Hammond & Gary Electric Railroad.—Incorporated in Indiana to build from Hammond to Gary. Capital stock, \$100,000. Incorporators: L. C. James, T. A. Carstensen and H. L. Underwood of Chicago and A. V. Barton of Elgin, Ill.

Denton Interurban Railway & Power Plant Company.—Incorporated in Texas with a capital stock of \$100,000. Incorporators: H. M. Griffin, W. W. Wilson, R. J. Wilson and Newt M. Lee.

Denver & South Platte Railroad.—Incorporated in Colorado to build an interurban line from Englewood to Roxborough park, a point in the foothills about three miles south of Platte canyon. This park will be developed as a resort and plans for a large hotel to be built next season are being considered. The line will be 21 miles long and by its connection with the Englewood car line will make Denver accessible by about an hour's ride. An order for 575 tons of steel has been placed with the Colorado Fuel & Iron Company and it is stated that grading will begin within 10 days. Right of way has been secured for its entire length and financial arrangements made for its construction. Incorporators: Thomas Doan, W. W. Borst and Daniel Prescott, Denver; Walter Lyon and Jacob T. Keil, Allegheny, Pa.

Elkins Electric Railway.—Incorporated in West Virginia to build an electric street railway in Elkins. Capital stock, \$50,000. Incorporators: J. C. McSpadden and H. F. Berkebile, Rockwood; W. J. Taylor, Pittsburg; J. E. Morgan and C. W. Maxwell, Elkins, W. Va.

Macon Americus & Albany Electric Railway.—Incorporated in Georgia to build an electric line from Macon to Albany, through Bibb, Crawford, Houston, Macon, Sumter, Lee and Dougherty counties, touching the towns of Byron, Fort Valley, Marshallville, Montezuma, Oglethorpe, Andersonville, Americus, Sumter, Smithville and Leesburg. The line will be 199 miles long, with the principal office of the company at Macon. Capital stock, \$200,000. Incorporators: W. J. Masee, M. Felton Hatcher, J. T. Moore, M. H. Masee, M. J. Hatcher, J. N. Neel and D. W. Davis of Macon; N. J. Cruger, Albany; J. C. Walker, Marshallville, and A. C. Riley, Ft. Valley. N. J. Cruger of Albany, Ga., is president.

Oklahoma City El Reno & Southwestern Electric Railway.—Incorporated in Oklahoma to build an electric interurban line from Oklahoma City to El Reno, Chickasha, Anadarko, Hobart, Lawton and intermediate towns; also from El Reno to Kingfisher, Hennessey, Enid and Medford, and from Kingfisher to Okeene by way of Kiel, a total of 275 miles. Capital stock, \$10,000,000. Incorporators: Fred Ehler, J. W. Smith, C. C. Smith and E. B. Cockrell of Hennessey, and W. R. Blackburn of Kingfisher.

Oklahoma City Rapid Transit Railway.—Incorporated in Oklahoma to build an interurban railway between Oklahoma City and Tecumseh, through the counties of Oklahoma, Cleveland and Pottawatomie, with headquarters at Oklahoma City. Capital stock, \$2,000,000. Incorporators: D. D. Klapp, E. W. Millburn, G. M. Sissna, J. H. Surber, Henry Lopp, G. A. Ruggles, M. H. Tension, C. B. Connor, S. B. Mitchell and W. E. Powell, Tecumseh, and Mr. Silsby, Saginaw, Mich.

Perkiomen Traction Company.—This company, which proposes to build an electric line 11½ miles long, will, on April 22, file an application for incorporation. It is stated that the road will use the Perkiomen turnpike part of the way and extend through the borough of Green Lane to a terminus at the intersection of the Perkiomen turnpike with the Sumneytown turnpike. Irvin H. Bartman, Schwenkville; Henry T. Hunsicker, Ironbridge; Samuel E. Hughes, George Dunn and John H. Dager, Norristown, Pa., are interested.

San Joaquin Valley Western Railroad.—Incorporated in California to build a line from Fresno westward to Watsonville, connecting at the latter point with the Ocean Shore Railway, now under construction south from San Francisco. Capital stock, \$6,000,000, of which \$225,000 has been subscribed. Incorporators: C. G. McBride of San Jose, Phillip McRae of Armona, James Shaw Robertson of Hanford, J. O. Hickman of Hanford, A. P. May of Coalinga, W. M. Graham, general manager of the California Oil Fields, Ltd.; Senator Thomas Flint of San Juan; Truman G. Hart of Fresno, and J. A. McClurg, Jr., of Fresno. The company is closely associated with the Ocean Shore Railway and J. B. Rogers of San Francisco is chief engineer of both companies.

Scioto Construction Company.—Incorporated in Ohio to build the extensions of the Columbus Magnetic Springs & Northern Traction Company from Magnetic Springs to Richwood and Larue, O., and the Columbus Urbana & Western Railway north from Columbus. Capital stock, \$25,000. Incorporators: Barton Griffith, F. H. Heywood, W. H. Ogan of Indianapolis, C. B. Howard, E. E. Bryan and J. A. Vandegrift of Philadelphia.

TRACK AND ROADWAY.

Alton Jacksonville & Peoria Railway.—J. M. Rhoads, secretary, Jerseyville, Ill., writes that this company proposes to build a line from Alton to Jacksonville, Ill., 65 miles, through Jerseyville, Carrollton, Whitehall, Roodhouse and Murrayville. The line has been surveyed and three miles of track, from Alton to North Alton, has been laid this year. Grading and overhead work have been completed from Alton to Godfrey, 5 miles. A. O. Auten of Jerseyville, president; Robert Curdie of Alton, vice-president; W. R. Heagler of Jerseyville, chief engineer. Headquarters, Jerseyville.

Bayou Teche Railway & Light Company.—This company, incorporated last year to build a system of electric railways radiating from New Iberia, La., has given orders for beginning surveys some time this week. Paul M. Schneidau, president, New Orleans, La.

Birmingham, Ala.—The Alabama Land & Improvement Company is interested in an electric line which it is proposed to build between Chattanooga, Tenn., and Birmingham, Ala. Right of way is being secured and grading is in progress at several points.

Carlyle & St. Louis Electric Railroad.—A mass meeting was held at Breese, Ill., last week by citizens of Carlyle, Beckmeyer, Breese, Aviston, Trenton and Summerfield, to consider plans for building an electric road through those towns to Lebanon, Ill., and St. Louis, Mo. It was decided to incorporate under the above name, with a capital stock of \$5,000, and a committee of 12 was appointed to effect an organization. T. E. Ford of Carlyle is chairman of the committee.

Cartersville, Ga.—It is reported that a route has been surveyed and partially graded for a line from Cartersville to Atlanta, Ga., and that a dam is to be constructed across the Etowah river, three miles from Cartersville, to furnish power for the line.

Chicago & Elgin Electric Railroad.—It is reported that this company will begin construction work this summer on its line, which is to connect Elgin, Bartlett, Bloomingdale, Addison, Elmhurst, Melrose Park, Maywood and River Forest. The line when completed will be 26 miles long. The capital stock is \$10,000. F. W. Kobusch is president; E. W. Fischer, vice-president; J. H. Roehler, secretary, and Charles F. Strauschild, treasurer. Office, Bloomingdale, Ill.

Chicago & Western Indiana Traction Company.—E. H. Barrows, general manager, Indianapolis, Ind., writes that the American Engineering Company of Indianapolis, which recently acquired this company, incorporated to build from Chicago to Louisville, 332 miles, via Valparaiso, Lafayette, Crawfordsville, Greencastle, Bloomington, and New Albany, now proposes to build the section between Greencastle and Lafayette, 57 miles, connecting at Crawfordsville with the line of the Indianapolis Crawfordsville & Western Traction Company, from Indianapolis, which is now nearly completed. This line, according to Mr. Barrows, will probably be acquired by the Indianapolis Crawfordsville & Western, which proposes to extend from Crawfordsville to Kankakee, Ill., making connection with the Chicago & Southern Traction Company, under construction between Chicago and Kankakee. The Greencastle-Lafayette line is now being surveyed, although the date of beginning construction has not been decided. Power will be taken from the power house of the Indianapolis Crawfordsville & Western at Crawfordsville. C. W. Wilson, president of the American Engineering Company, is also president of the Chicago & Western Indiana, and W. L. Eckhouse is chief engineer, with offices at 610 Traction Terminal building, Indianapolis.

Chicago City Railway.—This company has ordered 5,000 tons of 129-pound grooved rails, of the type described in last week's issue of the Electric Railway Review, page 457, from the Lorain Steel Company. Under the general plan of rehabilitation of the property, as provided in the city ordinances passed on April 2, these rails are to be used to replace the old ones now in use. H. B. Fleming, chief engineer.

Chicago Kenosha Milwaukee & Lake Geneva Railroad.—Roger C. Kimball, 210 Wisconsin street, Kenosha, Wis., writes that this company proposes to build from Kenosha to Lake Geneva, 40 miles, and from Kenosha to Waukegan, 16 miles. The line has been surveyed and a right of way 100 feet wide has been purchased from Waukegan to Kenosha. Franchise applications are now pending in both Waukegan and Kenosha. The company will condemn a route through Kenosha if a franchise cannot be obtained. Construction will begin as soon as terminal franchises are obtained. The Illinois portion of the road will be built under the name of the Chicago Waukegan & North Shore Railway. George Wilcox, Chicago, president; Frank R. Grover, Unity building, Chicago, vice-president; R. I. Douglas, Waukegan, local manager.

Chicago Union Traction Company.—This company has ordered 10,000 tons of 129-pound grooved rails from the Lorain Steel Company. These are the standard rails prescribed in the city ordinances, described in last week's issue of the Electric Railway Review.

Cleveland Alliance & Mahoning Valley Railway.—Announcement is made that all of the right of way has been purchased between Newton Falls and Warren, O., for the proposed electric railroad between Warren and Ravenna. The old Baltimore & Ohio line will be used between Ravenna and Newton Falls. This part of the road is financed and work will be begun within a week. J. W. Holcomb of Cleveland is one of the promoters.

Columbus Magnetic Springs & Northern Traction Company.—This company, which has acquired the Columbus Urbana & Western Electric Railway, has established offices in Columbus and will

at once begin securing right of way for an extension up the east bank of the Scioto river to Dublin. W. H. Ogan, general manager.

Columbus Urbana & Western Electric Railway, Columbus, O.—It is reported that the work of relaying the tracks on Spring and Water streets in Columbus will begin as soon as the city starts to improve the streets. Several carloads of grooved rails have been received.

Connersville, Ind.—A street railway system is being promoted in Connersville, together with a branch extending to Milton, six miles south. A franchise for the system has been granted to local capitalists, who brought an agent from the General Electric Company to Connersville to prepare the plans and estimates for the construction of the system and the equipment thereof.

Denton, Tex.—Ties have been ordered and 60-pound rails have been contracted for with the Carnegie Steel Company for delivery in July, for use on the street railway system for which N. M. Lee recently secured a franchise. The company has applied for a charter and has elected the following officers: President, H. M. Griffin; vice-president, R. J. Wilson; treasurer, C. M. Simmons; secretary, Newton M. Lee.

Duluth Street Railway.—Preparatory to the construction of its new line on Twenty-fourth avenue east, from Superior to Fourth street, this company will begin within the next 60 days to replace the "Y" at Eighth avenue west and Superior street, with a loop on which all the East End, Lakeside, Hunter's Park and East and West Fourth street cars will be turned back. The material has been ordered and the work of taking out the "Y" and of constructing the loop will begin as soon as the steel arrives. J. Carson, Duluth, Minn., chief engineer.

Eastern Pennsylvania Railways, Lansford, Pa.—This company has begun work on the construction of an extension from Tamaqua to Middletown, Pa.

Fargo, N. D.—It is stated that Fargo capitalists, including L. B. Hanna, are interested in a plan to build an electric line about two miles long, connecting Wahpeton and Breckenridge, N. D., although the plans have not yet taken definite shape.

Ft. Wayne & Springfield Railway.—This company has placed a large construction force on the Decatur-Portland division, with a view of a speedy completion of the extension between Decatur and Portland, Ind. When this road is completed to Portland it will make connection with the Muncie & Portland line and will thereby constitute a third through line between Ft. Wayne and Indianapolis.

Franklin & Towamensing Street Railway.—A. P. Berlin of Statton, Pa., states that preliminary surveys will be made this month for the company's proposed line to connect North Weissport and Milport, Pa., about 10 miles, and that the road will be built this summer.

Girard Coal Belt Electric Railway.—The engineers have completed the survey for this company's proposed line from Girard to Mulberry, Kan., and construction is to begin in about a week. The line passes through a rich coal territory. L. H. Phillips, secretary, writes the company's offices are located at Girard, Kan., instead of at Pittsburg, Kan., as reported. James McFarland is president.

Grand Central Traction Company.—This company, recently incorporated, has issued a prospectus announcing its plans for building a line from Indianapolis to Evansville, Ind., 172 miles, with a branch through Saline City, Patrickburg and Spencer, to Terre Haute, 66 miles, and city systems in Bedford and Bloomington. It is estimated that the line will cost \$7,000,000. Surveys have been started and the right of way is being secured. The capital stock has been increased to \$5,000,000 and it is proposed to issue \$7,000,000 bonds. The officers are: President, W. D. Whitney, Muncie, Ind.; vice-president and general manager, Ora W. Blickenstaff, Lafayette; secretary and general counsel, David H. Morgan, Brazil; treasurer, Nathan P. Carter, Indianapolis; chief engineer, Will Duncan, Bedford; chief electrician, Horatio A. Morgan, Brazil. The company has general offices in room 304 State Life building, Indianapolis.

Illinois & Indiana Traction Company.—E. E. Barclay, representing J. H. Fertig & Co. of New York, states that this company has been organized to build an electric line from Quincy, Ill., to Terre Haute, Ind., via Hannibal, Pittsfield, Roodhouse, Virden, Clarksdale, Taylorville, Assumption, Windsor, Neoga and Casey, and that a franchise will be applied for in Taylorville in a few days. According to Mr. Barclay surveyors will begin at once to locate the line and right of way will be secured.

Indiana Columbus & Eastern Traction Company.—It is announced that the route of the extension from Lima to Bellefontaine, O., will be via Huntsville, Lakeview, Lewistown and Waynesfield.

Jacksonville (Fla.) Terminal Company.—Bids will be received until April 20 for the construction of a double-track subway, about 470 feet long, including approaches. J. W. Richardson, engineer, Jacksonville, Fla.

Johnstown (Pa.) Passenger Railway.—It is reported that this company proposes to expend about \$140,000 in improvements in Johnstown this summer. Work has already been started on the double-tracking of the line through the Eighth ward out to Luna park, at a cost of \$36,000. Other improvements are as follows: Complete rebuilding and double-tracking of the road through the Fourth and Seventh wards and Dale borough to Walnut grove, at a cost of \$40,000; the reconstruction of the lines in Broad street, Fifteenth and Sixteenth wards, at an estimated cost of \$34,000; the purchase of 12 new open cars for summer use, the cost being \$13,000. These cars will be delivered on April 20. Improvements about

the car barns will cost \$7,000 and the installation of new machinery in the Baumer street power house will cost \$13,000.

Junction City (Kan.) Electric Railway Light & Ice Company.—This company has let a contract to Cook & Devine for grading an extension 8,000 feet long to the military reservation near Junction City. The work involves about 40,000 cubic feet of grading.

Kent Traction Company.—It is reported that this company will soon begin construction on its line from Tolchester to Chestertown, Md., via Fairlee, 11 miles. A. A. Lamkin of Baltimore, president.

Lancaster & Eastern Railway.—H. W. Crawford, Lancaster, Pa., chief engineer, writes that this company, which is operated by the Conestoga Traction Company of Lancaster, Pa., proposes to build an extension from Christiana to Coatesville, Pa., 10.3 miles, via Parkesburg, which is now being surveyed and upon which grading will begin as soon as the right of way is secured. The overhead construction will be of the span type. The company now has a line in operation from Lancaster to Christiana, 20 miles. W. W. Greist, Lancaster, is president.

Lima & Toledo Traction Company.—The work on the construction of the extension from Leipsic to Toledo, 47 miles, for which J. C. Carland of Toledo has the contract, has been progressing rapidly during the past two weeks. Grading is now practically completed between Leipsic and Deshlar and 100 teams and 125 men are now engaged on the grading between Leipsic and the Maumee river. From Deshlar the route is via Weston and Tontogany to Maumee, 11 miles from Toledo. From Maumee the route has not yet been announced. The Maumee river, 5 miles south of Maumee, is to be crossed by a large bridge. It is estimated that the construction of this line will cost about \$35,000 per mile. F. T. Hepburn of Lima, O., is general manager.

Litchfield & Torrington Street Railway.—It is reported that construction will begin this summer on this company's line from Torrington via Lake Bantam to Litchfield, Conn., 10 miles. W. F. Dowd of Litchfield, president.

Louisville & Northern Railway & Lighting Company.—The interurban line between New Albany, Ind., and Louisville, Ky., known as the "Daisy Line," which has been leased by the Louisville & Northern Railway & Lighting Company from the Kentucky & Indiana Bridge Company, will be extended to the business center of New Albany, Ind., within a short time, according to representatives of the company. Since the line was established, nearly 20 years ago, its terminus has been near the end of the Kentucky & Indiana bridge on Vincennes street. Under the new system passengers will not be required to change to city cars. The company has selected a route for its line from New Albany to Corydon and French Lick and West Baden Springs, and the first four miles is to be built at once.

Ludington Southern Railway.—It is stated that the right of way has been secured for this road from Ludington to Grand Rapids, Mich., and that construction will begin shortly. N. W. Gifford of Chicago is interested. Thomas J. David, Fremont, Mich., is chief engineer.

Macon (Ga.) Railway & Light Company.—As soon as material that has been ordered by the company reaches the city work will begin upon many changes in the present street railway system in Macon. Council has granted permission to the company to make several changes in the tracks. Some of the streets are to be double-tracked, several new switches are to be placed and a loop around the Brown house is to be placed. J. T. Nyham, general manager.

Minneapolis Rochester & Dubuque Traction Company.—William P. Mason of Minneapolis, secretary and general manager, writes that this company will build a third-rail line from Minneapolis to Dubuque, 246 miles, of which 165 are in Minnesota. Bids for the construction of the first 90 miles are to be advertised for at once. Officers have recently been elected as follows: President, M. W. Savage; vice-president, W. D. Boutell; treasurer, E. W. Murphy; secretary, William P. Mason, all of Minneapolis. Robert Baldwin of Minneapolis is chief engineer.

New York & Long Island Traction Company.—This company has organized by electing the following officers: President, George A. Stanley of Cleveland; vice-president, C. S. Thrasher of Cleveland; treasurer, Joseph Nutt of Cleveland; secretary, J. A. MacElhinney, 120 Broadway, New York. The company plans to build first to connect Mineola, Roslyn and Port Washington, N. Y. Later from Roslyn a line will be built to Manhasset and Great Neck, and eventually to the New York city line at Little Neck. All franchises have been secured and there are on deposit a bond for \$5,000 and \$5,000 in cash to insure the construction of the line. The contract for building has been placed with the Cleveland Construction Company and work will be begun at once. The plan is to rush construction and it is hoped to have the Mineola, Roslyn and Port Washington line, 10 miles long, completed and in operation by September 1. The company has arranged with the Nassau Electric Light & Power Company for securing power from that company's plant at Glen Cove.

Oakland (Cal.) Traction Company.—It is stated that this company will build 40 miles of various extensions this season.

Omaha & Nebraska Central Railroad.—Secretary J. H. Rodgers has announced that grading on the proposed line from Omaha to Hastings, Neb., will begin on May 1, at the Hastings end. W. H. Fuller, chief engineer, will begin this week placing the grade stakes.

Pacific Electric Railway, Los Angeles, Cal.—This company is

now making surveys for a line from Los Angeles to Huntington Beach, Cal.

Portland Railway Light & Power Company.—F. I. Fuller, vice-president, writes that this company proposes to expend about \$1,000,000 the coming season in extensions, reconstruction, new special work, new equipment, etc. The company's standard rail for residence city sections is a 6-inch, 72-pound high T-rail. On hard surfaces this rail is laid on a 6-inch gravel ballast, with concrete between the ties. A stone block pavement is laid between the rails and for one foot outside, on a 1-inch sand cushion. The filling between the rails is sometimes cement grouted and at other times hot paving pitch is poured in. On main city streets a 7-inch grooved rail is used. On suburban lines 60 and 70 pound standard T-rails are used for ordinary construction.

San Jose (Cal.) Railway.—This company, it is reported, proposes to rebuild about 16 miles of track this year.

Shore Line Electric Railway.—A. William Sperry, engineer of this company, which proposes to build from Stony Creek to Saybrook, Conn., states that rails have been ordered and contracts for the power house equipment have been placed with the Westinghouse company. Twelve miles of the right of way, from Essex to Westbrook, have been purchased. P. B. Learned of New London, Conn., is president.

South Dakota Gas-Electric Railway.—This company, of which Mayor J. A. Cleaver of Huron, S. D., is president, is making surveys for a line from the Northwestern depot to the state fair grounds, in Huron. This portion of the line is to be opened on September 1 and several extensions are planned. Each car will carry a 250-horsepower motor.

Springfield Clear Lake & Rochester Interurban Railway.—J. E. Melick, president and chief engineer, writes that this company, which is now building a line from Springfield to Clear Lake and Rochester, Ill., about 18 miles, also proposes to build a line to Hillsboro, 53 miles, and is making surveys for an extensive system connecting Springfield with various surrounding towns under the name of the Sangamon Valley Electric Railway. The United States Construction Company of Springfield, which is affiliated with the Springfield Clear Lake & Rochester and the Sangamon Valley companies, is doing the construction work. The line to Clear Lake has been completed for four miles out of the center of Springfield and cars were operated over this line on March 11. The cars will enter the city over the tracks of the Springfield Consolidated Railway and power will be rented from that company. Grading on the line to Hillsboro is to begin about June 1.

Tacoma Railway & Power Company.—Bids have been asked for the construction of four 200-foot bridges for the Puyallup line. Rails for the line have been delivered and one mile of track has been laid. Rapid progress is being made on the grading. Arrangements are being made for an extension of the American Lake line to Murray. 2½ miles.

Terre Haute & Western Railroad.—It is reported that a large force of men is now at work near Sandford, Ill., on the grading for this proposed line from Terre Haute, Ind., to Paris, Ill. James Stewart, Paris, Ill., is interested.

Texas Traction Company, Dallas, Tex.—Several additional grading outfits are to be employed on the Sherman-Dallas interurban line and the construction of the line pushed to completion at an earlier date than was originally contemplated. President J. F. Strickland said on April 6: "Arrangements have been made for a large force to begin grading just north of Dallas next week. We shall also more than double the force on construction within the next 30 days. The factories inform us that they are going to be able to deliver our material considerably earlier than they thought they could at the time we placed our contracts with them, and it is now conservative to say that the road will be completed before the end of the year. With the exception of the Cotton Belt at Plano, we shall have either overhead or underground crossings of all steam tracks intersecting our route. We shall cross the Frisco overhead just outside of Sherman, run under the Houston & Texas Central at Caruth's Switch and go above the Katy at a point from which we will connect with the Bryan street line of the Dallas Consolidated Electric Railway Company."

Toledo Wabash & St. Louis Railroad.—C. D. Whitney of Toledo, O., president, writes that this company proposes to build an electric line from Toledo to St. Louis, via Defiance, O., and Ft. Wayne, Indianapolis and Terre Haute, Ind. Surveys have been completed from Toledo to Ft. Wayne, 95 miles, and a power house at Miami, O., has been purchased. George G. Metzger, vice-president; J. P. McAfee, treasurer; S. L. McAfee, secretary, all of Toledo.

United Railways, Portland, Ore.—It is stated that rapid progress is being made in this company's lines in Portland. The rails are being laid on reinforced concrete stringers with steel ties. Twenty carloads of rails are being shipped. L. B. Wickersham, chief engineer.

Wausau (Wis.) Street Railway.—Work on the street railway line in Wausau was resumed last week. Last year three miles of track was laid and this year it is proposed to lay several more. The line is to be extended north to Brokaw, five miles, and possibly to Merrill. Neal Brown of Wausau, president.

POWER HOUSES AND SUBSTATIONS.

Black Hills Traction Company.—It is announced that tests have just been completed on the hydraulic power installation in the power house of this company, located at Redwater, about 10 miles

from Spearfish, S. D. The tests are reported to be highly satisfactory to the officials of the company, as well as the manufacturers. The generating capacity, which is 1,500 horsepower, is said to be the largest in the Black Hills.

Bristol & Plainville Tramway, Bristol, Conn.—This company has purchased a 250-horsepower boiler, to be installed in the new extension to the boiler room, to be built shortly.

Consolidated Railway.—This company, it is reported, will build a new brick substation at Middletown, Conn., about 36 by 70 feet.

Cumberland & Westernport Electric Railway.—It is reported that this company has begun construction of a power house at Claryville, Md., which will be of brick, concrete and steel construction, 30 by 90 feet, in which will be installed a 550-kilowatt generator and 650-horsepower boiler. J. E. Taylor of Frostburg, Md., is superintendent, and Daniel Shumm electrical engineer.

Evansville Princeton & Vincennes Interurban Railway.—It is announced that this company will enlarge the reservoir at the Ft. Branch (Ind.) power house to permit operating the station during dry seasons. The reservoir will be about 300 feet long, 200 feet wide and about 12 feet deep, which is expected to furnish a capacity sufficient for all emergencies.

Hudson Valley Railway Company.—It has been officially announced that the work of constructing the power plant to be erected on the property recently purchased by the Delaware & Hudson Company on the bank of the Hudson river, just south of Mechanicsville, will be begun at once by the Hudson Valley Construction Company, to whom the contract has been awarded. It is proposed to build a steam turbine power plant for generating electric power for the Hudson Valley Railway Company, including large buildings and an elaborate system of tracks, trestles and coal storage grounds. Spurs from the main line of the Delaware & Hudson Company will run to the property from both north and south, and according to the plans prepared by the architects, J. G. White & Co., the power station will be erected about 1,000 feet north of the dam of the Hudson River Electric Power Company. The engineers of the Hudson Valley Construction Company have been making measurements at the property and the company will begin soon to make excavations for building and intake canal from the river through the site of the big power station. This canal will be 480 feet long and 12 feet wide and will furnish water for the condensing plant. The engine room to be constructed will be about 180 by 70 feet and the boiler room about 180 by 75 feet. The Delaware & Hudson Company will expend between \$500,000 and \$600,000 in the construction of the plant. It is expected to have a part of it ready for operation in August of this year. A. Eckstrom is consulting electrical engineer, Delaware & Hudson Company, Albany; Charles P. Boland is general manager of the Hudson Valley Construction Company, Times building, Troy.

Lexington & Interurban Railway, Lexington, Ky.—It is reported that this company will erect its central power house at Valley View, Madison county, Kentucky, on the Kentucky river.

Mahoning & Shenango Valley Railway & Light Company.—It is reported that this company will install a complete coal and ash handling conveyor in its North avenue power station. When this work has been completed and other improvements and extensions which are now under way are completed the plant at West Federal street and at Niles and Edenburg, Pa., will be abandoned and dismantled.

Milwaukee Electric Railway & Light Company.—One of the 300-kilowatt direct-current generators at the Commerce street power house of this company was burned out on Monday evening, April 8, 1907. The accident caused a delay to traffic for about half an hour and necessitated switching the current from one line to another in order to keep all the lines in operation.

San Francisco Gas & Electric Company.—The power station of the San Francisco Gas & Electric Company, which supplies current to several of the interurban roads radiating from San Francisco, Cal., was severely damaged by fire last week, the loss being estimated at \$2,500,000.

Seattle Electric Company.—It is announced that the 3,000-kilowatt turbine ordered by this company has been shipped from the General Electric works at Schenectady, N. Y., and will soon be in operation. This is the first unit to be installed and will be immediately followed by an 8,000-kilowatt turbine, which will make the total capacity of the plant about 17,000 horsepower. The boilers and piping for the new unit are being rapidly erected and it is expected that they will be complete by the time the turbines are installed.

Utah Light & Railway Company.—It is reported that J. H. Babcock, supervising electrical engineer of all the Harriman railroad lines, is in Salt Lake conferring with W. H. Bancroft, president of the Utah Light & Railway Company, regarding the details of the plans now being prepared for a 15,000-horsepower railway station, to be erected at Salt Lake. The new power house, which when completed will have cost approximately \$1,000,000, will be of sufficient capacity to furnish all the power required for the electric car service should the water-power plant break down. No details of the construction have as yet been completed, but it is definitely announced that work is being rushed and operations will be commenced as soon as plans can be completed.

Winnipeg Street Railway.—This company has ordered all machinery and electrical equipment for the Winnipeg Selkirk & Lake Winnipeg Railway, which will be installed as rapidly as possible, and there will also be two booster substations along the route to compensate for the drop which would otherwise occur on such a long line.

Personal Mention

Mr. J. A. Pierce has resigned as superintendent of traffic of the Mexico Electric Tramways, Limited.

Mr. H. E. Chubbuck, general manager of the Illinois Valley Railway, has removed his office from La Salle to Ottawa, Ill.

Mr. R. C. Thurston has been appointed supervisor of electric service of the Erie Railroad, with headquarters at Avon, N. Y.

Mr. Fred Ikes of Rushville, Ind., has been appointed chief engineer of the Indianapolis & Louisville Traction Company at Scottsburg, Ind.

Mr. Alexander McIver has resigned as master mechanic of the Chicago & Milwaukee Electric Railroad, effective on April 12, to join the staff of the New York City Railway.

Mr. Morris Hacker of Washington, D. C., has been appointed principal assistant engineer of the Schoepf syndicate lines and will have headquarters at Lima, O., in charge of the construction work between Lima and Bellefontaine.

Mr. J. H. Bennett, formerly auditor of the Northern Electric Company, Chico, Cal., has been appointed general passenger and freight agent of its interurban lines, with headquarters at Chico, effective on April 8. Mr. H. L. Gibson will succeed Mr. Bennett as auditor.

Mr. R. E. Danforth, heretofore vice-president and general manager of the Rochester Railway, Rochester, N. Y., as announced in the Electric Railway Review of March 30, 1907, has been appointed general manager of the street railway department of the Public Service Corporation of New Jersey, to succeed Mr. A. H. Stanley, resigned.



R. E. Danforth.

Mr. Danforth, whose portrait is presented herewith, was born at Buffalo, N. Y., in 1868, and was educated at Cornell University. In 1891 he entered the service of the Buffalo Railway Company, in the mechanical department. From 1891 to 1901 he held various positions, including that of superintendent. In 1901 he was made general manager of the Lake Shore Electric Railway Company at Cleveland, O., and on April 1, 1902, resigned to become assistant general manager of the Rochester Railway. In December, 1903, he was made general manager of the Rochester Railway Company and in December, 1906, was given the additional title of vice-president. Mr. Danforth will assume charge as general manager of the Public Service Corporation on May 1. Mr. Danforth was president of the Street Railway Association of the State of New York during the year 1905-1906.

Mr. P. P. Crafts, general manager of the Iowa & Illinois Railway at Clinton, Ia., who was recently appointed manager of the electrical department of the Ft. Dodge Des Moines & Southern Electric Railway, Des Moines, Ia., has decided not to accept the new position, but will retain his position at Clinton.

Mr. F. W. Casler, superintendent of the Manchester street power station of the Rhode Island Company, Providence, R. I., has resigned to take charge of the Lincoln street power station of the Boston Elevated Railway, Boston, Mass. Mr. G. W. Hawley of Providence has been appointed to succeed Mr. Casler.

Mr. C. S. Young, who has been chief engineer of the New Orleans & Baton Rouge Electric Railway, with office at New Orleans, since that company was acquired by Stone & Webster of Boston, Mass., has been appointed general superintendent of construction of the Stone & Webster lines in Texas, with offices at Dallas.

Mr. F. L. Fuller, vice-president and general manager of the New York & Queens County Railway and the Long Island Electric Railway, was elected president of the former company at a meeting of the directors held in New York city on April 3, succeeding Mr. Arthur Turnbull, who is at present in Europe. Mr. Fuller has been connected with the New York properties since 1903. Prior to 1893 he had charge of the St. Paul (Minn.) street railways, resigning his position there to become assistant superintendent and later general superintendent of the West Chicago Street Railroad Company. In 1899 he was offered and accepted the position of president and general manager of the Interstate Railway Company, Philadelphia, where he remained until 1903, when he resigned to become vice-president and general manager of the New York & Queens County Railway, which position he has held until his present appointment.

Financial News

Atlantic City (N. J.) & Suburban Traction Company.—The creditors' committee, composed of John L. Clawson of Philadelphia, H. von H. Stoerer of Chester, Pa., and A. C. Stamm of Harrisburg, Pa., prior to the meeting of shareholders on March 30, at which it was decided to issue \$30,000 preferred stock, issued a circular letter, an abstract of which follows: The company defaulted in the interest due February 1, 1907, upon its \$750,000 outstanding bonds. The company has a floating debt of about \$100,000; has issued \$27,000 car equipment bonds, and has entered into a contract to pave Florida avenue, Atlantic City, at a cost of about \$15,000. The plan of readjustment which it seems best to adopt to accomplish the desired end is to defer the payment of the interest due on February 1, and August 1, 1907, on the first mortgage bonds; negotiable scrip will be issued for this interest payable with interest at the rate of 5 per cent per annum from the date of each coupon, the principal to be paid at the option of the company without impairment of the lien. The refunding mortgage bondholders are asked to agree that the interest for two years upon their bonds shall be deferred upon the same conditions, and also to purchase at par 6 per cent non-cumulative preferred stock in amounts equal to 12 per cent of their holdings of the bonds. The unsecured creditors are asked to accept preferred stock as full payment of their claims, as of March 1, 1907, amounting to \$50 and upwards. The taxes, as well as debts of less than \$50, must be paid in cash; but if the plan is to succeed and the property be saved from a receivership, unsecured creditors for advances, supplies, machinery, etc., must accept preferred stock.

Birmingham (Ala.) Railway Light & Power Company.—Gross earnings for the year ended February 28, 1907, are reported as \$1,998,270. Net earnings, after the payment of operating expenses and taxes, were \$808,925. After the payment of bond interest, amounting to \$406,322, the surplus was \$402,603.

Chicago & Milwaukee Electric Railroad Company, Chicago.—Joseph E. Otis and George M. Seward have resigned as directors and are succeeded by P. G. Beach and G. L. Francis.

Chicago General Railway Company.—Amy Bonney has filed a bill in the circuit court at Chicago alleging that Edward F. Bryant is incompetent to administer the trust of 50 persons interested in this company. She asks to have returned to her \$2,000 bonds of the Chicago Midland Transit Company and 700 shares of the Chicago General Railway Company, the value of which, she declares, has been reduced to practically nothing by the transactions of Mr. Bryant and his associates. In 1904 Mr. Bryant, the bill says, agreed to act as trustee for the holders of stocks or bonds of the Chicago General Railway Company, the Chicago Midland Transit Company and the West & South Towns Street Railway Company, and to reorganize the properties. The bill charges the fraudulent issue of receivers' certificates and asks the appointment of a receiver to take charge of all the securities and interests involved in the trust, and also that Mr. Bryant be compelled to render an accounting.

Humboldt Transit Company, Eureka, Cal.—Control of this company, it is reported, has been purchased by George Heazleton of San Francisco. The company has 10 miles of track in Eureka.

Indianapolis Huntington Columbia City & Northwestern Traction Company, Indianapolis.—The appointment of a receiver for this road has been requested by Frank M. Dell in court proceedings at Indianapolis. It is reported that the McGowan interests may acquire the property.

Lincoln (Neb.) Traction Company.—A semi-annual dividend of 4 per cent has been declared on the common stock, placing it on an 8 per cent annual dividend basis. In 1906 the rate was 6 per cent.

Philadelphia Rapid Transit Company.—The directors on April 4 issued a call of \$5.00 a share on the 600,000 shares of stock of the company, par value \$50, of which \$30 has been paid in. The assessment is payable on or before May 6.

United Railways & Electric Company, Baltimore.—The report for the year 1906 compares as follows:

	1906.	1905.	1904.
Gross earnings	\$6,853,102	\$6,023,698	\$5,440,942
Operating expenses	3,220,942	3,765,292	2,876,538
Net earnings	\$3,632,160	\$2,258,406	\$2,564,404
Other income	4,725	2,725	10,238
Total income	\$3,636,885	\$2,261,131	\$2,574,642
Fixed charges	2,365,587	2,230,067	2,244,578
Surplus	\$1,271,298	\$ 31,064	\$ 330,064
Extraordinary expenditures	980,000		
Balance	\$ 291,298	\$ 31,064	\$ 330,064

Since the fire in 1904 the company has spent for betterments and improvements \$6,891,734.21.

West End Street Railway, Boston.—The Massachusetts railroad commission has authorized this company to issue \$420,000 additional common stock at \$85 a share, par value \$50, to meet the cost of additions and improvements.

Manufactures and Supplies

ROLLING STOCK.

New York & Queens County Railway, Long Island City, N. Y., is in the market for 40 cars.

Henderson City Railway, Henderson, Ky., is in the market for three car bodies of the closed type.

Chicago City Railway, Chicago, has just placed an order for 300 cars with The J. G. Brill Company.

Puget Sound Electric Railway, Tacoma, Wash., has ordered six cars from the American Car Company.

Chester Traction Company, Chester, Pa., has purchased seven 35-foot semi-convertible cars from The J. G. Brill Company.

Meadville Conneaut Lake & Linesville Electric Railway, Meadville, Pa., has placed an order with the St. Louis Car Company for five cars.

Erie Cambridge Union & Corry Railway, Erie, Pa., is preparing plans and specifications for new cars and equipment and will make purchases about July 1.

Union Street Railway, New Bedford, Mass., according to official advice has ordered one double-truck freight car and six box passenger cars from J. M. Jones' Sons. These will be equipped with Taylor trucks and Westinghouse 10113 motors.

Spokane & Inland Railway, Spokane, Wash., has ordered from the Westinghouse Electric & Manufacturing Company eight single-phase electric locomotives, to weigh 144,000 pounds each. They will be equipped with four motors of 250 horsepower each.

Rhode Island Company, Providence, R. I., has placed an order for 20 vestibule cars for delivery next fall. The company placed orders some time ago for 21 cars for delivery in April and for 14 cars which are now ready to be put into service. It is understood all the cars will be built by the Cincinnati Car Company.

Dallas Consolidated Street Railway, Dallas, Tex., recently ordered six double-truck closed cars from the American Car Company. These are for city service, will be 40 feet long over vestibule, 8 feet 4 inches wide and will be equipped with Brill 27-G trucks and two motors on each car, with a capacity of 50 horsepower each.

Oakland Traction Company, Oakland, Cal., as reported in the Electric Railway Review of January 19, has arranged for the building of considerable new equipment in its own shops during 1907. This will include 60 motor cars, 20 of which will be 50-foot, double-truck cars and 20 double-truck cars 55 feet in length; also 10 coaches and 10 standard-gauge flat cars.

Northwestern Elevated Railroad, Chicago, is preparing plans and specifications for 45 coaches and will place the order in about two weeks. They will be of the same dimensions as the 35 combination motor and trailer cars ordered last fall from the Jewett Car Company, which are now being delivered. All the new cars will be equipped with 45-inch sliding doors and it is the intention of the company to remodel the vestibules and doors of all its old equipment to conform with that now being put into service.

Morris County Traction Company, Morristown, N. J., as reported in the Electric Railway Review of April 6, placed an order on March 12 with the Jackson & Sharpe plant of the American Car & Foundry Company, Wilmington, Del., for six semi-convertible cars for November delivery. These will have a seating capacity of 36 passengers, length of body 30 feet 9 inches, length over vestibule, 40 feet 9 inches, width over sills 8 feet, will have underframe and body of wood and will be equipped with American Car & Foundry Company's type C trucks.

Beloit Traction Company, Beloit, Wis., as reported in the Electric Railway Review of February 23, has placed an order with the St. Louis Car Company for six closed cars for delivery on July 1. The company expects to place an order this fall for four open cars for 1908 delivery. The specifications on the closed cars call for the following details:

Seating capacity ..32 passengers	Width—
Wheel base .....9 ft.	Inside .....7 ft. 8 in.
Length—	Over all .....8 ft.
Body .....22 ft.	Body .....Wood
Over all .....30 ft.	Underframe .....Steel
	Brakes .....Hand power

Camden Interstate Railway, Huntington, W. Va., as reported in the Electric Railway Review of March 2, has placed an order with the Niles Car & Manufacturing Company for eight interurban cars, for delivery on June 16. The specifications call for the following details:

Width, over all.....8 ft. 4 in.	Height, track to trolley
Length, over vestibule.47 ft. 8 in.	base .....13 ft.
Weight.....27,000 lb.	Wheel base .....6 ft.
Seating capacity..52 passengers	

Special Equipment.

Air brake .....General Electric	Seats .....Hale & Kilburn
Couplers .....Brill	Trucks .....Baldwin
Motors .....4 GE-80	

Conneaut & Erie Traction Company, Erie, Pa., as reported in the Electric Railway Review of April 6, has placed an order with the Jackson & Sharpe plant of the American Car & Foundry Company, Wilmington, Del., for two combination passenger and express

cars. These cars were ordered about February 1 and are for delivery about May 1. The specifications call for the following details:

Seating capacity..48 passengers	Width, inside.....8 ft.
Wheel base, each truck.4 ft. 6 in.	Over all .....8 ft. 4 in.
Length of body.....35 ft.	Height, track to trolley base
Over vestibule.....45 ft.	.....12 ft. 4 in.
Over all .....47 ft.	Body and underframe....Wood

Special Equipment.

Air brakes .....Christensen	Journal bearings.....Bronze
Brakeshoes	Journal boxes .....Peckham
.....Am. Brake Shoe & Fdy.	Motors .....4 GE-57
Couplers .....Radial type	Paint .....Tuscan red
Curtain material.....Pantasote	Roofs .....Steam road type
Fenders .....Co. standard	Safety tread...Am. Safety Tread
Gears and pinions.....Nuttall	Seats .....Hale & Kilburn
Gongs .....Brill Dedenda	Trolley poles and attach-
Hand brakes.....Am. C. & F.	ments .....Nuttall
Headlights .....Wagenhal	Trucks .....Peckham
Interior finish .....	.....Oak

City Railway, Dayton, O., as reported in the Electric Railway Review of April 6, placed an order on March 18 with the Barney & Smith Car Company for 11 closed cars for delivery in October, 1907. The specifications call for the following details:

Seating capacity..32 passengers	Width, inside.....7 ft. 4 in.
Wheel base.....6 ft. 6 in.	Over all .....8 ft. 2 in.
Length, inside body..20 ft. 7 in.	Height, inside.....8 ft. 3 in.
Over vestibule.....24 ft. 7 in.	Sill to trolley base.8 ft. 9 in.
Over all .....28 ft. 7 in.	Track to trolley base.11 ft. 1 in.
	Body and underframe....Wood

Special Equipment.

Curtain fixtures.....National	Headlights ...Dayton Mfg. Co.
Curtain material.....Pantasote	Interior finish.....Cherry
Fenders	Journal boxes and bearings.
.....Co. stand.—Crawford pattern	.....Barney & Smith
Gears and pinions.General Elec.	Motors .....4 GE-67
Gongs.....Dayton Mfg. Co.	Varnish .....Flood & Conklin
Hand brakes.....Kling	Trolley poles and attach...
Heating system.....	.....General Electric
.....Cooper hot water	Trucks.Barney & Smith class G

SHOPS AND BUILDINGS.

Albany & Hudson Railroad.—This company has leased a five-story brick building at 24 State street, Albany, N. Y., and will remodel it and use a part of it as a station.

Cleveland & Southwestern Traction Company.—It is reported that the new car barns at Elyria will be ready for occupation about the latter part of April.

Dayton, O.—Representatives of the various interurban lines radiating from Dayton conferred recently with the city council, which met as a whole, to discuss the erection of a traction depot. A number of sites have been suggested, and, besides learning the wishes of the council on that point, a number of other matters were discussed.

Georgia Railway & Electric Company, Atlanta, Ga.—At a recent meeting of the directors it was decided to greatly enlarge and improve the car building and repair shops as soon as the plans can be prepared by the architects, Morgan & Dillon. All of the new construction is to be of brick and steel and will be fireproof. A new car barn is also to be built, 238 feet long by 102 and 22 feet wide. New additions are also to be made to the paint and carpenter shops, respectively, 50 by 110 feet and 68 by 98 feet. The carpenter shop will be enlarged and an entirely new blacksmith shop will be built.

Indiana Union Traction Company.—This company is making arrangements for the construction of a passenger station at the Marion Country Club, Marion, Ind.

Inter-Urban Railway, Des Moines, Ia.—It is reported that this company will erect a large interurban station on the northeast corner of West Second and Grand avenues this summer or fall.

San Diego (Cal.) Electric Railway.—This company has secured a building permit for the construction of an addition to its present car house at San Diego, which will cost about \$10,000.

San Jose (Cal.) Railway.—This company, it is reported, proposes to erect a new car house, shops and offices this year.

United Railways & Electric Company, Baltimore, Md.—William A. House, acting president, has awarded a contract to David E. Evans, Jr., & Co., Baltimore, for construction of a car barn at North avenue and Gay streets, Baltimore; one story, 124 by 356 feet; reinforced concrete construction throughout, steel rolling doors, slag roof, fire doors, metal frames and sashes, galvanized iron skylights, metal lockers, sprinkler system, electric wiring and fixtures, sanitary plumbing, steam heating system. Simonson & Pletsch, Baltimore, architects.

Worcester Consolidated Street Railway.—It is reported that this company will build a \$65,000 extension to its Market street car house in Worcester, Mass., to be constructed entirely of brick and steel.

TRADE NOTES.

Carbonite Wheel & Abrasive Tool Company, Townson, Md., has been incorporated with an authorized capital stock of \$25,000, for the purpose of manufacturing a patented device for improvement in compositions for polishing and grinding. The incorporators are:

Charles H. Snyder, John J. Dotterweich, Charles Schlaffer and others.

Pantasote Company has moved its Chicago offices from the Monadnock block to 707 Fisher building.

Browning Engineering Company, Cleveland, has removed its Chicago offices from the Monadnock block to Room 1006 Fisher building.

The J. G. Brill Company, Philadelphia, lost by fire on April 4 its new foundry at Sixtieth street and Woodland avenue, Philadelphia, estimated at \$20,000.

N. H. Emmons on April 1 assumed charge of the Boston office of the Heine Safety Boiler Company, St. Louis, Mo., succeeding W. E. Muse, who resigned a short time ago on account of ill health.

Baldwin & Rowland Switch & Signal Company, New Haven, Conn., has received an additional order from the Norfolk & Southern Railway of Norfolk, Va., for four recording block signals and one Acme traction switch.

Charles E. Irwin, recently in the sales department of the Hukill-Hunter Company, Pittsburg, has been appointed general sales agent for the Fort Pitt Spring & Manufacturing Company, with offices in the Farmers' Bank building, Pittsburg.

Continental Engineering Constructing Company (Inc.), 50 Broadway, New York, announces the election of Shirley E. Johnson, recently with Fisk & Robinson, bankers, as vice-president of the company. Charles M. Meeker is president and W. L. Wheeler secretary.

Theodore D. Buhl, president of the Buhl Malleable Iron Works of Detroit, Mich., died suddenly of apoplexy near the Waldorf-Astoria hotel in New York. He was also president of the Detroit National Bank and was connected with the firm of Parke, Davis & Co. of Detroit.

Scioto Construction Company, Columbus, O., has been incorporated with a capital stock of \$25,000, for the purpose of doing a general contracting business. The incorporators are: Barton Griffith, Fred H. Heywood, W. H. Agan, C. B. Howard and E. E. Bryan, all of Columbus.

Goldschmidt Thermit Company, New York, on April 1 removed its offices from 43-49 Exchange place to the new West Street building, 90 West street. At the same time a San Francisco office was opened at 432 Folsom street, under the management of L. Heynemann, for handling the business of California, Oregon, Washington and Nevada.

Drummond's Detective Agency, New York, is offering special inducements to electric railways having periodical inspections of their roads. The company believes better results can be obtained under this method, and has accordingly arranged a cheaper rate schedule. No charge is made by the company for consultations and all inquiries will be properly handled.

Dossert & Co., 242 West Forty-first street, New York, have received an order from the Chicago City Railway for 900 Dossert solderless cable taps; also from the New York Central & Hudson River Railroad for 150 of these tap joints in addition to 100 straight two-way connectors. The use of these taps for tapping off feed wires is becoming more general among traction companies.

Blake Signal Manufacturing Company, Boston, Mass., has recently completed the installation of the Blake electric block signal system on the line of the Chautauqua Traction Company of Westfield, N. Y., which operates between Jamestown and Chautauqua, N. Y. This system, which was described in the Street Railway Review of April, 1906, page 190, was installed on a part of the Jamestown & Chautauqua line several months ago.

Clinton Wire Cloth Company, Clinton, Mass., will on May 1 remove its New York office from 33 Park place to 261 Broadway. At the same time the Chicago office will be removed from 237 Lake street to 30-32 River street. For over half a century this concern has been manufacturing wire cloth of every description, embracing woven wire fence, electrically welded wire fabrics for concrete construction, wire lath, hexagonal netting, perforated metals, etc.

General Supply Company, Railway Exchange building, Milwaukee, Wis., has recently been incorporated to deal in building materials, the company making a specialty of selling to the dealer all kinds of building supplies direct from the manufacturer. The company has arranged for every facility for prompt delivery and purchasers of this class of equipment are invited to send inquiries to the company. Julius H. Kirl is interested in the new concern.

William S. Johnson, for the past twelve years assistant engineer of the Massachusetts state board of health, announces that he has opened an office at 101 Tremont street, Boston, for the practice of civil engineering. Special attention will be given to design and construction of systems of water supply and sewerage, valuation of water works and of water power, treatment of manufacturing wastes and other matters relating to sanitary and hydraulic engineering.

J. M. Gallagher has recently been appointed manager of the sales department of the Electric Railway Improvement Company of Cleveland, O. This company is manufacturing and installing rail bonds under the Wherry patents for copper welding and the Ellhu Thompson patents for electric brazing. Mr. Gallagher has for several years located at Chicago as the western representative of the Mayer & Englund Company of Philadelphia, Pa., and the Protected Rail Bond Company, and since the organization of the Elec-

tric Service Supplies Company has been associated with it until forming his present connection.

Invincible Rail Joint Company, mentioned in our issues of March 30 and April 6, has opened offices at 54, 55 Ziegler building, Spokane, Wash. As previously stated, the company is building a plant for the purpose of manufacturing and putting on the market the J. B. Climo rail joint and the Owen-Shaw nut and bolt lock and track bolts and nuts.

Lake Construction Company has filed articles of incorporation in the state of Ohio, capitalized at \$100,000. It is the purpose of the company to do a general engineering and construction business along lines identified with the building of electric railways and also to manufacture building material, supplies and accessories used upon electric roads. S. H. White, H. D. Watson and Frank G. Frink are interested. The offices of the company are at Hammond, Ind.

Crocker-Wheeler Company, Ampere, N. J., manufacturer and electrical engineer, has opened an office in the Woodward building, Birmingham, Ala., in charge of B. A. Schroder, formerly representative of the company in the New Orleans territory. For some time the company has found it difficult to handle from its New Orleans and Baltimore offices its rapidly increasing business in electric motors and generators at Birmingham and to meet this demand was obliged to establish headquarters at that point.

Western Electric Company, Chicago, has awarded contracts for the construction of a 2-story factory building, 120 by 160 feet, to be built on the property of the company at Hawthorne, Ill., to be used in the manufacture of black enameled wire. It will have a tile roof, metal skylight, and will cost \$50,000. The company has also contracted for a 1-story pump house, 16 by 16 feet, to be erected at Hawthorne. It will be of pressed brick construction, concrete foundation, tile roof, and to cost \$1,800.

Milloy Electric Manufacturing Company, manufacturer of the Milloy base, automatic trolley retriever and the Milloy automatic signal, has moved from Cleveland, where it was formerly located, to Bucyrus, O., and has taken offices in the American Clay Machinery Company's building in that city. An extension to the plant of the American Clay Machinery Company of Bucyrus will be made to handle the business of the Milloy Electric Manufacturing Company. These extensions include an addition to the pattern storage building, a 70-foot addition to the foundry and considerable new special machinery.

Allis-Chalmers Company, Milwaukee, Wis., has received an order from the Light Heat & Power Corporation of Northampton, Mass., for a 375-kilowatt Allis-Chalmers engine type alternating-current generator and a 17½-kilowatt excitor; also from the Gould Storage Battery Company of New York for an Allis-Chalmers 600-ampere, 140-volt induction motor-driven generator set for the Elmira Water Light & Railroad Company of Elmira, N. Y. The set will be composed of an interpole shunt-wound generator, designed for a normal rating of 600 amperes at 140 volts, mounted on a combination base with a 60-cycle, 3-phase standard Allis-Chalmers induction motor.

New Departure Manufacturing Company of Bristol, Conn., manufacturers of automobile and bicycle specialties, as mentioned in the Electric Railway Review of April 6, has purchased the business and factory of the Liberty Bell Company of Bristol, Conn., and will use the Liberty factory building as a branch of its factory, continuing the manufacture of the well-known Liberty bells. Among other things secured by this purchase was the Liberty cushion trolley harp, which for some time has been marketed by the Liberty Bell Company and has given good service on many important electric railway lines. This harp will be manufactured and sold by the new owners.

ADVERTISING LITERATURE.

Kinnear Manufacturing Company, Columbus, O.—Wood rolling doors constructed with special reference to the requirements of roundhouses and other buildings where sulphurous fumes prove deleterious to steel work are the subject of an illustrated pamphlet issued by this company.

Allis-Chalmers Company, Milwaukee, Wis.—A new index, corrected up to April 1, has been issued to show the catalogues, bulletins, instruction books, etc., at present obtainable. This shows a list of 135 publications, each treating of a separate product or group of products of the Allis-Chalmers Company.

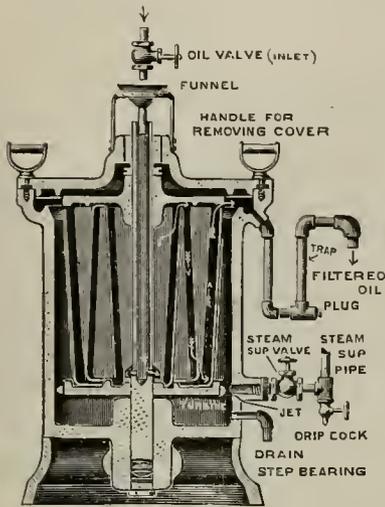
Paragon Concrete Fence Post Company, 417 Portsmouth Building, Kansas City, Kan.—A small booklet sets forth the merits of Paragon concrete posts as compared with those of wood posts, rough hewn stone posts and iron posts, and shows the form of the concrete post, together with the method of attaching woven wire to it.

B. F. Sturtevant Company, Hyde Park, Mass.—Bulletin 143 describes Sturtevant generating sets with horizontal engines. Generators of the horizontal sets are of the eight-pole type, direct-connected to the engines by flange couplings. Each generator has a capacity for a momentary 50 per cent overload without shifting of brushes or destructive sparking at the commutator.

Goldschmidt Thermit Company, 90 West Street, New York City, N. Y.—A handsome booklet, illustrating the various manners in which the Thermit process may be employed for effective welding purposes, has been published under the title of "Thermit Welding Process and What It Offers to Transportation Companies." The adaptability of Thermit to railway repairing provides the subject for a large portion of the book.

THE CENTRIFUGAL OIL FILTER.

One of the most frequent sources of waste in all industries in which machinery is required, and one which is generally the least thought about and considered, is the loss of oil through leakage and throwing away oil which has been used once and becomes dirty. The tendency of modern times, however, which forces the greatest economy to be practiced in even the smallest departments of an industry has extended so that it is no longer the custom to waste oil which has been once used, but to thoroughly filter the oil and carefully remove impurities so that the oil may be used over again.



Turbine Oil Filter.

Possibly one reason why oil filters were not generally introduced some time ago was that the older forms operated by gravity filtered so slowly and prohibited the use of a sufficient thickness and fineness of the filter bed to effectively remove all the foreign matter. To overcome this difficulty and provide a filter which will operate rapidly, occupy the minimum of space, and permit easy cleansing and cheap operation, the Oil & Waste Saving Machine Company, 1307 Real Estate Trust building, Philadelphia, has developed an interesting little turbine centrifugal oil filter, a vertical cross section of which is illustrated herewith.

As will be seen from the illustration, the filter consists essentially of a series of conical shaped bowls set one within the other and between which is placed the filtering material through which the oil is passed. The oil, it will be observed, passes into the hollow turbine shaft and enters the bottom of the innermost cone, from which it is thrown by centrifugal force outward through the filtering material, which because of the great pressure created at a high speed can be made sufficiently fine to remove even the microscopic particles of dirt which may be held in suspension in the oil. The filtering action is further assisted by the centrifugal force in that it increases the apparent difference in the specific gravity of the oil and the foreign matter which thus readily separates from the oil and is deposited on the inner surfaces of the cones.

The centrifugal machine is revolved at a high rate of speed by a small steam turbine, also shown in the section, which consists simply of a single row of impulse blades mounted on the circumference of the base of the centrifugal. Steam from a small nozzle forces these buckets around and causes the machine to revolve at a high rate of speed. As the entire rotating part is light and rests on oil films in the step bearing the amount of power required to revolve the machine is insignificant, so that an exhaust pipe is not necessary, the small amount of steam necessary to rotate the filter being easily condensed within the turbine and discharged through a small drain shown in the illustration.

The only care needed for the machine is simply to open the steam valve when using the filter and close it when finished. The step bearing is made of laminae, which reduces the relative surface velocity of the bearing surfaces which are also separated by an oil film, and thus the friction is reduced to a minimum and the wear of the step bearing is inappreciable for an indefinite period.

The filter itself is so arranged that it can be easily taken apart by lifting off the cover, which thus makes the filtering material easily accessible, so that it can be removed, cleaned and replaced. A feature which is of especial interest is that the filter is so arranged that should the first cone of the filtering material become clogged so that the oil cannot pass through it, the oil will go over the top of the partition and go through the second layer of material. The filter paper which is used in this filter is such an inexpensive item that when new paper is needed the old is simply thrown away instead of being cleaned and replaced.

The Page-Merritt bill in the New York legislature, the provisions of which and hearings thereupon considerable space was devoted in the issue of last week, has been under careful consideration for the past week, briefs and suggestions for amendments having been received up to April 10, when it was taken up for consideration by the committees of the two houses having it in charge. It seems probable that amendments providing a larger salary for the commissioners, a division of the cost of maintaining the metropolitan commission and some modification of the clause prohibiting railroads from investing in the stock of other railroad companies will be admitted by the supporters of the bill.

ECONOMIZERS FOR WATER-GAS PLANTS.

Theoretically 24 pounds of anthracite coal or coke is required for the manufacture of 1,000 cubic feet of water-gas, but owing to the great waste of heat which occurs during the "blowing up" period, both through the escape of CO formed during the process of blowing up and the loss of heat contained in the products of combustion, the actual amount of coal required for the manufacture of 1,000 cubic feet of gas is generally from 40 to 50 pounds. The efficiency of the system is, therefore, in general only approximately 50 per cent under normal conditions of operation. For many years since the introduction of the water-gas process, this heat contained in the products of combustion of the generator, and the heat formed at the base of the stack by the burning of the CO to CO₂, has been thoughtlessly allowed to escape, with the result that improvements which have been made in the retort process have again widened the field and caused many gas companies to return to the retort method because of its greater economy.

The Green Fuel Economizer Company of Matteawan, N. Y., realized these shortcomings of the water-gas process and started a series of experiments to determine what saving could be produced by utilizing a large part of the heat which was formerly allowed to go to waste. The method adopted in these experiments was the placing of a Green economizer and air heater in a brick setting, through which the products of combustion from the gas generator were caused to pass. This was accomplished by leading off a flue from the hood over the generator, which catches the gases that escape and leads them to the economizer, from which they are discharged into the atmosphere by an auxiliary stack.

The result obtained by the use of the economizer in tests which have been made clearly demonstrates that the saving of the heat not only reduces the coal consumption of the generator by 15 or more per cent, but reduces the coal consumption of the boiler and the amount of oil needed for enriching the gas as well. The reduction in the generator coal required is accomplished by forcing the air from the blower through the air heater, thus increasing the temperature of the air used for "blowing up" the generator. This results in a more complete union of the oxygen with the coal, thus reducing the amount of air which need be supplied and very materially increasing the temperature of the generator, which therefore requires a shorter "blowing up" period. Hence the loss of heat during the "blowing up" process is very much reduced.

The reduction in the amount of coal supplied to the boiler is the result of heating the feedwater up to the temperature of the steam in the boiler, with a consequent higher evaporation, per pound of coal. The increased temperature of the generator, owing



Economizer for Water Gas Plants.

to the hot blast, so greatly increases the temperature of the vaporizer that the oil is more thoroughly vaporized and "fixed," which accounts for the reduced amount of oil needed for the enriching process.

The economizer is of the usual Green type, made of high quality cast iron throughout. The cast-iron tubes of the economizer and air heater have slightly tapered ground ends, which are forced into correspondingly ground holes in the cast-iron headers. The pressed fit is made by a hydraulic press, which insures a tight

joint, which will not cause trouble from leakage. Each section when complete is tested under a hydrostatic pressure of 350 pounds to the square inch, and is therefore amply strong to resist the highest pressures. The effectiveness of an economizer or air heater depends solely upon the condition of the surfaces, as the average temperature existing between the water or air in the tubes, and the flue gases surrounding them, is so small that even a very thin coating of soot would prevent the transfer of heat. In order therefore to keep the surfaces of the economizer or air heater always in a perfectly clean condition they are equipped with the Green automatic scrapers, which constantly work up and down the tubes. The scraper may be operated by a small engine or motor, or from a line shaft conveniently situated. An important point which is worthy of careful attention is the use of metal to metal joints throughout, which avoids the difficulty experienced from leakage in the usual "made" joints. Although these air heaters have been especially designed for water-gas plants, they may be advantageously employed in power plants in general, as the more perfect combustion and resultant gain in economy from the use of preheated air in the furnace is a well established fact.

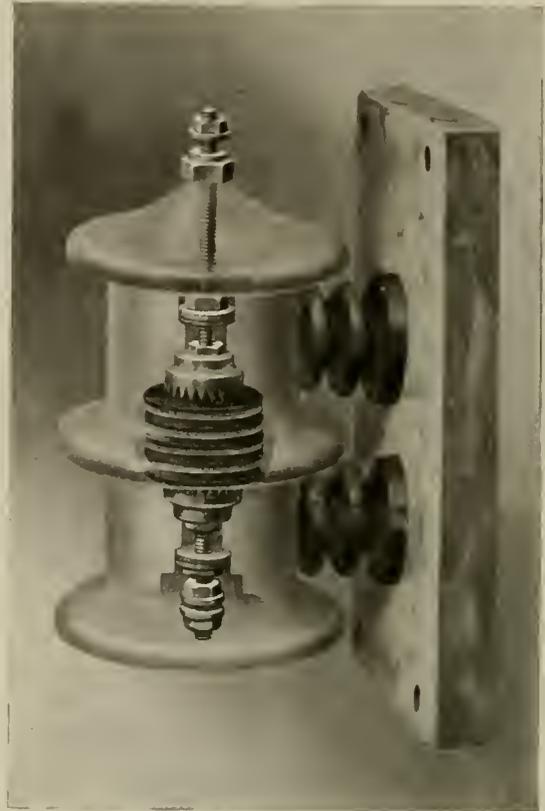
THE SHAW LIGHTNING ARRESTER.

The principles underlying the present design of the Shaw non-arcing lightning arrester are based upon results obtained from the various models heretofore placed on the market by the Lord Electric Company, 213 West Fortieth street, New York. A careful study has been made by representatives and engineers of the company of a great number of plants where this arrester has been installed. The data thus obtained have been utilized in the present construction to meet the latest requirements of central station and railway protection. Obviously the purpose of a lightning arrester is to offer a path of large capacity and relatively low static resistance from the transmission line to the earth. This has been found to be most easily accomplished by the use of conducting or semi-conducting parts separated by a series of spark gaps of higher electrical resistance. The Shaw patents are claimed to cover the basic principle of this construction. The low resistance conductors consist of rings, made in accordance with a special formula and having the outward appearance of carbon. These are treated by various processes. Each ring is so formed as to maintain an equal spacing between its periphery and that of the next succeeding ring. The cross section has the form of an ellipse and thus provides an internal as well as an external discharge path. Mica washers separate these rings from each other and these are constructed according to the service for which the particular arrester is intended. The ability of mica to carry static current, its high insulating qualities and non-absorbative nature, indicate this material as superior for forming spark gaps. The rings and mica discs are mounted upon porcelain arbors especially vitrified and so constructed as to give great mechanical strength. These arbors are inserted into the bore of the rings and discs, leaving the periphery exposed for the transmission of static discharges over large surfaces. For railway, electric light and power work the arresters are mounted in porcelain housings which have been subjected to high insulation test. For voltages of 1,000 and under, the housings are mounted on a supporting base made of seasoned hard wood, while instruments for over 1,000 volts are furnished with bases of white Italian marble.

The arresters are claimed to be absolutely water-tight and dust-proof and will not be affected by changes in temperature or any outside influence. For protection from accident they are furnished with wooden cases constructed of seasoned lumber so treated as not to be affected by moisture. The arrester is made in various models, designed for voltages from 60 to 66,000.

In connection with the mounting of these arresters the company offers a number of suggestions. Emphasis is placed upon the

be placed in such a position that the path from the line to the ground through the arrester is a straight one. In these connections bends, curves and sharp angles should be avoided if possible, but when impossible the bend should be made in the form of a curve of long radius. The ground connection is recommended to be of a bronze, brass or copper casting or plate of at least four square feet in area and weighing not less than 20 pounds. This should be packed well with powdered charcoal or coke. In case wires are run in iron pipe or conduit the wires should be soldered to the pipe,

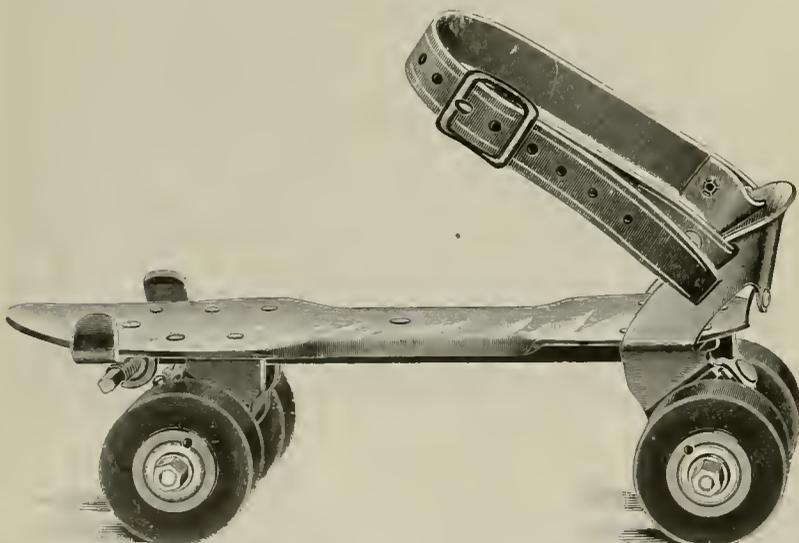


The Shaw Lightning Arrester.

otherwise soft wood molding treated with creosote is preferable. The accompanying illustration will show both the exterior and interior construction of this device.

BALL BEARING ROLLER SKATES FOR RINKS.

During the past three or four years there has been developed a steadily increasing interest in indoor roller skating, which was so popular about 20 years ago, and from the interest which pleasure-seekers throughout the country have exhibited in this healthful and enjoying pastime, there is every evidence that it will become more popular during the coming summer and succeeding years than it has been at any previous time. It is expected that this will be especially true of roller skating in the open rinks, which are operated in the parks of electric companies because they are situated out in the open, where all the enjoyment of skating can be associated with an abundance of fresh air. The introduction of high-class skates fitted with metal or composition wheels mounted on ball bearings no doubt has had much to do with the increasing interest in roller skating, and it is certain that the pleasure which is derived from this exercise depends greatly upon the quality of skates which are furnished by the rink management. In order to supply the demand of rink managers for skates of high quality which are light yet strong in construction, the Union Hardware Company of Torrington, Conn., has designed and is manufacturing a complete line of skates of superior merit. An illustration of the half clamp rink skates for men is presented, showing one of the latest designs, fitted with ball bearing "Hemacite rolls." A peculiar point in the construction of this skate, which is worthy of especial attention, is the bracing of the foot plate by means of a miniature angle iron riveted to the under side of the plate, which thus stiffens it very materially. The trucks, which are of pressed steel, are mounted on pivots so that they can oscillate and permit turning in a 3-foot circle, a point much appreciated by fancy skaters. The high heel band and strap attached will also be an attraction to most skaters, as the average individual has pretty weak ankles. The material used throughout is of the highest quality and the clamps which are so constructed that they take a firm grip on the soles of the shoe are easily adjusted and are very durable. These skates and a large variety of other designs are manufactured by this company.



Ball Bearing Roller Skate for Rinks.

difficulty liable to arise from cutting down the initial expense of making proper ground connections, as a large percentage of lightning arrester troubles have been traced to this source. The connection from the line to the arrester and from the arrester to the ground should be as direct as possible and the arrester should

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Gross earnings of 181 electric and street railways in 1906, as compiled by the Commercial and Financial Chronicle, reached the total of \$215,153,525, an increase of 11.67 per cent over the figures for 1905, while net earnings amounted to \$92,442,309, a gain over the previous year of 11.54 per cent. The compilation also gives the gross

and net earnings of 85 roads for the fiscal year ended on September 30 last, \$23,708,187 and \$6,798,100, respectively, and of 202 roads for the fiscal year ended on June 30, 1906, amounting to \$61,705,741 and \$27,339,786, respectively. The total gross earnings of the 468 roads in the different periods increased 11.49 per cent, and the increase in net earnings was 11.01 per cent, or only a slight variation from the record of the 181 roads in the last calendar year. The combined experience of these roads, which are located in all sections of the country and include both street and interurban lines, shows a striking increase of corresponding size in gross and net earnings.

The Illinois supreme court rendered a decision on April 18 that the city of Chicago cannot issue \$75,000,000 of Mueller certificates for the purpose of acquiring street railways without creating an indebtedness which would carry it beyond the constitutional limit. The effect of this decision is that, unless some other means of raising

money are devised, the city will be effectually barred, under the new ordinances approved on April 2, from purchasing the property of the Chicago City Railway Company and the Chicago Railways Company (Union Traction lines). The franchises, except in the event of purchase by the city, are for 20 years. The contention of the immediate municipal ownership advocates was that the city could issue the certificates against the street railway property alone and without regard to the existing outstanding city debt, which is limited by law to 5 per cent of the assessed valuation of property in the city. In discussing the plan to give holders of these certificates, if foreclosure took place, a franchise for 20 years,

the court recognizes the right of the city to purchase property and to bond it for the payment of the indebtedness; but under the plan contemplated in the Mueller certificates the city would extend the mortgage, not only over the tangible property which was purchased, but also over an entirely new franchise. The municipal ownership furor has died out in Chicago, and the new city administration, elected for four years, is opposed to the purchase of the street railway properties. In the recent election and the present decision the designs of those who would have plunged the city into a costly experiment have received an effective quietus.

The most important development in the Cleveland street railway controversy during the last week is the announcement of the Cleveland Electric Railway Company that its test of 3-cent fare operation on the Central avenue and Quincy street lines for the last three months proved unprofitable.

Since January 7, when the supreme court declared that the franchises for those lines had expired, the company has been operating the lines at a 3-cent fare under a temporary agreement to pay the city any surplus after operating expenses, depreciation and taxes had been deducted from gross earnings. In a communication to the council on April 15, which will be found on another page of this issue of the Electric Railway Review, the company states that not only has there been no surplus but that operation of the lines has actually resulted in a loss. This announcement is of especial interest in view of the fact that the entire issue in the Cleveland controversy is between a 3-cent fare, as advocated by Mayor Johnson and the Municipal Traction Company, and a 3½-cent fare as offered by the Cleveland Electric in return for a new franchise. Since November 1 the Municipal Traction Company has been operating the lines of the Forest City Railway on a 3-cent fare basis, but, although the company claims to have earned a small surplus over the 6 per cent rental on the property, the accuracy of its accounting methods has been questioned. The Cleveland Electric Company is evidently ready and willing to have the accuracy

of its results proved, for it has announced its intention of discontinuing the operation of the Central avenue and Quincy street lines on April 23. This action will give the Forest City company an opportunity to exercise its franchises on those streets. In case no purchaser is found for the tangible property of the Cleveland Electric Company in those two streets, the company states that it will proceed at once to remove its tracks. If that is done the Forest City company will have an opportunity to demonstrate whether it can finance the construction of new lines on the basis of 3-cent fare revenue.

THE CORRUGATION OF RAILS.

There are few questions connected with electric railways which have been the subject of more unsatisfactory discussion, or upon which more contradictory evidence has been presented than the cause of rail corrugation. This objectionable feature results in uncomfortable riding, the frequent renewal of rails, and the more rapid wear of rolling stock, and it is therefore one which justly deserves the continued attention of railroad engineers. A vexed and complicated problem of this kind is perhaps best approached by the collection of all possible facts bearing on the subject in the effort to find the cause, and the best remedy can then be more easily worked out.

The street railways of England appear to have experienced more trouble from corrugated rails than those in the United States; at least, they have given more attention to the subject and have developed machines for grinding off the high spots from rails in the track. The cause of corrugated rails may be found in some peculiar defect in the trucks, the rails or the track, and it is quite probable that it is due in some instances to a combination of these causes. In a paper on "Rail Corrugations," read at a meeting of the Institution of Electrical Engineers (London) on March 21, 1907, J. A. Panton has attempted to prove that the trouble lies entirely in the car trucks. His explanation is that the corrugations are caused by the lateral play of the wheels and axles in weak trucks and by the unsymmetrical thrust of the gear motor on the axle. This causes the wheels to skew in the track, the flanges to bind in the narrow grooves, especially at guard rails on curves, and the wheels are constantly tending to climb the rail and fall back, all this causing the irregular surface wear of the rail. While the trucks may be in some instances the cause of corrugations, it is too much to claim that they are the sole or principal cause, as there are many tramways with ordinary trucks which are not troubled with this defect.

It was pointed out in the discussion of Mr. Panton's paper that the axles could not be deflected from their natural radial position by the gear wheels, as their shafts are held rigidly in the motor frame, which takes the reaction. The general opinion of tramway managers in England is that the action of trucks of different types is much alike in its effect on the rail and that none has any marked effect. The Tramway and Railway World (London) has collected the opinions of over 50 tramway engineers and managers, who are practically unanimous upon this point.

The testimony in regard to the rail itself is equally confusing and unsatisfactory to one seeking the cause of corrugations. On solid track and with slow speeds the corrugations may have a pitch as small as 2 to 3 inches. On elevated lines over bridges, where a speed of 30 miles per hour is attained, the pitch is often 10 to 12 inches, while under other forms of track the pitch may be as long as 24 or 30 inches. The corrugations have also a different wave length in the same rail, being shorter at the joints than at the middle of the rail. The wave length also varies with the speed and track elasticity. For these reasons it is not reasonable to conclude, as some engineers have, that rail corrugations are due to periodic chatter of the rolling mill. Others believe that girder rails are rolled at too high a temperature and the web cools first and is distorted by the subsequent

contraction of the top and bottom flanges. It is difficult to understand how a rail should wear uniformly for several years and then develop corrugations as the result of an irregular web. It is a strange fact, and one which has not received satisfactory explanation, that when a rail has once begun to show corrugations the state is incurable and the fault will reappear even if the rail head is ground off level. It is often found also that if a corrugated rail is relaid in another part of the track which is free from the trouble, the surface will become smooth again. The opposite result will obtain if a rail from smooth track is transferred to an infected location, for then the corrugations will appear. This testimony appears to be the best that could be offered to prove that the methods of manufacture, composition or hardness are not to blame for corrugation, but it points rather strongly to the track as the cause.

The standard specification for tram rails used in England calls for a rather soft rail, and although soft rails wear most rapidly under heavy rolling stock, they do not necessarily wear irregularly, and rails from different makers, of various degrees of hardness, have shown corrugations in one place or another. It is found also that corrugations occur on steam lines when the rails are quite hard. From this showing it would appear that the rail itself has little to do with the strange phenomenon we are considering and the prospect for a valid explanation will be more encouraging if that be eliminated in the further search.

The managers of English tramways are generally agreed on the fact that corrugations usually make their first appearance on the outer rails of curves, particularly those of large radius, and the explanation offered to account for this is that the wheel flange is continually commencing to climb and then falling back, and, while falling, the wheel might jump forward and allow the axle to assume its position radial to the curve. It is this slipping which is supposed to be the cause of the corrugation, and as it is common to all trucks, no particular type of truck can be regarded as defective in this respect. The fact that the corrugations develop soonest on easy curves is due to the practice of running faster on such portions of the track and slower on sharp curves. But corrugated rails are not confined to curves and some lines are entirely free from them on curves and straight track. On the Leicester tramways the irregular wear is confined to straight track, more especially in the down-grade rails. On the London surface lines the corrugations are found on both straight and curved track, but the up-grade rails are most affected. At Portsmouth, England, the grades are free from corrugation, but they are found on the level curves of that system. At Sheffield the grades are comparatively free, but the few corrugations are about equally divided on up and down grades. With different kinds of track and rolling stock on these lines it is difficult to draw any conclusions from these reports. It might be thought that the quality of track has much to do with this irregular rail wear, but an English engineer who made a study of the tramway question in the United States reported to the London county council that neither the trucks nor the roadbed is responsible for corrugated rails and that increased elasticity of the roadbed has no effect on the trouble.

Other engineers are equally positive that the rigidity of the track is the main cause of corrugations. At Liverpool experiments have been made with rails laid on concrete, wood, and tar asphalt, and the corrugations are found with each kind of track. Some American engineers have thought that rail corrugations are due to the vibration or lateral bending of the web of the rail, and frequent cross braces have been suggested. Others think that corrugations may be due to the rails being loose on their support, or the ties loose in their foundation, or that there is a movement of the track foundation or substructure.

These various experiences and opinions relating to corrugated rails are here presented as a preliminary study of the subject for the benefit of future investigators, and to

show the difficulties which the problem involves. It will probably be found that there are a number of causes, some of them peculiar to certain lines, and that the best remedy will be found by a careful investigation of local conditions, rather than the development of a general theory applicable to all lines where the trouble exists. The improvements which are being made in roadway and rolling stock should lessen the evil, and the most substantial track should be found the most economical when the expense for rail renewals is considered.

MAINTENANCE AND DEPRECIATION.

The proceedings of the American Street and Interurban Railway Accountants' Association, just published, include a report of the executive session held at Columbus, O., on October 18, 1906, and elsewhere in this issue will be found the paper of Mr. R. N. Wallis on the subject of depreciation and an abstract of the discussion which followed. The remarks of a number of the speakers were interesting and instructive, but the discussion was to some extent hampered because of the narrowness of the text and because of the failure properly to define the terms used before proceeding to the discussion.

The question was: "Does the maintenance of an electric

for depreciation sufficient for all practical purposes. Mr. Neal, however, showed that if a property is replaced gradually and all renewals charged to maintenance, the value at any given time would be but little more than half of the original cost, and therefore to keep the value of a property intact it is necessary to provide a depreciation reserve in addition to charging all renewals to the maintenance accounts.

The conclusion of the Accountants' association was that in order to obviate the need of a charge for depreciation, "maintenance" must include "a sufficient charge set aside for future replacements of depreciated property." On reflection this will be found to be a much broader interpretation of maintenance than that of the standard classification which merely includes the expenditures for renewals as they occur. The unexpended balance of the "charge set aside" would cover the deficit referred to by Mr. Neal, or, as stated by Mr. Davies, the balance of the renewal reserve, together with the value of the property, would at any time be equal to the capital expenditure, which is the ideal condition.

In connection with this review of the ideas expressed by electric railway accountants as to the proper course to be followed in regard to repairs and renewals, it will be interesting to compare the theory and practice of the electric and the steam railways. It has already been said that the

Charges for Maintenance and Depreciation in Per Cent of "Operating Expenses."

	Fiscal year.	Maintenance of way and structures.	Maintenance of equipment.	Total maintenance.	Depreciation or renewals reserves.	Total maintenance and depreciation.
Steam railways of United States as reported to interstate commerce commission	1905	19.78	20.74	40.52	.....	40.52
Ditto if renewals were not charged in operating expenses (estimated)	1905	.....	.....	52.73	.....	52.73
Ditto if Stillwell and Putnam's estimated saving by electrical operation be accepted	1905	.....	.....	45.08	.....	45.08
Street surface, elevated and subway railways of state of New York as reported to railroad commission	1905	8.70	13.99	22.69	.....	22.69
Street railways of state of Connecticut as reported to railroad commission	1905	10.53	12.02	22.55	.....	22.55
Street railways of state of Massachusetts as reported to railroad commission	1905	10.02	10.92	20.94	.....	20.94
Ditto	1906	11.99	12.34	24.33	.....	24.33
Chicago Union Traction Company	1906	7.65	8.68	16.33	20.00	36.33
United Railways, St. Louis	1906	.....	.....	19.63	9.85	29.48
Milwaukee Electric Railway & Light Company (railway department)	1906	7.56	10.99	18.55	20.47	39.02
Twin City Rapid Transit Company	1906	7.43	9.15	16.58	18.36	34.94

railway at a high standard of efficiency eliminate the necessity of a charge for depreciation?"

The answer finally given to this question was: "The maintenance of an electric railway at a high standard of efficiency does not eliminate the necessity for depreciation unless the word 'maintenance' is construed to cover a sufficient charge set aside for future replacements of depreciated property." The association is to be congratulated upon thus officially recognizing the fact of depreciation and the need of making suitable provision for it.

The Street Railway Accountants' Association at its first regular meeting, at Niagara Falls in 1897, discussed the "Standard Classification of Operating Expense Accounts," submitted to the convention, wherein it was provided that each item under the heads, "A—Maintenance of Way and Structures" and "B—Maintenance of Equipment," should embrace the cost of repairs and renewals. At the next meeting of the Accountants' association, at Boston in 1898, the standing committee on "Classification of Accounts" submitted a revised report, in which some minor changes were made, but each paragraph under maintenance began: "Charge to this account all expenditures for repairs and renewals of," etc. This revised report was adopted by the association.

This direction that renewals be included in maintenance is today the recommendation of the American Street and Interurban Railway Accountants' Association, as it has been ever since the adoption of the report on classification of operating expenses by the association in 1898, and may be accepted as the theoretical standard of the association. In the case of a company having a perpetual franchise a strict conforming to this standard might be regarded as a provision

"Standard Classification of Operating Expense Accounts" recommended for the electric lines provides that renewals shall be charged to the maintenance accounts. This is also the standard prescribed for the steam railways by the interstate commerce commission in accordance with the federal statute known as the act to regulate commerce. The theory being the same for both classes of roads, the figures in the accompanying table are cited to show the practice.

Comparisons of this kind are most generally made in terms of gross earnings or of gross receipts, but it is believed that a comparison on that basis is too much affected by traffic conditions to bring out the point it is desired to make. For instance one of the reports cited shows two companies with ratios of operating expenses to total income of 51 per cent and 89 per cent, respectively. The total charges to the maintenance accounts are 4.4 per cent and 10.5 per cent, respectively, of the total income. When expressed as percentages of operating expenses the figures for maintenance are 8.5 and 11.7, instead of 4.4 and 10.5, which gives a better idea of what these lines are doing toward keeping up the property. The table herewith has been compiled to show, in terms of the money spent, how much has been spent for maintenance and how much has been spent (or reserved) for depreciation.

The statistics of the interstate commerce commission show that the steam railways of the United States in 1905 charged 40.52 per cent of "Operating Expenses" on account of "Maintenance," in which are included renewals. Inasmuch as the steam railways include renewals as part of operating expenses, the charge for maintenance is a smaller proportion of operating expenses than it would be were only current repairs so charged. Analysis of the maintenance and depre-

ciation charges of the Chicago Union Traction Company and the Glasgow Corporation Tramways, both of which are admitted to be attempting to make adequate reserves for renewals, shows that renewals amount to about one-third more than current repairs. Applying this correction to the maintenance charges reported by steam railways for 1905 the amount would be 52.73 per cent of "Operating Expenses" on the electric railway basis of computation. In a paper read before the American Institute of Electrical Engineers on January 25, 1907, Messrs. Lewis B. Stillwell and Henry St. Clair Putnam estimated that were the steam railways operated by electricity maintenance charges would be nearly 15 per cent less than at present. Admitting all these claims and making the correction, the maintenance charges of steam railways in the United States for 1905 would have been 45.08 per cent of "Operating Expenses," if the lines were operated by electricity. The electric railways in Connecticut, in Massachusetts and in New York are expending from 22 to 25 per cent of total operating expenses for maintenance, and the reports show no reserves for renewals.

While it is probable that the maintenance charges of the steam railways, which are twice as great as those of the electric railways, are to some extent swelled by expenditures for betterments, all of the difference is not due to this. When the figures for Connecticut, Massachusetts and New York electric roads are compared with those for the few American electric railways that are making partial or complete provision for depreciation in the way of reserves for renewals, the conclusion to be drawn is that electric railways in general are diverting an amount equal to 10 or 12 per cent of their gross earnings from operating expenses, and making it available for dividends, that is, provided it is not required for bond interest.

It is recognized that there is a depreciation of railway property not made good by current repairs. The extent of this depreciation, the best method of providing for it, and the most convenient way of handling the accounts relating to it are debatable matters which should receive the earnest attention of the Accountants' association. There are some points which seem clear: (1) If the difference between the theory and practice of the electric railways is to continue, the "Standard Classification of Operating Expense Accounts" should be revised. (2) To avoid excessive fluctuations in expenses, renewal reserve funds should be created by charges made at regular intervals. (3) It is desirable to have the total of the repair or up-keep accounts and the total of the renewal or depreciation reserves shown together, so that it may be seen whether the repair account is being favored at the expense of the renewal reserve.

These various questions are of especial interest now because the interstate commerce commission has been examining into the practice of the steam railways in accounting for repairs, renewals, replacements, betterments, improvements, additions and construction, and has invited from the railways a full statement of views on the methods of accounting for depreciation, and we understand the matter is to be discussed at the meeting of the Association of American Railway Accounting Officers at Atlantic City on April 24 next. The interstate commerce commission in its "Accounting Circular No. 8," just issued, submits a tentative plan for the consideration of the railway accountants. It is the purpose of the commission for the first year, beginning on July 1, 1907, to have the accounting department of each road determine what charge should be made for depreciation, and submit the reasons leading to the determination adopted. It is planned to make later a careful investigation to determine the useful life of various classes of material and equipment.

The Peoria-Bloomington line of the Illinois Traction System was opened on April 15, when a car carrying a party of officials made the trip from Bloomington to East Peoria, at a speed of about 40 miles per hour. It is expected to begin regular service about April 20.

ANNUAL MEETING OF THE IOWA STREET AND INTER-URBAN RAILWAY ASSOCIATION.

The fourth annual convention of the Iowa Street and Interurban Railway Association was held at the Lafayette Inn, Clinton, Ia., on Friday and Saturday, April 19 and 20, 1907. Thanks to the untiring efforts of the secretary, L. D. Mathes, and of the entertainment committee, of which P. P. Crafts is chairman, all was in readiness for the meeting and exhibits before the delegates from the railway companies arrived. The business meetings were held in the parlors of the headquarters hotel.

The first session was called to order by the president, F. J. Hanlon of Mason City, vice-president, secretary and auditor Mason City & Clear Lake Railway, at 10:10 on the morning of April 19.

Hon. H. U. Crockett, mayor of Clinton, made a short address of welcome, the response to which was made by C. D. Cass of Waterloo, general manager of the Waterloo Cedar Falls & Northern Railway Company. The president then read his annual address, as follows:

President's Annual Address.

It gives me great pleasure to open the fourth annual meeting of this association. It is not often that one meets as strong a body of men as the electric railway men of Iowa, a body of which I am proud to be a part. It seems but a few months since the first call was made for organization and at that time no one knew but that the infant would "die a bornin'," but we have prospered because there was a real need and a broad field for such a body as ours, and this year I think the owners of all electric railway properties have seen the association justified, and the wisdom of the founders has been commended on every side.

To our friends, the supply men, we owe a generous amount of praise for our success, and I speak for every member of this body when I say they are doubly welcome. Very little is sold at our convention, but when a man calls on me in my office, I like to think I saw him at the last meeting.

We are living in a record-making epoch and in fact will be looked upon in a few short years as pioneers in the electric railway business, when operating men will be joking in their meetings about the times when it was hard for an electric line to get a joint freight tariff, and we old-timers will be relating real experiences and swapping real stories about the hardships of the first 10 years of the twentieth century.

The most important work this year has been concerning legislation, which at one time threatened to overwhelm us, and I am proud to say that at every call a goodly number of our members were quick to respond and exert their influence in opposition to proposed legislation that would have been injurious to electric railway interests. I cannot commend too highly both branches of the legislature for their very evident desire not to embarrass the electric railways with hostile legislation, when the harmful effects of proposed acts were explained. Among the most important work was the defeat of the running board, Sunday closing and wire regulation bills and the securing of a 10-cent minimum on the 2-cent fare bill.

In these days of anti-corporation agitation, amounting almost to fanaticism, it seems to me that we have emerged almost unscathed and already we see signs that the movement has reached the crest and has begun to recede. These periods have come and gone in the past, and we may only expect a repetition of history.

The work of your secretary in this connection is worthy of the highest praise and to his watchful diligence and energy may be ascribed a goodly portion of our success. Not only in this matter but in all others he has been faithful, and I trust the members will in all instances show their appreciation of his efforts to protect your interests by prompt replies to all correspondence. He gets no salary and renders valuable service and needs encouragement instead of having to wait for "the letter that never came."

The value of the papers to be read in this meeting will be greatly enhanced by a free discussion and the programme has been so arranged that ample time is allowed for everybody to ask questions and give his experience. The officers of the association ask and urge every member to express his views on all the topics and I am confident you will be benefited if you bring your knotty problems before the association. Very likely your neighbor has had to unravel the same tangles.

In conclusion, gentlemen, let us consider that the field of electric railways is just commencing to broaden. Let us take care of our association, nurture it and not only keep it the lusty infant it now is, but make it the full-grown man.

All we need is the enthusiasm and the support heretofore given to maintain our fame, which has gone far beyond the borders of Iowa, as being the best, if not the largest, state association in the field.

L. D. Mathes, manager and purchasing agent Union Electric Company, Dubuque, read his annual report as secretary and treasurer. The report recited the work of the executive committee, and gave a financial statement showing the prosperous condition of the association.

Mr. Mathes, the secretary, read the paper by H. W. Garner on "Amusements: How Should This Feature be Handled by Operating Companies?" This paper and an abstract of the discussion which followed it will be found on page 516 of this issue.

Afternoon Meeting.

The afternoon session was called to order at 2:10 o'clock.

J. M. S. Waring, of the Electric Storage Battery Company, gave an informal talk on the application of the storage battery, in the course of which he described interesting examples of storage battery installations to equalize fluctuating loads on alternating current systems through the medium of suitable transforming apparatus. Replying to an inquiry, Mr. Waring said that the maintenance on storage batteries was not above 5 per cent per annum, and this included renewals and provided for depreciation, as the only depreciation was in the plates.

Mr. Mathes announced that there would be a discussion on depreciation at an executive session on Saturday.

H. H. Polk read a paper on "Modern Train Dispatching Methods on Electric Railways." This paper will be found on page 521 of this issue.

A paper on "Freight Handling by Electric Lines," read by P. P. Crafts, concluded the afternoon session. This paper will be found on page 518 of this issue.

Entertainments.

All arrangements of the convention details and for the entertainment of delegates at the Clinton meetings of the Iowa Electrical Association and the Iowa Street and Interurban Railway Association were in charge of a committee comprising P. P. Crafts, general manager Iowa & Illinois Railway, chairman; Thomas S. Crawford, general manager Clinton Gas Light & Coke Company; and R. M. Howard, general manager Clinton Street Railway. Associated with this committee and constituting a local committee to assist in the entertainment of guests were a number of the leading business men of Clinton, including G. E. Lamb, president Iowa & Illinois Railway; C. H. Young, president Clinton Street Railway; F. W. Ellis, C. C. Coan, W. F. Coan, C. B. Mills, Dr. L. M. Ellis, R. C. Langan, Dr. J. C. Langan, E. T. Boyle, H. E. Oates, W. J. Young, E. A. Young, C. C. Ewing, H. W. Seaman, W. S. Gardner, F. Iten, Val Bonney, F. A. Perkins, B. Bahnser.

The programme arranged included the following:

An excursion on the Mississippi river on the afternoon of Friday, G. E. Lamb, president of the Iowa & Illinois Railway, placing his houseboat, "The Chaperone," at the disposal of the convention for this purpose.

A Dutch lunch and smoker at the Lafayette Inn on the evening of Friday, features of which were music and an amateur vaudeville entertainment.

An excursion to Davenport, Rock Island and Moline, the party leaving Clinton on the afternoon of Saturday in a special car of the Iowa & Illinois Railway, and transferring to a special car of the Tri-City Railway at Davenport. After inspection of the government power house on Rock Island and the plant of the Tri-City Railway at Moline and a supper at the Commercial Club, Davenport, the party to return to Clinton.

The Clinton Street Railway, the Iowa & Illinois and the Tri-City companies all extended the courtesy of free transportation to the delegates and representatives of manufacturers in attendance.

List of Delegates.

The street railway men who had registered on Thursday night and the companies they represented were:

R. M. Howard, Clinton Street Railway Company, Clinton.
 P. P. Crafts, Iowa & Illinois Railway Company, Clinton.
 F. A. Perkins, Iowa & Illinois Railway Company.
 B. Johnson, Clinton Street Railway Company.
 C. F. Hillman, Iowa & Illinois Railway Company.
 W. C. Waters, Tama & Toledo Electric Railway & Light Company, Toledo.
 A. E. Park, Des Moines Winterset & Western Railway Company.
 L. D. Mathes, Union Electric Company, Dubuque.
 C. O. Elbert, Ft. Dodge Des Moines & Southern Railway Company, Boone.
 F. J. Hanlon, Mason City & Clear Lake Railway Company, Mason City.
 John A. Highbee, Howell N. Highbee and Charles E. Caster, Peoples Gas & Electric Company, Burlington.
 C. E. Fahrney, Ottumwa Railway & Light Company, Ottumwa.
 W. A. Stockfield, Citizens' Railway & Light Company, Muscatine.
 E. Moore, J. C. Federsen and J. Widerman, Iowa & Illinois Railway Company.
 John Reynolds, Boone Electric Company, Boone.
 H. W. Garner, Oskaloosa Traction Company, Oskaloosa.
 Mr. G. W. Bissell, Ames College, Ames.
 L. Sincere, Toledo.
 H. H. Polk, G. B. Hippee, Des Moines City Railway.
 R. A. Leussler, Omaha and Council Bluffs Street Railway Company, Omaha.
 H. B. Noyes, Omaha & Council Bluffs Street Railway Company, Omaha.
 L. Charles Nash, Omaha & Council Bluffs Street Railway Company, Omaha.
 E. L. Kirk, Sioux City Traction Company, Sioux City.
 C. M. Cheney, W. C. Breckenridge, L. E. Knowles, C. D. Cass, L. H. Breckenridge, Waterloo Cedar Rapids & Northern Railway Company, Waterloo.
 T. L. Cole, Davenport.
 F. Marron, Rock Island.
 J. E. Hayde, Boone, Ia.
 T. B. Terry, Cedar Rapids.
 C. D. Cass, Waterloo Cedar Falls & Northern Railway, Waterloo.
 H. R. Longanecker, Centerville Light & Traction Company, Centerville.
 L. E. Knowles, Waterloo Cedar Falls & Northern.
 H. G. Laurence, Chippewa Valley Electric Railroad, Eau Claire, Wis.

MANUFACTURERS' EXHIBIT AT CLINTON, IA.

At the annual conventions of the Iowa Street and Interurban Railway Association and the Iowa Electrical Association, held at Clinton, Ia., on Thursday, Friday and Saturday, April 18, 19 and 20, the basement of the Lafayette Inn was set aside for the manufacturers' display of electric lighting and railway supplies. The space available was about 2,000 square feet. The booths, which were 8 by 10 and 7 by 10 feet in size, were arranged so as to show to the best advantage the working models and other exhibits on display. The room was wired for both alternating and direct-current circuits, and current for power and lighting was furnished with the compliments of the local railway and lighting companies.

Among the manufacturers and dealers in electrical apparatus and supplies represented at the conventions were:

Allis-Chalmers Company, Milwaukee, Wis.—Represented by E. Dryer and D. K. Chadbourne.

American Steel & Wire Company, Chicago, Ill.—Double twin spindle track drills, rail bonds, trolley wire and insulated cables. Represented by George Long, George Quigley and Frank Conklin.

Atlas Railway Supply Company, Chicago, Ill.—Rail joints, braces and tieplates. Represented by G. M. Huber.

Benjamin Electric Manufacturing Company, Chicago, Ill.—Electric lighting supplies and car lighting specialties. Represented by H. E. Watson and W. L. Rogers.

Brilliant Electric Company, Cleveland, O.—E. Y. Hennecke.

Viscosity Oil Company, Chicago, Ill.—Represented by E. R. Stubbs and S. J. Ross.

Buckeye Electric Company, Cleveland, O.—Represented by A. J. Schram.

Buda Foundry & Manufacturing Company and Paige Iron

Works, Chicago, Ill.—Buda track specialties, consisting of track jacks and drills, spring switches and tool grinders. Represented by V. A. Swett and E. S. Nethercut.

Central Electric Company, Chicago, Ill.—Electrical supplies. Represented by F. R. Bryant.

Electric Appliance Company, Chicago, Ill.—Sangamo meters, electric laundry irons. Represented by P. R. Boole and J. K. Alline.

Electric Service Supplies Company, Philadelphia, Chicago and Keokuk.—Electric railway supplies. Represented by Thomas H. Henkle and E. R. Mason, of the Porter & Berg department.

Electric Storage Battery Company, Philadelphia, Pa.—Represented by G. W. Aktin and J. M. S. Waring.

Evans, Almirall & Co., New York, N. Y.—Central station heating. Represented by Benjamin Kauffman.

Everstick Anchor Company, St. Louis, Mo.—Everstick guy anchor and auger handle. Represented by Jasper Blackburn.

Federal Electric Company, Chicago, Ill.—Electric signs. Represented by G. T. Otis.

Ft. Wayne Electric Works, Ft. Wayne, Ind.—Single and multiphase meters, arc lights, motors, wattmeters, calibrators and transformers. Represented by F. S. Wiemeyer and A. L. Pond.

Fostoria Incandescent Lamp Company, Fostoria, O.—Represented by J. Rice.

Fox-Callahan Company, Milwaukee, Wis.—Terminal hood. Represented by E. M. Clark.

W. R. Garton Company, Chicago, Ill.—Porcelain insulators, lighting arresters, solder hands, Heaney fireproof wire, Wapax anchors, trolley cords and overhead railway materials. Represented by W. R. Garton and C. C. Ewing.

General Electric Company, Schenectady, N. Y.—Electric kitchen utensils, luminous radiators, railway supplies and electric lamps. Represented by E. L. Callahan, R. E. Keller, F. M. Vogel, Darwin Ulke, G. A. Seabury and J. D. A. Cross.

Gould Storage Battery Company, New York, N. Y.—Represented by E. M. Hervey.

Illinois Electric Company, Chicago, Ill.—Electrical supplies. Represented by C. C. Dawson.

H. W. Johns-Manville Company, New York, N. Y.—“No-ark” inclosed fuses, overhead line materials, insulators, meters and friction tape. Represented by J. W. Hardy and W. B. Roberts.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Root railway spring scrapers and fenders. Represented by Fred N. Root.

McClintock Manufacturing Company, St. Paul, Minn.—Railway signals. Represented by Charles H. Decker.

Monarch Electric & Wire Company, Chicago, Ill.—Monarch wire and flaming arc lamps. Represented by H. E. Mason.

National Brass & Metal Company, Minneapolis, Minn.—Represented by A. M. Nelson.

National Carbon Company, Cleveland, O.—Represented by C. W. Wilkins.

National Conduit & Cable Company, New York, N. Y.—Represented by F. B. Snitzer.

National Lead Company, New York, N. Y.—Represented by C. T. Clark.

Ohio Brass Company, Mansfield, O.—Railway supplies.

Ohmer Fare Register Company, Dayton, O.—Fare and recording registers. Represented by C. W. Ketteman.

John A. Roebing's Sons Company, Trenton, N. J.—Represented by H. N. Black.

St. Louis Car Wheel Company, St. Louis, Mo.—Represented by F. O. Grayson.

Shelby Electric Company, Shelby, O.—Represented by R. P. Bricker.

Standard Electric Manufacturing Company, Naperville, Ill.—Represented by R. W. Loose.

Standard Underground Cable Company, Pittsburg, Pa.—Weatherproof, trolley and magnet wires. Represented by J. E. O'Neill.

Tri-City Electric Company, Davenport, Ia.—Represented by Edward Kunkel and I. N. Butterworth.

W. T. Van Dorn Company, Chicago, Ill.—Drawbar and automatic couplers. Represented by N. P. Moerdyke.

Wagner Electric Manufacturing Company, St. Louis, Mo.—Electrical instruments. Represented by Frank N. Jewett and C. C. Warner.

Westinghouse Electric & Manufacturing Company, Pittsburg, Pa.—Alternating-current electric fans, electric meters. Represented by A. M. Miller, H. H. Caughlan and W. R. Pinckard.

Western Electric Company, Chicago, Ill.—Insulators, motors, arc lights, fans and electric railway supplies. Represented by D. C. Guest, W. E. Myers, O. B. Duncan, H. E. Griffin and M. R. Last.

AMUSEMENTS: HOW SHOULD THIS FEATURE BE HANDLED BY OPERATING COMPANIES?*

BY H. W. GARNER, GENERAL MANAGER OSKALOOSA TRACTION & LIGHT COMPANY, OSKALOOSA, IA.

It is not to be within the bounds of this article to bring before you in review the opinions and observations of any great number of persons who are engaged in devising, constructing and operating amusement parks and resorts, and catering to the amusement whims of the public. Every railway manager has only to read the excellent articles appearing regularly in railway publications and reviews, descriptive of amusement parks and their operation, to keep advised of the extent, development and constant progress along the lines of fostering and building up outdoor amusements.

It has been reliably stated that this country presents the greatest industry and the greatest prosperity in the way of outdoor amusements in the world; and in this connection it is safe to assume that without electricity the summer park, as we know it, would never have been evolved or brought to its present state of development. This article will endeavor to present to you:

1. What the electric railway companies of this state have accomplished in the way of furnishing or promoting amusements as a feature of their operation and for the purpose of inducing traffic.

2. To determine as nearly as possible to what extent the companies can invest conservatively and profitably in maintaining amusement resorts or in assisting in enterprises intended to provide pleasure for the public.

3. To point out in a general way the best methods to pursue, as shown by experience and observation.

The actual management and various features of amusement parks and resorts certainly present as varied and diverse sides as those of the transportation business itself, and today we find millions of dollars invested in this generally profitable business.

I feel safe in saying that the railroads in this state, as well as in other states, find themselves, in a way, the originator or sponsor for amusement resorts now in operation or contemplated. Evidently in only a very few of the larger cities of this state has the amusement park taken its place in the business world and passed from the hands of the street railway company into those of private investors and managers. However, in every instance the street railways are absolutely essential to the development of amusement parks; their interest and that of the park operators are mutual.

The electric railway interests of this state are now represented by 23 separate companies, operating a total of over 500 miles of electric street and interurban track, and serving an approximate population of 500,000. For convenience the companies are divided as follows:

Companies serving population of 40,000 to 100,000 = 6.
Companies serving population of 20,000 to 40,000 = 6.
Companies serving population of 10,000 to 20,000 = 7.
Companies serving less than 10,000 = 4.

To a certain extent every company appears to have engaged in the amusement business and every man apparently retains some distinct, if not comforting, memories. The writer remembers when it was one of his duties several years ago to preside over the ticket office of a summer vaudeville theater, and, after each performance of a colored minstrel troop, to lock up the band instruments for safe-keeping, these instruments being referred to in a certain chattel mortgage given to secure railroad fare advanced. At the end of a rainy week the minstrel troop had faded away, but the instruments adorned the company's office for some time afterward.

Reports from the various cities show that the railway companies of this state are well advanced in the provision of amusement parks for the patrons of their lines, and in several of the cities the companies have established and are now maintaining creditable and valuable amusement facilities.

To what extent the various cities have engaged in this departure it is not the purpose of this article to disclose. I find, however, that three companies own outright their parks and operate them under their direct control. Eight companies derive benefits from amusement parks operated either privately by the cities or leased by the companies. The remaining 11 companies derive no benefits from and do not have amusements or pleasure parks on their lines. The three companies first referred to guarantee the expenses of the parks, and none of these companies reports a profit on the actual operation of the park, from which it might be inferred that as a separate financial undertaking, apart from the profit derived from increased railway traffic, the summer park in this state has not proved to be a paying investment.

With very few exceptions the entrance to all parks is free, and it is a question whether the possible benefit that

*Read before the Iowa Street and Interurban Railway Association, Clinton, Ia., on April 19, 1907.

might be secured in making an admission charge and enabling the management to provide a better grade of attractions might not be offset by a decrease in patronage due to the admission charge.

Every manager reports music and band concerts as the feature most attractive and best enjoyed by the park patrons, when furnished in congenial surroundings, with forest trees, flowers, greensward and plenty of shade. Every manager who sets out to furnish summer amusements must hold ever before him the fact that mankind never ceases to love and to take pleasure in the open air, the beauties of nature and the restfulness of music.

He was a clever man who named a park "sans souci," which means "without care." The railway manager whose duty and interest it has become to provide for this side of man's nature, knows well from observation that his park or his amusements are successful and lasting only when they cater to this desire to be merry and care-free.

Other attractive features which have been provided by the companies of this state for their patrons include vaudeville and summer theatrical and operatic performances, moving pictures, merry-go-rounds, balloon ascensions, and aerial acts, boating and bathing facilities, figure eights and various other amusement devices.

Sunday is universally the best day for parks and, as near as the writer can ascertain, the amusements furnished and intended to be provided at every park operated in the state, directly or indirectly under the control or patronage of street railway companies, are absolutely clean and moral in nature, and free from objectionable features. The only parks or amusement resorts that have stood the test of time and are recognized today as legitimate and permanent investments are the respectable parks.

Certain members of this association will remember distinctly a bill which was introduced in the last legislature, governing Sunday amusements. It was a significant fact that in the debate on this bill, which took place before the committee, the attractions and music furnished at parks operated by street railway companies were not specifically designated by the supporters of this measure as the objectionable amusements which were considered a desecration and obnoxious. Nevertheless, every man who was present at this hearing knows, and developments proved later, that if this measure had become a law practically every park now being operated by street railway companies would have closed its gates, and this measure, which was aimed to strike at a supposed existing evil, would have embraced in its jurisdiction every park and pleasure resort; and the great public, the people who ride, would have been deprived of what is perhaps the greatest free blessing that comes to the weary, the restfulness of beautiful shady parks, the diversion of pleasing innocent amusement, the refreshing stimulus of music. What railroad company could operate its park without the traffic on Sunday, the one day in the week for which the park is made? This bill did not become a law because the street railway men of the state convinced their representatives that the parks were created for the people and that no man had yet openly presented any convincing arguments why the parks should close. The laws for two years are made, but it behooves every street railway company operating or interested in any park or amusement resort which is patronized by the public on Sunday, so to operate that park that no man can support a measure which may close the park because it is a nuisance or because it is objectionable to any great class of men and permits a desecration of the Sabbath.

The majority of the railway companies of this state encourage financially, in nearly every instance, baseball games; and, in fact, if the truth were told, the national games could hardly flourish without the boosting hand of the street railway company. Circuses are welcomed and in many instances furnished free grounds adjacent to car facilities. Chautauqua meetings have generally proved to be good traffic producers. Street fairs and carnivals are somewhat out of date and railway companies have apparently not suffered any great loss. County fairs, race meets, conventions and football games are all worthy of encouragement.

Harvest days for the street car companies are not without their burdensome conditions. Chief among these in the handling of summer traffic are: The restriction of single-track roads; regular schedules which are not maintained on account of increased traffic; increased liability to accident because of extra traffic; inability to secure competent and trained men for short periods of summer traffic; and last, but not least, sufficient reserve capacity in cars, and the peak load problems. These so-called "necessary evils" must be encountered, carefully considered, and then provided for by every manager; and to attempt to standardize the remedies for these conditions would be as impracticable as to attempt to reduce to an exact science the design and operation of amusement parks. Local conditions must be recognized in

each particular case, but to these can be added the known experience of the past.

To many of the street railway companies of this state, the extent to which they are warranted in establishing or investing in amusement resorts is a perplexing question. On one hand you are told by the experienced successful park manager: "If you go in, get in strong." The writer knows of several instances when we "got in strong." On the other hand a too conservative policy may be depriving your company on every bright summer day of traffic that is waiting to be invited. With at least one-half of the companies operating in this state the writer believes, from his observations, that it is financially impossible to maintain regularly during the summer season a park theater, presenting attractive and entertaining features. In the remaining cities it may be possible, although reports received from the companies do not indicate flattering returns on the venture itself.

In nearly every city, however, in which a street railway line is in operation, it appears to be practicable and eminently desirable, according to the size of that city and the resources of the company, to secure either directly or indirectly by lease or purchase, park grounds, distant from the center of the city and provided with good car facilities. In the smaller cities the assistance of the city council and the people is almost necessary to the establishment of a public park.

The writer, in presenting this article, assumes that the majority of the managers at this meeting are not vitally interested or affected in a consideration of this subject by the practices and conditions existing with street railway companies in cities of over 100,000 population.

In preparing this article the writer is indebted for several excellent letters received in response to requests for suggestions. Among these is a letter from Paul D. Howse, general manager of White City, Chicago, modestly designated as the "finest amusement park in the world." It may be of interest to learn from Mr. Howse that the fire show was the greatest single attraction ever placed in White City. The scenic railway has had the longest life and drawing power. Free attractions are maintained at all times when White City is open. In Mr. Howse's opinion, street railway parks have been unsuccessful most frequently because no money was spent for free attractions.

I believe that no better advice can be given to the members of this association on the question of how amusement features are to be handled and considered than that which has come to me through the courtesy of E. C. Boyce, vice-president of what is really one of America's most beautiful scenic resorts, Dreamland, Coney Island. Although Mr. Boyce has been interested in building many of the largest amusement resorts of this country, his suggestions are equally valuable for the guidance of managers who are interested in smaller enterprises. Mr. Boyce writes:

"In cities of from 5,000 to 65,000 population, I would advise street railway companies to keep clearly in mind the fact that an amusement resort should be considered solely as an indirect means of creating traffic for the railway. In this connection I append the following list of things that may be profitably undertaken: 1. The erection of a band stand and maintenance of free music during the summer season, the cost of the music to be governed entirely by the income from traffic. 2. Free fireworks weekly or bi-weekly. An excellent exhibition can be had for an expense of \$50. 3. The building of a roller coaster or so-called figure eight. This is one of the two amusement devices that can be profitably operated for an indefinite period and whose first cost is comparatively low. The other device is the merry-go-round or carousel. 4. Free outdoor attractions, aerial acts, animal shows, etc., are particularly attractive where prizes are given to children.

"Aside from the things above enumerated, I would not advise street railway companies to invest in any other form of amusement or entertainment. The most practical method is for the company to lease or purchase a suitable tract of ground, located preferably between 20 and 60 minutes' ride from the city; to make the ground reasonably attractive by means of bunting, electric lights, etc., and plan to sublet concessions either on a percentage or for a flat rental, preferably to local people, for any and all wholesome forms of amusement. The rental thus obtained always returns a large percentage of profit to the owners of the land.

"It is always possible to find sufficient concessionaries to make a resort as attractive as the business will warrant. In this way a railway company cannot possibly lose money on the venture, and it is always enabled to control generally the conduct of the resort, this being a very desirable feature. Under no circumstances is it wise to charge an admission fee to such a resort, and the policy of the railroad company should be liberal in the matter of supplying and charging for electric light, power concessions, space, etc."

Mr. Boyce's suggestions, in my mind, are conservative and are well worth following, either by the company already

engaged in the amusement business or by one about to venture in the field.

Discussion on Amusements.

Mr. Garner's paper was discussed at considerable length. G. B. Hippee (Des Moines City Railway) believed that local conditions should govern railway amusement enterprises and that it is important for companies to proceed cautiously. At Des Moines, he said, the attractions of the present park, with its large theater, had been increased gradually. Admission to the park is free, but charges are made for theater seats. Visitors may reserve seats for the park theater at the Des Moines office of the company. The park itself lost money. Mr. Hippee stated, but traffic on the park line had increased 50 per cent.

P. P. Crafts (Iowa & Illinois Railway, Clinton) said that he had found their park successful in increasing traffic. Special features at the park are a refreshment pavilion and swings and tables in the woods. The profits of the restaurant paid all the expenses of the park except those for music. Round-trip rates of 40 cents, and for children of 25 cents, are made to the park, which is located 18 miles from Davenport and Clinton.

L. D. Mathes (Union Electric Company, Dubuque) had found that the park at Dubuque is an aid in creating favorable public sentiment because the park has a good moral influence. The park was open three months and increased railway receipts over \$20,000, with expenses of \$12,000. Mr. Mathes believed that a mistake had been made in having the park free.

Mr. Hippee believed that every electric railway could make money by having a park on its line, but thought that the best results were generally obtained by leasing concessions. One of the greatest attractions had been the bathing of the Hagenback circus elephants in the park lake.

C. D. Cass (Waterloo Cedar Rapids & Northern Railway) stated that his road was taxed to its capacity in handling the traffic at the Chautauqua meetings, which now last four weeks. Last summer the national conventions of various societies had been held at Chautauqua park during the months preceding and following Chautauqua meetings. The Chautauqua association had the Thomas orchestra at Waterloo last summer for a week; and although the association suffered a loss, it is to have a similar feature this year.

All speakers agreed that the roller coaster was the most profitable attraction, with the merry-go-round second.

FREIGHT HANDLING BY ELECTRIC LINES.*

BY P. P. CRAFTS, GENERAL MANAGER IOWA & ILLINOIS RAILWAY COMPANY, CLINTON, IA.

It was not so many years ago that projectors of an interurban railway were shown the exit if they approached capitalists with a proposition in which the earnings from freight handling were to be considered as a part of the road's income. Now the situation has reversed and the investor gives very careful consideration to that part of the business which he formerly scorned.

What has brought about this change of front? Simply the faith, locked in the breasts of interurban managers, that freight haulage would sooner or later become profitable and a strong influence in the earning power of properties under their charge. These managers have continued to hammer away until, in the western section of the central west, particularly, the results have been generally satisfactory and in some cases astonishing.

You may ask, why should not eastern roads have developed their freight business in the same proportions? A number of roads have met with considerable success, but, owing principally to physical and franchise conditions, due to lack of experience and foresight of the earlier builders, the freight business has been greatly restricted. Interurban roads which have been constructed recently, however, have drawn a lesson from the earlier roads and now build with proper regard to that traffic.

It is now customary, wherever possible, to organize in-

terurban roads under the general railway laws, to build on ample right of way and, when building through small towns under franchise rights, to obtain the right to transact a general railway business, including freight, and to locate the line in such towns at some other point than on the main street. When conditions warrant, steam rights are obtained. The character of roadway construction also is changing, not only for the maintaining of high-speed passenger service, but also for the operation of heavy freight trains, with steam locomotives if necessary.

It is impossible to give here an estimate of the proportion of freight to total gross earnings which might be expected of a new road, for that is governed purely by local conditions, some of which I shall enumerate: 1. The population served outside of the main terminal and its dependence upon that terminal as a trading center. 2. The proximity of other trading centers to the population served outside of the main terminal, and the railway facilities tending to attract business away from the main terminal. 3. Steam trunk line connections leading to the main arteries of commerce and the ability of interurban roads to establish joint rates with them.

The Inter-Urban Railway of Des Moines and the Iowa & Illinois Railway of Clinton, respectively, provide examples of the first and second conditions. Des Moines, being located at a great distance from a city of superior class, is the normal trading center for the towns reached by the Inter-Urban Railway; consequently the current of freight traffic to the smaller towns is principally from Des Moines.

In the case of the Iowa & Illinois, however, although the tri-cities—Davenport, Rock Island and Moline—would seem to be the normal trading centers for Clinton, owing to the difference in population, yet Clinton is only 138 miles from Chicago, and as a consequence divides its business. The trading of Clinton with the tri-cities is constantly increasing, but it will continue to be divided to a greater or less degree, depending largely on the business-getting methods of the tri-city merchants, jobbers, etc. The examples just illustrated bear more particularly on the package, or less than carload, traffic.

A full exposition of the third condition cannot be given without consuming too much time. In general, however, an interurban road with proper freight handling and terminal facilities, which offers quick and efficient service, together with joint rates with some trunk line, in competition with other trunk lines operating between competitive points, may reasonably expect a fair division, or a greater portion, of the freight traffic. Shippers desire the best service with lowest rates, but, assuming rates to be even, shippers are generally favorable to the roads which provide good passenger accommodations; consequently the interurban roads reap the reward of frequent passenger service.

The proportion of freight to total gross earnings varies in this state from 5 per cent to an amount in excess of passenger earnings, depending upon the foregoing conditions. Interurban freight traffic may be properly divided into the following classes:

1. Strictly light packages, transported only in baggage rooms of passenger coaches, at express rates or at a fixed charge per package or per hundred pounds, regardless of class, and generally termed express business.
2. Less than carload freight transported on fast baggage cars at regular freight or special tariffs under regular or special classifications, generally the former.
3. A combination of class 2 and the haulage of a few local carload shipments daily at regular tariffs and classification.
4. Regular carload traffic hauled by steam or heavy electric freight locomotives at regular tariffs and classification. Or any combination of the above-mentioned classes.

A freight business of class 1 may be conducted at small expense and is of material assistance in the earnings of a road. The freight carried consists generally of packages that are easily transported in the baggage compartments of passenger cars, which are usually empty except for a very few trips per day. Usually no extra office force is required the only expense being for stationery, books and possibly a small storage space at the main terminal. In some cases, when the charges are a certain rate per package, regardless of weight within reasonable limitations, a proper system of tickets dispenses with waybills, expense bills, etc.

Inasmuch as the majority of freight-handling interurban roads of the middle west come under the head of class 2, and that part of the paper will probably be of interest to the greater number of electric railway managers, I shall enter into greater detail in handling the subject. Interurban roads which conduct their freight business under the head of class 2 more nearly approach operating conditions parallel

*Read before the Iowa Street and Interurban Railway Association, Clinton, Ia., April 19, 1907.

to the time freight business of steam railways. The ability of the interurban roads to make fast time and to deliver at highways, farm crossings and warehouse or store doors is an inducement to either the shipper or the receiver, which assists in obtaining the business. Being usually restricted, however, to a narrow car similar in appearance to a passenger car, due to operating over city streets, an interurban road has limitations on its freight-earning capacity.

The profits of such a business depend largely upon the opportunity of the management to secure combined freight and passenger depots at the termini and in the larger local towns, so that extra labor in billing and handling at stations may be avoided, upon the charges of terminal city railways for the right to haul freight over their tracks, and upon the hour of day when freight may be delivered to receivers.

Generally speaking, the margin of profit in this class is close and only careful management will produce a profit, particularly during the first few months after the business is started. Expenses must be carefully watched and attractive freight houses and convenient handling facilities at terminals sacrificed for something which costs less to maintain.

Damage claims must be very carefully handled, and to that end it is advisable to adopt some system of billing and accounting which permits a shipment to be easily traced from its origin to the final destination. Some interurban roads have adopted simple billing systems, requiring only one writing to make the receipt, waybill, expense bill and office copy. Such a system, however, does not permit of proper checking, particularly if merchandise is transported over more than one road.

After an interurban road enters class 2, a good local commercial agent is a necessity. The business, consisting of a great number of small shipments, requires constant development and care, particularly if competition exists. A live commercial agent, who is a good street man, and not a desk man, earns his salary many times over, particularly if he understands how to deal with shippers. The business obtained depends considerably on the personality of the commercial agent.

A few interurban roads make team deliveries, either adding to the tariff to cover the expense of optional deliveries, or maintaining an express tariff covering team delivery. In all cases that I have personally investigated I discovered that the cost of operating teams consumed a large portion of the profits derived from the car service. As an illustration, the rates of one 50-mile interurban road were based on express tariffs and its freight earnings amounted to nearly \$13,000 per year, but its net earnings were only \$2,600. I believe the advantages of frequent service compensate for any advantage gained by making team deliveries.

I fear that many managers, in charging expenses to the freight business, do not give proper consideration to such items as additional clerks, printing and stationery, insurance on goods in freight houses, a proper percentage of the receipts to cover loss and damage, power for freight cars, proportion of track and line maintenance, telephone service, interest on the freight-handling investment, etc. Neglect of these items deceives the manager as well as his stockholders, and unless receipts grow beyond the safe point the awakening will be painful and embarrassing.

An average interurban road operating 30 to 50 miles of track, serving a total population of 130,000 to 200,000, should not enter the freight field unless its receipts from freight will exceed \$10,000 a year, beginning with the second year. If the receipts are below that figure, the margin of profit will be too small for consideration or the expenses will exceed the receipts.

Perhaps a brief description of the freight business conducted by the Iowa & Illinois may be of interest as illustrating the point brought out in the foregoing. We went into the freight business in a very tentative manner. In fact, it took considerable time for us to decide whether or not there was sufficient business in less than carload lots to warrant the purchase of a freight car and the expense of operating a freight business.

The next grave question was that of rates, and, after considering for some time a reduction of the rate below that permitted by the Iowa state laws for class "A" roads, we finally concluded to adopt the maximum tariff and to consider the business as freight and not express.

At first our old passenger depot in Davenport served also as a freight depot, but within a very few months we outgrew the capacity of the space allowed to freight and were forced to take our passenger business to a new location. In Clinton we still have sufficient space to handle the business, but within a very few months we will be compelled to seek additional storage room.

Immediately upon starting the business we engaged a commercial agent, and the quick growth of the receipts to the point where we were paying expenses showed our wisdom. Within one year, with one freight car engaged in the business and the use of passenger coaches to carry some freight, the business grew to a gross figure exceeding \$10,000 a year. During the summer and fall of 1906 we were compelled to operate our freight car two round trips per day for nearly 75 per cent of the time, and after the contract with the American Express Company was put into effect we purchased and placed in service a trailer freight car with the same capacity as the motor. The improved facilities which we have been able to offer shippers since purchasing the second car have increased the business at a very rapid rate, and we are now considering the purchase of a third car.

We make a specialty, on less than carload business, of beating the time of the steam railroads 24 hours between Davenport and points on the Chicago & Northwestern Railway in the western part of the state. For this reason we obtain considerable business which is transferred to that road.

The schedule of our freight cars is as follows: The trailer express car, attached to one of the passenger motors, leaves Clinton at 5:15 a. m., arriving in Davenport about 6:30 a. m. This trip accommodates the southbound American Express and such freight business as is offered for early delivery. The motor express car leaves Clinton at 8:45 a. m., doing all of the local work and arriving in Davenport about 11 o'clock. Returning in the afternoon the trailer car leaves Davenport at 3 p. m., attached to a regular passenger motor, and carries nothing but goods for transfer to the Chicago & Northwestern, local goods to Clinton, and American Express, no intermediate local freight being accepted for this trip. The motor car leaves Davenport about 3:45 p. m., carrying local freight and such Clinton local freight as cannot be handled by the trailer car. Besides this, rush shipments in small quantities, milk, cream, butter, eggs, etc., from certain stations are handled in the baggage rooms of the passenger coaches. Our passenger schedule, however, is extremely close and permits of very little freight handling. The northbound American Express is handled on three successive passenger cars, leaving Davenport at 6, 7 and 8 p. m., respectively. We anticipate having in a very short time a third car to handle the northbound American Express and such freight as is offered to us after 3:45 p. m. This car will leave Davenport at 7 p. m. We find that a trailer freight car is much cheaper to operate than a motor, but of course it can handle only through business. It does not seriously delay the passenger motor to which it is attached.

When the freight business was started we adopted what we considered to be a very simple set of forms for billing and accounting, but we soon ascertained that the tracing of damaged and stray shipments was very difficult, and after carefully looking over the field we finally adopted the forms that are used by the Chicago & Northwestern Railway. These forms appeared at first to be very complicated, but a short acquaintance with them indicated their simplicity and the ease of tracing damaged and stray shipments.

We make a specialty of rush orders by telephone via our private line. Often a merchant in Clinton who finds himself short of some particular article telephones to our Clinton office, and, through our Davenport office and our private line, we transmit the fact to the shipper in Davenport. Shipments so ordered are frequently in Clinton within two hours from the time we were called up at the Clinton office.

Wherever possible we deliver from the cars to the store doors, which saves drayage and naturally brings business to us. A number of small platforms at which we stop our local express cars have been built by the shippers between towns.

We constantly endeavor to please our shippers and to show a spirit of co-operation, which has a great influence on the growth of our business. We endeavor to be conservative in charging off expenses against the freight business and work into it anything which rightfully belongs to it. We go so far as to charge off monthly 3 per cent of the gross freight receipts. This is piling up a tidy fund, but we propose to allow the account to grow, for at any time we may have to meet heavy freight damages due to fire, water or wreckage.

At the present time the gross earnings from this business amount to practically 15 per cent of the total gross earnings, and we hope to see it reach 20 on the same basis, i. e., while our freight business comes under the head of class 2.

Referring again to the main subject in hand, very little can be said about interurban roads coming under classes 3 and 4. Their business is merely a further development from class 1. The earnings from freight then become a large per-

centage of the total, and in class 4 may equal or exceed the passenger earnings.

Joint tariffs are desirable either with steam trunk lines or a system of interurban roads, particularly the former, in order that the carload business may prove profitable. Owing to the antagonistic attitude of the steam railways, however, joint tariffs are difficult to establish, except where competitive conditions are such as will induce one of the steam roads to join with the interurban road. Let us hope that before long, under rulings of the national and state railway commissions, interurban roads, irrespective of the fact that electricity is used as motive power, will be given the same rights to establish joint rates with the steam railways as are enjoyed among the steam railways.

Interurban roads coming generally under classes 3 and 4 must of necessity have steam railway terminals and yards, and the experience of our steam friends should teach us how far we can go in the development of such yards and terminals. It is a very easy matter to become seriously overloaded with yard and terminal maintenance and fixed charges, which are not warranted by the traffic handled. Such matters should therefore be very carefully watched.

Another point which has been discussed by interurban roads for several years is as to the best and cheapest motive power, steam or electricity, for hauling heavy trains. It is my opinion that unless a road is equipped for very heavy traffic in its power house, substations, overhead wiring, etc., the operation of heavy trains by electricity involves too great an investment and that it is, therefore, much cheaper to operate by steam locomotives. Taking, as an example, the ordinary interurban road of 30 to 50 miles in length, its power generating equipment, substations and overhead lines, particularly the latter two, have not sufficient capacity to successfully operate heavy locomotives. Consideration of the investment necessary for the increased capacity against the higher operating expense of a steam locomotive as compared with an electric locomotive will favor steam operation.

The development of the freight business upon electric railways in Iowa has been very healthful for the past few years and promises to continue its growth in reasonably high percentages from year to year. We have all gained considerable experience in this part of our business and, looking into the future, can readily see the benefits which our properties will derive. The development of the freight business also has been particularly strong in the states of Ohio, Indiana, Michigan, Wisconsin, Illinois and Missouri, that is, in that section of the country generally termed the "middle west."

As an example of the growth of freight business on interurban roads in Iowa, I will enumerate the present and guaranteed prospective roads which will make freight haulage a feature of their business:

The Inter-Urban Railway, operating from Des Moines to Colfax on one division, and to Perry and Woodward on a recently constructed second division, is an excellent example of the development and growth of freight traffic on interurban roads. It conducts both a fast less than carload and a carload business upon Iowa distance tariff and classification. An operating and joint rate agreement with some of the steam trunk lines is of assistance to the road and to the territory served by it. Both electric and steam locomotives are employed as motive power.

The Waterloo Cedar Falls & Northern, one of the first roads in Iowa to enter the freight field, conducts practically the same class of business and under like conditions relating to joint rates and motive power as the Inter-Urban Railway.

The Mason City & Clear Lake Railway conducts considerable carload business between Mason City and the Chicago & Northwestern at Clear Lake, operating under an agreement with the latter road. All freight is hauled by electricity. Its carload business is of considerable magnitude on that account.

The roads above mentioned may be included under classes 3 and 4. Beginning on a comparatively small scale, the growth of traffic has been steady and substantial until their receipts from freight haulage now constitute a large proportion of the total gross earnings.

The Cedar Rapids & Iowa City Railway & Light Company commenced operating in 1904 and immediately entered the freight field, conducting both a less than carload business in a baggage car and hauling carload business by an electric locomotive.

The Iowa & Illinois Railway commenced operating in 1904, carrying at first packages on passenger coaches and starting a baggage car in 1905. A very small local carload business is conducted, an electric locomotive or the baggage car being used as motive power.

Neither of the two roads last mentioned has joint tariff agreements with any of the trunk lines, but the Iowa & Illinois Railway does considerable less than carload business.

The Cedar Rapids & Marion City Railway, the Tama & Toledo Electric Railway and the Oskaloosa Traction & Light Company conduct a local business partly in baggage rooms of passenger coaches and partly in baggage cars. These roads are examples of classes 1 and 2.

The Ft. Dodge Des Moines & Southern Electric Railway, now under construction, connecting Ft. Dodge, Boone, Ames and several smaller towns with Des Moines, will be the greatest example within this state of combined electric and steam operation and the development of this road will undoubtedly be watched with great interest by the electric railway men. This road is really a combination, physically at least, with the present Newton & Northwestern steam line, inasmuch as approximately 40 miles of the latter road will be electrified to complete the connections between the branches touching the towns above mentioned. It is proposed to operate electric passenger and fast freight service combined, with steam locomotives for heavy freight service. The combined mileage of the roads involved will be nearly 160 miles.

Backed by our experience in the past and the present, I believe we can feel assured that any average interurban road, the investment in which is warranted by the prospective passenger business, has a successful freight business practically assured, which within a very few years will become an important factor in its earnings.

STEAM MOTOR: ITS VALUE IN INTERURBAN SERVICE.*

BY W. G. WAGENHALS, OF THE KOBUSCH-WAGENHALS STEAM MOTOR CAR COMPANY, ST. LOUIS, MO.

While considerable advancement has been made in steam motor cars by English, Austrian and French inventors, the field has practically been neglected in this country. The only real effort to develop a steam motor car of any size was made in 1898 by the Baldwin Locomotive Works, which built a car on the order of the Cincinnati Hamilton & Dayton Railway Company for use between the cities of Middletown and Hamilton, O., which was to be run in competition with the interurban electric line of which I was general manager. I paid very little attention to the details of this machine, but after repeated trials, it was placed out of commission, and the Baldwin people made no effort to revive the steam motor car business. Since that time I know of no effort to design a steam motor car for railroad service.

About three years ago I built a steam railroad, 24 miles in length, from Ripley to Sardinia, O., and, finding that the passenger receipts did not justify the operation of a train service, I endeavored to find some form of a self-propelled car which would reduce the expense of operation, as our franchise obligated us to run three trains each way per day. I took the matter up with Mr. Kobusch, president of the St. Louis Car Company, and he advised me that there was nothing in the market which would fill these conditions. At that time I had under contract the 24 miles of steam road and 50 miles of electric road and, after talking the matter over with Mr. Kobusch, we formed a partnership for the construction of a motor car for this service. I agreeing to give up the construction business, and to devote my entire time to the perfection of a motor car along the lines which I presented to him at that time. After nine months of work in this direction, we have produced the largest self-propelled motor car which has ever been built.

This car has a total length of 82½ feet with a seating capacity of 64 people; the weight on the driving wheels is 115,600 pounds, with 62,960 pounds on rear trucks, or a total weight of 178,560 pounds. This car has a greater tractional weight than the largest 6-wheel locomotive. This car under repeated tests has handled 22 loaded freight cars on level track at a speed of 5 miles per hour, which gives its maximum pulling capacity. It has developed a speed of 45 miles per hour on 0.5 to 1 per cent grades, at which speed it would easily be able to handle one or two trailers. The car has a water carrying capacity of 2,000 gallons, sufficient for a 45-mile run, and an oil tank capacity of 1,000 gallons, sufficient for a 500-mile run.

This car has been operated over the Chicago Burlington & Quincy Railroad out of St. Louis in the presence of mechanical men and general superintendents of the largest steam railroads in the country, and no criticism has been offered by them as to its design or performance. No alterations have been made in the original design of the car, as every detail of the operating mechanism has worked out as originally designed.

The engine is built entirely of steel castings, with the

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exception of cylinders and valve chambers, which are of cast iron. The frames of the engine are so designed that they form at the same time an oil tight case for the cranks and cross head; the forward end of the case is extended to form an axle bearing to hold the engines in line with the driven or truck axle. The arrangement is identical with the present method of mounting motors in an electrically propelled car. All bearings are provided with removable brass shells which make the repairs of the wearing parts practically the same as in an electric motor car.

The success of the car can be attributed to the combination of both steam and electric railroad practice, as far as the general mechanical design is concerned, the duplex steam engine displacing the motor, and the power house (or boiler) being carried in the car itself, avoiding the transmission of electrical energy over a trolley line, as is the practice today.

The engine on the forward truck is connected to the body of the car through a flexible steam connection, consisting of two ball and one expansion joints, which have been demonstrated to be perfectly tight under 300 pounds pressure. The boiler is of a marine water tube type, tested to 500 pounds cold water pressure with an allowed running pressure of 250 pounds per square inch. This type of boiler is in service on a number of United States government torpedo planting boats, and after five years of continued service has shown that a minimum of repairs is required; and, owing to the rapidity of the circulation, very little scale is formed.

The boiler has demonstrated its rapid steaming qualities, and has a greater number of square feet of heating surface for its size than any other boiler in the market today.

In a space of 3 feet square and 8 feet high, we have over 1,215 square feet of heating surface with a total grate area of 43½ square feet. This compares favorably with the largest 6-wheel locomotive of today.

Steam is generated by crude oil, atomized through a steam jet burner of special design, which sprays or atomizes the oil in the fire box and, although we have five of these burners, it has never been necessary to use more than two of them with the car exerting the maximum effort in speed or pulling capacity.

In one of the tests over the Burlington railroad, on a 1½ per cent grade, 8 miles long, at a speed of 35 miles per hour, the car started the grade with 180 pounds pressure and mounted the top with 250 pounds, with the engine running at ¼ cut off. This performance, in the presence of a number of Burlington officials, was declared by them superior to any performance of their locomotives.

The engines used on this car are specially designed, with cylinders 11 by 12 inch stroke. The valves are of the piston type, and were furnished by the American Balance Valve Company, which has recently furnished to the Pennsylvania Railroad over 1,200 pairs of valves of the same type. The valves have shown perfectly tight under pressure of 300 pounds per square inch and, owing to their design, there is very little friction, and they can be moved by hand under this pressure.

The valve gear is a standard type of Stephenson link, as is used in the ordinary locomotive. All bearings are amply large to withstand the different strains, and as noted heretofore, the engines are so designed that they are self-lubricating, the frames forming the crank case. The cylinders, while small in comparison with locomotive practice under the pressure used, develop 275 horsepower at the rail.

The connection between the car body and truck for the control of the link is made through an arc of a circle with an arrangement similar to that used with the brake system for an ordinary double-truck interurban car. This allows of curvature of the truck without affecting the position of the links or the throw of the valves.

The exhaust of the engine passes through the center plate, through a metallic packed joint, which also allows for curvature, the exhaust ending in the stack of the boiler. The car is heated by both exhaust and live steam.

Now, as to its practicability and uses: The car was originally designed to displace train service on branch lines of steam railroads where the ordinary train service would not pay. With a locomotive and one or two cars, four or five men are necessary for the operation of the train—an engineer, fireman, brakeman, conductor and flagman—without taking into account hostlers and repair men at the terminals. This type of car is operated by two men, an engineer and conductor. The same service can be obtained with the engineer doing his own repair work and also supplying the car with fuel oil, when necessary, as the only labor involved is the connection of a hose from the storage tank to the tank under the car, and the opening of a valve. Compare this with the unloading of coal from a car in the holsting bucket,

the operation of a crane, and the removal of cinders necessary where coal is used for fuel. We claim a saving in labor which will pay the interest on the investment.

I do not claim that the car can be operated in competition with electric power where the service is hourly or less, in which case operation by electricity is superior to any other power, but for interurban service, where a service of one or two hours is all that is necessary, the steam car can be operated for less money than the power house. Take as examples, short lines from 10 to 20 miles, extending from county seats to small distant towns which have no railroad connections. This car opens a field where it can have no competition. The expense of construction lies only in the road bed and the equipment of one or more cars.

All freight and express matters can be handled with the same equipment, as the car is able to pull several trailers at its maximum speed. Repeated tests have shown a consumption of oil of about 2 gallons per mile run. Figuring oil at 3 cents per gallon gives running expenses per mile which compare very favorably with the gasoline type of motor car or steam generated with coal.

MODERN TRAIN DISPATCHING METHODS ON ELECTRIC RAILWAYS.*

BY H. H. POLK, PRESIDENT AND GENERAL MANAGER INTERURBAN RAILWAY COMPANY, DES MOINES, IA.

Until recently the managers of electric railways have given but very little attention to that most important part of train operation, the dispatching of trains. However, they have at last come to realize that it is just as important to safely dispatch electric trains as steam trains. Both should be dispatched in much the same manner. Even today the dispatching systems on most electric railways are crude, go-as-you-please propositions.

There are three important factors in train operation to be taken into consideration:

1. First and above all others is safety both to passengers and property. This must be obtained regardless of cost.
2. The speedy operation of trains over the road, giving all possible dispatch commensurate with safety.
3. The economical operation of trains, keeping them on the "go" all of the time and not lying "dead" on some side track waiting to be passed by something.

In order to obtain these very important results it is absolutely necessary that trains be operated on train orders issued from a central office, directing train movements in addition to the movements provided for in the rules and timetables. If the printed timetables showing the meeting places and time of all regular trains, and the rules directing how these trains are to proceed with relation to each other, are studied by all trainmen, thoroughly understood by all alike, and faithfully carried out, collisions will be prevented. If, however, it becomes necessary to issue special orders for trains not on the timecard, then the train order is absolutely necessary. These orders must be clearly expressed and the form, and even the paper on which they are written, must be such that they may be easily and quickly understood by all those whose duty it is to read them. Conductors and motormen must know that the orders are given by competent authority and that all concerned have corresponding orders. Only one dispatcher must issue orders on a division at a time. "This is one of the few cases where one head is better than two." For two dispatchers to issue train orders on the same division involves very serious risks, and also contributes largely to the lack of confidence on the part of all trainmen. Never let two men dispatch a train.

When a timecard is issued a receipt should be taken therefor from all persons concerned, thereby making certain that it has been received. In issuing train orders it is more difficult to be assured that they have been received and understood by all concerned. After the order has been prepared by the dispatcher it is then transmitted to the desired persons either by the telegraph or telephone.

The telephone is used almost universally by interurban roads for train dispatching, while the telegraph is used by steam railways; however, in my opinion the telephone is far superior for transmitting train orders on interurban lines. All stations and sidings can be equipped with telephones, where a train crew may communicate with the train dispatcher at any time, thus avoiding serious delays.

The system now in use on the line I represent follows the standard dispatching systems of steam railroads, some modifications being necessary to adapt it to our use. All

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trains leaving the central waiting station of the Des Moines City Railway Company are under its jurisdiction while running on its tracks, and receive their first order from the Inter-Urban Railway Company dispatcher at Beaver Valley Junction on the Beaver Valley division and at Grand View Park on the Colfax division. At these points are located telephones, a pad of standard No. 31 train order blanks, and a locked box in which to deposit a third copy, of which I will say more. One of these booths is also located at each siding on the line.

The conductor of an out-bound train, on arrival at one of these points, steps into the booth and calls up the dispatcher, saying, "Jones train No. 96 at Beaver Valley Junction." The dispatcher reads to him the order which he wishes to issue, the conductor writing it himself verbatim as given and making three copies by the use of carbon sheets, one copy to be given to his motorman, one to be retained by himself and the third to be deposited in the box, to be used in case of any misunderstanding of orders, as a means of placing the blame upon the proper person. After the order is written by the conductor, he reads it back to the dispatcher, who checks it with his copy and, if correct, says "Complete;" the conductor then writes "Complete," together with the time the order is made, and signs his name. He then goes to the motorman's cab, giving him a copy, which the motorman in turn repeats to him. The conductor is then permitted to board his train. He gives two bells and the train starts.

We are very particular to have the conductor deliver the order to his motorman before boarding his train in order to absolutely avoid any start without a thorough understanding on the part of the motorman. With us it is a very serious offense to violate this rule. A few years ago we had a very serious accident because the crew disobeyed this rule. The conductor, after receiving his order, stepped on the rear platform, signaled his motorman to go ahead, and was walking through the car to give the motorman his copy when the collision occurred. The order in this case was a "hold order."

A conductor is required to report at all stations where agents are located, and should his train become delayed between stations, he must call the dispatcher from the nearest telephone booth, thus giving the dispatcher the opportunity to change the order if desirable. Our sidings are about two miles apart, but trains must report at only such sidings as are designated on the timecard, and must never leave those sidings without a clearance or train order.

In-bound trains must report their arrival at Beaver Valley Junction and Grand View Park, and also at the central waiting station in Des Moines.

Our dispatcher issues daily an average of 120 train orders. On the Beaver Valley division we operate 36 passenger trains, two package express cars and two freight trains between 5 a. m. and 12:40 p. m., making a total of 1,303 miles per day. On the Colfax division we run 34 passenger trains, four package express cars, and freight trains when necessary, making 1,065 miles per day.

The telephone line as installed consists of two No. 9 galvanized iron wires carried on cross arms in the usual manner on the same poles and underneath the high-tension transmission lines, and transposed every ten poles to prevent interference from parallel power and feeder line. The dispatcher's switchboard was made by the Stromberg-Carlson Telephone Manufacturing Company. The telephone instruments are of standard make and of the bridging type.

By reason of the almost constant use of the telephone line by the dispatchers, it became impossible to transact any company business without seriously interfering with the safe dispatching of trains. It therefore became necessary either to build a second telephone line or to install what is known as a composite system. We chose to do the latter; it is much the cheaper, involving only the cost of installing telegraph instruments. By this change we have doubled the capacity.

In the installation of the telegraph we had the choice of two general methods, one being what is known as the European or open-circuit method, the other being the American or closed-circuit method. The former of these two systems was adopted upon the advice of Mr. Cunningham, our electrical superintendent, as it has many advantages over the latter, especially for the composite system. The European or open-circuit system is essentially a multiple system, while the American, or closed circuit, is a series system. With the European open circuit no power is used except when the instruments are actually in use. Another advantage is that in case the line should break instruments could be used on each side of the break. As no switches are used on the keys it is impossible for the operator to go away and leave the line open by leaving his key open.

Both sides of the telephone line are used as one side of

the telegraph line. The telegraph instrument is connected between both sides of the telephone line and the ground by means of a suitably balanced super-wound impedance coil, wound and connected in such a manner as to offer impedance to the alternating telephone current and signaling current passing from one side of the line to the other, but offering little impedance to the direct-current telegraph current passing from both sides of the telephone line through the telephone instruments to the ground.

The success of the composite system depends upon both sides of the telephone line having the same resistance, impedance, capacity and inductance. In other words, the telephone line must be perfectly balanced, preventing the double-current intermittent telegraph current impulses from passing from one side of the telephone line to the other through the receivers. In a perfectly balanced line there is no disturbance or interference between the telegraph and telephone instruments.

The use of the telegraph on the telephone line does not necessitate any more care than would be necessary for a satisfactorily operating telephone circuit paralleling high-tension lines. The energy used to operate the telegraph instruments is obtained at each station direct from the 600-volt, double-current feeder by shunting one 16-candlepower lamp in a series of five.

A composite system not only doubles the amount of business that can be handled over a single line, but is much more reliable and convenient than either a telephone or telegraph line alone. The telephone and telegraph are not affected by the same cause; that which would knock out or disable one might not affect the other.

IOWA ELECTRICAL ASSOCIATION.

The seventh annual meeting of the Iowa Electrical Association was held at Clinton, Ia., on April 18 and 19, the headquarters being at the Lafayette Inn. On the first day the papers presented were as follows:

"Cost of Operation per Dollar of Income," by Prof. L. B. Spinney, Iowa State College. This paper was based on somewhat incomplete returns from the electric lighting plants of Iowa and brought out the fact that there is great need of adopting a uniform system of accounting. In discussing this paper L. D. Mathes (Dubuque) urged the importance of sound accounting methods, and especially the recognition of and provision for depreciation; he believed that it would be only a short time until electric lighting companies would be subject to regulation by state commissions, and pointed out the importance of having complete and accurate accounts when opposing requests for reductions of rates.

"Central Station Economies," by Gus Lundgren, Cherokee, Ia. This paper dealt with practical points of the business and emphasized the need of weighing and measuring devices in the station in order that the management might have accurate knowledge of what the plant is really doing.

"Increasing the Central Station Day Load," by E. S. Callahan, General Electric Company. The paper considered various applications of electricity for domestic and especially kitchen use.

"Manufacture of Ice," by Rufus Lee, Clarinda, Ia.

"Co-operation," by J. R. Crouse, Cleveland, O. Mr. Crouse was unable to attend the meeting and sent copies of a paper on "Profitable Commercial Co-operation," read before the National Electric Light Association, together with a letter inviting the Iowa association to appoint a committee of two to act with the Co-operative Electrical Development Association, which is intended to secure the co-operation of all electrical interests in a campaign of education to encourage greater use of electricity.

The programme for Friday's meeting included the following papers:

"Central Station Advertising," by Curtis Advertising Company.

"Central Station Lighting—Steam and Hot Water," by W. H. Schott, Chicago.

"Selection of Steam Engines," by H. E. Chase, Des Moines, Ia.

"Producer Gas Engines," by Prof. G. W. Bissell, Iowa State College, Ames, Ia.

"Electric Distribution Systems," by Prof. A. H. Ford, Iowa State University, Iowa City, Ia.

ELECTRIC FREIGHT HANDLING AT NEW BEDFORD.

About three and a half years ago an electric express service was inaugurated with New Bedford, Mass., as a center by the interests controlling the Union Street Railway Company of New Bedford. The business then begun in a small way has now been extended to through service between New Bedford and Providence, R. I., a distance of 34 miles, and between New Bedford and Monument Beach, Mass., 26.75 miles. In New Bedford the cars are operated on the tracks of the Union Street Railway Company; while the Dartmouth & Westport Street Railway and the Providence & Fall River Street Railway companies handle the service between New Bedford and Providence. In the streets of the latter city the traffic is under the auspices of the Rhode Island Company. Eastward from New Bedford the Union Street Railway Company operates the cars as far as the Fairhaven and Mattapoisett line; the New Bedford & Onset continues the service to Onset, and the Taunton & Buzzards Bay completes the run to Monument Beach.

We present herewith a view of the original freight station in New Bedford, which was established in the basement of an old house. A spur track of the local system served one side of a platform, which extended at right angles around a corner of the building. Express wagons and trucks received and delivered freight at the further end of the platform from the spur track. The capacity of the terminal was limited, and the company secured half the basement of an old cracker factory at the corner of William and Bethel streets, and equipped it for a general express business. This terminal is located within three minutes' walk of the most crowded part of the business district in New Bedford and is thus easily accessible from all the important stores, hotels and mercantile houses.

The present freight terminal in New Bedford receives express matter and freight at five doors on the west side of the building from trucks and wagons. From the wagons it is trucked across a platform in the interior of the building to the express cars which stand on a spur track in the middle of the station. The track has a capacity of two cars, and it is surrounded on both sides by the platform, so that both sides of the cars can be loaded or unloaded at once. An

department of the Dartmouth & Westport Street Railway, under the management of Mr. Edward F. Nicholson. E. E. Potter, general superintendent of all the electric lines centering in New Bedford, has oversight of the freight business in addition to his other duties, but the operating details are handled by Mr. Nicholson, who gives his whole time to the express traffic. The classification of express matter and freight is based largely upon the standard classification of



Electric Freight Handling at New Bedford, Mass.—Original Freight Station in New Bedford.

steam railroad freight as used by the Pennsylvania and other companies, although in cases where the merchandise cannot be handled profitably at the regular steam rates or thereabouts, a special charge is made for the prompt service of the trolley express. In general the company handles all merchandise which can be brought to its terminal by wagon, and the variety of articles transported is very great, ranging from prescriptions to furniture and beef. Explosives are not handled by the company.

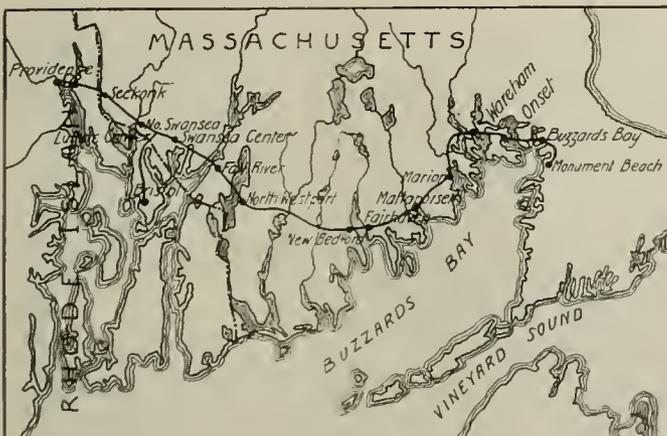
Daily service is maintained as follows in the freight department: Cars leave the Rhode Island Company's freight station in Providence for Fall River at 10 a. m., 3 p. m. and 5 p. m., and for New Bedford at 12 noon and 5 p. m. Cars leave Fall River for Providence at 8:30 a. m. and 12:30, 3 and 5:30 p. m., and for New Bedford at 8:30 and 10:15 a. m., 1:15, 3 and 4:45 p. m. Cars leave New Bedford for Providence at 6:10 a. m. and 1 p. m., and for Fall River at 8 and 10:15 a. m., and 3:15 p. m. In Providence connections are made for all points reached by the freight service of the Rhode Island Company. Cars leave New Bedford for Onset at 8:30 a. m. and 2:30 p. m. In the summer season afternoon trips are made to Buzzards Bay, Bourne and Monument Beach. Between New Bedford and Fall River the line is double-tracked.

Table I gives the rates charged on the different classes of merchandise handled by the service between New Bedford and Providence.

Table I.—Rates in Cents per Hundred Pounds.

	Class					Miles.
	1.	2.	3.	4.	5.	
New Bedford to—	1.	2.	3.	4.	5.	
Smith Mills	8	7	6	6	6	3.5
Westport Factory	8	7	7	6	6	6.5
Beulah	9	8	8	7	6	
North Westport	10	9	8	7	6	
Fall River	10	9	8	7	6	15
Swansea Center	14	12	11	10	9	
Barneyville	16	14	12	10	9	
Seekonk	17	14	13	10	9	
Providence	17	14	13	10	9	34

The running time to Fall River is about 1 hour and the running time from Fall River to Providence 1½ hours. A considerable portion of the traffic between Fall River and New Bedford consists of cloth shipments from the cotton mills. Beef is handled over this route without the necessity of icing it in transit.



Electric Freight Handling at New Bedford, Mass.—Map Showing Through Routes of Electric Freight Service Centering in New Bedford.

office for the use of the manager and clerks of the freight department is located on the side of the building nearest the street corners, as shown in one of the engravings, as an extension of the receiving shed. The outside of the shed is effectively lighted by three groups of five 16-candlepower incandescent lamps, each group being mounted in an old wooden tub, which is painted white inside and serves as a reflector.

The freight handling business is conducted by a separate

Table II gives the rates in force between New Bedford and Monument Beach local points.

Table II.—Rates in Cents per Hundred Pounds.

	Class					Miles.
	1.	2.	3.	4.	5.	
New Bedford to—	1.	2.	3.	4.	5.	
Fairhaven	5	5	5	5	5	1.5
Mattapoissett	7	7	6	5	5	6.75
Marion	8	8	7	6	5	12
Wareham	11	10	9	8	7	17.5
East Wareham	13	11	10	9	8	
Onset	14	12	11	10	9	20.5
Bourne	16	13	12	10	9	24
Buzzard's Bay	15	13	12	10	9	25
Monument Beach	17	14	13	11	10	26.75

The running time to Wareham is 1 3/4 hours and to Onset

bill number, leaving time, shipper, consignee and destination, description of articles and charges. At the office of the freight department in New Bedford receipts, cash, bills and reports are kept with the usual ledger accounts.

Six cars are available for express service, four being in use constantly. One of the illustrations is an exterior view of one of the through cars running to Fall River and Providence. All the cars are double trucked, with four-motor equipments, and they are geared for a maximum speed of about 20 miles per hour. The car bodies are 30 feet long, and vestibules are provided at each end. Fenders, wheel guards, air



Electric Freight Handling at New Bedford, Mass.—Electric Freight Station, William and Bethel Streets.



Electric Freight Handling at New Bedford, Mass.—Express Car.

2 1/4 hours. In the summer season the population of the Buzzards and Narragansett Bay territories is very much enlarged, and the electric express service has proved to be a great convenience. Even in the winter season persons living in the districts served can telephone orders to New Bedford in the morning and receive their goods the same afternoon by 3:30 or 4:30. A sketch map of the lines traversed by the through express cars is shown. Warehouses for the temporary storage of goods are located at Westport, Fall River, Mattapoissett, Marion, Wareham, Onset and Bourne. Agents of the company

brakes and double trolleys are installed. The motors are mainly General Electric 67 or Westinghouse 51, and the freight capacity of each car is from 12 to 14 tons. The crew consists of a motorman and a conductor, who handle the freight together with the assistance of local agents when it is necessary. The use of four motors greatly increases the reliability of the service and enables the cars to make a good schedule speed. Although the maximum speed is not as high as that of the passenger cars, the absence of as frequent stops and the greater ability of the express cars to coast enables the



Electric Freight Handling at New Bedford, Mass.—Offices of the Union Street Railway, New Bedford.



Electric Freight Handling at New Bedford, Mass.—Interior of Waiting Room, Union Street Railway, New Bedford.

are located at all the important centers and at Marion the agent gives practically his whole time to the electric freight business. Orders are handed to agents by the public in special heavy manila envelopes, 3 1/2 by 6 inches. Accounts of freight received and shipped, cash and charges are kept in much the same general way as on a steam road. Each car carries a waybill of its contents showing the car number, way-

freight traffic to be handled at speeds which keep the equipment well out of the way of the passenger cars. The company handles mail regularly between Fall River and New Bedford in a special mail car, which has greatly facilitated the arrival of postal matter, especially in the first morning delivery.

The general offices of the Union Street Railway Company are located in an attractive building at the corner of Purchase

and William streets, New Bedford. The waiting room is about 50 feet long by 18 feet wide, and it is provided with comfortable seats throughout the length of one side and in the large bay window which faces the intersecting streets. At one side of the room is a large soda fountain, which is operated under a concession. The waiting room is admirably lighted by 10 inclosed arc lamps, and it is provided with standard time service, a telephone pay station, cigar and souvenir postcard stand, photographs of scenery along the company's lines, United States mail service, and steam radiators mounted high enough on the walls to be well out of the reach of patrons. The room is finished in light oak with an ornamental tile flooring, and the company maintains an office at one end where tickets are sold, timetables given out and parcels checked. The general superintendent's office is also readily accessible on the street floor, and the other general offices are located at the head of a flight of stairs leading to the second story. The modern design of the waiting room is a pleasing contrast to the trolley stations found in many cities, in which the conditions are far from attractive. Passengers who desire to wait out of doors for their cars are protected from the weather by a large glass awning in the front of the bay. The company's private branch exchange is located at this station, which is the operating center of the system.

All the express cars as well as the passenger cars are maintained at the principal shops of the company, which are located about a mile and a half from the center of the city. In the shops the practice in hoisting facilities and motor driving is of particular interest. All the tools in the machine department are driven by a single motor on the group plan, the motor being a shunt machine of modern design. The company turns down its worn-out axles into armature shafts, makes its own journal bearings, armature and field coils. A new mail car is now being built in the carpenter shop, which is fitted up with electrically driven tools. Special care has been taken to protect the workmen by inclosing any low-running belts in wooden housings. Worn-out pinions having 22 teeth are milled down to 17-tooth pinions, the holes, stock and key ways remaining unchanged. The equipment includes a large wheel press, a boring mill and a wheel grinder for the removal of flat spots as well as lathes, shapers, coil winders, drying oven and a number of traveling air hoists. The tracks in the paint shop are provided with a crossover to facilitate the movement of cars in and out, and heavy fire doors are installed between all departments. A valuable feature of the electric express cars is a special box in the vestibule which has a hinged cover held in place horizontally by chains when the box is unlocked. This serves as a desk for the conductor, who would otherwise be somewhat at a loss to handle his papers.

A special contrivance in use in the paint shop is an

arrangement for securing light at any point where it is needed in concentrated form. Two 5-lamp circuits of incandescent lamps are mounted at the bottom of a rod about 15 feet long, which can be hung by two hooks across the trolley wire and across a special overhead ground wire, run through the paint shop. The two circuits are controlled by a special snap switch on the pole, and the device can be taken anywhere without the least trouble from dangling wires or the annoyance of disconnecting and connecting circuits.

ELECTRICITY AT JAMESTOWN EXPOSITION.

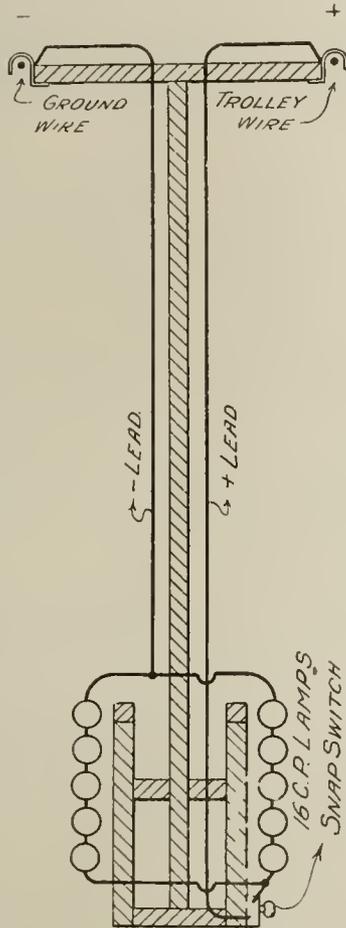
Electric illuminating effects have now become one of the most important attractions at large expositions, and this will be still further exemplified in the illuminating effects which are being planned for the Jamestown exposition. The principal lighting, as in the case of the Pan-American exposition, will be by incandescent lamps, and the illumination for the police will be by constant-current series arc lamps. A feature which will probably attract a great deal of attention will be the illumination furnished by a large number of searchlights on land and searchlights on the large fleet which will be assembled in Hampton Roads. No doubt this will be a great attraction.

All the current necessary for operating the motors which will be distributed throughout the grounds for running exhibits, and current for the lighting, will be furnished by Curtis steam turbines located in the power house of the Norfolk Railway & Light Company, which is about seven miles from the exposition grounds. The current will be transmitted from there by the high tension over a model transmission line from the power house to the transformer station, which will form one of the exhibits in Machinery Hall. This substation will be arranged on the same general plans as the high-class substations found in practice. Here will be located large air-cooled transformers and a number of small type H transformers for the general illumination, and there will also be supplied a number of constant-current transformers for the series arc lighting system. The direct-current service for the grounds will be furnished by motor-generator sets of ample capacity. The switchboard for controlling the various circuits throughout the exposition grounds is located in a gallery and is representative of a modern switchboard in large central stations. The switchboard and electrical equipment of the substation throughout will be furnished by the General Electric Company, which will also supply the lamps.

SALE OF CONTROLLING INTEREST IN THE CHICAGO & SOUTHERN TRACTION COMPANY.

W. S. Reed of Chicago, president of the Chicago & Southern Traction Company, has announced that he has sold a controlling interest in the property to a Detroit syndicate, composed of C. J. Reilly, C. A. Black, Matthew Slush and J. M. Mulkey, and that the company has increased its capital stock from \$2,000,000 to \$5,000,000 and the bonded debt from \$2,000,000 to \$5,000,000.

The company operates the Chicago Electric Traction Company, now in the hands of a receiver, Charles Henrotin, which has a line from Sixty-third street and South Park avenue, Chicago, to Morgan Park, Blue Island, West Harvey and Harvey. The Chicago & Southern also has a line from Harvey south to Kankakee, Ill., which is now in operation as far as Crete. Between Crete and Kankakee the track is laid and the overhead work is completed, and it is expected to begin operation in about six weeks. With the increased capital stock and bonds it is the intention to extend from the present main line to several points outside the southern limits of Chicago and also to extend the line to Lafayette, Ind., connecting there with the Indiana and Ohio systems. Two subsidiary companies were incorporated last year to build these extensions, the Chicago Blue Island & Joliet Traction Company to build to Joliet, Ill., and the Chicago Kankakee Lafayette & Southeastern Railway to build the line to Kankakee.



Electric Freight Handling at New Bedford, Mass.—Flexible Lamp Banks.

DISCUSSION ON "DEPRECIATION" BEFORE THE ACCOUNTANTS' ASSOCIATION.*

The president, W. B. Brockway, announced that the purpose of the concluding session of the American Street and Interurban Railway Accountants' Association at Columbus was to give the accountants of American street railways a better idea of the meaning of "Depreciation." He said the executive committee believed the peculiar opinion held regarding "Depreciation" was that depreciation was right in principle, but the longer its consideration could be postponed the better. This had raised a feeling in the minds of street railway men that they were criminally neglecting the subject, and has also raised a spirit of antagonism in the mind and action of the public because it had assumed the railways to be in very much better condition and making far more money than they really were. The companies seemed to have gone upon the principle that so long as they deferred the question of "Depreciation" just so long could the companies pay 10 per cent in dividends instead of perhaps 5, or 5 per cent instead of nothing at all. The chair then introduced Mr. R. N. Wallis, treasurer Fitchburg & Leominster Street Railway, Fitchburg, Mass., who read the following paper:

Depreciation as Applicable to Electric Railways.

BY R. N. WALLIS.

Accounting recognizes three methods of treating depreciation. The first provides, by an annually increasing fund or account or a periodical charge, an amount to represent the decrease in value which cannot be met by ordinary maintenance. The second assumes that, by including betterment charges as expense, values will be kept in correct proportion. The third ignores the presence or possibility of a deterioration which the ordinary maintenance expense does not cover. Factories and similar undertakings most commonly adopt the first; American railroads the second; while street and electric railways—particularly in America—have been quite prone to follow the third. This is not strange, since the history of accounting shows that in the development period of an industry, when all is new, when the life of apparatus is unknown, when funds are enthusiastically tossed into the property without investigation, little attention is ever given to depreciation. As the industry settles on a firm basis, however, the need for a proper settlement of the problem appears.

Roughly, 15 years of electric railroading have passed, during which time—in this country—there has obtained very little practice of accounting for depreciation as such. Some few roads have established funds or accounts to provide for it. Some are charging betterments against income to a greater or less extent. Some have "charged off for depreciation" through the profit and loss account. Undoubtedly a considerable proportion of the older undertakings have already, consciously or unconsciously, looked to the future in this matter and have so ordered their finances as to be on a safe basis when they come face to face with the problem; many of more recent beginnings will do so as they grow older. Not to have established a fund or a bookkeeping account for depreciation does not necessarily mean that no provision has been made.

Whether or not the industry needs—as manufacturers do—to establish some practice, within reasonably elastic limits, of allowing in its accounting for this ultra wear and tear is a question for debate. Our brethren across the water almost universally consider a fund or account providing for renewals a necessity. This subject was discussed in 1904 at the International Tramways Union, comprising many European companies. The replies to questions indicate that practically all anticipate depreciation by annual payments to a fund (the most common method) or charges to an account. Of 41 companies replying only 2 expressed the slightest doubt of the necessity of providing renewal funds. Of the 39 M. Haselmann found that 22 gave sufficiently complete replies to admit of classification as to their methods of maintaining a fund. Twelve turned annually into a renewal account or fund certain percentages of the cost of installation, varying as follows:

For tracks, etc.....from 1 to 10 per cent
For line constructionfrom 1 to 8 per cent
For rolling stockfrom 1.25 to 10 per cent
For power station equipment.....from 2.5 to 10 per cent

Six companies based the percentage upon the capital invested, varying from 1.5 per cent to 3.5 per cent, while four

companies took as a basis the gross receipts, varying from 5 per cent to 10 per cent. After a careful study of practices, M. Haselmann, quite tentatively, suggested that the following percentages of first cost value be set aside annually as a renewal fund:

Rails, ties, switches, crossings, etc.....	1.9 per cent
Poles (presumably iron)	1.0 per cent
Wires, feeders, etc.	4.0 per cent
Cars	1.7 per cent
Engines, generators, batteries, etc.....	4.0 per cent

After some discussion, during which it appeared that the German association was studying the question of standard percentages, it was decided to await action until another convention and secure the benefit of the studies of that association. Since then the latter body has abandoned the attempt to fix any uniform percentage, holding that dissimilarity of the undertakings precludes any definite action. The English association has reached much the same conclusion.

At the last meeting of the Municipal Tramways Association of Great Britain in 1902 Mr. James Dalrymple, in his report on a standard classification of accounts, suggested depreciation credits to asset accounts, aggregating 18 per cent of the gross expense or 13 per cent of the gross receipts. The details were as follows:

	Per car-mile (in pence).	Percentage of cost value.
Permanent way .....	.....	.....
Electrical equipment of line.....	.30	4
Ground .....	.....	.....
Buildings and fixtures.....	.17	3
Power station and substation plant.....	.35	6
Workshop tools and sundry plant.....	.035	2
Cars .....	.23	8
Electrical equipment of cars.....	.23	8
Miscellaneous equipment .....	.02	5
Office furniture .....	.008	16

The latest schedule from Mr. Dalrymple does not materially differ, although he has added \$2,182 per mile of track for its renewals. Against the amounts so credited to asset accounts all large renewals would be charged.

In the discussion which followed the report the question of depreciation rates was declared out of order and it is impossible to determine the sentiment of the others present. There was some disposition shown, however, to criticize the rates, though there was no dissension from his view of the need of depreciation accounts, discussion on that subject being in order.

The fixing of exact rates must be regarded as impossible. What holds in one climate or in one class of construction, or under one frequency of service, or under one management, or under one policy regarding repairs, does not in another. Each company must settle that problem for itself after careful study of its circumstances.

That the foreign practice is to establish a renewal fund or account does not prove that it is necessary for American companies. This method contemplates the growth of a fund or account large enough to care for any heavy renewals, such renewals to be paid from the fund or charges to the account, the amount received for worn-out materials being credited. The amount or percentage to be set aside annually should, strictly speaking, be large enough to provide for supplanting patented devices on account of new inventions and other such contingencies.

Now if all the track or line or cars are to be replaced at one time, obviously it becomes necessary to provide through a series of years for the payment. If, however, an equal proportion of the renewals is made each year, then depreciation is provided for automatically. Somewhere between these two limits lie the actual facts of our industry. Depreciation of power plant in many roads or other forms of investment concentrated in one or two parcels may well be considered separately, since the ultimate determination of life means wiping out the whole of that part of the investment. Part cannot be replaced each year.

A balance sheet should be a statement of fact. Theoretically it should show the exact state of the investment at the time it is issued. Any method that contributes to this condition may rightfully be adopted; anything which causes misrepresentation should be rejected. The ideal balance sheet puts in figures the actual value, at the time of its casting, of each item it contains. Tracks, line construction, cars installed today and in constant use are not as valuable after a year's wear. Theoretically their actual value at the end of the year should be set down. Hence a reduction should be made either by reducing the amount of the asset accounts, by offsetting on the liabilities side an account or accounts which shall provide for this reduction in value or by payment from the earnings to a fund to keep pace with this depreciation. In the last two cases this account or fund should care for the amount spent for replacing when the old shall have worn out and this replacing should be charged to such account or fund and not to expense.

*Abstract of the proceedings of the executive session of the American Street and Interurban Railway Accountants' Association, Columbus, O., October 18, 1906.

A reserve account has this superiority over a reserve fund in providing for depreciation—that stockholders may consider the fund which exists in cash or securities as an actual profit or asset, whereas it merely represents a loss or something which is gone. As a liability the reserve account represents exactly what it should. Whatever, if any, accounting for deterioration is adopted, the rate should be subject to frequent revision as to its accuracy, the most accurate way being by revaluation of assets.

In fact, however, the method in the electric railway has been more often to charge down such asset accounts as are subject to depreciation according to the profit—if good, a large charge; if little, a small charge; if the profits are none, no charge. This is a haphazard way and yields far from a truthful balance sheet, the accounts representing neither cost, actual value, nor a reasonable depreciation charge. The only way this may be considered fair is to make the charge smaller in one exceptionally hard year to be offset by an extra charge in the next year. If, however, a fair percentage of receipts to “charge off” be determined upon, the method of charging to various asset accounts is questioned, as tending to confuse and misrepresent, inasmuch as it does not show the cost value of the various assets. Putting this to the credit of a general reserve account is considered better. The method suggested by Mr. James Dalrymple of Glasgow may overcome the objection to crediting to asset accounts, namely, to show on the report or statement the amount of the actual capital investment, deducting what has been allowed for depreciation, showing the net in a separate column.

Again, in the railway business there are indications that the surplus account is built up or kept at a high level in many cases through the failure to write off sufficiently from the capital value, or failure to keep the capital value at a proper figure by charging betterments to expense or against net income. This, of course, cannot last without introduction of new capital with resulting fictitious balance sheets. That this tendency is fast decreasing is evidenced by the discussion which the general question is evoking from our managers and accountants.

Experience in other industries suggests that, except small roads, railways may properly charge renewals to expense—with proper allowance for value of the replaced—in such departments as need a steady replacement from year to year (such as tracks, poles, wires, cars); while in departments which require replacement only occasionally (such as engines, generators, boilers, buildings), a depreciation charge should be made. On very small roads obviously the renewal of two or three cars in one year would cause a serious drain on net income, and should not be provided for in any one year. There is more need, therefore, for depreciation reserve or fund with the small road than the large.

The practice of having big power station units requires more attention to depreciation of machinery on all roads than would be necessary if the units were small. It is undoubtedly the first department to receive consideration in deciding where to begin with depreciation.

A new corporation has more need of meeting depreciation than one well established. In its first years the wear and tear is going on with very little or no expense for repairs or renewals. As it becomes well established, the expenditures for repairs and renewals become more nearly equal from year to year, and, by applying proper amounts, both repairs and deterioration may be provided for by the actual expenditures.

In case depreciation has been ignored until expenditures must be made for some large renewal, there may be established a suspense account which should then be reduced as rapidly as possible. This method, while legitimate, should not be used unless necessary, since manifestly it treats unfairly owners or stockholders before and after the establishment of the account, to the advantage of those before and to the disadvantage of those after.

If any other individual or corporation is financially interested in the cost of anything produced by the electric railway, for example, a concern buying power, the price determined should certainly allow a reasonable amount for deterioration.

The public should allow sufficient rates for a fair return upon the investment and enough over to maintain an ample surplus after keeping the asset accounts, by depreciation or otherwise, at a figure equal to the value of the assets they represent. Any corporation selling groceries, or one manufacturing clothing, for example, may do this without question, but through some peculiarity of the public mind a public service corporation which succeeds in doing it is regarded as luxuriously rich. The public attitude only too common toward electric railways is to demand more than it is willing to pay for. Clearly this leads to poor service as well as loss for the many investors, owners of the corporation. Electric railway officials have been too prone to bend to this attitude of the public without attempt to show it the unreasonableness of its

position. We should use more care to give the people the exact facts to enable them to see the truth. The public is reasonable if it understands. Any audit or appraisal to be just must allow a fully reasonable amount for depreciation of property as shown by its actual value. This should be done regardless of what policy the company may have pursued with reference to depreciation.

A fund to meet the loss resulting from a suspension of privileges of a short time franchise should be independent of any depreciation fund or account. For this purpose a sinking fund of actual cash or securities should be established, sufficient payments being made to it to secure the return of their investment to the stock and bond holders at the termination of the franchise.

The question of appreciation must also be considered. The authorities on accounting regard it as inadvisable to appreciate because of increase in the value of assets. “Marking up” assets is sufficiently rare as to be almost disreputable. The failure to consider depreciation in the electric railway business would have caused worse results had not the value of nearly all the materials it uses increased in value. For instance a modern car fully equipped, built five or six years ago, is worth as much today, despite wear and tear, as when it was bought. And so with other items. The reason accounting authorities discourage taking advantage of appreciation is that fluctuation of prices may wipe out the appreciation. If it has been allowed for, when prices fall the resulting loss must be charged off; if it is not allowed for, it stands as an actual surplus—a “hidden profit.”

Discussion.

The chair then announced as the subject for discussion: “Does the maintenance of an electric railway at a high standard of efficiency eliminate the necessity of a charge for depreciation?”

C. N. Duffy (Milwaukee Electric Railway & Light) inquired whether “maintenance” as used in this question included “replacement” or “renewal.”

Mr. Wallis said that in his opinion it did not.

Mr. Neal (Boston Elevated) said he construed the question to include the matter of keeping up the property, whether it had been depreciating seven or eight years or not, and perhaps exclude an item like the replacement of a large engine by one of a different character, etc. He would construe “maintenance” very much more broadly and say that unless there is a difference in the value and character of the equipment everything is maintenance. He considered that to keep a high standard of efficiency it was necessary to renew the materials and different parts, and believed that “maintenance” should be considered in a broad sense, although excluding actual betterments.

F. R. Henry (United Railways of St. Louis) said he believed that if maintenance charges covered all renewals there would be no need for a depreciation fund, but maintenance as generally understood did not include a charge for replacement and that no matter how efficiently the property was maintained it would be necessary to provide a reserve for depreciation. His company had such a fund to provide for renewals and replacement and to enable it to proportion the cost properly. He considered that a replacement or depreciation fund was necessary in order that the books should show the actual statement of the business and that it was not fair to the stockholders or to the public to make two statements, one for stockholders which showed no depreciation and a second one for the taxing bodies wherein depreciation was shown. Mr. Henry cited the practice that generally obtained among street railways of capitalizing the cost of reconstruction and said he believed that there must be an end to this continuous capitalization of expenditures to take care of the depreciation of the property, and that the conservative management of the future would require that a reasonable charge for depreciation be made. In his opinion the depreciation charge should be set up monthly and based on a percentage of the gross earnings, as thereby each month and year would be charged with the proportion of this reserve which it could best stand.

W. F. Ham (Washington Electric Railway & Light Company) said he could argue the question from only one stand-

point. He considered that maintaining the property at its highest efficiency meant to spend upon the property all that could be spent in keeping it up to the best standard known to the art. At the end of 10 years there would not have been spent upon the property, assuming it to have been new to begin with, an amount representing the actual deterioration. Such an amount could not be spent because the property was not worn out. At any period there would exist as a liability the value of the wear or reduced life which had resulted from the use of the property and which could not be replaced by maintenance, and for the purpose of meeting this liability a depreciation fund should be provided. Mr. Ham distinguished between the physical property and the value of the franchise and believed it would be desirable to keep these two assets separate on the books.

John I. Beggs (Milwaukee Electric Railway & Light Company and United Railways of St. Louis) addressed the convention and gave some account of the policy which had been followed by him since his connection with the street railways of Milwaukee and St. Louis. He indorsed the position taken by Mr. Ham. Mr. Beggs said that the method followed by him in creating a reserve fund charged against earnings was not popular with the financiers or managers because it did not permit a good showing of earnings to be made, at least in the first few years. Many persons were in the electric railway business not with the intention of keeping the properties as permanent investments, but for the purpose of making a good showing from operation and then unloading. To do this to advantage it is necessary to show earning capacity, as the larger the earning capacity the more profit the promoter could make. He agreed with Mr. Ham as to the need of providing for the wear that commences with the first turn of the wheel over the rail and which was imperceptible at first and might continue to be imperceptible for several years. Mr. Beggs said further that in making replacements he had not added anything to the capital accounts and consequently had succeeded in getting rid of some of the water, which had been injected into these properties in their early days, by a process of gradual evaporation. He cited as an example the replacing of single-truck cars by double-truck cars in Milwaukee. The modern cars he considered worth three times as much for transportation purposes as the old cars, but the cost of the large car was very little more than the original cost of the old single-truck car. In answer to a question by Mr. Duffy Mr. Beggs said that if "replacements" or "renewals" were construed as "maintenance" or "up-keep" of the property there was no need of a further allowance for depreciation, and that he did not consider that the up-keep of the property required an independent open account on the books, such as appeared on the books of his companies. Continuing, Mr. Beggs mentioned the need of an amortization fund which he said should not be confused with the up-keep of the property.

Mr. Ham asked what Mr. Duffy meant by "providing" for maintenance, to which Mr. Duffy replied that if track and equipment were maintained by the replacing or supplanting of worn-out portions the mere physical performance of having replaced, or restored, or substituted, kept the property good and there was no necessity for any further provision for the depreciation of the tangible property.

Mr. Ham stated that he believed Mr. Beggs had misunderstood Mr. Duffy's question because Mr. Beggs had said first that in the case of a new property it was absolutely impossible to make sufficient expenditures on account of maintenance to equal the deterioration that accrued, and that upon Mr. Duffy's putting the question in a different form Mr. Beggs had said that if the property is maintained it is not necessary to provide for depreciation.

Mr. Duffy replied that if property was replaced or restored at the end of a given period when worn out then that kind of maintenance of it had removed the necessity for depreciation.

Mr. Neal read a letter from H. L. Wilson, auditor of the Boston Elevated Railway Company, as follows:

No matter how well property is kept up there must be a certain lessening of value going on all the time. Of course the better the property is maintained the less rapidly does this loss occur. The equipment that is well taken care of may be used for a much longer period and if disposed of will realize a much better price.

Some roads need a depreciation account more than others. Those that need it most are those that have taken the poorest care of their equipment.

I have in mind two large cities, in one of which the equipment is kept up to a high degree of efficiency; in the other some of the equipment has been abused by both the public and the company's employees. The first one has not only kept its property in excellent condition, but has laid by something for depreciation; the second one has done neither. Both pay dividends; the first earns them and a little more; the second is running up a nice deficit, as the rate of dividend is guaranteed. One is honestly capitalized and has charged its expenses conservatively, the other is well irrigated and has treated expenses in a very liberal manner. It will be very hard to make both managements look at this question of depreciation in the same light.

Take a new company that starts out with everything new; for the first year the maintenance expenses are very light, everything is in excellent condition, but there is certainly a depreciation going on, and it is during this time that a certain sum should be set aside. This is desirable for several reasons. An important one is that the owners may get an inflated idea of what a success the road is from the showing of net earnings, and later on when the expenses begin to run up may be disappointed. Naturally, a new road should increase its business as time goes along, and the management might say that in this way the maintenance charges can be provided for. This may be partially true, but, if the business increases, the amount of equipment must increase, and the wear and tear on the property will be greater.

Suppose during the first 10 years a substantial sum is set aside for depreciation, the road prospers and all its property is kept up to a high degree of perfection, and after the 10 years it is able to pay for all renewals and substitutions out of earnings; in a case of this kind the depreciation charges might stop and the sum already provided be allowed to remain as it stands.

Unfortunately we cannot always start with a new proposition, and the question is what can we do with the older companies who have never provided for the day of reckoning. The larger part of such companies have made no provisions for the rainy day, and too many of them have suddenly realized that they were in a precarious condition and did not know which way to turn for assistance. Several have reorganized or scaled down their stock, and others ought to have done so, but they hope they may weather the gale and are struggling along.

The impression that was prevalent a short time ago that an electric railway could not help but be a paying investment anywhere, has proved in many instances to be a mistaken idea, and in practically all instances the business must be handled in the same way that any manufacturing plant must be treated. Years of practice have shown that organizations of this latter kind that have not charged off a depreciation, but have been satisfied to keep their equipment in good repair, have finally got into difficulties, and there is no reason to think that electric railways can escape a similar fate.

There is another way that a certain amount of depreciation may be provided for other than to take out a sum from earnings from time to time and transfer to an account with this title, and that is by charging out direct to expenses the total cost of new equipment purchased to take the place of that disposed of or the cost of reconstruction where the cost of new property exceeds the cost of that which it replaces. I think in most cases where new property costs more than that which it replaces cost when it was new, it has been the practice to capitalize the excess cost.

In fact, there are many instances where betterments are charged that exist only for the reason that it is desired to make a good showing. I know of one instance where cars were rebuilt and 90 per cent of the amount expended was charged to equipment and 10 per cent to operation. If these charges had been reversed it would have been only a fair division, and it would have been perfectly proper to have charged the entire expense to operation.

There is another company (not a railway company) that makes a very fine showing each year by charging

replacements at cost and crediting what is removed at second-hand value. Thus they show a small operating expense, and then they turn about and charge out a fairly liberal sum to a depreciation account. This makes a very handsome report, and they point with pride to the liberal fund they have created.

Mr. Neal said that this letter showed that Mr. Wilson believed in the establishment of a depreciation fund no matter how great the state of efficiency secured by maintenance. As an example he took a case where it is assumed that the entire equipment of a road is eliminated in 10 years and that the policy is adopted of renewing one-tenth of that road every year. There would be one piece of road that was brand new, another that was nine years old, another eight, etc. If at any time the actual condition be computed the road would be found to have but 55 per cent of its new value. He considered that without question something more than a high degree of maintenance was necessary to provide for the other 45 per cent of the physical property. Each item of equipment or construction had a different life in service and it required good judgment in making estimates of life for different kinds of equipment.

A. H. Ford (Ford, Bacon & Davis) said that he wished to congratulate the Accountants' association in taking up the question of depreciation, which was one that had been begged from the beginning. Financiers would not discuss it because a reserve for depreciation might and in many cases would interfere with dividends. He considered that the statements such as those made by Mr. Beggs were of the kind needed to secure proper action by those who had to decide concerning depreciation. The statements of the properties with which he was connected showed maintenance charges equal to about 10 per cent of the gross earnings. This charge was not sufficient to provide for renewals and the properties were wearing out, and the time would come when the present physical equipment would have to be replaced.

Mr. Edwards (New York Edison Company) at the request of the chair gave a summary of the method followed by his company in providing for depreciation. He said that when the subject was first taken up it soon grew beyond any preconceived ideas. After the management had had some years' experience and had made comparative records, it was found that the electric lighting properties were disappearing. The ordinary wear and tear incident to the electric lighting business was but a portion of the decrease in value. The important thing in the electric lighting business Mr. Edwards designated as "supersessional depreciation;" that is, the depreciation in value which comes from the necessity of superseding unexhausted machinery by new and improved types. Mr. Edwards stated that since he had been connected with electric lighting work he had seen six different systems thrown on the scrap heap. He believed that when renewals exceed in value the things renewed the excess should be charged to capital account, because the capital account should show the facts, and an increase in value was as much a fact as a decrease in value would be. He indorsed the policy of providing reserve funds to care for damages, fire losses, etc. Mr. Edwards said that his company did not use the word "maintenance," as it was believed that the term "repair and renewal" was more expressive. He urged the need of including depreciation in the statements of corporations. A statement in which depreciation is neglected invites agitation to secure a reduction in rates charged for the service rendered, because state legislatures and other rate regulating bodies take the position that the company is earning too much money; and in some instances it had been found that they object to admitting the propriety of a charge for depreciation that has not been shown in the regular statements of the business.

Mr. Edwards stated that his company charged to operating expenses one cent per kilowatt-hour for a reserve fund.

The debit was made to "Contingent Expense" account and the credit to "Contingency and Renewal" account. This one cent per kilowatt-hour was the result of experience and was intended to include damages such as might be incident to an earthquake or a great conflagration, ordinary wear and tear, and supersessional depreciation; therefore, the term "contingency and renewal" was used as being broader than maintenance or depreciation.

H. J. Davies (Cleveland Electric Railway) stated that his company had had to confront two propositions at the same time. The first was a suggestion from Mayor Johnson that the company name a price at which the Cleveland Electric Railway would lease or sell its property to a holding company until the time came when the laws of Ohio should authorize municipalities to own and operate street railways: the price to be the present value of the physical property and the estimated worth of its future net earnings during the life of its franchises. The second was an investigation of the property by a committee of the Cleveland chamber of commerce to ascertain what it had cost in the past to carry passengers, and at what rate the present company could afford to carry passengers in consideration of a 20 or 25 year franchise grant. Mr. Davies said that conditions as to street and interurban railway investments in Ohio were very serious. A number of interurban companies had been placed in the hands of receivers—some of them more than once—and others would follow the same course to the disappointment of investors. These financial troubles were because of the failure to provide for renewal of the property as it wore out, making it necessary to assess stockholders or sell bonds when the time for renewal came. In cities where the fare had been five cents or thereabouts, managers and directors of companies, with a view rather to the effect of their reports upon the stock market than to the preservation of their properties, had put out statements showing operating expenses to be about 50 per cent of gross earnings, from which the public could easily and logically argue that since a company was making 2½ cents profit per passenger it could afford to carry passengers for 3 cents. Mr. Davies quoted extracts from his last report to the president of his company as follows:

DEPRECIATION OR RENEWAL RESERVES.

Track Depreciation.—Following the suggestion made in my last annual report, a charge has been made each month to expense, and a corresponding credit to a number of reserve accounts, which we have called "Depreciation Reserves," for wear and tear of track, equipment, etc., in addition to the ordinary repair charges. The rule of the Street Railway Accountants' Association, as expressed in the Standard Classification of Operating Expense Accounts, provides that all expenditures for repairs and renewals shall be charged to maintenance (expense) accounts. This rule, if not incorrectly expressed, is likely to be misinterpreted and misapplied. The rule should provide that there be charged to expense all expenditures for repairs as distinguished from renewals, and, in addition, each month, by way of reserve, a sum large enough to take care of or provide for the wear of the month, this sum to be such a proportion or percentage of the cost of renewal as the month bears to the probable life of the property; so that when a piece of track or equipment is entirely worn out and replacement must be made, a reserve sufficient to pay for the replacement will appear on the books. The reserve and the value of the property ought to equal at any time the cost of replacement. It would be still more accurate and scientific to charge to maintenance expense a certain sum per car-mile run in each month, large enough to cover both ordinary maintenance charges and the month's proportion of the probable cost of renewals, crediting this sum to a "Renewal Reserve" account.

To follow strictly the rule of the association would require that the cost of renewals be charged to expense in the year or month in which the renewals are made, throwing an abnormal burden on the summer months, when track-laying is done, whereas the wear on the track is as great per car-mile run in the winter months as in summer. If, instead of charging the cost of renewal to expense at the time the expenditures are made, the cost be spread over several future months or years, as was our custom until recently,

the subsequent periods will show a much larger maintenance expense than the period immediately following construction. The first few years after construction, if no charge is made for renewal, will show very low maintenance cost; the first few years after renewal, if the cost of renewals is made and spread over a term of years, will show very high cost of maintenance. This method of accounting has deceived stockholders and the public as to the earnings of street railway companies, and as to the cost of carrying passengers. No provision having been made in the early years of operation for renewal reserves or funds, the owners of street railway properties have had to provide additional capital for renewals; and this had led in many cases to over-capitalization. And this process of renewing from new capital has been repeated by some companies several times.

Provisions should be made from the current earnings of the company for depreciation of its property by reason of wear for depreciation by reason of progress and improvements in the arts of manufacture and in methods of operation, and for decrease in the value of franchises due to lapse of time. There is less excuse for neglecting this provision on the part of companies possessing short-time franchises than on the part of those, like the New York and Pennsylvania companies, that have franchises running for 99 or 999 years. But I know of no railway company in the country that is making adequate provisions for this deterioration and depreciation.

Depreciation of Cars.—We own 876 passenger cars. If they were all of our new convertible type, we might be able to do the present business with 800. Eight hundred convertible cars, with trucks, motors, air brakes and other accessories, would cost us now, new, nearly four million dollars. Their life would probably not exceed 10 years. To provide funds for 800 new cars when these wear out, we should, therefore, charge to expense, in addition to expenditures for ordinary maintenance, or, at least, should deduct from income in some way and put in a renewal reserve for cars and motors, nearly \$400,000 per year. As before stated, we charged off \$20,000 for this purpose last year.

Our total depreciation charges amounted to 1.24 per cent of our capitalization of \$31,426,000; to 2.6 per cent of \$15,000,000, Mayor Johnson's estimate of the cost of reproducing the entire property.

Mr. Davies said that 2.6 per cent on this valuation would indicate a life of between 30 and 40 years, which was a ridiculously long estimate.

Mr. Davies discussed two methods in the accounting of depreciation for wear and tear and for renewal of machinery or other property that had been worn out by use or had become obsolete. One of these was to set aside from earnings a fund for renewal or replacement, and the other was to put aside nothing for this purpose, but to divide all surplus earnings among stockholders and then put up new capital for the reconstruction of the plant. If in the case of a street railway with a short-term franchise the latter method had been followed and within the life of its franchise the company had earned good dividends and had also returned to the stockholders the entire amount of their investments less the value of the physical property, at the end of the term the company ought not to expect the public to be eager to make a new contract under which the company might earn good dividends not only upon the cost of a new plant but also upon the cost of the worn-out plant, in addition to getting back the cost of the new plant from year to year as it depreciated. He considered that it was not fair to the public to renew the plant by the investment of new capital and to expect to earn dividends upon double capital, unless there has been a failure to earn upon the original investment. Also, it was not fair to one management to charge to maintenance the cost of renewing a plant which had been worn out or partially worn out by another management which had not provided for renewals.

Mr. Davies considered the better plan to be to provide from current earnings for renewals that must be made within the life of the company's franchise. While renewal charges probably should be less in the earlier years than in the later years, because the business was less, a renewal charge proportional to the work done by the plant should be made. He considered that the charging of depreciation to expense was in accordance with the standard classification of expense accounts recommended by the association,

and drew an analogy between the method followed by most companies in creating accident reserves by charges to expense account No. 33 (Damages). He believed that a charge to provide for repairs and renewals based on a unit of service or output—the car-mile, the car-hour or the kilowatt-hour, for instance—was better than a charge based on the inventory of value and the estimated life. According to the classification of accounts recommended by the association there should be charged to maintenance each month the cost per unit, not alone of keeping the track and cars in running order, but also the cost of renewing track and equipment, the amount so charged to maintenance accounts to be credited to a depreciation reserve. All expense of ordinary repair and renewals should be charged to the depreciation or reserve account, the balance to the credit of the account representing all that portion of the property that had disappeared by wear or rust or otherwise. That balance of the depreciation reserve account and the value of the property at any time should equal the original capital cost. Mr. Davies suggested, in lieu of this, that ordinary repairs might be charged to the appropriate expense accounts and then enough additional charged to these accounts to bring them up to the several sums per unit which had been determined to be the cost of repairs and renewals, depreciation being then one of the subdivisions of each maintenance account.

Mr. Wallis spoke of the effect of the Massachusetts law which required that the railroad commissioners fix a price, in their opinion the market value of the stock, at which new stock might be issued, and suggested that in case a company in this way sold stock at a premium of \$40 or \$50 a share, this premium could be used to provide for depreciation.

Mr. Davies called attention to two recent publications on depreciation, references to which he desired to have included in the record. These were a paper by G. W. Bissell, professor of mechanical engineering, Iowa State College, on "The Depreciation of Electrical Properties," read before the Iowa Electrical Association and published in the *Electrical Age* for June, 1906, and an editorial in the *Electric Railway Review* for August, 1906.

C. L. S. Tingley (American Railways Company) said that the necessity for a depreciation account or reserve—that is, some provision other than the current charge for maintenance—is more apparent with a small property than with one in a large city, because on the smaller road a larger proportion of track and of equipment would reach the limit of usefulness at the same time. He considered it imperative that small companies provide month by month and year by year for taking care of the contingency of renewal when it should arrive.

After considerable discussion as to the language in which the sense of the meeting should be recorded, the following resolution was adopted:

"That the maintenance of an electric railway at a high standard of efficiency does not eliminate the necessity of a charge for depreciation unless the word 'maintenance' is construed to cover a sufficient charge set aside for future replacements of depreciated property."

An especially handsome private car is now being turned out by the Cincinnati Car Company for W. Kesley Schoepf, president of the Indiana Columbus & Eastern Traction Company. The car will be finished in solid mahogany and will have a combination parlor and dining-room, library, kitchen, lavatory and observation platform, the latter to be inclosed in glass. The car will be 60 feet long over all, 8 feet 8 inches wide and 13 feet 4 inches high, and will weigh 40 tons.

It is estimated that 100,000 people visited Coney Island last Sunday, April 14, most of them traveling over the lines of the Brooklyn Rapid Transit Company. The regular season at the resort will not begin until May 11, when Dreamland and Luna Park will open.

ARTISTIC TROLLEY POLES IN DENVER.

The trolley poles which are used on Sixteenth street, Denver, were designed in accordance with the ideas of the Art Commission of the City and County of Denver. The plan to use combination ornamental trolley and light poles was first suggested by Robert W. Speer, mayor of Denver. His idea was to have ornamental poles support both arc lights and trolley wires. Mr. Speer requested the art commission



Artistic Trolley Poles in Denver—Effect of New Poles.

to select the most graceful and artistic design available which would fill the desired purpose.

The Denver City Tramway Company removed the old trolley poles and furnished the steel tubular poles which are set in concrete on the curb lines. The city furnished and placed the outside ornamental cases and the Denver Gas & Electric Company furnished the electric lights and wires for the lights. The poles are attractive and the effect is pleasing, both by night and day.

For the following description and the accompanying illus-

trations, we are indebted to Henry Read, the chairman of the art commission.

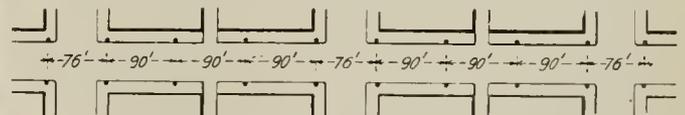
The standard trolley pole consists of an inner wrought-iron pole with an outer cast-iron casing. This construction was necessary because, on account of the strain of the span wire, the Tramway company was unwilling to be responsible for a complete cast-iron standard. The strain and the resulting curvature were carefully measured on existing poles. The Tramway company was obliged to have the poles set at a slight angle and these conditions compelled the use of a more cumbersome casing than was at first contemplated. All inner poles were of the same height, but heavier poles were used at street intersections to provide for the additional strain at the curves. The following are the specifications for the two styles of poles:

Street intersection poles—One piece 8-inch extra heavy, 21 feet long; one piece 7-inch extra heavy, 12 feet long, swedged 24 inches at joint; one piece 6-inch standard, 5 feet long, swedged 36 inches at joint.

Inner poles—One piece 7-inch extra heavy, 21 feet long; one piece 6-inch extra heavy, 11 feet long, swedged 24 inches at joint; one-piece 5-inch standard, 5 feet long, swedged 36 inches at joint.

The third section in each case is designed for the double purpose of providing a receptacle over which the casting that supports the wire can slip, and for reinforcing the pole down far enough to permit the insertion of eye-bolts through the double thickness at a point 21 feet from the sidewalk for a straight line span wire. The other point of attachment for wires on curves, etc., is 24 feet from the sidewalk and this attachment passes through the double thickness.

The inside poles are set in the ground 7 feet below the sidewalk and the others are set 6 feet below the sidewalk.



Artistic Trolley Poles in Denver—Showing Location of Poles on Street.

The manner in which the standards were set is shown in the accompanying plan. Eight standards in each block are set on the curb, and those which are placed at street intersections are 2 feet outside of the lot line of the transverse streets. The blocks are 286 feet in length, including 16-foot alleys. The streets, including the sidewalks, are 80 feet in width. Multiple alternating-current enclosed arc lights are used. Only the outer light is used, so that a single line of lights is presented. No other poles are used now on Sixteenth street in Denver. The installation has been entirely successful.

ELECTRIFICATION ON THE LONG ISLAND RAILROAD.

In the annual report of the Long Island Railroad Company for 1906, the president, Ralph Peters, refers as follows to the progress of improvements and electrification:

The section of your line between Springfield Junction and Valley Stream was electrified, thus completing a loop service from the Far Rockaway branch to the Old Southern road, which is the short line between Jamaica and Springfield Junction. This makes a total of about 100 miles of single track now operated by electric third rail. Its workings during the year have been very successful and the service has been reliable and efficient in every respect; and, while it has not yet been economical, owing to the fact that your power is not fully employed, it has materially increased your passenger traffic.

Plans are being prepared for the electrification of your lines from Long Island City to Port Washington and to Whitestone Landing; and as soon as the tunnels under the East river are completed, your lines will be electrified to Jamaica and to Woodhaven Junction, via the Glendale cutoff, a connection between the main line of your company, the Montauk division and the Rockaway Beach division. Plans are also being made for an enlarged terminal at Jamaica, where the change from steam to electric locomotives will be made.

The Long Island Consolidated Electrical Company has

completed the acquisition of a one-half interest in the New York & Long Island Traction Company and in the Long Island Electric Railway Company, and has also purchased during the year the Babylon Railroad, a small line in the village of Babylon. The company has also planned the construction of a cross-island line from Huntington to Babylon via Farmingdale and Amityville, and the necessary franchises for this extension have been secured. It is proposed to obtain the funds for this purpose through the sale of the electrical companies' bonds, guaranteed by your company.

DEDICATION OF THE ENGINEERING SOCIETIES BUILDING.

The building of the Engineering Societies, the gift of Andrew Carnegie, at 29 West Twenty-ninth street, New York, was dedicated during the present week. The exercises began on Tuesday, April 16. The proceedings were opened by a prayer by the Rev. Dr. Edward Everett Hale, chaplain of the United States senate. Communications were read from the president of the United States, the president of the republic of Mexico and the governor-general of Canada. Charles F. Scott, president of the American Institution of Electric Engineers and chairman of the conference and building committee, gave a historical address, in which he related how the gift had been made by Mr. Carnegie and the steps which had been taken leading to the construction of the building, which was now for the first time turned over to the three societies—the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the American Institute of Mining Engineers. On behalf of the United Engineering Societies, which is the holding organization, E. E. Olcott, president, accepted the building. He was followed in an address by Mr. Carnegie, in which he referred to the good results which were brought about by the co-operation of societies devoted to associated lines of work. He said that whenever men unite and try to do good, unification takes place, but wherever they conspire against the public good they find themselves unable to trust each other and they therefore fail. In this he saw great hope for the future.

An oration was delivered by Dr. Arthur T. Hadley, president of Yale University, who had chosen for his subject "The Professional Ideals of the Twentieth Century." In the course of this he said:

A serviceable public opinion can only be formed when intelligent people, technically trained for different lines of life, seriously try to find out how their work can be made to meet the public needs. They are the only ones who can do this well. If it is done by anybody else it will be done badly. If the lawyers as a class try to keep the law in line with the demands of intelligent public opinion we can get good law. But if lawyers are content to see the law perverted to private ends and judges take refuge in technical construction of precedents without full regard to the needs of the existing situation legislatures will step in to create a chaos of conflicting laws which are worse than no law at all.

If our engineers get their own minds clear and get the public mind clear as to the political economy of the properties intrusted to their charge and the ethics of their management they can forestall those conflicts which now threaten to break out at every moment. There are three professions today which do not regard themselves as servants, but as masters—the financier, the journalist and the politician. If the engineer and the lawyer accept positions as servants it is not simply a confession of inferiority, it is a dereliction of public duty.

In the evening a joint reception was held, the receiving parties consisting of the presidents of the three societies and later each society held a reception in the rooms which had been assigned to them. The entire building was open for inspection.

On April 17 the exercises were continued, consisting of addresses by Dr. Samuel Sheldon, president of the American Institute of Electrical Engineers; Dr. F. R. Hutton, president of the American Society of Mechanical Engineers; and Dr. J. Hays Hammond, president of the American Institute of Mining Engineers. Medals for distinguished services were presented to Ralph W. Pope, Frederick R. Hutton and Rossiter W. Raymond, secretaries and past secretary of

the several societies. Presentation of the John Fritz gold medal to Alexander Graham Bell was made by Charles S. Scott, chairman of the John Fritz medal board of award. Dr. James Douglas, past president of the American Institute of Mining Engineers, delivered an oration upon the subject of "Ethics of Secret Processes in the Arts."

PLAN FOR SETTLEMENT OF INTERLINE ACCOUNTS.

The Central Accounting Conference has adopted a plan for the settlement of interline freight and ticket accounts. It is provided that settlement for all interline way-bills shall be made by the receiving road.

In a report of the initial meeting which was held in Dayton, O., on March 2, received from Mr. C. B. Baker, freight auditor of the Western Ohio Railway Company, Lima, O., who is secretary of the conference, it is stated that it was thought best to use the word conference in the title, rather than association, as the latter might be misunderstood and the purpose of the gatherings misconstrued. The secretary was directed to request auditors and other accounting officers of all electric lines in the territory which were not represented at the meeting, to become members of the conference and to attend the next meeting in Indianapolis on June 1. It is not expected that the meetings will last longer than one day and as they are to be held in centrally located points the time spent in attending them will not be great.

The conferences are intended to be informal gatherings for the purpose of interchanging thoughts on accounting matters and to discuss the best methods of handling the accounts of electric lines in the hope that a uniform method may prevail. It is believed that many of the differences between the various lines can be adjusted to advantage through the meetings of the conference.

The plan for settlement of interline freight accounts and ticket accounts, which, it is expected, will be followed by all lines wherever practicable, is as follows:

Interline Freight Accounts.

Interline billing shall cover the movement of freight and express shipments between such points and over such lines as may be agreed upon between the accounting departments of the respective lines.

It is understood that when shipments covered by interline billing move over more than two lines the forwarding line shall furnish to the intermediate line or lines, daily, copies of all way-bills moving over such lines or line.

Settlement for all interline way-bills shall be made by the receiving line.

A report of all interline way-bills received shall be rendered by the receiving line on or before the fifteenth day of the succeeding month and shall include all way-bills received during the month for which the report is rendered; the original report, accompanied by a division statement showing the apportionment of earnings between all lines interested, shall be mailed to the forwarding line, and legible copies of such reports and division statements shall be mailed to all intermediate lines interested. The report and division statement as rendered by the receiving line shall be accepted as a basis for settlement and all errors or omissions shall be taken up by correspondence with the receiving line and adjustment shall be made in the succeeding month's report.

The receiving line is responsible for the collection of proper revenue on all way-bills received and shall correct the freight earnings on all way-bills to the basis of current rates and divisions and should issue correction sheets to all lines at interest, reporting the way-bill on monthly abstract at corrected figures; but no changes may be made in the advanced charges or total prepay of any way-bill received, until authority for the change is obtained from the forwarding line.

If errors occur in the advanced charges or total prepayment shown on way-bills, the receiving line should make a request to the forwarding line for authority to correct and, as soon as authority is received, issue correction sheets to all lines at interest accordingly.

As soon as interline abstracts have been exchanged between lines for each month, and not later than the twenty-fifth day of the succeeding month, the debtor line shall for-

ward a voucher in favor of the creditor line for the balance due on interline billing for the previous month.

It is understood that the debtor line shall not wait for any bill or notice from the creditor line before making the voucher.

It is desirable to settle interline billing each month and the voucher should show the month for which settlement is made. If more than one month's interline billing is settled by one voucher, the balance for each month should be shown separately on voucher, so that the creditor line may properly handle the amount in its accounts.

It is expected that all lines will promptly reply to all communications relating to differences in interline abstracts, so that adjustment of all errors may be made whenever possible in the following month's account.

Interline Ticket Accounts.

Ticket reports shall be rendered monthly covering all ticket sales over foreign lines and the line selling tickets shall apportion earnings to all lines at interest.

Ticket reports shall be rendered as soon after the close of each month as possible, not later than the fifteenth day of the succeeding month, and the reports as rendered shall be accepted and all differences handled by correspondence and included in the subsequent report.

As soon as ticket reports for any month have been exchanged, and not later than the twenty-fifth day of the succeeding month, the debtor line shall forward a voucher in favor of the creditor line for the balance due on interline tickets for the month for which the report is rendered, without waiting for a bill or notice from the creditor line.

It is desirable to settle interline ticket accounts monthly, but if more than one month is included in the voucher, the amount for each month should be specified to enable the creditor line to properly handle the payment.

It is understood that interline excess baggage will be included in ticket reports and settlements.

CLEVELAND RAILWAY DELIVERS ULTIMATUM.

The Cleveland Electric Railway Company has formally thrown down the gantlet to Mayor Johnson and the 3-cent fare promoters. At the meeting of the city council on Monday night, April 15, the company presented a communication signed by President H. E. Andrews by order of the board of directors, in which it is declared that the company will cease operating over the Central avenue and Quincy street lines at midnight on April 23 and unless a purchaser approved by the council takes over the fixed property on those lines before that date it will proceed forthwith to tear up its tracks. Since January 7, when the decision of the supreme court declared that the franchises on those lines had expired on March 22, 1905, the company has been operating under a temporary agreement by which the city was to receive any surplus over cost of operation at 3-cent fares. The company now states that operation at 3-cent fares has resulted in a loss. The communication to the council follows:

The operation of these lines under the temporary arrangement made with the city, under which a fare of three cents has been charged and transfers given, has not returned to the company the cost of operation, taxes and depreciation, but has subjected, and is now subjecting, the company to an actual loss in operation. This being the situation, the company cannot longer consent to operate upon these terms.

In this connection, we remind your honorable body that the decision of the supreme court determining that the franchises of this company had expired upon Central avenue and Quincy street was rendered January 7, 1907—more than three months ago. The object of the temporary arrangement, which was made to operate at three cents, was for the accommodation of the public, to the end that you might have a reasonable time to determine what the public interests required as to a permanent arrangement with reference to the operation of these lines. Up to this time, we are not advised of any disposition on your part to make a grant to this company upon these lines, but, as we understand your attitude, you propose turning over these routes to some other company, not giving to us even an opportunity to bid upon the same. We beg to advise you that this company cannot longer afford to operate the lines at the present rate of fare thereon charged, and that it will, at midnight of April 23, 1907, discontinue such operation.

We beg also further to advise you that this company is

willing to turn over its fixed investment in these lines to a purchaser approved by the council, at a reasonable valuation, provided such purchaser accepts this offer and makes payment for such property on or before said April 23, 1907. Unless the property can be so transferred by that date, we ask permission of the city to remove the property of the company from these streets.

The council will please understand that this action is taken only because, in the judgment of the board of directors of the company, it seems the only course of conduct proper for the company in the circumstances; but it is not intended as in any way modifying the offer which this company has heretofore made to accept a renewal of its franchises on these streets with a rate of fare of seven tickets for a quarter, including liberal transfer privileges to cross-town and other lines. This offer, which has heretofore related to the entire system, we now renew as to the Central avenue and Quincy street lines in question.

This action of the company was entirely unexpected. The mayor immediately urged the passage of a resolution requesting the company to name at once a valuation of the property so that the council could proceed to find a purchaser. He insinuated that the Cleveland Electric had purposely made the operating expenses on the lines in question as high as possible, by putting on too many cars to permit the showing of an earning.

The council then adopted a resolution taking a recess until 10 a. m. on Tuesday and requesting the Cleveland Electric to attend the meeting by an accredited representative, prepared to inform the council what the property consists of that it desires to sell and what it deems the fair value of such property. Another resolution was passed calling upon the Forest City Railway Company "to proceed at once to prepare to operate its street railroad in Central and Quincy avenues in accordance with its grant, and to operate at once upon the suspension of operation by the Cleveland Electric Railway Company."

At the council meeting on Tuesday morning the Cleveland Electric presented a communication signed by President Andrews, refusing to deal with the city council in regard to the price of the property. The communication was as follows:

After passing a resolution designating the Forest City as the proper company to negotiate with the Cleveland Electric, and giving the Cleveland Electric permission to remove its tracks, in case no agreement is reached, under the direction of the board of public service, the council adjourned until Thursday morning.

In the afternoon Mr. du Pont conferred with Mr. Andrews and endeavored to make the latter name a price and specify just what property the company would sell. Mr. Andrews, however, refused to open negotiations until the Forest City Railway Company furnished the directors with a satisfactory guarantee of its financial ability to pay for the property. Mr. du Pont then sent to the Cleveland Electric directors a communication protesting against the action of Mr. Andrews and offering in behalf of the Forest City Railway Company to buy the tracks, poles, trolley, span and feed wires in place on Quincy avenue, Central avenue, east of East Ninth street, and East Ninth street from Central avenue to Prospect avenue for the sum of \$149,993.19 cash, to be paid on April 23 at 12 o'clock at the Citizens' Savings & Trust Company on delivery of a good marketable title to the property and an agreement of the Cleveland Electric not to harass or interfere with the enjoyment of it for street railway purposes directly or indirectly. He also offered to buy a car house and cars if a price could be agreed upon and requested an answer by noon on Friday, April 19.

The Cleveland Electric directors on Wednesday refused the offer of the Forest City company of approximately \$150,000 for the property on Central and Quincy avenues, promising to designate later a price at which it would sell.

President du Pont on the same day issued orders to make preparations for the operation of the lines by the Municipal Traction Company. The Low Fare Railway also began laying tracks on Sumner avenue in accordance with a notification sent to both of the other companies on April 11.

MUELLER CERTIFICATES WOULD EXCEED CHICAGO'S CONSTITUTIONAL DEBT LIMIT.

A decision against the Mueller law, which provided for an issue of \$75,000,000 certificates for the purchase of the property of the Chicago street railways, was rendered by the Illinois supreme court at Springfield on April 18. The court holds that the issue of these certificates would make the indebtedness of the city exceed the constitutional limitation. Unless a new plan for raising money is devised, the city will therefore be unable to purchase the Chicago City Railway and Chicago Railways (Union Traction) properties, as proposed in the new ordinances.

The decision has raised the question whether the new Chicago charter, which is under consideration by the Illinois legislature, should contain the provision giving the city the right to issue public utility certificates to "be payable solely out of the revenues or income to be derived from the public utility property for the acquisition of which they were issued."

The decision, which was rendered by Justice John P. Hand, states in part:

Without the right to those who purchase at foreclosure sale to operate the street railways for 20 years from the date of purchase the certificate holder would have only a lien on the rails in the street and other equipment of the street railway, which would be of little value without the right to operate said street railways in the streets of the city. By the trust deed or mortgage proposed to be executed by the city to secure the payment of said street railway certificates, in case of its foreclosure and a sale under the foreclosure decree, the city would lose the right itself or through its grantees or licensees to use its streets for the period of 20 years from the date of the foreclosure sale for street railway purposes, and also the compensation which it receives, as license fees or otherwise, from their tracks, the surrender of which rights would entail upon the city not only the loss of the control of its streets for street railway purposes for 20 years, but would deprive it of many hundred thousands of dollars which would be paid into the treasury during that period by street railways as compensation for the use of its streets upon its streets upon which they operate their street car lines.

The supreme court therefore reverses the decree of the circuit court and remands the case to that court with directions to overrule the demurrer to the bill of complaint.

Progress of Reorganization.

George W. Wickersham and Lewis C. Krauthoff, attorneys for the New York stockholders in the Chicago Union Traction Company, have been in Chicago in consultation with the local interests. The plan for reorganization which they have drafted has been submitted to P. S. Grosscup, judge of the United States Court at Chicago. When the plan has been approved by the various interests concerned its details will be made public. It is announced that as the reorganization of the company is so near, Judge Grosscup will not appoint a successor to James H. Eckels, one of the receivers of the Union Traction Company, who died on April 15.

The New York stockholders of the company have been requested to deposit their shares with the Central Trust Company of that city. The committee is composed of J. N. Wallace, president of the Central Trust Company, Alfred Skitt, John W. Castles, James Jourdain, Robert M. Galloway and H. B. Hollins. The call states that the benefits of the new ordinance are available through a deposit of stock, both common and preferred, to an amount specified in the ordinance; and that a plan of reorganization is to be formulated, and prompt action is essential to secure proper representation and consideration of the rights of stockholders in the preparation and adoption of the plan. Deposits will be received up to and including May 15, 1907.

Beginning on April 18 transfers were exchanged between the Chicago City Railway Company and the Chicago General Railway Company. The latter company operates a line in Twenty-second street from Cottage Grove avenue west to Crawford avenue, with feeder lines in Kedzie and Ashland avenues, Throop street and in Lawndale. The new ordinance

requires the use of part of the Chicago General lines for through routes and the Chicago City Railway Company conceded the transfer privilege. The Chicago General company is making plans for new equipment with the idea that its traffic will be largely increased by the new arrangement.

Bion J. Arnold has been in New York City this week and no announcement as to the two other members of the board of supervising engineers has been made. The new cars which are to be used on the Chicago City Railway and the Chicago Railways (Union Traction) lines, are so much wider and larger than the cars which were in use when the present tracks were constructed that in the plan for the new track the space between the tracks will be increased.

Formal acceptance of the ordinance, together with a bond for \$100,000, was filed with the city clerk by the Chicago City Railway Company and the Chicago City Railroad Company on April 15.

AMERICAN STREET AND INTERURBAN RAILWAY ASSOCIATION COMMITTEES.

In addition to the committees of the American Street and Interurban Railway Association for carrying on the work during the present year, which have already been published in previous numbers of the Electric Railway Review, the following have been appointed:

Promotion of Traffic.

W. E. Harrington, president Pottsville Union Traction Company, Pottsville, Pa., chairman.

Howard F. Grant, manager Seattle Electric Company, Seattle, Wash.

H. E. Reynolds, assistant general manager Boston & Northern Street Railway Company, Lynn, Mass.

H. J. Crowley, general manager American Railways Company, Philadelphia, Pa.

G. W. Parker, general express and passenger agent Detroit United Railway, Detroit, Mich.

Subjects.

Richard McCulloch, assistant general manager United Railways of St. Louis, St. Louis, Mo., chairman.

Ernest Gonzenbach, general manager, Sheboygan Light Power & Railway Company, Sheboygan, Wis.

R. E. Danforth, general manager Public Service Corporation, Newark, N. J.

C. L. S. Tingley, second vice-president American Railways Company, Philadelphia, Pa.

H. H. Adams, superintendent shops United Railways & Electric Company, Baltimore, Md.

B. B. Davis, claim agent Columbus Railway & Light Company, Columbus, O.

Car Wiring.

John W. Corning, electrical engineer Boston Elevated Railway Company, Boston, Mass., chairman.

C. B. King, general manager London Street Railway Company, London, Can.

L. P. Crecelius, superintendent Public Service Corporation, Newark, N. J.

Hugh Hazelton, electrical engineer, 32 Park place, New York.

I. D. Shipper, The J. G. Brill Company, Philadelphia, Pa.

Insurance.

H. J. Davies, secretary Cleveland Electric Railway Company, Cleveland, O., chairman.

A. H. Ford, vice-president Birmingham Railway Light & Power Company, New York, N. Y.

R. B. Stearns, general manager Chicago & Milwaukee Electric Railroad, Highwood, Ill.

Charles O. Kruger, second vice-president Philadelphia Rapid Transit Company, Philadelphia, Pa.

G. L. Estabrook, secretary and treasurer East St. Louis & Suburban Railway, Philadelphia, Pa.

Public Relations.

John B. Parsons, president Philadelphia Rapid Transit Company, Philadelphia, Pa.

W. Cary Ely, president Ohio Valley Finance Company, Buffalo, N. Y.

Jere C. Hutchins, president Detroit United Railway, Detroit, Mich.

Henry A. Robinson, general solicitor New York City Railway Company, New York.

E. C. Foster, president New Orleans Railway & Light Company, New Orleans, La.

News of the Week

Philadelphia Enabling Act Approved.

Governor Stuart of Pennsylvania has approved the Fahey bill, an act enabling the city of Philadelphia to enter into contracts with the Philadelphia Rapid Transit Company, which was passed by the legislature at the instance of the retail merchants' association of Philadelphia. Before Governor Stuart signed the bill he heard members of the Trades League of Philadelphia in opposition to the measure. The league representatives charged that the provisions of the enabling act were in direct conflict "with the vital and fundamental principles of modern municipal progress" and would place the city of Philadelphia at a serious disadvantage with other American cities for 999 years. The Trades League is in danger of disruption because of its attitude on the traction situation. In the last month 13 influential organizations, including bankers, business houses and manufacturers, have withdrawn from its membership.

Seeks Interchange of Freight with Steam Roads.

The Grand Rapids Grand Haven & Muskegon Railway of Grand Rapids, Mich., an electric line operating between the towns named in its title, and handling through freight for Chicago, under an arrangement with the Goodrich Transportation Company, which operates in the great lakes, is seeking to make prorating agreements with the steam roads. Mr. S. L. Vaughan, traffic manager, advises us that he has written to the several trunk lines west of Chicago asking them to concur in tariffs he was about to publish, naming the all-rail rates and all-rail percentages as a basis. Several lines notified him that they had general concurrences filed with the interstate commerce commission covering the issuance of such tariffs. Later on, evidently discovering that the Grand Rapids line was an electric line, some of the roads wished to be eliminated from such tariffs, but the concurrence in a tariff is effective for 40 days before a non-concurrence takes effect. Mr. Vaughan was advised that at a recent meeting of the Western Trunk Line Association it was agreed not to participate in such through rates. The company then filed an informal complaint with the interstate commerce commission. The Grand Rapids shippers are anxious for through service and at a recent meeting of the transportation committee of the board of trade a resolution was passed asking the interstate commerce commission to give the company's complaint careful attention.

Chicago Employees Refuse Wage Increase.

The motormen and conductors of the Chicago City Railway Company, which operates the south side lines of the city, have refused to accept the increase of wages promised by the company before the election in case the settlement ordinances should pass and which the company on April 12 announced that it was willing to make effective as of April 1. Division 260 of the Amalgamated Association of Street Railway Employees of America held a mass meeting on Saturday night, April 13, and decided not to make a new contract with the company, in place of the present contract, expiring on June 31, unless the employees of the elevated roads of the city and of the Chicago Union Traction and Consolidated Traction companies, operating on the north and west sides of the city, are assured a similar increase. The rate of wages under the present contract, which was made after the strike of 1903, is 19 cents per hour for the first six months' service, 24 cents per hour for the following six months, and 25 cents per hour thereafter. On March 29 the company offered an increase, conditional on the passage of the ordinances, to 23 cents for the first three months, 25 cents for the following nine months, and 27 cents thereafter, and on April 12, after the election, President Mitten announced that the company stood ready to grant the increase, effective as of April 1, with an extension of the contract to July 31, 1908. Increases were also offered to men employed on cinder, supply and sprinkler cars, who were not included in the original promise.

The conference board of the Union Traction employees met on April 17 and decided to demand a scale of 33-1-3 cents an hour and a nine-hour day. The Union Traction and the City Railway companies have both paid the same scale since the men organized six years ago.

Rapid Transit Affairs in New York.

The rapid transit commission on April 11 received two bids for the construction of the first section of the subway loop to connect the Brooklyn and Williamsburg bridges, the section between Canal and Pearl streets, about one-half mile long. The Degnon Contracting Company submitted a bid of \$2,952,000 for the subway construction and \$83,000 for the pipe galleries. The bid of the Cranford Contracting Company of Brooklyn was \$3,775,000 for the subway and \$50,000 for the pipe galleries. This section will take two years to build and work is to begin within 60 days from the awarding of the contract. The contract would have been awarded to the Degnon company, but for the fact that there were only four members of the commission present at the meeting, while six votes, or a majority of the board, were needed. Action was therefore postponed until Thursday, April 18.

A flow of water in the subway at One Hundred and Fifteenth street and Lenox avenue, although combated energetically by the Interborough Rapid Transit Company for weeks, has assumed more dangerous proportions than ever and on April 15 it became necessary to shift the northbound trains to the southbound tracks between One Hundred and Tenth and One Hundred and Twenty-fifth streets, which resulted in a serious congestion. In the construction of the subway under Lenox avenue, trouble was met in the form of an underground stream, which ran out of the Harlem Mere in a westerly direction. Eight feet of concrete, heavily covered with

waterproofing and tarred paper, were laid to protect the tracks, but they kept the subway dry only for a time. Water began to seep in several months ago. Serious trouble has been avoided by the use of pumps, but no method of restraining the flow has yet been ascertained.

Legislation Affecting Electric Railways.

Missouri.—Bills substantially alike have been introduced in both houses to provide for the regulation of public service corporations by the state railroad and warehouse commission. The principal provision is as follows: "That all cities, towns and villages in this state shall have power and authority, by ordinance, to regulate and fix, within the city limits, the rates and charges for their respective service, commodity or other thing of value of all telephone companies, telegraph companies, street railway companies, electric light companies, gas companies, water companies, refrigerating companies, heating companies, subway or conduit companies, tunnel and viaduct companies and all other companies, corporations and persons owning or operating any public utility or utilities under franchise granted by the state or any municipality thereof, and to provide and enforce penalties and fines for the violation thereof. Provided, however, that any such rate or charge so fixed must be a reasonable one and shall not be changed oftener than once in every 12 months."

New York.—A bill introduced by Assemblyman Sheridan provides that any street surface railroad company may remove its tracks from a street provided the board of railroad commissioners certify that the tracks to be removed are not required for the convenience of the public. The bill further provides that such a company may also, with the consent of the mayor, discontinue the operation of cars over any portion of its road whenever the railroad commissioners shall certify that the operation of cars thereon is unnecessary for the convenience of the public by reason of the operations of other lines. It is also provided that such removal of tracks shall not impair the validity of the company's franchise. The bill is intended to enable the New York City Railway to remove some of its unused tracks, which have been a subject for complaint.

Pennsylvania.—The house on April 10 voted to reconsider the Fahey bill, which it had defeated the day before. The bill makes it necessary, before a charter can be granted for a new line or an extension, for the company to first obtain the right of way from the municipalities through which it proposes to build. The bill is in the hands of the committee on electric railways.—The Homsher bill, granting the right of eminent domain to electric railways, was passed by the house on April 11. As amended on second reading the bill provides that all companies taking advantage of the law shall be common carriers of express matter and light freight.—Governor Stuart on April 15 signed the McNicol-Fahey bill, which is intended to make possible the retail merchants' plan for reorganizing the Philadelphia Rapid Transit Company, by enabling municipalities to make contracts with electric railway companies operating within their limits for the purchase of the lines at an agreed price, and to secure representation on the directorates of such companies.—The committee on municipal corporations has reported a bill which empowers common pleas courts to declare the forfeiture of the rights and privileges of public service companies for failure to keep agreements with the city or to perform any of their corporate functions or obligations.—The Homsher trolley freight bill was passed by the senate on April 16 by a vote of 40 to 0 and sent to the governor. The bill provides: "That the right and privilege to do an express business, and to transport and carry farm produce, garden truck, milk, merchandise and other light freight and property upon, along and over all street railways, and to charge and collect a reasonable compensation therefor, is hereby extended to, and conferred upon, all street railway companies, including every kind of street railway, suburban street railway, or interurban street railway, whether their lines of railway are to be and are maintained either at the surface or above or below the surface of the earth, and by whatever power their vehicles are to be and are transported, and upon all companies, duly authorized to become the lessees or operators of such railways, heretofore or hereafter incorporated, under the laws of this commonwealth, even though the said street railway companies may have been heretofore restricted as to the kind of power to be employed, or in such transportation or may have been forbidden to transport freight or other property." In conclusion the bill provides that the transportation of express matter by trolley companies shall be subject to reasonable regulations of the local authorities, and that these regulations shall be subject to the supervision of the courts.

Electric Freight Rights Granted.—The Massachusetts railroad commission has granted certificates of public necessity and convenience for the carrying of freight to the Blue Hill Street Railway, the Newton & Boston Street Railway and the Newton Street Railway.

Wage Increases.—The Chicago South Bend & Northern Indiana Railway of South Bend, Ind., has announced an increase in wages for conductors and motormen from 17½ to 19 cents per hour.—The Grand Rapids (Mich.) Street Railway has increased the wages of its conductors and motormen from 18, 19 and 20 cents per hour to 20, 21 and 22 cents per hour, according to length of service.—The Columbus Railway & Light Company has increased the wages of its conductors and motormen ½ cent per hour.—The Louisville & Northern Indiana Traction Company and the Louisville & Northern Railway & Lighting Company have announced an increase of wages for conductors and motormen, effective on May 1. The men on the interurban and suburban lines will receive 20 cents per hour for the first two years and 22 cents per hour thereafter. The men employed on the city lines will receive 17½ cents per hour for the first two years and 19½ cents thereafter.

Construction News

RECENT INCORPORATIONS.

Blue Valley Railway Company.—Incorporated in Missouri to build and operate an electric railway. Capital stock, \$100,000. Incorporators: Alexander Massey, John Georgen, Edwin L. Browne, Joseph S. Chick, Jr., and Willard E. Winner.

Carlyle & St. Louis Railway.—Incorporated in Illinois to extend the East St. Louis & Suburban Railway system from Lebanon, Ill., eastward to Carlyle, Clinton county, 25 miles. The road will parallel the Baltimore & Ohio Southwestern from East St. Louis to Carlyle, with principle office at Carlyle. Capital stock, \$5,000. Incorporators: Thomas E. Ford, Carlyle; J. C. Eisenmayer, Trenton; B. H. Helmann, Aviston; August J. Kluthe and Henry Hu-mert, Breese, Ill.

Greenfield Bernardston & Northfield Street Railway.—Incorporated in Massachusetts to build an electric railway from Greenfield to Northfield. Capital stock, \$75,000. Incorporators: John Wilson, Lester A. Luey and Archibald D. Flower of Greenfield; John W. Chapin and Everett E. Benjamin of Bernardston; and Charles H. Webster of Northfield.

Tampa & West Coast Railway.—Incorporated in Florida to build a railway, probably an electric one, from Tampa to Clearwater and St. Petersburg, Fla., about 40 miles. A franchise has been secured from the county commissioners. Capital stock, \$300,000. Incorporators: J. N. Holmes, C. B. Ware and J. Craig Phillips of Tampa, Fla.

Waterbury & Milldale Tramway Company.—Incorporated in Connecticut with \$300,000 capital stock to build an electric railway through Waterbury, Wolcott, Cheshire and Southington.

Windsor Locks & Western Street Railway.—Incorporated in Connecticut with \$100,000 capital stock to build an electric railway from Windsor Locks to East Granby.

FRANCHISES.

Cheyenne, Wyo.—Parks Bros., bankers, of Kansas City, Mo., have applied for a franchise to build an electric street railway system through the business section of Cheyenne. They agree to have the line in operation inside of 90 days and have deposited a certified check of \$10,000 as a guarantee to carry out the agreement.

Decorah, Ia.—The Minneapolis Rochester & Dubuque Traction Company, at a special election on April 12, was granted a franchise for the use of several streets in Decorah. The line must be in operation within two years. William P. Mason, secretary, Minneapolis, Minn.

Elkins, W. Va.—The city council has granted a franchise to the Elkins Electric Railway, which proposes to build a street railway in Elkins. The company has deposited a bond of \$5,000 to insure the completion of the line in 12 months. C. W. Maxwell of Elkins is interested.

Galena, Kan.—The Southwest Missouri Railroad of Webb City, Mo., through A. H. Rogers, president, has applied for a franchise for an outlet from Galena for a line to Baxter Springs, Kan.

Hamilton, O.—The Cincinnati Northern Traction Company has secured a franchise from the county commissioners to take up its old tracks between Hamilton and Middletown and lay a new double-track line between the two cities.

Kansas City Springfield & Southern Traction Company.—This company, which proposes to build an interurban line from Nevada to Springfield and other points, is seeking right of way from Carthage to the county line, about 20 miles.

Lima, O.—A franchise has been granted by the county commissioners to the Indiana Columbus & Eastern Traction Company for the operation of its Lima-Bellefontaine extension in Allen county.

Milwaukee, Wis.—A franchise has been granted to the Chicago & Milwaukee Electric Railroad for the use of Wells street as far east as Second street for the operation of its cars. This is an amended franchise to one granted to the company about a year ago and some opposition was raised on the ground that the "exclusive right" clause in the franchise would bar other companies from entering Milwaukee over the viaduct. As the railroad company will pay \$80,000 for the construction of the viaduct it refused to accede to the demand that a competing company be allowed to use the same tracks. The franchise finally was passed with two amendments regarding the opening of two streets to other lines, provided these lines give the Chicago & Milwaukee company reciprocal rights or pay a reasonable sum for the use of the tracks.

Mt. Vernon, O.—The 25-year extension to the franchise of the Mt. Vernon Electric Railway, which recently was granted by the city council, has been vetoed by the mayor on the ground that provision regarding payment by the company to the city for this privilege has been omitted in the instrument.

Sapulpa, I. T.—Schmidt & Reynolds have been granted a franchise for an electric line from Sapulpa to the oil fields, eight miles.

Silvis, Ill.—A 50-year franchise has been granted to the Moline Rock Island & Eastern Traction Company for a single or double track line in Silvis. Four months' time is allowed in which to

finish laying the tracks after acceptance of the franchise. The rails already have arrived in readiness to begin construction work.

TRACK AND ROADWAY.

Ardmore Street Railway.—Work has begun on the construction of the street railway in Ardmore, I. T.

Asheville & Hendersonville Railroad.—C. F. White, Skyland, N. C., writes that this company proposes to build an electric railway from Asheville to Hendersonville, N. C., 22 miles. Surveys are being made. C. E. Van Bibber, 60 Wall street, New York, chief engineer.

Atlanta Buford & Gainesville Railway.—H. D. Jaquish of Gainesville, Ga., president, states that work will begin this summer, probably in June, on the proposed line to connect Atlanta, Norcross, Buford, Cumming and Gainesville, Ga., which will be about 80 miles long.

Augusta & Columbia Railway.—James U. Jackson, vice-president, states that the surveys for this line from Aiken, Ga., to Columbia, S. C., 59 miles, have been completed and it is proposed to begin construction at once. J. A. Wills of Augusta is chief engineer.

Barberton Doylestown & Orrville Railway.—It is reported that Cleveland capitalists have signed a contract to finance and build this proposed line from Barberton to Orrville, O. The cost is estimated at \$400,000 and the work is to be completed in 18 months.

Bath Branchport & Hornell Electric Railroad.—A hearing on the application for a certificate of necessity to build this road from Bath to Branchport, N. Y., was held on April 9 before the New York railroad commission. Among the witnesses were John F. Tuerk, president, and Fred Hastings of Bath, secretary. Several business men of towns on the proposed route testified as to the necessity of the road. The hearing was adjourned until April 23.

Baton Rouge Electric & Gas Company.—Work on the reconstruction of this property has been started by Stone & Webster of Boston, Mass. The entire line of about four miles is to be rebuilt with 90-pound rails and several extensions will be built.

Bayou Teche Railway & Light Company, New Orleans, La.—Surveys have begun for the street railway in New Iberia, La., and the interurban line to Jeanerette. H. R. Fine of New Orleans, who will have charge of the construction work, has announced that all of the construction material has been ordered and that work will begin at once. P. M. Schneidau, New Orleans, is president.

Beaumont, Tex.—An engineer named Sanders, representing Ft. Worth interests, is reported to have completed surveys for an electric line from Beaumont to Port Arthur, Tex., 19½ miles.

Belmont Electric Railway.—The Riggs & Sherman Company of Toledo has been engaged to make surveys and estimates for this proposed line from St. Clairville, O., to Wheeling, W. Va.

Buffalo & Rochester Traction Company.—The application of this company for a certificate of public necessity for its line from Buffalo to Batavia and Rochester, N. Y., has been denied by the state railroad commission, on the ground that the territory is now adequately provided with transportation facilities. The company has already secured much of the right of way for the line and, it is stated, will probably appeal to the appellate division of the supreme court.

Buffalo Lockport & Rochester Railway.—Paul Iglehart, division superintendent for J. G. White & Co., who has a contract for building this road between Rochester and Lockport, N. Y., 54 miles, writes that two-thirds of the roadbed has been completed and 10 miles of track laid. The route includes South Greece, Spencerport, Brockport, Holley, Albion, Knowlesville, Medina and Middleport. The overhead construction will be of the span type in towns and of the center pole type outside of towns. Five substations and one car barn are now under construction. The power house will be of 3,200 kilowatts capacity, generating 60,000-volt, 3-phase, 25-cycle current. Maximum grade, 1½ per cent; maximum curvature, 7 degrees; weight of rails, 70 pounds. All contracts have been let. C. B. Hill, Buffalo, N. Y., president; Edmund Wragge, Toronto, Can., chief engineer. The headquarters are at Toronto, Can.

Charleston & Summerville Electric Railway.—The first 15 miles of the grading on this line from Charleston to Summerville, S. C., has been graded ready for tracklaying. The site for the power house has been selected and work on the foundations is to begin in a few days.

Chicago & Milwaukee Electric Railroad.—The MacArthur Brothers Company of Chicago has been awarded a contract for some very heavy steam shovel work near Milwaukee, Wis. The work is being commenced and is expected to last all season. Thomas Dixon, Lake, Wis., is superintendent for the contractors.

Chicago South Bend & Northern Indiana Railway.—It is reported that Henry Schaal, right of way agent, has secured about three-fourths of the right of way for the line between South Bend and Michigan City, Ind. The route as finally selected runs about five miles north of Laporte.

Cincinnati Northern Traction Company.—Judge Murphy of Hamilton, O., has handed down two decisions in suits brought to determine the manner in which the company shall cross the tracks of the Pennsylvania and the Cincinnati Hamilton & Dayton at Coke Otto and north of Trenton on its new route between Hamilton and Middletown, O. The court decided that overhead crossings should be built and ordered that the expense, amounting to \$40,000,

be divided equally between the companies affected, but assessed the cost of maintenance on the traction company.

Citizens' Railway, Lincoln, Neb.—This company expects to build about seven miles of extensions within the city limits of Lincoln, Neb., besides an interurban line to Havelock, about 4½ miles. Work on the city lines has already been started.

Columbus & Northern Traction Company.—This company, which has purchased the Columbus Urbana & Western Electric Railway, which has a line about eight miles long, running north out of Columbus, O., will soon begin making surveys for an extension north to Lima or Bellefontaine. W. H. Ogan of Indianapolis is interested.

Columbus, O.—Work has been started on the electric road which S. B. Hartman is building from South Columbus to his stock farm, south of the city. A large force of men has been put to work and it is expected that construction will proceed rapidly.

Corbin & Nashville Railroad, Somerset, Ky.—It is reported that this company has let contracts for building the line from Tateville to Monticello, 25 miles, and that work will start in the near future.

Denver, Colo.—It is reported that St. Louis, Mo., capitalists are interested in a proposed road to connect Denver and Colorado Springs, Colo., and that as soon as arrangements can be made for a connection with the Denver City Tramway a franchise will be applied for.

Des Moines Winterset & Creston Electric Railway.—It is now stated that 90 per cent of the right of way has been secured for this line from Des Moines to Creston, Ia., and that financial arrangements are being made with the expectation of beginning construction by June 1. B. Schreiner, Des Moines, chief engineer.

Duluth, Minn.—It is reported that an electric railway is being promoted to connect Duluth with Ft. Frances, New Ontario, on the Rainy river.

East Shore & Suburban Electric Railway, Martinez, Cal.—This company has commenced the extension of its line along the Bay shore to Point Orient. It is stated that the road will be in operation within 90 days.

Ellwood City & Hazel Dell Railway.—C. J. D. Strohecker, president, Zellenople, Pa., writes that this company, recently incorporated, proposes to build an electric line from Beaver Falls to Ellwood City and New Castle, Pa., 20 miles. The preliminary arrangements are now being made. George B. Nye of Zellenople, secretary.

Elmira Corning & Waverly Railroad.—G. Tracy Rogers of Binghamton, N. Y., president, is quoted as saying that the line will be completed between Elmira and Waverly by June 1 provided the company is successful in securing the remainder of the right of way. Work on the line between Elmira and Corning has been discontinued, for the reason, it is stated, that the status of public service corporations under the proposed "public utilities" bill is too uncertain to permit of further expenditures of capital.

Enumclaw, Wash.—Surveys are being made for an electric line from Enumclaw to Auburn, Wash. S. Knickerbocker and J. J. Smith are interested.

Evansville, Ind.—Tillman Bethell of Henderson, Ky., is said to be interested in two proposed lines from Evansville, one to Uniontown, Ky., and one to Owensboro, Ky.

Ft. Smith (Ark.) Light & Traction Company.—This company has recently completed an extension on Catholic avenue to Hawthorne place.

Fresno Traction Company.—This company is reported as planning to build five or six miles of extensions in different parts of Fresno, Cal.

Helena Light & Railway Company.—A carload of steel rails has arrived from the Carnegie Steel Company, which will be used in extensions on State and Lawrence streets, Helena, Mont. This is the first shipment of a large order of rails.

Henderson Traction Company.—This company, recently incorporated to build street railways in Henderson, Ky., has organized by electing the following officers: President, Henry P. Barret; vice-president, J. Henry Lyne, and secretary and treasurer, Charles E. Dallam, all of Henderson. The directors are: Henry P. Barret, J. Henry Lyne, C. E. Dallam and B. G. Witt of Henderson; C. C. Tennis, Pittsburg; C. A. Hinch and W. F. Boyd, Cincinnati.

Honesdale & Hawley Electric Railway.—Surveys are being made for this line from Honesdale to Hawley, Pa., via White Mills.

Illinois Traction Company.—Tuttle Brothers of Decatur, Ill., who recently were awarded the contract for the Springfield-Jacksonville line, have also been awarded a contract for the grading on the Decatur belt line, which is to be built this summer. The first of the material for the new bridge over the Sangamon river east of Decatur, on the Champaign-Decatur line, has been delivered by the Decatur Bridge Company. The bridge will have four spans, each 45 feet in length, and two spans, each 20 feet in length. A deep cut will be made between the bridge and Decatur.—General Manager L. E. Fischer of Danville has announced that the line between Lincoln and Mackinaw will be built next and will be completed by fall.—It is expected that a meeting of the directors will be held at an early date to determine upon plans for the bridge across the Mississippi to St. Louis. The plans for the location have not yet been approved by the secretary of war. It has been persistently reported during the past few days throughout the state that the company was planning a line from St. Louis to Kansas City. We are officially advised that the company has taken no action in regard to such a line.

Indiana Columbus & Eastern Traction Company.—Vice-president Norman McCl. Crawford and General Manager J. L. Adams recently inspected the route of the Bellefontaine-Lima extension and Mr. Crawford stated that construction would begin on May 1. All of the right of way has been secured and surveys have been completed. J. C. Carland of Toledo has the contract.

Indianapolis Newcastle & Toledo Electric Railway.—E. E. Stevens, secretary, announces that the exceptionally fine weather has advanced the completion of the line between Indianapolis and Newcastle at least one month. The roadbed is now ready for the ties and rails and the power house is almost completed. If equal progress is made during the next month the line will be in operation between Indianapolis and Newcastle by June 1. This line is being very carefully and substantially built and it is the purpose of the company to handle a heavy freight traffic.

Lewiston Augusta & Waterville Street Railway.—This company has let a contract to Gore Brothers of Boston, Mass., for the construction of nine miles of electric road from Sabattus to Mechanic Falls, Me., of 21 miles from Sabattus to Gardiner, and 21 miles from Augusta to Waterville, the construction of the last line to be conditional on the success of the company in securing right of way. The entire contract calls for the expenditure of about \$800,000.

Milwaukee Northern Railway, Port Washington, Wis.—W. A. Comstock of Detroit, president, states that the company expects to open its line between Milwaukee, Port Washington, Cedarburg and Grafton, Wis., on July 4.

Minster Loramie & Southern Railway.—The Riggs & Sherman Company of Toledo has been engaged to make surveys and estimates for this proposed line from Minster to Versailles, O., 16 miles. R. B. Anderson of Wapakoneta, O., is interested.

Mississippi Southern Railway, New Albany, Miss.—This company has employed a corps of engineers to make a survey of the proposed road from Gulfport to West Point.

Missouri Interurban Railway, Sedalia, Mo.—A contract has been awarded to the Bell Construction Company of Indianapolis, Ind., for building this line from Sedalia to Jefferson City, Mo., about 80 miles. Work is to begin on May 15 at Ottaville and will be pushed in both directions. J. D. Starke of Saleville, Mo., is president, and B. W. Colby, St. Louis, chief engineer.

Mountain Copper Company.—This company has just completed the construction of an electric railway line from Boulder, Colo., to the Hornet mine for the transportation of ore.

Niagara St. Catharines & Toronto Railway.—This company's extension from St. Catharines to Fonthill, Ont., 12 miles, was opened for traffic on April 15. The line will probably be extended to Welland and Ridgeville during the summer. E. F. Seixas, general manager, St. Catharines.

Northern Ohio Traction & Light Company.—The Barberton-Wadsworth line was formally opened on April 13.

Northwestern Ohio Electric Railway.—It is reported that preliminary agreements for the financing and construction of this line from Defiance to Montpelier, O., via Bryan, have been made and that contracts will be signed in a few days. The line will be 34 miles long and it is estimated will cost \$30,000 per mile. Construction is to begin on May 1. It is proposed to issue \$1,000,000 of bonds. The road is being promoted by E. C. Bell and J. W. Weadcock of Toledo; Mayor John Crowe, Dr. R. A. Rigrish and J. H. Hockman of Defiance. The home offices of the company will be at Defiance.

Omaha Lincoln & Beatrice Electric Railway.—Fifty carloads of rails are now being delivered for the tracklaying between South Omaha and Sarpy City, Neb. The grading on this section has already been completed.

Parkersburg Marietta & Interurban Railway.—It is reported that this company, which now connects Parkersburg, W. Va., and Marietta, O., proposes to extend its line this summer up the Muskingum river, from Rainbow to Beverly. Surveys are being made. J. P. Horstman, chief engineer, Parkersburg.

Petersburg, Va.—A movement is on foot and a committee has been appointed to secure funds for building an electric railway connecting the Norfolk & Portsmouth Traction Company's lines with the Richmond & Petersburg Electric Railway.

Philadelphia & Western Railroad.—It is stated that arrangements are being made to turn over this road to the operating department about May 1. The road extends from a connection with the Philadelphia Rapid Transit Company's elevated line at Sixty-third and Market streets, Philadelphia, to Wayne, Pa.

Pittsburg & Butler Street Railway.—This line was completed from Butler as far as Etna, Pa., on April 12. The road will soon be in operation between Pittsburg and Butler.

Puyallup Valley Northern Transit Company.—The Continental Engineering-Constructing Company, 50 Broadway, New York, has been awarded the contract for building this line from Tacoma to Seattle, Wash. The officers of the company are: President, Fred J. Chamberlain; secretary, John Mills, both of Puyallup, Wash., where the offices of the company are located.

Rochester Corning & Elmira Traction Company.—President Meders has announced that work on this line from Rochester to Elmira, N. Y. will begin in 60 days. It is now planned to build a branch from Dansville to Hornell.

Salem Street Railway.—Judge Harter of Salem, O., has denied an injunction applied for by property owners on Broadway to

restrain the Salem Street Railway from operating cars on Broadway under a franchise owned by the Youngstown & Ohio River Railroad. It is stated that the case will be appealed to the circuit court. If the decision is sustained the Salem Street Railway will form a link in the Youngstown & Ohio River line from Youngstown to East Liverpool.

Schoenectady (N. Y.) Railway.—This company expects to open its line between Saratoga and Ballston, N. Y., on June 1.

Silver Belt Electric Railway.—This company has been organized at Montreal, Que., and proposes to build an electric line from Latchford to Cobalt, Halleybury and New Liskeard. Branches will also be run into various mining camps. Harvey Graham is president and Mr. A. J. Young one of the directors.

South Bethlehem & Saucon Street Railway.—This company, which, it is stated, will soon begin work on its line from South Bethlehem to Center Valley, Pa., has elected officers as follows: President, Charles P. Hoffman of South Bethlehem; and directors, William H. Lauer of South Bethlehem, O. H. Wieand, Thomas Mulligan, P. F. Cannon of Allentown, and C. P. Hoffman of South Bethlehem.

Southern Illinois Traction Company.—This company, which has located an electric railway from Murphysboro, Ill., through the coal belt, touching Carbondale, Herrin and Johnson City, has awarded a contract for building the line between Herrin and Johnson City to McCann Brothers. Work is to begin May 1.

Springfield (Mass.) Street Railway.—It is reported that this company will spend \$60,000 in laying double tracks and making other improvements in Long Meadow, Mass.

Toledo & Indiana Railway.—The circuit court at Auburn, Ind., on April 9 decided a suit involving a dispute between this company and the Toledo & Chicago Interurban Railway Company, in regard to the ownership of a right of way between Waterloo and Butler, Ind., in favor of the Toledo & Chicago. Following this decision it is reported that the company has made arrangements with the St. Joe Valley Railway, a projected road which has secured a right of way from Butler to Robinson Park, about 10 miles north of Ft. Wayne, whereby the latter company will build the road and make a traffic agreement with the Toledo & Indiana Railway.

Union Traction Company of Kansas.—Work has been commenced on the stringing of the trolley wire between Independence and Coffeyville, Kan., and only about six miles of rails remain to be laid. The line is expected to be in operation by June 1. D. H. Siggins, president, Independence, Kan.

United Railways of St. Louis.—This company has started work on 20 miles of proposed reconstruction work in St. Louis.

Washington Railway & Power Company.—This company has ordered five miles of 60-pound rails for the first part of the street railway in Vancouver, Wash. The company also proposes to build an extensive system in the vicinity of Vancouver, including lines to Washougal and to Proebstel, which are to be built as soon as the city line is complete. W. H. Moore of Portland, president.

West Chester (Pa.) Street Railway.—This company will rebuild all of the overhead work on its line through Coatesville, Pa., and work is to begin at once. The material is on hand.

Winona Interurban Railway.—The Whitley (Ind.) county commissioners have authorized an election for May 7 for the purpose of voting on a subsidy of \$30,000 for the projected line from Winona to Ft. Wayne.

York County Traction Company.—Plans have been completed for the construction of the proposed extension from York to Hanover, Pa., about 20 miles. The contract for building the line from Bear's Station to Hanover, 15 miles, has been let to Dodge & Day of Philadelphia, and for the section from Bear's Station to York, five miles, to John L. Dobbins of York. W. F. Bay Stewart of York is president; L. C. Mayer of York, chief engineer.

POWER HOUSES AND SUBSTATIONS.

Bay City (Mich.) Traction & Electric Company.—It is announced that this company will spend about \$125,000 to build a new power house, which will be fitted with steam turbines, boilers and all necessary auxiliary machinery.

Denver City Tramway.—This company has placed an order with the Westinghouse Electric & Manufacturing Company for a 2,000-kilowatt turbine unit, to be erected about July 1.

Grays Harbor Railway & Light Company.—It is announced that this company began the work of clearing the site for its new power house at Hoquiam, Wash., on April 10. The cost of the power house will be about \$200,000. Details of the equipment have been given in a previous issue.

Indiana Columbus & Eastern Traction Company.—It is reported that this company is preparing to build two new substations, one at Etna, Ind., and the other on Licking switch.

Montreal Street Railway Company.—This company, it is announced, has placed an order with the Canadian General Electric Company for three storage battery units, to be installed at the St. Henri, St. Denis and Maisonneuve substations. These batteries are at present being installed and it is believed that they will have a marked influence on improving the street railway facilities, as well as reducing the cost of operation of the plants.

Personal Mention

Mr. W. K. Ball has resigned as superintendent of shops of the Tacoma Railway & Power Company, Tacoma, Wash., to engage in other business.

Mr. A. J. Connelley has been appointed chief inspector of the Louisville (Ky.) Railway Company, succeeding Mr. Frank M. Tucker, resigned on account of ill health.

Mr. J. F. Heyward has resigned as manager of the Cincinnati Traction Company to become president and general manager of the Citizens' Traction Company, Oil City, Pa.

Mr. J. W. Parker, who has been connected with the Springfield Troy & Piqua Railway, Springfield, O., since its organization, has resigned his position as superintendent to engage in other business.

Mr. William H. Brown, secretary and treasurer of the Springfield Consolidated Railway, Springfield, Ill., has been appointed secretary of the Peoria (Ill.) Gas & Electric Company, succeeding Mr. J. M. Robb, resigned.

Mr. Samuel Cross has resigned as superintendent of repairs and tests of the Interborough Rapid Transit Company, New York, to devote his time to the Cross-Lachance Electric Company, of which he is president and general manager.

Mr. S. L. Vaughan, whose photograph is presented herewith, has been appointed traffic manager of the Grand Rapids Grand Haven & Muskegon Railway, with headquarters at Grand Rapids,



S. L. Vaughan.

Mich., as reported in the Electric Railway Review of April 6, 1907. Mr. Vaughan, who is now 42 years of age, is a graduate of the Plattsburg, N. Y., high school. In 1881 he removed to Michigan, and after learning telegraphy, became an employe of the Chicago & West Michigan Railway, with which company he remained in various capacities for 20 years. In 1901 he was appointed Michigan agent for the Barry Transportation Company, operating a line of steamers on Lake Michigan, between Muskegon, Grand Haven and Chicago, with office at Grand Rapids, Mich. In the spring of 1902 he was appointed general freight and passenger agent of that company, with office in Chicago. In April, 1906, he was appointed auditor and general accountant of the Grand Rapids Grand Haven & Muskegon Railway, which operates a system of about 50 miles, connecting the cities named in the title, and handles through freight to Chicago in connection with the Goodrich Transportation Company. His appointment as traffic manager becomes effective on April 15.

Miss R. Boydland has been appointed general accountant for the Grand Rapids Grand Haven & Muskegon Railway, Grand Rapids, Mich., succeeding Mr. S. L. Vaughan, recently appointed traffic manager. Miss Boydland entered the service of the company about three years ago as stenographer.

Mr. E. V. McGrath has resigned as assistant general passenger and freight agent of the Toledo Urban & Interurban Railway, with headquarters at Bowling Green, O. Until October, 1906, Mr. McGrath was soliciting freight and passenger agent of the Indiana Columbus & Eastern Traction Company at Springfield, O.

Mr. Blaine Gavett of Saginaw, Mich., effective on April 15, was appointed superintendent of the Kalamazoo Lake Shore & Chicago Railway of Kalamazoo, Mich. Mr. Gavett formerly was connected with the passenger department of the Pere Marquette at Detroit and more recently with the Saginaw division of that road as trainmaster.

Mr. Frank M. Tucker has resigned his position as chief inspector of the Louisville (Ky.) Railway on account of ill health, effective on April 1. Mr. Tucker has been connected with the company for more than 30 years, 20 of which have been spent as inspector and chief inspector. Mr. Charles C. Ostrander, formerly assistant to Mr. Tucker, will be his successor.

Obituary.

James H. Eckels, one of the receivers of the Chicago Union Traction Company, died in Chicago on April 14. At the time of his death Mr. Eckels was president of the Commercial National Bank of Chicago, a director of the Chicago Union Traction Company and of the Allis-Chalmers Company, besides being prominently connected with various financial institutions. In 1893 he was appointed comptroller of the currency of the United States under President Cleveland.

Financial News

Boston Elevated Railway.—This company has filed a petition with the Massachusetts railroad commissioners for approval of an issue of \$5,800,000 bonds. The proceeds of the bonds will provide funds for construction, equipment and the purchase of real estate. The company has also asked for authority to issue \$8,000,000 additional capital stock to meet the cost of construction and equipment of the new Cambridge subway.

Central California Traction Company, San Francisco.—The California Safe Deposit & Trust Company of San Francisco offers the first mortgage 5 per cent bonds of this company at 97½ and interest. The bonds are due on April 1, 1936. Of the total issue of \$1,500,000 there have been issued \$500,000, and the balance are reserved for further extensions and improvements. A sinking fund is provided of \$15,000 annually for the first 10 years, \$30,000 a year for the ensuing 10 years and \$45,000 a year for the remaining four years. The company was organized, the circular says, to construct and operate an interurban system for passenger and freight traffic in the central valleys of California, having as its initial point the city of Stockton, thence extending north about 50 miles to Sacramento, forming the first division of the system. Franchises in the cities of the system run for 50 years. All rights of way, other than those obtained in the cities, are the company's private property. The company's line in Stockton is finished and in operation, and consists of 10 miles of track, with 65-pound steel rails, power houses and car barns. About a mile of track has been graded in a northerly direction toward Lodi, outside of the city limits. This has been installed at an approximate cost of \$200,000, paid for by stockholders. The company now proposes to construct the road to Lodi, 14 miles from Stockton. The cost of this work and equipment will be about \$350,000. The electric power is furnished by the American River Electric Company, which is installed in Stockton and in Sacramento. It is expected by the company that freight and passenger traffic connections will be made with the Western Pacific Railway and the Atchison Topeka & Santa Fe.

Cincinnati Northern Traction Company, Cincinnati.—The annual report for 1906 compares as follows:

	1906.	1905.	1904.
Gross earnings	\$1,027,728	\$847,229	\$703,796
Expenses, construction, etc.....	799,603	764,819	655,864
Net earnings	\$ 228,125	\$ 82,410	\$ 47,932
Other income	463	122	93
Total	\$ 228,588	\$ 82,532	\$ 48,025
Charges	95,892	77,860	79,926
Surplus	\$ 132,696	\$ 4,672	*\$31,901

*Deficit.

Cleveland (O.) Electric Railway.—The directors have declared a quarterly dividend of three-fourths of 1 per cent on the \$23,400,000 capital stock. In 1906 quarterly dividends of 1¼ per cent were paid. From 1901 to 1905 the rate was 4 per cent per annum. The reduction is attributed to the decrease in earnings resulting from the company's experiment in selling seven tickets for 25 cents, which has now been abandoned.

Columbus Delaware & Marion Railway, Columbus.—At the annual meeting of stockholders at Columbus on April 16 the following directors were elected: John G. Webb of Springfield, O.; George H. Holzbog of Jeffersonville, Ind.; O. M. Gottschall of Dayton, O.; N. J. Catrow of Miamisburg, O., and H. B. Hanc of Marion, O.

Coney Island & Brooklyn Railroad.—The New York railroad commission, in granting authority to this company to increase its capital stock from \$2,000,000 to \$3,500,000, stipulated that only \$1,000,000 of the new stock may be issued without further action of the commission. The proceeds of the new issue will be applied to improvements.

Galveston (Tex.) Electric Company.—The annual report of this company, which has been filed with the secretary of the city of Galveston, shows that the gross receipts in 1906 from fares and sale of tickets were \$274,459. From light there was received \$36,107; from power, \$3,568, and from other income, \$900. The agreement between the company and the city of Galveston provides that whenever the gross income of the company from passenger fares and tickets shall amount to \$300,000 per annum or over, the city shall have the right to pass appropriate ordinances requiring the railway company to furnish transfers to passengers who may be compelled to use two lines of the company in order to reach their destinations.

Hudson (N. H.) Pelham & Salem Electric Railway.—A decree of foreclosure and sale against this company under a suit started by the New York Trust Company, as trustee of the first mortgage bonds, was entered at Concord, N. H., on April 8 by Edgar Aldrich, judge of the United States circuit court. The company is controlled by the New Hampshire Electric Railways Company.

Kalamazoo Lake Shore & Chicago Railway, Kalamazoo, Mich.—This company has leased from the Pere Marquette Railroad for 25 years from April 15 the South Haven & Eastern branch, extending from South Haven to Lawton, Mich., a distance of 37 miles. The rental is \$1,500 a month for the first five years and increases for the balance of the term. The lessee pays all taxes and maintenance charges. The Kalamazoo Lake Shore & Chicago was completed in 1906 from Kalamazoo to Paw Paw, Mich.

Lewiston (N. Y.) & Youngstown Frontier Railway.—A majority

of the \$134,000 capital stock of this road has been acquired by the Niagara Gorge Railroad Company of Niagara Falls, which has operated the road under a short-term lease.

Louisville (Ky.) Traction Company.—At the meeting of stockholders of this company in Jersey City on April 13 an increase in the common capital stock from \$12,000,000 to \$15,000,000 was authorized.

Pittsfield (Mass.) Electric Street Railway.—This company has been given authority by the Massachusetts railroad commission to issue \$100,000 first mortgage 4 per cent bonds, due on July 1, 1923. The proceeds will be used to retire floating debt and for new construction.

Puget Sound Electric Railway, Tacoma, Wash.—A new issue of \$1,000,000 convertible 5 per cent notes, dated on February 1, 1907, and due February 1, 1912, has been authorized, and \$500,000 of the notes are offered by Boston bankers at 94¾ and interest, yielding about 6¼ per cent. The notes are convertible at par from February 1, 1909, at the option of the holder into 6 per cent preferred stock.

Rutland (Vt.) Railway, Light & Power Company.—The following report is made of operations for the year ended on March 31, 1907, of the Rutland Street Railway, which is controlled by this company:

	March 31, 1907.	March 31, 1906.	Increase.
Gross earnings	\$105,154	\$93,726	\$11,428
Operating expenses	56,003	55,370	633
Net earnings	\$ 49,151	\$38,356	\$10,795

Terre Haute Indianapolis & Eastern Traction Company, Indianapolis.—This company has given a trust deed to the Fidelity Trust Company of Philadelphia, trustee, to secure an issue of \$10,000,000 bonds, maturing on April 1, 1932. The company has formally acquired the property of several of the constituent companies, as contemplated in the plan outlined in the Electric Railway Review of March 30, 1907, page 440. The property of the Indianapolis Coal Traction Company, the Indianapolis & Western Railway and the Indianapolis & Eastern Railway was purchased. The property of the Indianapolis & Northwestern Traction Company and the Indianapolis & Martinsville Rapid Transit Company was leased for 999 years. The Indianapolis & Northwestern Traction Company has outstanding \$2,470,000 bonds out of \$3,000,000 authorized, and \$450,000 preferred stock out of \$1,000,000 authorized. The new company assumes the payment of 5 per cent interest on bonds, and also 6 per cent dividends on the preferred stock, payable quarterly, beginning in June, 1908. On the \$750,000 outstanding bonds of the Indianapolis & Martinsville Rapid Transit Company the new company guarantees 5 per cent interest.

United Railroads of San Francisco.—The Wall Street Journal publishes the following statement concerning the cost of betterments and improvements: "Telegraphic advices from the United Railroads of San Francisco state that the company has had to face an expenditure due to the earthquake and strike and for betterments and improvements from March 1, 1906, to March 1, 1907, amounting to \$4,294,271. This had all been provided for, so that the company on March 1, 1907, had current liabilities amounting to \$2,310,209, against which it had current assets of \$2,177,410. In addition to this it had sold securities which were delivered in March that netted it an amount in excess of \$900,000, and still left in its treasury over \$2,500,000 of its 4 per cent consolidated bonds. It is claimed that by the sale of securities the \$4,294,271 above mentioned has been provided at a cost not exceeding 5 per cent interest."

West Shore Traction Company.—The New York state railroad commission has given authority to this company to increase its capital stock from \$2,500,000 to \$5,000,000 and to issue \$900,000 first mortgage bonds. The company will build an electric road from Carteret, N. J., to Tompkin's Cove, N. Y.

Winnipeg (Man.) Electric Railway.—The earnings for the year 1906, with a comparison, are as follows:

	1906.	1905.
Gross earnings	\$1,416,305	\$1,119,768
Net earnings	714,341	544,021
Fixed charges	251,038	119,570
Dividends	248,668	200,000
Balance	214,635	194,451
Total surplus	761,538	546,052
Passengers carried	17,229,554	13,081,249
Capital stock outstanding on December 31	\$4,575,200	\$4,000,000
Bonds outstanding	5,400,000	3,500,000
Due Bank of Montreal	331,912	918,904

Dividends Declared.

- Cleveland (O.) Electric Railway, quarterly, three-fourths of 1 per cent.
- Columbus (O.) Railway, preferred, quarterly, 1¼ per cent.
- East St. Louis (Ill.) & Suburban, preferred, quarterly, 1¼ per cent.
- Grand Rapids (Mich.) Railway, preferred, quarterly, 1¼ per cent.
- Milwaukee Electric Railway & Light Company, preferred, quarterly, 1½ per cent.
- Twin City Rapid Transit Company (Minneapolis), common, quarterly, 1¼ per cent.
- West Penn Railways (Pittsburg), preferred, quarterly, 1¼ per cent.

Manufactures and Supplies

ROLLING STOCK.

Southern Street Railway, Chicago, is figuring on a number of new cars.

Iowa & Illinois Railway, Clinton, Ia., is considering the purchase of one additional freight car.

Schenectady Railway, Schenectady, N. Y., is reported as contemplating the purchase of 16 large cars.

Sacramento Electric Gas & Railway Company, Sacramento, Cal., is building 14 cars at its Sacramento shops.

Waterloo Cedar Falls & Northern Railway, Waterloo, Ia., is asking prices on six new open cars for early delivery.

El Paso Electric Railway, El Paso, Tex., has placed an order for four interurban cars and four open cars for delivery about June 1.

Douglas Street Railway, Douglas, Ariz., recently placed an order with the American Car Company for two 38-foot semi-convertible cars.

Southeastern Ohio Railway Light & Power Company, Zanesville, O., has ordered one work car from the Jewett Car Company. This will have a 4-motor equipment.

Oregon Water Power & Railway Company, Portland, Ore., has under construction at its Portland shops 10 box cars, to be 40 feet in length and with a capacity of 50,000 pounds.

Sioux City Traction Company, Sioux City, Ia., as reported in the Electric Railway Review of February 9, is erecting six summer cars at its shops. They are to have 20-foot bodies, 5-foot 9-inch vestibules and are to be 8 feet wide. The cars will be mounted on Taylor trucks.

Gulfport & Mississippi Coast Traction Company, Gulfport, Miss., has ordered three 25-foot vestibule semi-convertible cars and two 40-foot trailers from the American Car Company, for delivery about June 15. The trailers will contain 15 seats and all cars will be mounted on Brill 27-GI trucks.

San Antonio Traction Company, San Antonio, Tex., has placed an order with the G. C. Kuhlman Car Company for 10 semi-convertible cars, 40 feet long over vestibule, with a seating capacity of 40 passengers, to be equipped with 4 GE-54 motors, to be used for city service and for delivery on August 1.

Erie Cambridge Union & Cory Railway, Erie, Pa., as reported in the Electric Railway Review of April 13, is preparing plans and specifications for new cars and equipment, and will make purchases about July 1. The building and equipping of this road is being handled by the Van Bibber Company, 60 Wall street, New York.

Omaha & Council Bluffs Street Railway is building at its Omaha shops eight summer cars for use on its lines. These cars, which have already been framed, are 46 feet 6 inches over bumpers and 7 feet 10½ inches wide over sills. The body of the cars are 34 feet 6 inches long. The cars will replace the open cars having side steps formerly used by the company. They are to be inclosed by 18-inch sides, above which wire screens 3 feet high will be fastened. Entrance to the car will be made at the ends. This is the first effort the company has made at manufacturing its own cars.

Trans-St. Mary's Traction Company, Sault Ste. Marie, Ont., as reported in the Electric Railway Review of April 6, has ordered from The J. G. Brill Company two semi-convertible type cars, to have bodies 38 feet 8 inches long and 41 feet 9 inches over all. These will be equipped with type GE-67 motors and with the General Electric Company's type K-28 controllers. The trucks will be of the Brill type 27-G, Providence fenders, and will be heated with the Consolidated Car Company's system of electric heating. The cars are designed for city service and will be equipped with double trolleys.

Chicago Lake Shore & South Bend Railway, South Bend, Ind., has just placed an order with the Niles Car & Manufacturing Company for 24 heavy interurban coaches, to be 57 feet long over all and 10 feet wide. Fifteen of the cars are the exclusive passenger type, with passenger and smoking compartments, and nine cars are combination passenger, smoking and baggage cars. These cars will be equipped with Baldwin class 90-35 heavy trucks, with 38-inch M. C. B. section steel-tired wheels and Westinghouse No. 148 A. C. motors, geared to 75 miles per hour. The passenger cars are for delivery in the spring of 1908 and the combination cars for delivery this fall. An interesting feature of the cars is their dimensions, which fit them for operation over steam roads.

SHOPS AND BUILDINGS.

Coal Belt Electric Railway, Marion, Ill.—The city council of Herrin, Ill., has passed an ordinance vacating some property on East Walnut street so that the company may erect thereon an interurban passenger station.

Fresno Traction Company.—It is reported that this company will erect a car house with a capacity for about 30 cars, also a paint and machine shop, at Fresno, Cal.

Shreveport Traction Company.—This company is now building

a fireproof brick and concrete car house to cost \$25,000. The dimensions of the building are to be 120 by 160 feet.

TRADE NOTES.

Lackawanna Steel Company occupied its new offices on the eighteenth floor of the United States Express building, 2 Rector street, New York, on Saturday, April 13.

Browning Engineering Company, Cleveland, has removed its Chicago offices from the Monadnock block to room 1506 Fisher building, instead of room 1006, as previously reported.

Green Engineering Company will on May 1 move its Chicago office from the Western Union building to the Commercial National Bank building. The Pittsburg office has been moved from the Lewis building to the Farmers' Bank building.

L. F. Purtil, who has for many years represented the Westinghouse Air Brake Company at Buffalo, N. Y., has been appointed representative of the New York Belting & Packing Company, with headquarters at 61-63 Chambers street, New York.

Ohmer Fare Register Company of Dayton, O., which recently enlarged the output capacity of its plant, reports a very large and rapidly growing increase in its business, and wishes to announce that every effort is being made to fill orders promptly.

Lord & Burnham Company, 1133 Broadway, New York City, has received an order from the Norfolk & Western Railway for the installation of its sash operating device in the Roanoke (Va.) shops of the company. The order calls for 7,000 feet and is for operating monitor and clear story sashes.

Brig.-Gen. Eugene Griffin, first vice-president and general sales manager of the General Electric Company, died very suddenly on the evening of April 10 at Schenectady, N. Y., of apoplexy. With his wife and daughter he had gone to Schenectady to witness



Brigadier-General Eugene Griffin.

an amateur play given by a local club, of which his son, Hancock Griffin, was a leading member. General Griffin was born at Ellsworth, Me., on October, 13, 1855, and was a little over 51 years of age. After receiving a preparatory school education he entered West Point and graduated in 1875 with high honors. Following his graduation he entered the engineer corps and obtained the rank of captain. From 1883 to 1885 he was professor of civil and military engineering and the art of war at West Point. He was then aide-de-camp on the staff of Maj.-Gen. Winfield Scott Hancock and later until the close of the year 1888 was chief of the engineering division of the Atlantic and the department of the East.

In 1889 he resigned from the army to take up electric engineering with the Thomson-Houston Electric Company as second vice-president. In 1881, when the Thomson-Houston Company was consolidated with the General Electric Company, he was elected first vice-president of the General Electric Company. In 1893 he was elected president of the Thomson-Houston International Electric Company, and was also director of that company. At the outbreak of the Spanish-American war, General Griffin offered his services to the United States and organized the First regiment, United States volunteer engineers, of which he became colonel. In January, 1899, he was promoted to brigadier-general, which rank he held to the end of the war. He was a prominent member of several clubs in New York City and was also a member of the Metropolitan Club of Washington, the Somerset of Boston, and the City Liberal Club of London. He held a membership in the more prominent of the engineering and army clubs.

Union Hardware Company, Torrington, Conn., has awarded the contract to Tracy Brothers Company, 52 Benedict street, Waterbury, Conn., for the erection of a new factory building. The main building will be 100 by 150 feet, two stories high and will have a three-story ell, 40 by 75 feet. The building was designed by Richard P. Jenks, Providence, R. I.

W. J. McBride, for the past seven years first vice-president and general manager of the American Car & Foundry Company, has resigned to accept the active management of the Haskell & Barker Car Company of Michigan City, Ind. Mr. McBride will assume his new duties on June 1. Edward F. Carry, second vice-president and manager of the Chicago office of the company, has been appointed first vice-president and general manager to succeed Mr. McBride, effective about May 1.

Green Fuel Economizer Company has removed its New York offices from 74 Cortlandt street to the new West Street building, 90 West street. The new offices of the company will be considerably larger and will enable the company to handle promptly its increasing business in economizers, fans, blowers and exhausters. Since entering the fan business this company has built many large fans

for mechanical draft, including several with over-hung wheels. The New York office will be represented as heretofore by William Downs.

National Brake & Electric Company of Milwaukee, Wis., reports that as a result of the passing of the recent traction ordinance in Chicago, the Chicago City Railway has given instructions to proceed at once with the filling of an order for 300 of the new National air brake equipments, which had been placed some time ago. This is one of the largest recent orders for air brake equipments for electric cars, and brings the total number of National equipments in service on the Chicago City Railway to the imposing total of nearly 1,000.

Blake Signal & Manufacturing Company, 246 Summer street, Boston, Mass., is in receipt of an unsolicited testimonial from Mr. Arthur Bessey Smith of the department of telephone engineering at Purdue University with regard to the soldering tube flux manufactured by the Blake Signal & Manufacturing Company. Inasmuch as this testimonial comes from a man of recognized standing in telephone engineering and one who has a practical knowledge of telephone work as well, having filled every position from telephone lineman and repair man to manager, the testimonial is considered effective evidence of the practical usefulness of the tube flux.

ADVERTISING LITERATURE.

Columbia Foundry Company, Cincinnati, O.—Columbia brake-shoes of various types to meet the needs of railways, both steam and electric, are illustrated and briefly described in a 20-page pamphlet.

Trussed Concrete Steel Company, Detroit, Mich.—An elaborate brochure, entitled "The Typical Factory," describes in detail the new plant of the George N. Pierce Company, manufacturers of automobiles at Buffalo, N. Y. The plant is a large one, with several buildings which exemplify reinforced concrete construction under the Kahn system.

Weston Electrical Instrument Company, Waverly Park, Newark, N. J.—Bulletin No. 6 is a four-page leaflet devoted to the Weston multimeter, model 58, which is designed to quite accurately serve the purposes of a direct-current voltmeter, milli-voltmeter, ammeter, mil-ammeter, ohmmeter, ground detector and wheatstone bridge.

Allis-Chalmers Company, Milwaukee, Wis.—Bulletin No. 1423 describes Gates rock and ore breaker with a short head and concaves, for fine crushing and designed particularly to meet the demand for a crusher which will utilize screenings and other fine material to advantage. Bulletin No. 1057 is devoted to the Allis-Chalmers type K direct-current motors and generators and provides a number of illustrations of motor driving as applied to heavy shop machinery.

THE TOMLINSON AUTOMATIC RADIAL CAR COUPLER.

With the advent of the electric railway, where train operation of cars is of frequent occurrence, and in connection with the operation of two or more cars, the necessity soon became apparent for an automatic coupler to fulfill the new requirements, which are different from those of steam road practice.

The latest development in the line of automatic couplers for electric railway operation is the Tomlinson automatic radial coupler,



Tomlinson Automatic Car Coupler—Figure 1.

recently placed on the market by the Ohio Brass Company, and which is the only coupler absolutely automatic in action.

In operating the Tomlinson coupler no adjustment whatever is required, except the alignment of drawbars, and it is never necessary to enter between the cars when coupling. It is only necessary to back the cars together, which engages and firmly locks the couplers. Moreover, there are no loose parts to be inserted in the coupler to put it in readiness for action; therefore a car cannot be left, through negligence or otherwise, with the coupler in an inoperative condition. After uncoupling, which is accomplished by simply pulling a chain, the parts return automatically to the normal position, ready for instant coupling. Its construction is such as to give maximum strength for minimum weight.

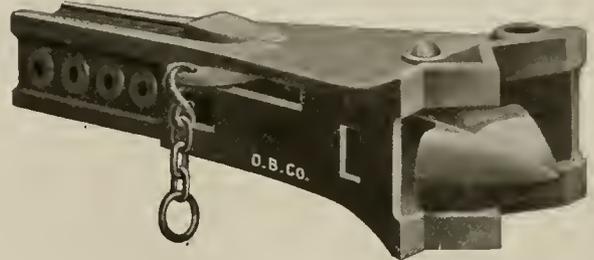
Mr. C. H. Tomlinson originated the idea of this coupler and patents were issued to him fully covering this invention. The following description will be of interest, for the Tomlinson system is thoroughly practical in every particular.

The Tomlinson coupler is made in two sizes, known as numbers 2 and 3. Size number 2 is designed to meet the requirements of all classes of city and light interurban service, and size number 3

is adapted to elevated and subway service, also heavy interurban service and for all places where it is desired to intercouple with steam road cars.

Besides the variation in size, the couplers also differ as to draft-gear connection. They are made in four forms—for rectangular-bar draft gears, for channel-bar gears, for 80-pound rail-section gears and for drop gears—the principle of the coupler action being the same in all.

The coupler consists essentially of a strong malleable iron head-piece, which is hollow and contains an arrow-pointed, drop-forged coupler hook, with sufficient play in a horizontal direction to allow



Tomlinson Automatic Car Coupler—Figure 2.

the coupler hooks of two engaging couplers to slide past each other and become locked. This hook is shown plainly in Figures 1 and 2.

The hook in each coupler is prevented from moving past the center of the coupler. It may, however, move toward the side of the coupler in opposition to the action of a spring. Thus, when the opposing coupler hooks meet, they are forced apart against the action of the springs sufficiently to allow the hooks to slide past each other, the shoulders interlocking. The arrangement is such, however, that should the spring in one of the couplers break and allow the hook to move to one side, there still would not be sufficient clearance to allow the couplers to unlock. The spring is under tension only at the instant of coupling or uncoupling and gets no strain of the train load, either push-in or pulling.

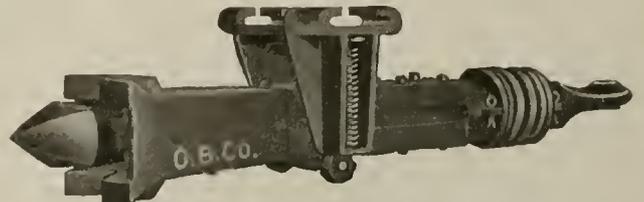
In uncoupling the hooks are forced apart by a lever cam. To this lever cam is connected a chain, a slight pull on the chain of either coupler being sufficient to disengage the hooks.

An important feature of the Tomlinson coupler, and one which effectually prevents lateral movement of the coupler heads, is the form of the coupler face used. The faces of the couplers are serrated, as shown in Figures 1 and 2, and fit together accurately. The faces have large bearing surfaces and the serrations prevent any movement in a lateral direction. When once coupled, therefore, the connection between the cars is practically rigid, and surging of the cars is prevented. This feature greatly facilitates the control of the train and does away with the necessity of buffing platforms, now used to take the slack out of other couplers, and which cannot be used successfully on cars which travel short-radius curves. It is also impossible for the cars to become uncoupled when rounding curves.

The Tomlinson coupler will intercouple with all standard radial car couplers now in use, without removing or even deranging any of its parts. By the addition of an emergency knuckle (Figure 1) it will couple automatically with all M. C. B. couplers, as used on



Tomlinson Automatic Car Coupler—Figure 3.



Tomlinson Automatic Car Coupler—Figure 4.

steam roads. A wedge-shaped extension of the knuckle is made of the right dimensions to fit into the space in the Tomlinson coupler, which ordinarily receives the coupler hook of the opposing coupler. This knuckle is made only for the number 3 couplers.

Figure 3 illustrates the spring hanger attachment, which is used where unduly sharp variations in the grade line make necessary some allowance for vertical play of the coupler and draft gear. The hanger consists of a rectangular casting through which the draft gear passes, being supported by a yoke which rests on springs, allowing vertical movement, either up or down. These springs carry the weight of the coupler and draft gear and normally hold the former in a position parallel to the car sills. The spring,

however, allows vertical movement through a considerable range, so that the coupled car can conform to any sudden breaks of grade, as caused by viaducts, subways, etc. The carrier is supported by a radial slide bar under the car sills, the slide bar being formed in the arc of the circle, around which the hanger is free to slide when going around curves.

The fact that these couplers are absolutely automatic makes it only necessary to align the drawbars and bring the cars together to effect instant coupling. This is of particular advantage in case of emergency, as, for instance, a car barn fire. One man could, in such an emergency, back a motor car into a line of cars standing in the barn and bring out the whole train without assistance.

It is apparent that this coupler is not only strictly automatic in coupling with itself, but also will intercouple with all other types of radial couplers and automatically couple with M. C. B. couplers; even a push-bar can be used with it successfully. Heretofore, in making couplers, no such provision has been made for intercoupling with foreign cars.

FOUNTAIN WASH BRUSHES.

One of the departments of electric and steam railways which receives too little attention, considering the saving in time and money which could be produced if properly managed, is that controlling the cleaning of cars. The old custom of cleaning car windows and exteriors, floors, etc., with sponges, mops and buckets of water is not only an expensive method of having the work done and keeps the cars off the road longer than necessary, but it is also not sanitary and is a very unsatisfactory method of performing this service, as the cleaners do not renew the water often enough, and therefore the work, when finished, is really only half done.

Realizing the advantages of having an ample supply of clean water supplied to the brush or sponge while the work is being done, the Baumruk's Fountain Brush Company of Chicago, Ill., has devised a fountain cleaning brush and fountain sponges, a



Fountain Cleaning Brush.

typical illustration of which is presented herewith. The advantages of these cleaning brushes will be self-evident, as a fresh supply of water is constantly being discharged through the bristles of the brush while it is being used.

A hose, which is attached to the handle, may be supplied with hot, cold or warm water, depending upon the service for which it is required. It is hardly necessary to say that one man can do the work of several men if furnished with one of these brushes, as it is unnecessary for him to stop to refill his pail or to wash out his sponge or mop while at work, consequently the exterior and interior of a car can be washed as rapidly by one man with one of these brushes as by several using the old method. Consequently, not only is the cost of labor reduced, but the time required for the cars to be out of service is likewise reduced, which is a feature of great importance in railway work, and represents an important saving.

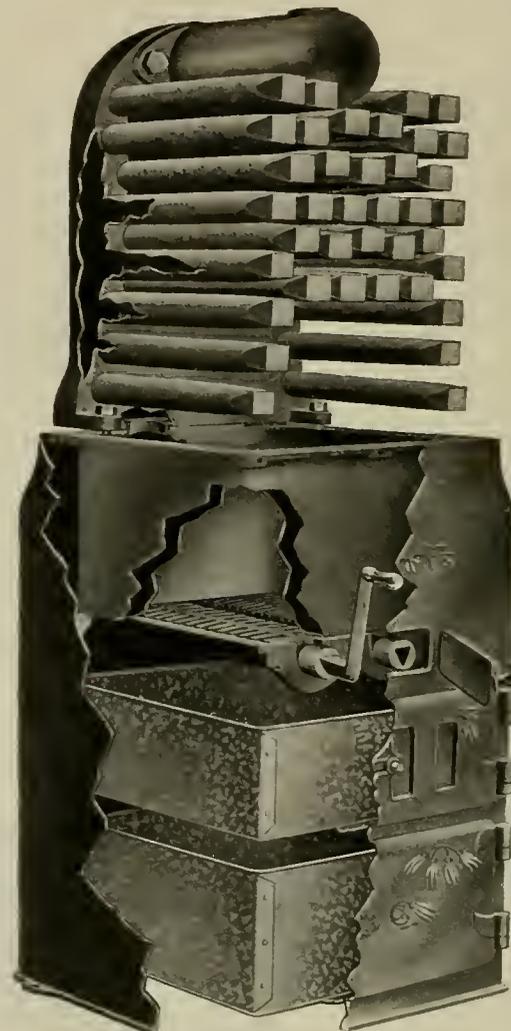
THE COOPER CAR HEATER.

Probably the earliest attempt at heating public conveyances was the placing of hot stones in the early stage coaches, on which passengers could place their feet and thus make the trip a little more comfortable than would otherwise have been the case. This insignificant attempt at heating was necessarily supplemented by frequent stops at taverns along the road, where warmth could be, both externally and internally, applied. With the introduction of steam railways and longer trips it soon became evident that some more effective way of heating must be devised, and soon stoves, generally using wood for fuel, were installed in the cars. This was also inadequate and was soon abandoned and steam heating coils, furnished with steam from the locomotive, were installed in the car, which furnished a uniform heat throughout the car and was a heating system considerably less expensive to operate. This was perfectly satisfactory on trains operated by steam locomotives, but with the introduction of electric cars it was necessary, when heating was desired, to return to the stoves, which, owing to their inadequate local heating, were soon to be replaced by electric heaters. These, however, were expensive to operate and required increased size of feeders, generators and boilers to supply the extra current demanded by them, and furthermore, with the old types of electric heaters much difficulty was experienced because of the intense local heat, which caused the passengers no end of discomfort and occasionally injury because of their clothing having taken fire. These conditions soon led to the introduction of hot water heaters, which could be placed in the car, and the heat from them distributed evenly throughout the car by means of coils of pipe placed along the seat, giving a more even distribution of heat at a lower cost.

From the primitive attempt of heating by means of stones the demand for comforts furnished by adequate heating has increased until now the problem of car heating has become one of the most important and serious which faces the manager of a transportation

line. A heater which it is believed is highly efficient, simple, durable and safe, has been devised by the Cooper Heater Company. An illustration and description of the heater is herewith presented. One of the most important features in the design of this heater is the remarkably small floor space which it occupies, varying from 12 $\frac{3}{4}$ by 12 $\frac{3}{4}$ inches in the smallest size, adapted for city cars, to 17 by 18 inches in the largest size, adapted to the heating of the largest interurban cars. The height of these heaters is from 42 to 46 inches, which also includes the space occupied by the ash pan and coal bunker of sufficient size to provide fully for 24 hours in the coldest winter weather.

Referring to the illustration, it will be seen that the heater consists essentially of a firebox formed of a cast-iron water wall, which is connected to a vertical water wall placed above it. As seen from the illustration, the vertical water wall contains numerous tubes of large diameter, giving a good circulation and a very large heating surface, compared to the grate area. A drum is also connected at right angles to the water wall at the top and from this the hot water connection is taken. The grates are of the rocking type, very substantially built to withstand the abuse which such parts naturally get in the hands of careless conductors. They



Cooper Hot-Water Heater.

are easily shaken and will not burn out easily, as the fire required for keeping the water at its maximum temperature is not hot enough to even damage the grates, which obviates one of the great difficulties which has been experienced with hot water, steam and stove heaters. The lower portion of the stove is enclosed in a neatly decorated cast-iron case and the upper portion is constructed of double walls with asbestos insulating material between them, thus preventing great radiation of heat and a consequent overheating of the vestibule. It is stated that the fire when started in the fall can be maintained throughout the entire heating season without relighting the fire. The construction of the ash pan and coal bunker is of sufficient size for 24 hours' fuel, a point of great importance, as it avoids stopping at car barns to replenish coal and empty the ashes, which always causes great annoyance to passengers and provokes unfavorable comment on the management. Throughout the design of this heater compactness, durability and efficiency have been sought, and it should be a great satisfaction to the designer to note the degree of success attained.

It is stated from actual test that it has been found that during weather ranging from 10 to 20 degrees above zero, and coal at \$6.00 per ton, the cost of fuel for heating a 21 by 8 by 8 foot car (inside dimensions) was found to be only 10 cents, and only 12 $\frac{1}{2}$ cents per 24 hours when the weather was below zero.

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The Homsher freight bill, giving street and interurban railways the right to carry light freight and to do a general express business, which was passed unanimously by both houses of the Pennsylvania legislature and was signed by Governor Stuart on April 22, will undoubtedly prove an important factor in the development of the electric railway industry in that state. This law, which goes into effect at once, opens for the companies a field that, in states with more favorable laws, has been a profitable source of income, producing in many instances a large percentage of the entire gross earnings. In Iowa, where freight handling by electric lines is of great importance, the proportion of freight receipts, as stated in the paper read by P. P. Crafts before the Iowa Street and Interurban Railway Association, which was published in last week's issue of the *Electric Railway Review*, varies from 5 per cent of the earnings from all sources to an amount in excess of passenger earnings. Besides conferring a great benefit on the rural population by providing increased facilities and cheap and speedy transportation of farm products to the cities, this law should give a strong impetus to the construction of additional lines in a state in which the building of short connecting lines has already attained remarkable development.

In the design of stations for rapid transit service it is frequently a difficult matter to show various schemes clearly on plans and elevation drawings. If the situation is complicated by the need of showing tracks and platforms at different levels, it is a help even to the eye of the engineer to have a perspective view of the proposed design at hand for reference. The fact that one is accustomed to reading drawings does not lessen the value of the picture or isometric sketch of the completed layout. The perspective method of analysis has been worked out very nicely by the Boston Elevated Railway Company in connection with recent tunnel and terminal station studies made by its chief engineer of elevated and subway construc-

tion, George A. Kimball. In this work the usual drawings were prepared, but in addition a number of complete pasteboard models of the stations were made to a scale of one-eighth of an inch to the foot. All the physical features of the stations were shown clearly, including stairways, platforms, depressed tracks, entrances, exits, news-stands, windows and ticket offices. The relations of various foot passages to the platforms and sidewalks were especially well indicated in studies for the modification of the Old State House station of the East Boston tunnel, in the proposed terminal changes at Dudley street and in the new Washington street tunnel. In the studies made of land takings and building removals at the incline entrance of the Washington street tunnel the dimensions on the reduced scale were worked out with great care, so that the precise changes proposed could be understood readily even by the layman.

Some of the models of stations have been used in connection with the submission of plans to commissions, at directors' meetings and wherever it has been thought advisable to avoid the long and difficult study of detailed plans. Their construction was naturally a painstaking piece of work, but by using stiff pasteboard, glue and small tacks the models when completed were found to be strong enough to withstand pretty severe handling. In the study of station designs it is usually desirable to consider various locations of ticket offices, and this was provided for in a flexible manner by building separate models of these booths about an inch high, which could be moved about at will or fastened in place. As far as possible drawings were made in the interior of the models to show tracks and the individual risers of stairways. It was not considered necessary to construct the separate risers, but stairways were represented by an inclined plane of cardboard of the proper width, with parallel lines ruled thereon to represent the risers. In connection with these studies small meshed wire netting was used to represent fencing, and in some cases celluloid templates of the cars in plan were con-

Usefulness of Station Models.

structed on a small scale to facilitate the study of terminal arrangements. All these graphic methods of bringing complicated conditions into comprehensive focus were found to be valuable aids to a broad study of the station problems at issue.

As a means of preventing accidents and facilitating traffic an automatically controlled electric buzzer is being tested on some cars of the Denver City Tramway Company. On the lower car step contacts are placed between the step proper and a safety tread. Springs are also interposed here so that normally the contacts are separated. However, if a passenger steps on the safety tread his weight compresses the springs, closes the contacts and causes a buzzer to ring either in the motorman's vestibule or near the center of the car. At present buzzers are being tried in both locations, so that the most serviceable place may be determined. There are several reasons why such a system for signaling the presence of a passenger on the lower step should be of value: If a passenger steps off the car while it is in motion and an accident occurs, the motorman, who in the meantime has heard the buzzer and tried to stop the car, will be an excellent witness for the company. The same reasons hold in the event of a prospective passenger being hurt by trying to board a moving car and falling off. The presence of a passenger on the step will signal the motorman that he should stop at the next crossing, even though the conductor may have forgotten to ring the bell. In a crowded car, where the conductor is unable to see the step, he is notified by the buzzer whether or not a passenger is getting on or off the car and thus some little time, ordinarily lost, may be saved. At railroad crossings or other places where the conductor must leave the car the motorman is notified by the buzzer when the conductor again boards the car. These few reasons would seem to justify a careful test of this ingenious scheme for lessening the work of the claim department and assisting in maintaining better schedules.

GRAPHITE TROLLEY WHEEL BUSHINGS.

Periodically since the introduction of graphite trolley wheel bushings, the question of whether or not oil should be used on them has been the subject of heated discussions among the master mechanics of different systems. Most of these discussions have been more confusing than beneficial, for the testimony presented seemed about equally balanced, and the arguments equally reasonable and convincing. The result has been that those seeking information were compelled to experiment and settle the question for themselves.

As a matter of fact, the graphite bushing was originally intended to be run without oil and thus do away with the possibility of the wheels being ruined by lack of lubrication. Graphite is itself one of the best lubricants known when it is used under the proper circumstances. For the conditions for which the graphite bushed trolley wheel was originated it was perfectly satisfactory. Immediately after its introduction, however, the speed of electric cars was greatly increased, and likewise the capacity of the motors, consequently necessitating a much greater current to be collected, which greatly increased the arcing between the bearing and the axle on which the wheel turns. This and the high speed naturally cause the bearings to wear more rapidly and become rough and pitted from the constant high current arcing. The natural result is that in the roughened state of the wearing surfaces graphite alone is not a sufficient lubricant.

Furthermore, if even the least play exists between the wheel and the axle, the vibratory blows on the graphite and metal of the wheel, due to the centrifugal force of slightly unbalanced masses in the wheel when running at speeds of

from 3,000 to even 10,000 revolutions per minute, will cause the graphite to crumble. The bearing will therefore wear rapidly if not lubricated with oil or grease.

These considerations as well as practical experience suggest the advisability of using oil for lubricating trolley wheels, as the oil dampens the vibrations, and acting as an insulator reduces the arcing between the bearing and the axle. Hence practically all of the current is taken from the wheel by the springs on the sides of the wheel, and thus also prolongs the life of the bearings by preventing the roughening and scoring of the surfaces, which is the inevitable result of undampened vibrations in journals.

The question may be asked why graphite bushings are any better than ordinary bearing if oil must be used. The answer to this is, that, while it is necessary to use oil on graphite bushings to obtain the best results and greatest mileage, the life of the wheel is not so seriously impaired if the oil supply fails or if the barn men neglect to oil them, as would be the case with ordinary bushings, as graphite bushings can be operated without oil. If the oil supply fails on ordinary trolley wheel bushings, the general result is a hot box and a sliding of the wheel, which soon wears through and catches in the overhead work with disastrous results.

To sum up, it may be said that the graphite bushing was designed for far less severe conditions than are met in modern practice. They served the conditions for which they were designed well without the use of oil. The changed conditions of today are far more severe. In the case of city service the difficulty arises through dragging the wheels through a mass of special work, and on interurban lines the more severe conditions arise through high speed, and these conditions can only be properly met by an unfailing oil supply.

THE ECONOMY OF POOLING REPAIRS ON SMALL ROADS.

When scattered groups of electric railways are consolidated into a single operating organization the concentration of power plant capacity into a few stations or perhaps a single modern installation follows as a matter of course. It would seem feasible for the same general idea to be carried out with reference to repair shop practice in some instances where the adjacent roads are friendly, but where no actual consolidation of property has taken place. The cost of repairs per car on a small system is seldom as low as that on a large road, because the small company cannot as a rule afford the refinements of the large company in the way of specialized machinery and processes. We find in recent practice that a road owning 3,325 cars paid \$247 per car for repairs in one year; a road with 1,130 cars paid \$283; a line having 719 cars paid \$257; one with 310 cars, \$300; one with 26 cars, \$358; one owning 16 cars, \$294; and one with 7 cars, \$414. Allowing for differences in conditions, there is a definite tendency toward a higher cost of maintenance per car on the smaller lines.

By the erection of a central and thoroughly modern shop in a territory occupied by a number of small roads, it is probable that great economies could be enjoyed. The shops, in the first place, could be of fireproof construction. The shops could be equipped with a thoroughly up-to-date system of keeping stock and cost records; the tools could be direct driven by individual motors, and a brass foundry could be a prominent feature. Practically all the advantages of the large city shop could be afforded, and the work could pass through in a far more regular volume than obtains on a single road with a few cars, tending to lower the cost of production. Emergency and light repairs could, of course, be handled at local car houses. By the consolidation of interests there would be no necessity for the small roads, individually, to purchase expensive machine tools, which stand idle perhaps 80 per cent of the time; and the union of financial strength applicable to repairs would permit the payment of higher wages in some

cases than a struggling road can possibly afford in its shops under the other method.

It is true that there would be disadvantages in pooling repairs. The lack of standardization of equipment on different roads would make the spare parts rather extensive, and there is no doubt that lack of harmony among the different managements would make the work of the centralized shop very difficult. Dead mileage in some cases would be large. But after these points are weighed, it is hard to see why some scheme of this kind, if entered into in a broad spirit of co-operation, might not be feasible. A large amount of capital is at present tied up in duplicated supplies and tools in small street railway shops in the same territory; the "load factors" of the employes are irregular and the equipment stands idle a good part of the time. The master mechanic of the centralized shop would have to be a man of first-class caliber, worth certainly from two to four times the salary which a single road of small means could pay. There is certainly need of rolling stock standardization, when a single road operates from six to ten different styles of cars on its tracks. Co-operation and centralization of industrial functions are the spirit of the times, and the policy of annually spending large sums of money for the sake of maintaining a limited number of cars in an inferior shop that is one's own is open to question in the face of what has been done by legally consolidated companies to decrease their operating costs per unit of rolling stock.

LESSONS FROM A CAR HOUSE FIRE.

Every disaster has its lessons, and the destruction of the One Hundred and Forty-fifth street car house of the Metropolitan Street Railway Company of New York, a brief account of which was given in the *Electric Railway Review* of April 13, 1907, raises several points which it may be of benefit to mention.

It seems hardly necessary to state that the construction of a car house of above one story in height, which, on account of the high price of property, was apparently necessary in this instance, is deplorable unless conditions are such that the floors may be entered independently from different street levels or from the street level and an elevated structure, as otherwise an elevator is required to lift the cars to the floors above; and an elevator shaft becomes a dangerous fire hazard.

The car house of the Metropolitan Street Railway Company was a 4-story structure and cars were hoisted through an open elevator shaft. The pits were on the first floor. The second floor was used as a general storage and repair room for service cars, and the third and fourth floors contained the paint shop, where inflammable paints, oils, etc., were necessarily kept. With conditions of this kind it is plain that only extraordinary precautions in preventing dust and oily waste from collecting in and about the elevator shaft and among the first floor pits, and great care to avoid sparks or flame of any origin, could forestall the possibility of a sudden fire, which, having once gained headway, would sweep up the elevator shaft and spread to all floors.

The exact origin of the fire which occurred may never be known. One theory is that it was caused by defective insulation of an electric light wire; another, that a short circuit in a conduit carrying a conductor rail caused sparks to fly from the plow of a car, and to set fire to oily waste. Whatever the origin may have been the elevator shaft served as a flue which carried the flames to the explosive and inflammable oils on the upper two floors.

The car house of the Metropolitan Street Railway Company was built a good many years ago before it was generally thought necessary to provide concrete fire protection for steel construction. An examination of the tangled wreckage of steel work in the ruins indicates that the members buckled under the intense heat, dropping large areas of floor. What the damage would have been had the all-steel work

been incased in concrete is, of course, a matter of conjecture. Those who have had charge of the disposition of old car bodies know that they burn so furiously as to destroy all wood, even the heavy timbers, in about half an hour. The burning of a large number of cars between floors would furnish a severe test even for steel carefully incased in concrete, and the material burned would be greater in proportion to floor area than has probably been burned in any concrete building which, after passing through a fire, has been cited up to this time as an argument recommending the use of concrete. Where cars are stored on several floors, of which one or more contain a paint shop, it might be found to be impossible to provide a structure sufficiently fireproof to present a good insurance risk, but the subject should certainly receive the most exhaustive attention of engineers whenever it is found impracticable to store cars and provide shop facilities on one floor.

The appearance of the ruins of the Metropolitan Street Railway Company building also makes plain the fact that a fire wall between the power house and any other structure which is subject, as this car house was, to possible sudden destruction by fire, is not to be regarded as a sufficient safeguard for the power plant. Although the dividing wall between the power house and the car house ruins in New York still stands, one or two large apertures were caused by the falling steel work, and the wall was cracked so badly that the company found it necessary to close the power house, fearing that the vibration of the engines and generators would cause the wall to collapse.

It will be of interest to see how the Metropolitan Street Railway Company will solve the problem of fire risk in reconstructing its building.

ANNUAL REPORTS OF RAILWAYS.

United Railways & Electric Company of Baltimore.

The annual report of the United Railways & Electric Company of Baltimore says that the most important event of the year 1906 was the adoption of the new financial plan. This plan comprised the funding of coupons on the income bonds and the formation of the Maryland Electric Railways Company. The funding of these coupons made available the income, above interest requirements on the first mortgage bonds, for track reconstruction and repair, improvement of power houses and general improvements and betterments. In addition to this surplus an amount will be realized from the sale of property which is no longer needed.

At the end of the year the holders of \$13,584,000 income bonds, out of a total of \$13,940,000 outstanding, had accepted the plan which provides for the issue of 5 per cent 30-year coupon bonds dated June 1, 1906, at par, for the income coupons from June 1, 1904, to June 1, 1906, inclusive. Upon these coupons and upon those dated December 1, 1906, to December 1, 1910, inclusive, and also upon the income bonds, there was stamped a reference to an agreement whereby the company is bound to issue on the dates of these coupons to holders thereof its 5 per cent funding bonds or scrip at par. As under this funding agreement money is available for improvements only as earned, it was deemed expedient to anticipate the company's income and facilitate improvements by increasing the floating debt and retiring it at convenient periods.

In addition to the betterment of the existing property the company needed new stations, car houses, equipment, extensions, excursion resorts and other improvements. Associated interests therefore secured the charter of the Maryland Electric Railway Company. The property of this company and of the Baltimore & Annapolis Short Line were acquired by the Maryland Electric Railways Company, which authorized an issue of \$8,000,000 5 per cent first mortgage bonds, the proceeds of which are to be used only for acquiring new additions and new facilities. The entire property

is leased to the United company at an annual rental equal to 6 per cent upon the actual cost, and, beginning in 1910, an additional 1½ per cent per annum. The United company also agreed to purchase the property at maturity of the bonds by paying an amount sufficient to retire them. The money paid as a sinking fund, including increment, is to be applied toward the purchase price. A special sinking fund is provided for purchases of rolling stock, the lease of which is limited to 10 years.

The report discusses many other matters. On the advice of expert accountants an account for extraordinary expenditures was opened, and there was expended during the year for rehabilitation purposes \$1,436,692. The total amount paid for taxes increased 16 per cent.

The report gives in detail the work of improvement. During the year over 31.6 miles of single track were reconstructed. A total of 8.6 miles of new track was constructed. The conversion of the remaining portion of the old cable system to electricity was completed. The company now operates 394 miles of main track, of which 172 miles of suburban lines are laid with T-rails, and 172 miles are laid with 9-inch girder rails. The reconstruction of the car house on Light street, near Heath, and the extension which was begun in 1905 were completed during the year.

The Maryland Electric Railways has awarded contracts for the erection of one new car house which will be leased to the United company. It will also erect four other car houses, one of which will contain an office and a passenger station. The Maryland Electric Railways acquired Bay Shore park in October. This park had previously been leased to the United company.

The main figures of the report, with comparisons with two preceding years, were as follows:

	1906.	1905.	1904.
Gross earnings	\$6,583,102	\$6,023,698	\$5,440,942
Operating expenses and maintenance	*4,200,942	3,765,292	2,876,539
Net earnings	\$2,382,160	\$2,258,406	\$2,564,403
Fixed charges, taxes, etc.....	2,365,587	2,230,066	2,244,579
Surplus for year.....	\$ 16,573	\$ 28,340	\$ 319,824
Other income	4,725	2,725	10,238
Balance	\$ 21,298	\$ 31,065	\$ 330,062
Car-mile runs	26,035,327	25,431,376	23,397,515
Revenue passengers	133,785,601	122,318,433	109,526,908
Transfers	53,413,492	49,292,821	43,932,219

*Includes \$980,000 credited to extraordinary expenditures.

Operating expenses amounted to 48.93 per cent of gross earnings, as compared with 47.05 per cent in the previous year. The increase in gross earnings was 9.29 per cent, and the increase in operating expenses, after allowing for extraordinary expenditures of \$929,761 in 1905, was 13.59 per cent. This large advance was due to increased car service, to the payment of higher wages in every department, and to the increased cost of materials and supplies. The frequent and heavy rains in 1906 greatly interfered with excursion travel. The report states: "It should be borne in mind that Baltimore has a comparatively small floating population. Street railways in New York, Philadelphia, Washington, New Orleans and some other cities have an advantage in this respect; hence the increase in gross earnings of the system may be regarded as permanent."

It is announced that the Indiana Union Traction Company and the Ft. Wayne & Wabash Valley Traction Company have made arrangements with, and will undertake to transport the visitors to the annual G. A. R. encampment at Ft. Wayne on May 21-23 at a rate of \$3.00 for the round trip from Indianapolis. A rate of one cent a mile has heretofore been granted the old soldiers by the steam lines, but they declined to do so this year because of the 2-cent law recently passed by the legislature.

The new anti-pass law passed by the Iowa legislature goes into effect on July 4 and applies to electric as well as steam railroads.

REPORT OF BION J. ARNOLD ON STREET RAILWAY PROBLEMS IN TORONTO.

Bion J. Arnold of Chicago has submitted a report to C. H. Rust, city engineer of Toronto, based on a study of street railway conditions which was made for the city authorities. An abstract of Mr. Arnold's report follows:

I have made a study of the street railway transportation problem of the city of Toronto, giving particular attention to the following subjects:

The center of population referred to a north and south line.

The future growth of the population by general observation only.

The possible direction of such future growth with reference to the present north and south center line of population.

The operation of the cars of the Toronto Railway Company with special reference to traffic during the "rush-hour" period.

Immediate remedies to apply to relieve congestion.

Immediate track extensions.

From statistics furnished me by the assessment department of the city of Toronto, I find the north and south center line of population to be west of Yonge street, coinciding approximately with McCaul street.

It seems evident that the population of Toronto should grow by a steady annual substantial rate of increase. While, owing to the unusual activity that seems to prevail in your country at present, the rate of increase may remain about uniform for several years, or might possibly increase, statistics show that the average rate of annual increase of population of all cities is a decreasing one, and the rate of population increase of your city will, therefore, probably be a decreasing rate of increase, particularly after the passing of abnormal conditions.

In making an examination of the evident growth of your city in the immediate past, and the building activity to be observed at present, it would seem that the future building in the city will probably be more to the north and west than otherwise, thus tending to move the north and south center line of population in a westerly direction, rather than easterly.

Exhaustive observations have been made of the traffic conditions, with particular attention to headway of cars and the congestion of cars upon the streets.

From these observations it was learned that car congestion in your city is confined to Yonge street, and this congestion obtains to that part of Yonge street between Front street and Queen street, and in a measure affects the cars on Front street, King street and Queen street, in the vicinity of Yonge street, but, outside of this Yonge street congestion, objectionable congestion is not yet apparent.

In my judgment immediate relief should be furnished to Yonge street by the construction of additional tracks upon some north and south street adjacent to Yonge street. From the fact that the present north and south center line of population is west of Yonge street, and from the fact that the future growth of the city seems to favor a westward movement of this center line, the relief of Yonge street should be by a street west of Yonge street, and this without further argument suggests Bay street as being the logical street upon which to build additional tracks, and this construction is recommended. This new track should extend north of Queen street and should reach as far north as Bloor street in order to distribute the cars to the west upon the east and west lines.

In my judgment, in order to develop the entire system in such a manner as to at all times have the greatest capacity, I recommend that tracks be now constructed as follows: On Bay street from Front to Queen street; on Terauley street from Queen to College street, and then through Queen's park from College to Bloor street.

It would seem to me, after a study of population by wards, and an examination of the existing lines, that ward five may require in the immediate future an additional north and south line, possibly in the vicinity of Claremont, Clinton and Christie streets.

I understand that the Toronto Railway Company is requesting the right to construct connecting tracks at several points in the downtown district. These tracks are asked for by the company to facilitate the handling of cars during the rush hours and to make the system more flexible. I do not see any serious objection to the granting of these requests. In my judgment the people should be willing to grant any reasonable concessions to the company the acquirement of which will tend to facilitate the handling of the cars in a manner to benefit the public. The necessity for and the objections against these last named extensions should be apparent to those in daily contact with the actual conditions upon the ground, but were the decision left to me I should authorize their construction.

THE PITTSBURG & BUTLER STREET RAILWAY.

BY H. C. REAGAN, ELECTRICAL ENGINEER.

The Pittsburg & Butler Street Railway, as its name implies, connects the cities of Pittsburg and Butler. It traverses a territory which contains valuable oil and mineral resources and is well populated. Between Pittsburg, one terminal, and Butler, the county seat of Butler county, in the oil district of western Pennsylvania, the road passes through attractive suburbs of Pittsburg and important oil and coal centers. The line was designed to provide safe and speedy service between the two terminal cities.

The Pittsburg & Butler railway will connect at Etna, a suburb of Allegheny, with the Pittsburg Railways Company lines. The route is shown on the accompanying map. The road extends northward from Etna, going through Glenshaw, Gibsonia, Bakerstown, Valencia, Mars, Renfrew, McCalmont and Lyndora on the way to Butler. The Butler terminal is at

stone ballast the entire length of the line. The gauge of the tracks, 5 feet 2½ inches, was adopted to conform with that of the Pittsburg Railways Company, as the cars of the Pittsburg & Butler will use the Pittsburg Railways Company tracks in entering Pittsburg. Thirty-three-foot A. S. C. E. section steel rails, weighing 75 pounds per yard, are used. They are joined together mechanically by 4-bolt fishplates, and electrically by M. E. concealed bonds. The cross bonds which are used at intervals between the tracks and the special bonds at switches are of No. 0000 copper. Guard rails are used on all curves greater than 9 degrees. These guard rails are raised seven-eighths inch above the running rails by means of rail blocks which are inserted under the rail on every third tie. Between the guard rail and the main rail is an irregular shaped casting three inches long. This was designed by Mr. Layton.

Bridges.

In the bridge construction concrete and steel were used



Pittsburg & Butler Street Railway—Bridge over Thorn Creek.

Main street and connection is made with the Butler Passenger Railway.

In planning the route for the road it was the desire of Charles Gibson, the general manager, and Hudson F. Layton, the chief engineer, to follow the most direct line possible between the two terminal cities, and yet to keep close to the centers of population. In carrying out this plan many obstacles were met, as the country through which the road passes is generally mountainous and presents varied and costly engineering problems. On the line as constructed the grades are reduced to the minimum, permitting high speed and economical operation, and the curves are of long radius.

The roadway was constructed in accordance with standard steam road practice. All dirt fills are made around trestle bents, insuring a solid foundation and a minimum amount of shrinkage in the roadway. The ties, 7 by 8 inches by 8 feet, are spaced 24 inches on centers and are laid on

throughout. The principal steel bridge was built over the Baltimore & Ohio Railroad at Bryant. A feature of this bridge which is of interest is the economical abutment construction. Another important bridge, which is shown in one of the accompanying illustrations, was constructed over Thorn creek, near Renfrew. This bridge is 800 feet long and the highest point above the water is 85 feet, while the main span between towers is 118 feet long. The piers and abutments are of concrete construction. Sawed oak ties are used and guard rails are provided on the sides and in the middle of the track. On the viaduct which was constructed where the road enters Butler concrete was used for the piers and abutments. Straight through girders were used over the streets. This viaduct contains one girder 115 feet long with a depth of 9 feet. Another girder is 60 feet long with a depth of 5 feet. The towers are well braced with lateral and diagonal braces. All of the bridges on the line were designed

to support a standard steam railway train. The bridges were designed by J. H. Barrett, bridge engineer, under the direction of Mr. Layton.

Power Plant.

The power plant is located in Renfrew, about seven miles from Butler, and at the junction of Conoquennessing and Thorn creeks. This point was selected on account of the volume

and of the turbine room 51 feet 5 inches. The foundations of the building are concrete with an average thickness of 24 inches, and with the footing course varying from 3 to 6 feet at the pilasters. A point which was carefully considered in designing the boiler room was the provision of sufficient room over the boilers to facilitate the repairing of valves and the repacking of valve glands, pipe joints, etc., which occa-



Pittsburg & Butler Street Railway—Showing Concrete Abutment of Thorn Creek Bridge.



Pittsburg & Butler Street Railway—Showing Bridge at Bryant Under Construction.

of water available for condensing purposes. The plant is on the line of the Baltimore & Ohio Railroad and on a siding of the Bessemer & Lake Erie Railroad, providing good transportation facilities for coal. The power house is 105 feet 10 inches by 98 feet 7 inches.

The building is divided into boiler and turbine rooms.

sionally becomes necessary and is many times neglected because of the difficulty of working in the cramped space above the boilers, where the heat may be intense. The ashes are removed from under the boilers by means of an ash car, which is run on a track in a concrete tunnel built under the firing floor from a point immediately in front of the fireboxes



Pittsburg & Butler Street Railway—Private Car and Standard Equipment.

A monitor ventilator, extending over each section of the building, provides ample ventilation. The building is well lighted. The doors of the power house are of the Wilson roller steel pattern. The frame of the roof is of steel and the roof is shingled with Bangor slate.

The interior width of the boiler room is 48 feet 5 inches

to a hydraulic lift, which raises the loaded car to the boiler room level, whence it can easily be run to the ash dump. The boiler room equipment consists of four Babcock & Wilcox boilers, which are arranged into two batteries. The boilers are rated at 350 horsepower each. They are of the double-deck type and have 4-inch tubes and superheaters

capable of superheating the steam to 125 degrees F. A Ford damper regulator and water regulator is fitted for each boiler, and, while the boilers are fired by hand at present, they have been arranged so that stokers can be installed in the future. The blow-off valves are arranged with one plug cock and a standard B. & W. valve, the plug cock being next to the boiler, so that the blowing is always done by the

and for superheated steam. The superheated steam lines connect the boilers with the turbines. The saturated steam lines connect the auxiliaries and condensing engine pumps and dry vacuum pump to the steam drums of the boilers.

The superheated steam lines are of heavy steel piping and are fitted with screw flanges. At the rear of the boilers and suspended on brackets are two header lines, one 10 inches in diameter, which is used for superheated steam, and the other 6 inches in diameter, which is used for saturated steam.

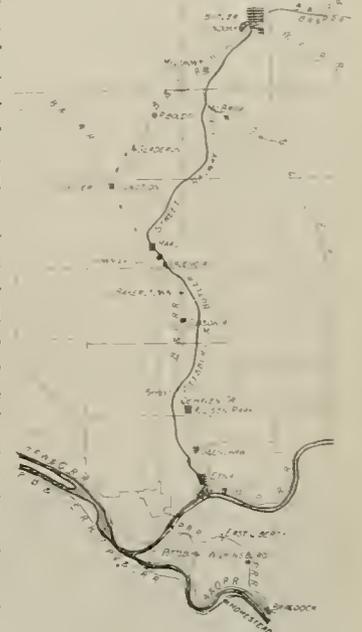
The superheated steam passes from the boilers to the header through a 6-inch line, which rises vertically from the superheated pipes to an automatic stop and check valve, thence runs by easy curves to the header. There are four of these pipes. Expansion and contraction of the steam piping is taken up by long radius bends and the pipe lines are carried on lower bearings to permit free expansion without causing undue strains on the piping. The exhaust pipes to the atmosphere from the turbine

are connected with a 30-inch exhaust line and the branches from each turbine are 18 inches in diameter and are fitted with check valves. The main exhaust pipe is fitted with a 30-inch atmospheric relief valve. The piping is extra heavy. The valves used are of Chapman manufacture.

One 2,000-horsepower Bonar vertical open heater has been installed in the boiler room near the pumps. The exhaust steam from the auxiliaries passes into this heater, as does also the steam from the turbines when operated non-



Pittsburg & Butler Street Railway—Viaduct on Line Entering Butler.



Pittsburg & Butler Street Railway—Map of Route.

first valve. This insures a tight valve in the plug cock, as it is not subjected to wear. The boilers are connected to the feed pumps by duplicate feed water pipes in such a way that if one of the pipes should break the other can supply the water to the boilers. In one of the lines there has been installed a Worthington duplex piston type hot water meter.

The stack is of brick, 125 feet high and stands on a solid concrete base 16 feet in diameter and 16 feet deep. The diameter of the stack base above ground is 14 feet with an



Pittsburg & Butler Street Railway—Power House at Renfrew, Pa.



Pittsburg & Butler Street Railway—Turbine Room.

inside diameter of 10 feet 6 inches and a flue opening 9 feet 6 inches. The wall at the top of the base is 24 inches thick, and the stack has a thickness of 8 inches at the point where it corbells out for the top. The top is surmounted by a cast-iron cap and a two-piece lightning rod, which is connected by a copper rod to a large ground plate.

The piping system consists of separate lines for saturated

condensing. The piping is so arranged that the steam can be by-passed around the heater when it is necessary to clean or repair the heater.

There are two Carpenter service pumps, 7½ and 8½ by 10 inches, installed in the condenser room. These supply water to the heater or to the storage tank and take their supply either from the discharge tunnel of the condenser or

from the intake tunnel. These pumps also furnish the gland water for the turbines and the jacket water for the dry vacuum pumps. The boilers are fed by two Epping-Carpenter duplex outside packed plunger pumps, 12 and 7 by 12 inches. Each of the feed pumps is of sufficient capacity to supply the boilers and discharge into a duplicate feed system, which eliminates the possibility of a shut-down in case of accident to the piping or pumps. The pumps are all equipped with Ford regulators.

The water for condensing and for boiler feed purposes is taken from the two creeks that join at the power house. A concrete dam was erected below the junction of the two streams, having a weir and sluice valve in the breast. The water enters an intake above the breast, which is designed as a settling basin. This intake is square and the stream side is constructed with 3-inch tile placed in the concrete walls, a movable screen being over the face of the tile. This basin is filled with coke, which thoroughly filters all the water before it enters the mouth of the tunnel leading to the condenser. The tunnel is made of concrete and extends from the well to the power house, thence under the condenser room floor to the pumps. There is also a discharge tunnel running the length of the building, and extending down to the lower



Pittsburg & Butler Street Railway—Interior View of Rotary Substation.

side of the dam, where two 30-inch gate valves control the discharge.

The condensers, which are of the jet suction type, were made by the Alberger Condenser Company. The condensers are served by a volute centrifugal pump, driven by a 6½ by 8 inch Westinghouse junior engine, direct connected by means of a flexible coupling. The use of the pump makes it possible to place the condenser below the turbine and thus avoid extending the exhaust pipes above the engine room floor. The exhaust pipe connection from the turbine to the condenser is by means of a 30-inch ell. The condensers are served by two stage rotative dry vacuum pumps, one for each unit, and with condensing water at a temperature of 70 degrees F. They are capable of maintaining a vacuum of 28 inches of mercury. The dry vacuum pumps are fitted with rotary valves with flash ports, and the cylinder heads and barrels are water cooled. The pumps are 8 by 16 by 16 by 12 inches. The condensers have each a capacity of 15,000 pounds of steam per hour. All piping except the steam and air discharge line is located below the turbine room floor.

Turbines, Generators and Transformers.

The generating units consist of two Westinghouse Parsons 750-kilowatt turbo-generators, designed to operate at 1,500 revolutions per minute, with steam at 160 pounds pressure and 100 degrees superheat. The turbines are connected

to a 750-kilowatt 3-phase generator of the standard Westinghouse turbo type, with a 35-kilowatt exciter mounted on the same shaft.

The foundations for the turbines are built up in the form of piers with intervening arches. These piers form a double row for each side of the bed plate, the center being open around the foundations. Resting on the foundations is the



Pittsburg & Butler Street Railway—Boiler Room.

frame of the turbine, which extends to the floor level. The construction of the foundations in this manner enables employes to pass from one end of the condenser room to the other without going around the end of the foundations, and also permits the condensing apparatus to be seen from any point in the condenser room and from the engine room floor. The main steam pipe to the turbines is provided with a thermometer so that the exact degree of superheat can be ascertained instantly, and thermometers are also fitted to the bearings and oil pipes so that the operator can tell at a glance whether the bearings are running warm or if the oil is not being cooled.

The generators are wound so that either 3,300 or 6,600 volt current, single or 3-phase, can be generated. The revolving field of the generators is of the two-pole type, and the field winding is laid in slots and retained by non-magnetic wedges. The generators are entirely inclosed and are venti-



Pittsburg & Butler Street Railway—View of Rotary Substation.

lated by ducts suspended under the turbine room floor. The intakes to the air ducts are provided with screens to prevent foreign material from entering the generators. The windings of the generators can be easily inspected by removing the end bells.

The Bonar continuous oiling system has been installed in

connection with the turbine oiling system. The apparatus is located in the condenser room and is composed of two filters and one oil tank and a steam pump for raising the oil to the storage reservoir on the gallery in the turbine room. The storage tank is also connected to the oil tanks of the turbines. When it is desired to change the oil of the turbines the valve is opened to the filters and the oil flows into them by gravity.



Pittsburg & Butler Street Railway—Transmission Lines.

When the oil is all out the valve is closed and the valve to the storage tank is opened.

The gauge board has mounted on it one pressure gauge, one pyrometer, two vacuum gauges and one recording steam pressure gauge, draft gauge and mercury column for checking the vacuum gauge.

The transformers are located in a room provided at the north end of the building. This room, which is 40 feet 6 inches long by 16 feet wide and 12 feet 6 inches high, is sufficiently large for six 500-kilowatt oil cooled transformers, of which four are now installed. A feature worthy of attention is the mounting of all the transformers on wheels. This arrangement permits the ready removal of any transformer in case of accident and the substitution of a new one in its place. The roof of this room forms the gallery upon which are mounted the stick type circuit-breakers, barriers, choke coils and lightning arresters. The transformers as at present

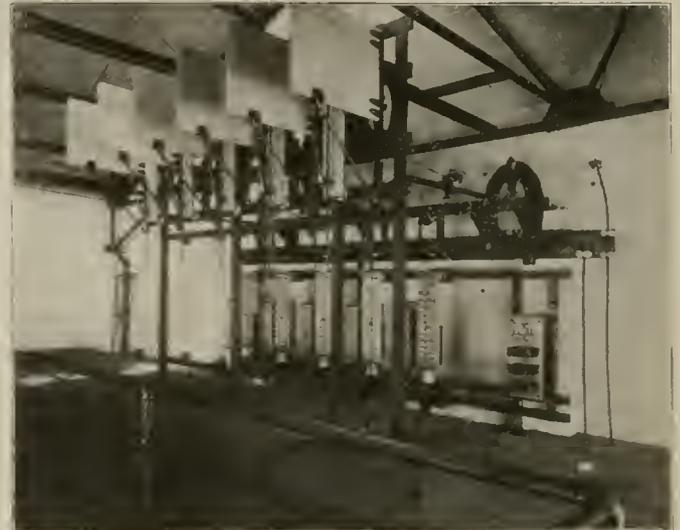
3,300 volts and step it up to 22,000 volts. The outgoing lines pass upward and through the concrete roof through the transformer room to the rack and circuit-breakers, and from there through 10-inch tile to the exterior lines.

Transmission Lines.

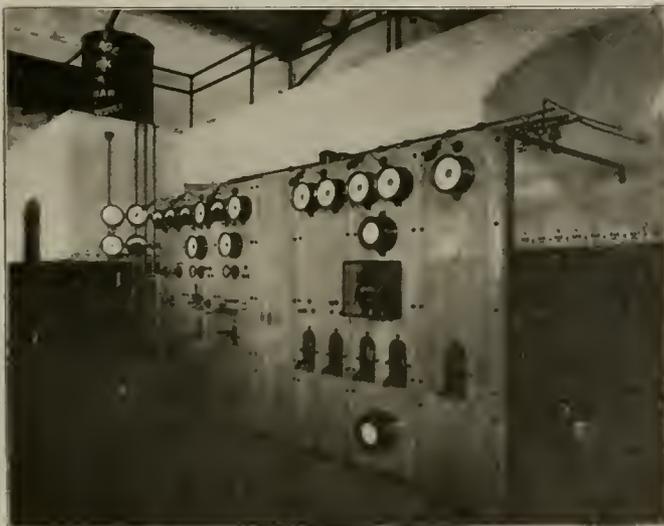
Outside of the terminal cities the road is to be operated by single-phase alternating current, with a line pressure of either 3,300 or 6,600 volts. Within the corporate limits of Pittsburg and Butler direct current will be used.

There are two transmission lines leading from the power house at Renfrew. One of these is composed of No. 4 wire and is to be used in transmitting single-phase current to Bryant at 22,000 volts pressure. The other line extends 3-phase from the power house to the substation at Butler, which supplies current for operating cars within the city limits.

The trolley line is of the Westinghouse type of catenary cable construction. No. 000 grooved trolley wire is used, and is suspended on a 7-16 inch steel messenger cable by clip hangers, spaced 10 feet apart. The catenary cable is supported by insulators on the bracket arms. On curves the trolley wire is held in line by strain arms, which are carried on large corrugated insulators. The cross-arms used are of



Pittsburg & Butler Street Railway—Circuit-Breakers and Lightning Arresters.



Pittsburg & Butler Street Railway—Switchboard in Power House.

installed are connected two in delta for the 3-phase line to Butler, which operates the rotary converter. Two transformers are connected in multiple for the single-phase transmission between Butler and Pittsburg. The low tension windings take current from the bus bars at a pressure of

oak and are 3 feet 10 inches long. The pole line is of rigid construction. The poles, which are of native grown chestnut, are 35 feet in height, and have minimum 8-inch tops. The poles are spaced generally 100 feet apart except on curves, where the spacing is 50 feet. Each pole is guy anchored.

The trolley is divided into three sections by line breakers, which break the catenary cable as well as the trolley circuit. One of these section breakers is placed at the power house and one at each of the two static substations. The ends of the trolley wire are connected to disconnecting switches in the power plant and substations, so that either section may be cut out if trouble occurs, or the substations may be cut out and the current passed directly from one section of the trolley wire to the other. The trolley wire is carried over bridges on span wire construction, the span wires being supported by steel poles. These poles are fitted with cross-arms, which carry the high tension lines. The insulator used for the high tension lines is of the Knowles No. 9373 porcelain triple petticoat type, and is carried on an iron pin set in cement. The diameter of the insulator is 8½ inches, and the height above the cross-arm is 15 inches. The insulators are spaced on the arm 36 inches, center to center, and are tested to withstand 75,000 volts. Where the 2-phase line is used, the top insulator is carried on a galvanized iron

saddle, which spans the top of the pole and is fastened to it by lag screws.

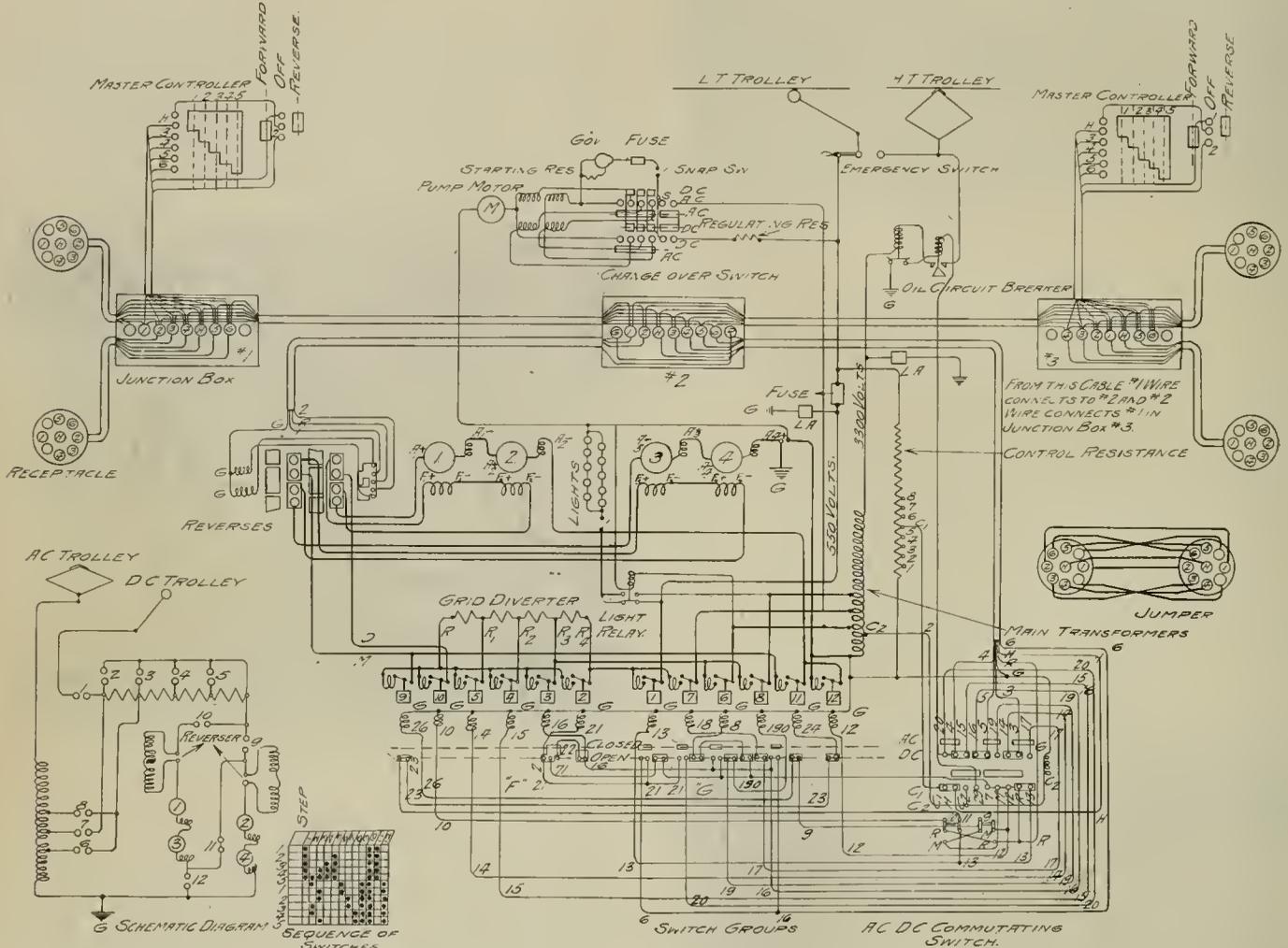
Switchboard and Wiring.

The switchboard is composed of seven panels of blue Vermont marble, six panels being mounted and one being left blank for the future generator installation. All panels have the instrument lights at the top of the board. All instruments are finished in black. The swing bracket at the top has mounted on it two 4,500-volt meters, one for each generator, and one synchroscope.

The wiring from the generators to the switchboard is suspended from the under side of the turbine floor on racks and insulators and passes up through the floor at a point back of the switchboard. The cables are lead covered and

breakers. The bus lines and choke coils and lightning arresters are located back of the framing.

The two static stations, used to furnish current to the single-phase trolley line between Butler and Etna, are located at Mars and at Bryant, about 11 miles apart. A line from the power plant supplies current directly from the generators to the trolley at 3,300 volts. In each station is installed one 500-kilowatt oil-cooled static transformer of the shell type. These transformers receive current at 22,000 volts and step it down to 3,300 volts, at which it passes out to the trolley line. Each station is provided with the usual stick type circuit-breakers and barriers with choke coils and lightning arresters. The line from the low-tension side of the transformer to the trolley is provided with a type "F" double-pole oil circuit-



Pittsburg & Butler Street Railway.—Diagram of Car Wiring.

pass through camp tile under the transformer room to the outlet in front of the transformers. The high-tension bus lines are located above the transformers in the transformer room. The single-phase transformers can be disconnected from each other at the bus by disconnecting switches. The single-phase current is taken from the middle and outside phase at the bus bars on the back of the board.

Substations.

There are one rotary substation and two static substations. The rotary substation is used to supply current to the Butler City Passenger Railway Company, and contains at present one 500-kilowatt, 550-volt rotary converter and three 200-kilowatt oil-cooled transformers, which supply current to the rotary. These receive current at 22,000 volts from the power station. The high-tension circuit-breakers are mounted on the framing directly over the transformers. Upon this framing are also mounted the barriers between the circuit-

breaker switch. There is a choke coil and lightning arrester on the outgoing trolley circuit. The ground return from the rail to the switch enters the station through a tile. The Mars station, which is half way between the power plant and the station at Bryant, is provided with circuit-breakers in the high-tension transmission line which passes through the station, so that the section beyond Mars can be cut out in case of trouble. The general style of these stations, which are built of brick, is shown herewith.

Car Equipment.

The cars for the road were manufactured by the Niles Car & Manufacturing Company, Niles, O. The cars are 51 feet 3 inches long, over all, 8 feet 1½ inches wide, and 9 feet 5 inches high. The lumber used in the construction of the car bodies was well seasoned. The sills and bottom framing were made strong, so as to carry safely the heavy equipment. The outside sills are composed of yellow pine timbers, 4½ by

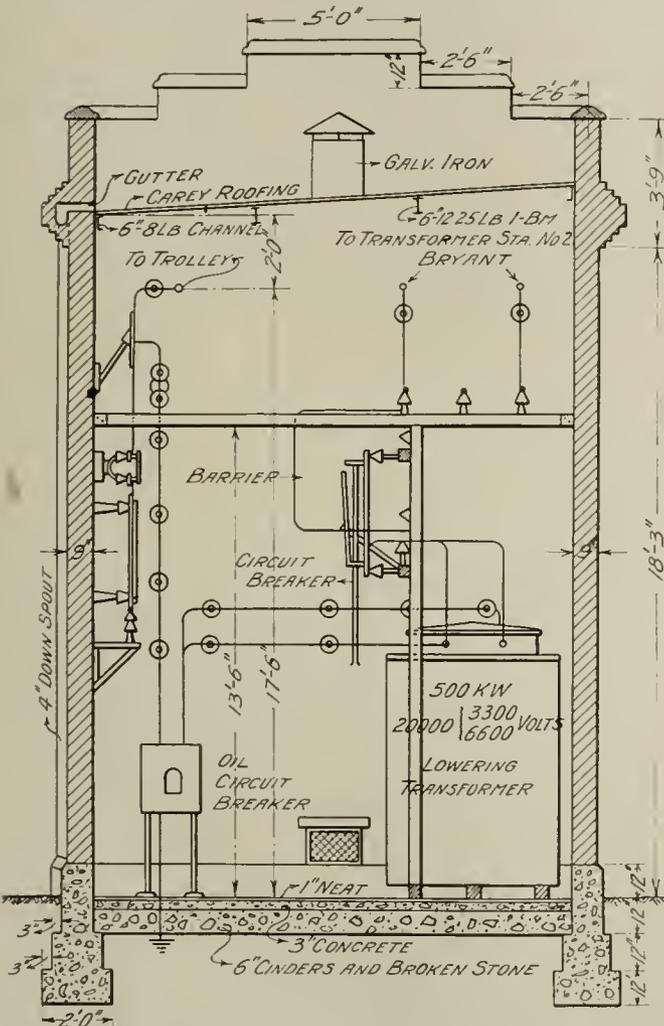
7 $\frac{3}{4}$ inches. The two center sills are composed of 6-inch I-beams and yellow pine fillers. The end sills are oak.

The windows of the cars are of the Pullman style, with the upper sash made stationary. The main compartments of the cars are provided with 15 reversible seats and four end seats, all of which are upholstered in mohair plush. The smoking compartments contain four reversible and four end seats. These are upholstered in leather.

The interiors of the passenger cars are finished in mahogany. The ceilings are of the full empire type and are painted a light green. The cars are heated by the Peter Smith hot-water heating system. Each car is equipped with two trolley poles and a pantograph current collector, the latter being used for alternating-current operation.

The trucks were built by the Standard Motor Truck

switches, one for the alternating-current and one for the direct-current control, the grid resistance, one combined alternating-current circuit-breaker and limit switch with pneumatic reset, which is operated from the platform, one reciprocating-type reverser switch, one commutating switch, for changing over from direct current to alternating current, one emergency change switch by which current can be taken for the alternating-current operation by trolley wheel to operate the car in case the pantograph becomes disabled. When in the normal position the switch is set to use current in the direct-current operation. There is one relay-light switch, which changes the

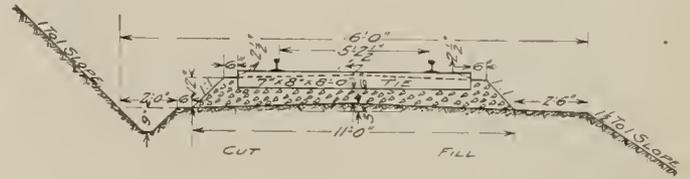


Pittsburg & Butler Street Railway—Section of Rotary Substation.

Company. They are solid forged from low-carbon, open-hearth steel and are designed to carry a load of 64,000 pounds at the king pin. They weigh 17,200 pounds and have a wheel base of 6 feet 8 inches. Rolled steel wheels, 36 inches in diameter, and forged steel axles, 6 inches in diameter, are used. The brake rigging is suspended from the equalizing bars. Peacock hand brakes and Westinghouse air brakes are used on the cars.

The cars are equipped with the Westinghouse alternating-current and direct-current multiple-unit electro-pneumatic control. Each truck has mounted on it two No. 132 100-horsepower alternating-current and direct-current motors. The general scheme of wiring of the cars is shown in the accompanying diagram.

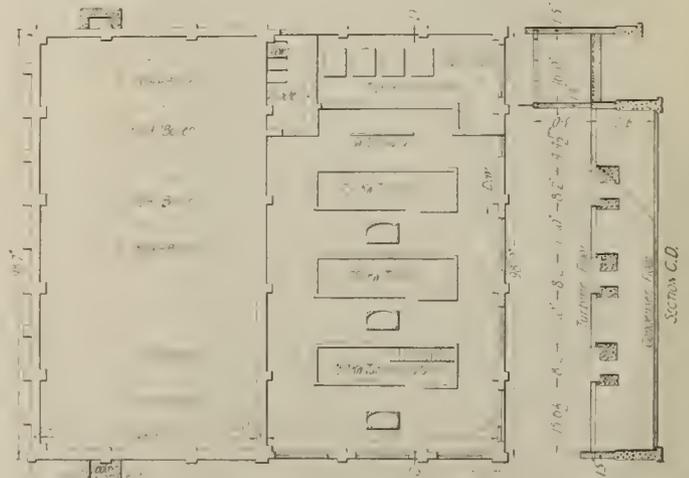
The electrical mechanism installed under the car body is one 200-kilowatt air-cooled auto-transformer, two sets of unit



Pittsburg & Butler Street Railway—Track and Roadbed Construction.

lights from direct current to alternating current when the car passes from one to the other. The auto-transformer is kept cool by a small motor-driven fan placed in one end of the transformer casing. The air is taken from openings in the cable duct and driven through the transformer coils and out at the other end. This motor is constantly in circuit.

The wiring for the pneumatic control is all in loricated conduit with junction boxes for distribution to the various points of connection. The main cables are also carried in a cable duct provided in the center of the car floor by the car builders. All cables to and from the reverser to the motors are carried in cable ducts. There are two trolley leads from the emergency switch, one alternating-current and one direct-current. The alternating-current lead passes from the pantograph in the center of the car in loricated pipe and is connected to an oil circuit-breaker. The two trolley circuits for direct-current operation merge into one lead, which passes down at the corner post of the car to the emergency switch, a fuse being provided in this circuit to take care of the over-



Pittsburg & Butler Street Railway—Plan of Power House.

load or short circuits. The air pump change-over switch is placed on the platform, so that the change from one system to the other can be made without getting off the car. The air pump motor is of the alternating-current and direct-current compensated type. When operating by direct current the fields are all in series and when operating by alternating current the fields are in multiple.

Motor Operation.

When using direct current the motors 1, 2, 3, 4 are in series, with all resistance in on the first point of the con-

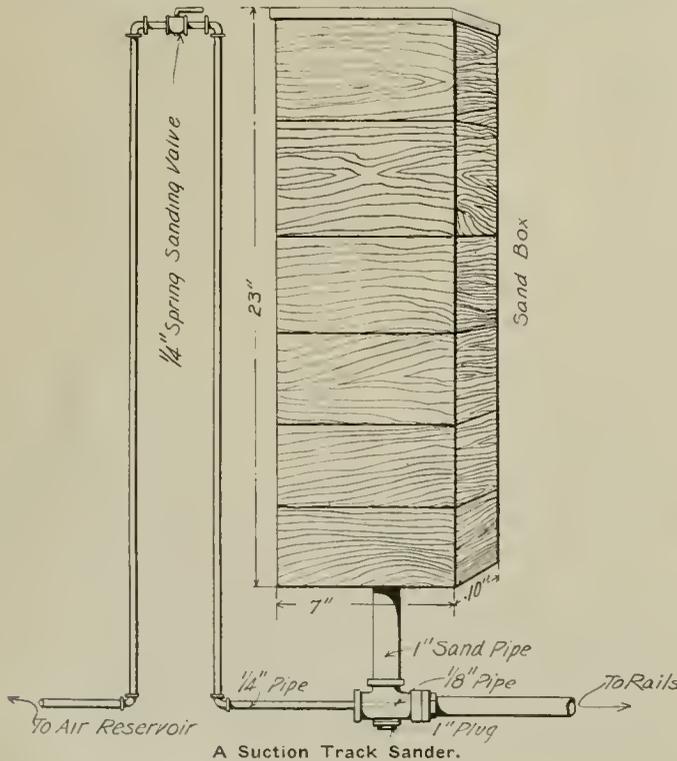
troller. The resistance is gradually cut out on points 2, 3 and 4, and on point 5 all resistance is cut out. The current passes through the entire winding of motors 1 and 2 to the reverser, then through the armatures and the compensated field winding of motors 1 and 2, then through the reverser to the ground. The current takes a similar course in passing through motors numbers 3 and 4.

When operating on alternating current the motors are operated two in series, forming a unit, and the two units are operated in parallel. Motors 2 and 4 have ground connections. The auto-transformer has three taps brought out to the unit switches. When starting, the lowest voltage tap is put in circuit by the unit switch, and each successive point in the master control increases the voltage. Before passing from one tap to the other a reactive resistance is put in series with the circuit, the resistance being a part of the grid resistance used in the direct-current control. The number of steps on the master controller is the same for both currents, the fifth point being the maximum speed position. It will be seen that with these motors the reversing is done in the field winding instead of in the armature, as is usual in direct-current practice.

The Pittsburg & Butler Street Railway Company was promoted by Charles Gibson, Jr., of Pittsburg, and was financed by the Pittsburg Trust Company, which is now operating the property. The road was designed, located and constructed by Hudson F. Layton of Pittsburg as chief engineer, who, since turning the finished road over to the operating department, has been retained as consulting engineer. Mr. Gibson acted as general manager during the construction period and since has been retained as vice-president and a director. Mr. Gibson and Mr. Layton are well known in railroad circles as designers and constructors. The future extensions of this road will give one of the longest electric lines in the country, forming, according to plans, the shortest line between Pittsburg, Erie, Lake Chautauqua and Buffalo.

A SUCTION TRACK-SANDER.

A suction track-sander designed along original lines by Mr. H. H. Buchanan, master mechanic of the Louisville & South-



A Suction Track Sander.

ern Indiana Traction Company, New Albany, Ind., is presented in the accompanying illustration.

As shown, the sand-box is connected to one of the vertical

branches of a cross by a 1-inch pipe. A 1/4-inch pipe connected to the compressed air reservoir is reduced to 1/8-inch at the cross and enters one of the horizontal openings and extends a little beyond the center line of the sand-pipe. This prevents the sand from being blown out of the sand-box when pressure is applied. From the opening opposite the air pit a 3/4-inch pipe leads the sand directly on the rails under the wheels. The branch of the cross below the sand-pipe is plugged to facilitate cleaning. A valve on the air line located near the airbrake serves to control the sanding.

TRAINMEN WITHDRAWING WAGES FROM DAILY COLLECTIONS.

The novel practice of allowing conductors to withdraw each night from money collected during the day sufficient amounts for their own and their motorman's wages has been in successful use by the Denver City Tramway for the past 18 years. The accompanying reproductions of some of the blank forms used by this company's auditing department will serve to illustrate the simplicity of this method of payment.

The daily trip-sheet, as shown, exhibits blank spaces for the usual information and also, at the lower right-hand corner, bears a blank receipt for the day's wages of the car crew. At the end of his day's service the conductor, having properly filled out the main portion of the trip sheet, withdraws from his fares the proper amount of money with which to pay his motorman and himself. He indicates the rates per hour, amounts of wages withdrawn, punch mark and the badge numbers in the proper spaces and then signs the formal receipt on the blank. This receipt is also signed by the motorman.

It is stated that by this method of paying there are practically no misunderstandings regarding wages and that

Denver City Tramway—Correction Notice Given Conductor.

Denver City Tramway—Trip Sheet with Blank Receipt.

the errors are remarkably few. Whenever the auditing department does find errors a correction notice, as illustrated, is handed the conductor who is responsible. Thus the error is adjusted at once and friction avoided.

CONCLUDING SESSION OF THE IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION.

Before adjourning the fourth annual convention at Clinton, Ia. on Saturday, April 20, the Iowa Street and Interurban Railway Association re-elected officers for the ensuing year. An account of the proceedings at the opening session on Friday, April 19, with four papers which were read before the association, and other information relating to the meeting, was published in the Electric Railway Review of last week. The following officers were elected:

President—F. J. Hanlon of Mason City, vice-president, secretary and auditor Mason City & Clear Lake Railway.

Vice-President—P. P. Crafts of Clinton, general manager Iowa & Illinois Railway.

Secretary and Treasurer—L. D. Mathes of Dubuque, manager and purchasing agent Union Electric Company.

At the invitation of the Des Moines City Railway and the Inter-Urban Railway, Des Moines was selected as the meeting place for the next annual convention. It was decided that the papers and discussion during one-half day of the 1908 convention shall be devoted to the consideration of operating problems.

The association passed a vote of thanks to the railways and citizens of Clinton for the entertainment afforded the delegates during the convention. At the session on Saturday morning Isaac B. Smith read a paper on the "Joint Operation of City and Interurban Cars over City Tracks." This paper and an abstract of the discussion which followed it will be found on page 556 of this issue.

Handling Peak Load Traffic.

E. L. Kirk (Sioux City Traction Company) gave an informal talk on effective methods of handling peak or rush-hour traffic on city lines. He said he believed that the easiest and the most logical way to handle peak load traffic is through the use of trailers. His company had gone to extremes in using trailers and had developed trailer cars that will seat 90 people. These are handled by motor cars having a seating capacity of 68 people and are usually used on the long-haul park runs. In handling the night peak load some cars are sent out between scheduled cars as trippers. During the three years that trailers have been used at Sioux City not a person has been injured through their use and not a derailment has been reported. The cars are equipped with hand brakes.

J. G. Huntton (Tri-City Railway & Light Company) said that his company operates trailers on the arsenal division, but had not been so fortunate in avoiding accidents as the Sioux City Traction Company.

G. E. Miller (Union Electric Company, Dubuque) approved of the use of trailers. His company has used trailers on the park line for four years without an accident. In caring for peak loads he had developed the bellows schedule, which closes up as the travel increases. After the peak of traffic has been reached an inspector sees that all cars resume their regular schedule. He believed that the successful operation of trailers depends almost entirely on the care of motormen and conductors.

A short discussion followed the reading of the paper on the "Steam Motor: Its Value in Interurban Service," which was published in the Electric Railway Review of last week, page 520. As the author of the paper, W. G. Wagenhals, was not present to explain the questions that came up no satisfactory conclusions were reached. H. H. Polk (Inter-Urban Railway, Des Moines) said he believed that many small lines would eventually be built and would adopt as a standard a car similar to the one described.

On Saturday afternoon the delegates, accepting the invitation of the Iowa & Illinois Railway and the Tri-City Railway, inspected the government power house at Rock Island and the Tri-City Railway & Light Company's power station at Moline. Eighty of the members of the association and

representatives of manufacturers attended a dinner at the Commercial Club, Davenport, on Saturday evening.

Discussion on Train Dispatching.

Following the reading by H. H. Polk of the paper on "Modern Train Dispatching Methods on Electric Railways," which was published in the Electric Railway Review of last week, page 521, a discussion of the relative merits of the various systems of dispatching took place. Mr. Polk said that running cars on train orders as well as on the timecard schedules gives a double check on all trains, thereby reducing the dangers of collisions.

Mr. Crafts favored the issuing of orders only when unusual conditions prevail and advised the regular operation of cars on timecard schedules. He had made this the practice on the Iowa & Illinois Railway and had obtained excellent results. When cars are more than three minutes late conductors must obtain orders from the dispatcher before proceeding. Such cars are held at sidings so that all other cars may run on their regular schedule. By this system only the late car loses its schedule time. When all cars are running late some confusion results, but it is offset by the elimination of the dangers incident to the issuing of orders at each station. Mr. Crafts believed the frequency with which electric cars are run makes electric railway operation different from steam railway operation.

Mr. Hanlon said he favored the issuing of orders at given points, but believed that no railroad maintaining a fast schedule of cars can successfully have orders issued at all stations.

The discussion turned upon the merits of oil versus electric lamps for markers, switch lamps and crossing signals. Mr. Polk said that his company pays \$75 a month for maintenance of oil lamps on its line. He is now experimenting with electric lights, which, he believes, can be kept lighted day and night at a lower expense. He thought that lights which are worked automatically by a trip on the trolley wire would never be a success, as the danger that the trolley wheel would leave the wire at the critical point would make the system unreliable.

C. D. Cass (Waterloo Cedar Falls & Northern) stated that his company, which owns both a steam and an electric railway, follows steam railway practices in the operation of cars. He believed that if companies would make their sidings of the stub-end type they would have no trouble at those points.

Mr. Crafts said he thought stub-end switches were too slow for use on a railway operating on a fast schedule.

Discussion on Freight Handling.

In discussing the paper of Mr. Crafts on "Freight Handling by Electric Lines," which was published in the Electric Railway Review of last week, page 518, Mr. Polk said the Inter-Urban company derives 30 per cent of its gross receipts from freight traffic.

G. B. Hippee (Des Moines City Railway) believed the Iowa electric railways are far in advance of the railways of the east in the handling of freight. He said the eastern companies do not realize that the freight business can be developed as it has been developed in the west.

Mr. Crafts said he believed an interurban railway which was built for the operation of cars at high speed was necessarily of substantial construction, and he knew of no reason why it should not be safe for freight carrying in carload lots.

In answer to a question by A. E. Park (Des Moines Winterset & Creston) Mr. Polk said that the question of handling freight should be considered in building a new line. He had never obtained data on the comparative cost of handling freight in large and small quantities by steam and electric railways. However, he was positive that up to 8 or 10 cars in a train the cost of handling freight on electric railways was less than on steam railways.

Mr. Hanlon said that his company's track was built with 60-pound steel rails and there had been no difficulty in handling coal in carload lots. He said that electric railways

should adhere to steam railway practices and by maintaining the rates on freight work in harmony with the steam railways.

THE JOINT OPERATION OF CITY AND INTERURBAN CARS OVER CITY TRACKS.*

BY ISAAC B. SMITH, TRAFFIC MANAGER CEDAR RAPIDS & IOWA CITY RAILWAY & LIGHT COMPANY, CEDAR RAPIDS, IA.

Since the assignment by the association of this subject, an Iowa law has been passed fixing the rights and duties of electric railway companies with respect to the joint use of city facilities. The law is now in full force and effect and a treatment of the subject is, therefore, practically limited to the law and its application. I assume that only electric railways were intended to be considered and that the term "city tracks" means the tracks within the corporate limits of a city that belong to a street railway company or an interurban railway company or to a company performing both classes of service.

Section 1 of the statute provides, in substance, that any person, firm or corporation owning or operating an electric street railway in any city in Iowa is authorized and required: (1) To permit the use of its terminals (except car houses and approaches thereto), tracks, poles and wires located within such city, by the passenger and combination baggage cars of interurban railway companies when used for interurban business only and not for local street railway business. (2) To furnish electric power for interurban cars over city tracks so used; but only during the hours when street cars are operated, and provided the capacity of the power house is ample. In the use of tracks and power the grantor company is to have the preference, in order to avoid delays in service. Interurban companies shall pay reasonable compensation for all facilities and power furnished; and, in case of disagreement, questions involving compensation and conditions under which facilities shall be furnished, used and operated, shall, on petition, be heard and determined by the board of railroad commissioners of Iowa. An order of the commissioners, or court of appeal, shall be subject to judicial modification and review.

Section 2 provides: (1) The manner of perfecting an appeal from an order of the board of railroad commissioners. (2) That an order of the commissioners from which an appeal has been made shall not be suspended during review, provided the interurban railway company gives an indemnity bond satisfactory to the court or judge appealed to, and provided the compensation as awarded is made or secured to the grantor company.

The law gives no rights to a street railway company as against an interurban railway company already occupying city streets. But such a condition is unusual. The street railway is almost always the forerunner of the interurban railway, and it seems inadvisable to take up the consideration of the details of a contract that would be used so little, even though it should logically be included in the discussion. The passage of the law removes the necessity of securing a special grant from a city to authorize and permit the use of city tracks for interurban cars, which might be necessary in many cases. This is a most important feature of the law.

No single instrumentality brings constantly more orders to a city or more passengers for street railways than interurban lines, which are undoubtedly a great benefit to the city they enter; and, if local competition is eliminated, are an equal benefit to any system of city railway operating in such city. Interurban railways deserved encouragement, but street railways owning grants to important city streets were in a position legally to impose burdensome conditions upon them. Such anomalous conditions were no doubt the cause of the enactment of the statute in question.

It would seem that the question of compensation will be met by requiring a payment to the grantor company of a reasonable sum based upon the cost of terminals, their maintenance and operations, such compensation to be proportioned on car mileage, wheelage or some other equitable and established custom.

Looking at the proposition as a whole it would seem that the passage of our recent statute has very much simplified the matter of arranging for the joint use of city tracks by city and interurban cars. The rights and duties of contracting parties are well recognized and established, and it would seem that fair, reasonable and uniform regulations governing the joint use of city tracks by city and interurban cars are bound to result.

With regard to the actual details of operation, it would seem that current should be furnished by the company owning

the tracks, otherwise legal and electrical difficulties might be encountered by the erection and use of an individual transmission system over a track used in common.

If the line over which joint operation is to be performed is long or service is frequent, a double track will be necessary to give satisfactory service. An interurban car entering a city after a long run cannot be operated as close to schedule as city cars and delays at meeting points on a single track would certainly result. If the schedule of interurban and city cars either leaving or entering the city is the same (or nearly so), the interurban cars should precede the city cars. The former should do but little or no city business, and hence will not impede traffic by frequent stops. The delays incident to the following of a city car by an interurban car are very vexatious to interurban passengers, and, if there is active competition with some steam roads, such delay might seriously affect interurban revenues.

The Iowa law affecting joint use of city terminals absolutely forbids competition in city business. There is another statute, which, in the absence of any other provision to the contrary, enables interurban companies to charge a greater fare than five cents. These two features should serve to effectively prevent city passengers from using interurban cars and hence should do away with the necessity of recording city fares and providing extra crews.

The company seeking the privileges of using the tracks of another should, and I think would, be obliged to follow the operating rules of the grantor company so far as applicable. With regard to the question of damages, either to the public or as between companies, I believe they should be assessed to the company responsible, as determined by the facts in each case.

In conclusion and in the face of the law and the facts it would seem that a contract covering joint use and operation over city tracks should be, and, indeed, must be, approached in the spirit that the street railway and interurban railway are not competitive but complementary and are beneficial to each other.

Discussion on Joint Operation over City Tracks.

In the discussion which followed Mr. Smith's paper, Mr. Hippee said that interurban lines should use as few miles of city track as possible and should have a separate loop and terminal station at some point away from the center of the city. He said the Des Moines company will put this arrangement into practice as soon as it is possible to do so, as the plan will enable both city and interurban cars to operate with less delay.

Mr. Crafts believed interurban cars should be given the precedence in operation over city streets, as they are usually compelled to run on a fast schedule and if delayed on the city tracks may find it difficult to make up lost time. He agreed with Mr. Hippee that the city tracks should be used as little as possible in large cities, but believed it was impracticable to consider this point in the smaller cities. Interurban cars should be given the right of way and interurban stations should be situated on the outgoing line. This, he said, decreased the confusion on busy days, as a large number of the incoming passengers would leave the car before it reached the station.

Arrangements for Handling Crowds at the Jamestown Exposition.

President R. Lancaster Williams of the Norfolk & Portsmouth Traction Company, Norfolk, Va., is quoted as saying that the company is spending nearly \$3,500,000 to improve its properties, and within a short time will have in operation one of the finest power plants in the country, which has cost about \$1,000,000. The company is spending from \$1,500,000 to \$2,000,000 for betterments in Norfolk and Portsmouth, which includes extensions and modern equipment. Concerning the arrangements for handling the crowds of visitors to the Jamestown exposition he is reported as saying:

"We will be able to handle 10,000 people an hour each way during the exposition. That means a schedule of two and a half minutes on each line. Taking both lines, we will have a schedule of one and a quarter minutes. Cars will be operated with trailers. The cars will go over a belt, so that no time will be lost in switching. During the rush hours of the morning and evening we will run cars at intervals of a minute and a half on each line. That will make a car from Norfolk to the exposition grounds each 45 seconds."

*Read before the Iowa Street and Interurban Railway Association, Clinton, Ia., on April 20, 1907.

DEVELOPMENTS IN THE CLEVELAND TRACTION CONTROVERSY.

The street railway situation in Cleveland has developed rapidly in the last few days. The Cleveland Electric Railway on Tuesday night ceased operation on its Central avenue and Quincy street lines, on which its franchises have been declared invalid by the supreme court, but by securing injunctions prevented any of the low-fare companies from operating the lines. The peace agreement made on January 11 was broken on Monday and the injunction restraining the Municipal Traction Company from operating over Cleveland Electric tracks was put in force, but the low-fare interests evaded it by turning over the operation of the cars to the Low Fare Railway, which was incorporated for just such a purpose, to nullify the effect of the claim that the Forest City franchises are invalid on account of Mayor Johnson's financial interest.

All negotiations for a sale of the Cleveland Electric Railway property in Central avenue and Quincy streets were declared off on April 19. The Cleveland Electric Railway offered to sell the property for \$448,473 instead of about \$150,000 as offered by the Forest City on April 17, as reported in the Electric Railway Review of April 20. The company also reserved the right to dispute any attempt of the Municipal Traction Company to operate from the western end of the Central avenue line to the Public Square. The company stated that in fixing the price it had followed the method suggested by Mr. du Pont and that if this was unsatisfactory it was ready to abide by the results of an impartial arbitration. This offer was at once refused by the Forest City directors, who stated that their objection was against the terms of the offer and not the price.

On April 19 the Cleveland Electric Railway applied formally to the board of public service for permission to remove its poles and wires from the streets in question. This permit was granted the following day, but with many restrictions calculated to prevent the interruption of service until the Forest City Railway could lay its tracks and begin operation. It was provided that the track should be removed in sections in a prescribed order and that crossovers should be built so as to permit operation during the progress of the work of removal. The Forest City forces put in an active day on Saturday setting poles and stringing wire to bring power from the West Side power house for the operation of the Central-Quincy lines.

On Monday, April 22, the Cleveland Electric Railway, through its attorneys, sent a notice to the Municipal Traction Company and the Forest City Railway Company, stating that they had violated the provisions of the peace agreement as entered into on January 11 and renewed on February 8, and that consequently it would consider the agreement terminated. It was further stated that the temporary injunction against the use of the Cleveland Electric Railways tracks by the Municipal Traction Company, which was suspended during the peace agreement, was again in force, and the low-fare companies were notified to cease at once the operation of cars from Fulton road to and around the Public Square. Another notice was sent to the board of public service stating that the company's franchise contract with the city provided for the removal of the tracks upon the expiration of the contract, that the board of public service had no authority to impose restrictions as to how the work should be done and that the company refused to accept the board's permit and would proceed to remove its property in accordance with the terms of its contract.

On Tuesday, April 23, the Municipal Traction Company made a lease to the Low Fare Railway whereby the latter company may operate its cars between Detroit avenue and West Twenty-eighth street and the Public Square. The object of the arrangement was to prevent the operation of the injunction against the Forest City company on account of the mayor's alleged financial interest. To indicate the transfer of

the property under the lease a 10-foot crossover connecting the Forest City and the Cleveland Electric tracks at Superior avenue and West Twenty-eighth street was removed and then replaced in the presence of witnesses. Operation was then resumed under the name of the Low Fare Railway. The Cleveland Electric Railway then applied to Judge Ford for injunctions against the Municipal Traction Company, the Forest City Railway Company and the Low Fare Railway Company, on the ground that Mayor Johnson is financially interested, to prevent any of them from operating the Central-Quincy lines after the Cleveland Electric Railway should cease operation at midnight. Judge Ford granted a temporary restraining order and called a hearing on a permanent injunction for 9:30 the next morning, saying that he would not permit the interruption of service on those lines for a longer period unless he was convinced that the legal points involved were of more importance than the public convenience.

Promptly at midnight on Tuesday, April 23, the Cleveland Electric Railway ceased operation on Central avenue and Quincy street, and turned off the power, as it had announced it would do in a communication to the city council on April 15. No attempt was made, however, to remove the tracks. About 200 policemen were stationed all along the lines to prevent any violation of the restrictions imposed by the board of public service and the company decided not to attempt any clash with the city. The company announced that it would increase the service on several parallel routes in order to make up partially for the lack of service on the Central-Quincy lines.

At the council meeting on Wednesday night an ordinance was introduced and given its first reading to give the Low Fare Railway a franchise over the entire Central-Quincy route, as an extension of its East Fourteenth street and Sumner avenue lines. It was planned to give the ordinance its second and third readings on Thursday and Friday so that the company might begin operation at once. The Forest City Railway already has a franchise for this route, the validity of which is disputed because of the mayor's alleged financial interest. As it will probably take a long time to settle the financial interest suit now pending in Judge Phillips' court, it is planned to have the Low Fare Railway take over the operation of the 3-cent lines. The temporary injunction cases restraining the three low-fare companies from operating over the Central-Quincy routes, which Judge Ford was to have heard on Wednesday morning, were held over until Thursday, nearly all of Wednesday having been taken up in attempting to decide before what court the cases should be heard.

The Berlin (Germany) Electric Railways.

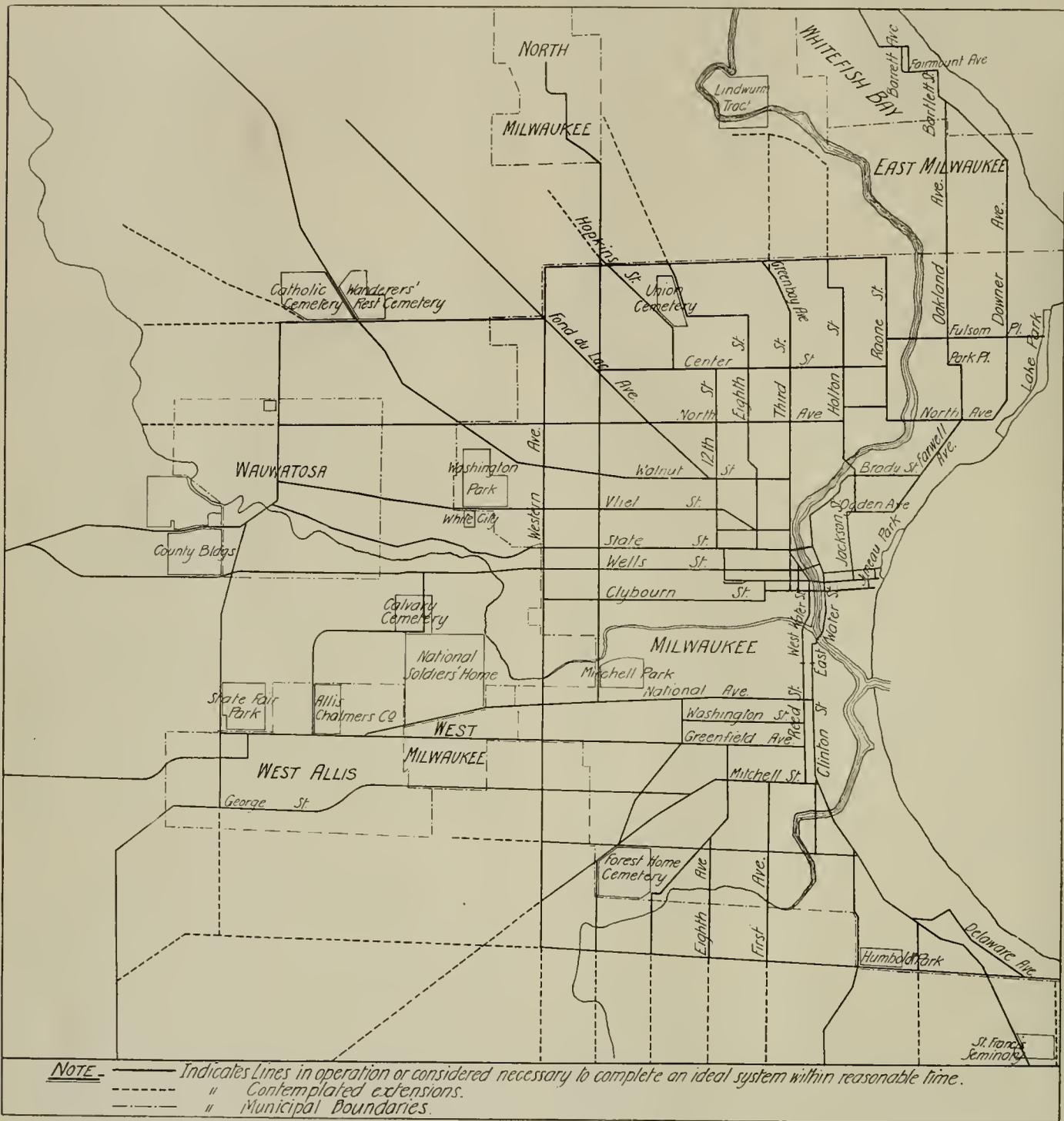
It has been found necessary to remodel the entire system of the Berlin Metropolitan Railways. It is understood that the system will be modeled after the lines now being built between Hamburg and Altona, and will be operated with single-phase alternating current. The third rail is considered impracticable and an overhead line carrying a 10,000-volt alternating current will be used. Two new power stations will be erected, one at Westend and the other at Rummelsburg, each containing six 5,000-kilowatt turbo-dynamos. In the new system it is expected that trains will be run on an interval of every 100 seconds and that each train will accommodate 475 passengers. The trains will consist of four motor carriages and three or four trailers. The cost of converting the system is estimated at £11,000,000, and the capacity will be increased from 200,000,000 passengers a year to about 300,000,000. The annual receipts are estimated at £1,333,000 and the profits at about £333,000. On account of the heavy expense involved it is expected that the fares will be increased about 50 per cent. This vast project is expected to require about four years for completion, during which the whole of the present Stadt, Ring, and Vorortbahn systems will be changed to use the single-phase alternating current.

ARGUMENTS HEARD ON MILWAUKEE SERVICE.

In connection with the investigation by the Wisconsin railroad commission into the railway service provided by the Milwaukee Electric Railway & Light Company, John I. Beggs, president of the company, presented with his testimony on

crimination and said that, compared with St. Francis, Tippecanoe and other suburban points, gross discrimination was practiced against Wauwatosa. He said that the suburban business should be considered as city business.

C. N. Duffy, comptroller of the company, testified that there is no separation of investments on the books of the



Plan for Ideal Street Railway System in Milwaukee as Submitted to Wisconsin Railroad Commission by John I. Beggs.

March 19 a map showing a plan for an ideal street railway system in Milwaukee. The principal features of the plan are shown in the accompanying illustration.

Testimony Before Wisconsin Commission.

Hearings were held by the Wisconsin railroad commission at Madison, Wis., on April 22 and 23 in the cases of Wauwatosa and Milwaukee against the Milwaukee company. L. S. Pease, who represented Wauwatosa in its demand for a 5-cent fare to Milwaukee, based his argument on the ground of dis-

crimination which would determine the value of the Wauwatosa lines alone.

Edwin S. Mack, one of the attorneys for the company, said that the complainants in the case had applied every test except the right one. This, he said, was the legal obligation of the company under its various franchises and the state's policy of regulating the use of streets. Mr. Mack said: "This is a question of classification and distinction, not one of discrimination. It is the established policy of the state

that local governing bodies shall control the terms and conditions under which street railway companies may use the streets. Consequently it is a fact that conditions that apply in Wauwatosa do not apply in West Allis, St. Francis or Tippecanoe."

Mr. Mack said that if an attempt is made to lower the rates of fare at any point the company will insist upon its contract rights as defined in its franchises. "This is a difficult constitutional question," he said, "and I prefer not to go into it until we have reached the reasonableness of fares. This question is not involved now, and cannot be unless the commission determine that there has been discrimination against Wauwatosa."

George P. Miller, attorney for the Milwaukee company, in referring to a statement of Mr. Pease that single fare limits are fixed arbitrarily by the company, said that as the community has grown settlements have developed beyond the city limits. As favors to the people living there, the single fare limit has gradually been extended. But there must be a line drawn; otherwise in the course of time the company would be carrying passengers to Madison for one fare.

John Barnes, a member of the commission, asked if Mr. Miller contended that a franchise grant limiting the rate of fare to "not to exceed five cents" gave the company the absolute right to charge five cents. He replied "yes."

John T. Kelly, city attorney of Milwaukee, in his argument on April 24, said that he would be satisfied with an order which would insure continuance of the present service on the Milwaukee city lines. He asked that the commission order the company to have its cars swept out in the barns during the night and sent out in the daytime with fires lighted.

Mr. Barnes of the commission said that on the question of brakes the duty of the railroad commission is merely to determine whether the hand brake is a reasonably adequate contrivance to control cars. Air brakes may be superior to hand brakes, but, if the latter are reasonably adequate, the commission cannot order their abandonment. If the safety of the public and the rapid operation of the cars demand the use of air brakes, the adequacy of the service is involved and the commission may order their substitution for hand brakes.

Mr. Miller said that the company had been preparing for improvement in its service for over a year and that the new cars were ordered over a year ago. He said that an order relating to the sweeping of cars would be an unjust reflection on the company, because all complaints which had been based on the lack of sweeping were caused by failure of employes to obey orders.

Mr. Miller agreed to file with the company a brief proving that the company has the right to operate construction trains. An order is not necessary, he said. The commission has no jurisdiction over this question because there is no evidence to show that the construction trains inconvenience the public.

As to the substitution of air brakes for hand brakes Mr. Miller said that the duty of the commission was to protect the traveling public and enforce reasonable, adequate service.

"The company has had many years of experience," Mr. Miller said, "but no person has ever been injured on our cars because of the lack of air brakes. Under present conditions people on our cars are much safer than other people using the streets."

Mr. Miller said he hoped the commission would recommend what changes and extensions it deems advisable, and said that the company would be glad to follow the recommendations to the best of its ability.

The commission has taken the cases under advisement.

The Chicago & Milwaukee Electric Railroad, which is extending its line from Kenosha north to Milwaukee, Wis., is employing both a day and a night force on the construction, arc lamps furnishing the light. More than 600 men are now employed.

HENRY J. PIERCE SHOWS THE NEED OF CO-OPERATION.

Henry J. Pierce, president of the International Railway Company of Buffalo, made an address before the Buffalo chamber of commerce on April 18, in which he spoke of the need of settling wisely the questions which confront the country, and suggested a plan for co-operation between the public and the corporations. Mr. Pierce said in part:

The bulwark of the nation is its people and their property, which has been built up by years of toil. The protection of the person and his property is the purpose for which all government exists. Any proposed measures of government that may strike at this fundamental reason for the very existence of government are wrong. Every citizen should uphold the law. But no law should wrongfully hold up the citizen. Government is not intended to be the arbitrary despot of the people and their property. Property, accumulated through years of thrift, should not be endangered by an impulse for experiment. Every man to his trade, gentlemen! In a matter of interpreting the law, let the lawyers be heard. In a matter of business, let the business men be heard.

Commerce has come to mean corporate transaction of the great bulk of business. The merchant, the miller, the manufacturer, the dealer, have incorporated for the better handling of their business, and today we find the world of business peopled with corporations large and small. They represent a vast volume of the nation's wealth. Prominent among them are the public service corporations. Their real owners are not the few, but the many. Here or there a man momentarily may rise only to end in acknowledging that the people, the thrifty citizens who have accumulated more or less money and invested much of it in large and small amounts in stocks and bonds, the great body of the nation, are the owners of the nation's wealth. The builders of great things must borrow the money to build. The people have no wish or time to listen to demagogues. Especially they have no confidence in any who in sheer wantonness or selfishness may attack the business institutions in which the money of the people is invested. The people expect every representative business body, which undertakes to voice their views, to turn its back upon malign clamor designed to undermine the commercial welfare of the country. Honest criticism is always welcome; dishonest criticism is despicable.

In a matter of making the laws let us not leave it to the lawyers alone, especially in laws that pertain well-nigh wholly to business. This I mention not with reference to any individual, but because more than 60 per cent of the members of our national congress and our state legislatures are lawyers. Let us hear what the business men have to say. Let them be consulted; let them be advised with; let their point of view be considered and their information, suggestions and experience be utilized in the framing of legislation which affects the business interests of the country. These are no times for experiments with our prosperity.

It is a time for sincere counsel and not for insincere controversy. Above all, in this impending crisis it is a time for wise and careful consideration of whatever may tend toward governmental action. I believe it would be of tremendous benefit if during the session or after the adjournment of the legislature in each state the governor of the state should call a second assemblage to meet at the capitol, and this second gathering should be composed of representatives of every chamber of commerce in the state. It should not meet for a day, but for weeks if necessary. It should discuss every question of interest or at issue in any way affecting the public service of the people. Its members should aid to bring about a thorough understanding of corporation business from the business standpoint. It would result in a better understanding, and during that time, if later the laws needed to be amended, the state's chief executive and other officials would ascertain the practical business side, apart from the technical legal side, for subsequent use in such amendment, if any, as might be found necessary. Let this second assemblage have regular sessions, let there be no hesitancy in presenting any problem or question pertaining to the business welfare of the country, the commonwealth or the corporation. Let it be all open and above board, so that every citizen of the land may know what occurs. Let its sessions be controlled by a spirit of sincerity and fairness and a true desire for co-operation among all the elements of our national business life. The convening of such second assemblages would mark a new era in our country's development. Certainly no harm can come from hearing all sides of every question. Then we could ascertain just what charges of corruption, if any, in public service corporations are true, and just what accusers and accusations are untrue. Then we could hear in open discussion any allegation that the head of any public service corporation does not know how to

manage his own business or that he is an oppressor and a cheat. Instead of reckless assault or irresponsible defamation there could be sincere discussion and thoughtful consideration. If a dozen or if only one of the foremost states of the union would lead off with such gatherings, officially called, others would follow, and within a year the benefits to business and to the country would be seen and felt throughout the entire land.

In what I have said I have spoken with a freedom born of the feeling that every man here tonight is equally sincere with myself in desiring that every pending problem may have a happy solution. Nothing is settled until it is settled right.

ANNUAL MEETING OF THE OKLAHOMA ASSOCIATION.

The first annual convention of the Oklahoma Electric Light, Railway and Gas Association was held at Oklahoma City on April 22 and 23. The following officers were elected for the ensuing year:

President, F. H. Tidnam, general manager Oklahoma Gas & Electric Company, Oklahoma City; first vice-president, Edward Reynolds, Tulsa, I. T.; second vice-president, J. H. Merrill, general manager Choctaw Railway & Lighting Company, South McAlester, I. T.; third vice-president, Fred Bentley; secretary, Galen C. Crow, general manager Guthrie Electric Light & Power Company, Guthrie, O. T.; treasurer, W. J. Dibbens, manager Guthrie Gas, Light, Fuel & Improvement Company, Guthrie, Okla.

Executive committee: (For two years) H. C. Stetmund, Chandler, O. T.; C. T. Mercer, Geary, O. T.; (for one year) Clarence Klein, Tulsa, I. T.; and J. E. Turner, Elk City, Okla.

Committee on finance: Charles W. Ford, general superintendent Oklahoma City Railway; R. Wonderlich, Sulphur Springs, I. T.; and W. W. Balington, Okmulgee, I. T.

Advisory committee: H. H. Stephens, El Reno, O. T.; J. J. Patterson, Ada, I. T.; and E. M. Cooper, Wilburton, I. T.

J. H. Merrill, general superintendent of the Choctaw Railway & Lighting Company, South McAlester, I. T., read a paper on "Interurban Railways." Mr. Merrill spoke of the development of interurban roads. He urged members who are constructing new roads to avoid cheap rates which would overload the equipment and, considering the cost of maintenance and new equipment, would not yield fair profits. Mr. Merrill also advised against the establishment of a service that would be unprofitable, saying that a four-hour service was often as profitable as an hourly service, and would not require so large an outlay of money.

In his annual address, the president, F. N. Tidnam, reviewed the organization of the association, told of the work of the officers during the last four months in preparing the constitution and by-laws, in answering the questions of members and assisting them with data on rates and franchises, and in keeping in touch with legislation pertaining to public utilities. Mr. Tidnam urged the opening of a question box and that a committee be formed to obtain answers from the most reliable sources, and also that a committee be appointed to report on legislation adverse to the railway, gas and electrical interests. He suggested the appointment of a business committee to report on better methods of increasing the use of electric cars, light, heat, power and gas as offered by large and small properties and suggested that this committee have the power to assist contractors and to supply means of introducing new appliances.

J. Cliff Leavitt of Oklahoma City read a paper on "Car Painting and Other Uses of Paint." Mr. Leavitt gave advice as to the use and durability of different paints and discussed all the parts of cars to which paint is applied.

E. L. Callahan of Chicago, of the General Electric Company, read a paper on "Increasing the Central Station Day Load." He showed the members how to develop interest in heating and cooking by electricity.

The Nebraska railway commission has addressed a letter to the Lincoln Traction Company, the Citizens' Railway of Lincoln, the Omaha Lincoln & Beatrice Electric Railway and the Omaha & Council Bluffs Street Railway notifying them that they are subject to the terms of the new anti-pass law and will be expected to obey it.

DETROIT SERVICE ORDINANCE ENJOINED.

The Detroit United Railway on April 24 secured from Judge Swan of the United States circuit court a temporary injunction restraining the city of Detroit from enforcing the provisions of the city ordinance introduced by Mayor Thompson and approved on April 16, which requires the company to increase greatly its service during rush hours. The company has filed a bill of complaint, stating that to provide all the cars required and to carry out all of the provisions of the ordinance would force it into bankruptcy. Section 1 of the ordinance provides:

That every person, firm or corporation operating cars upon the streets of the city of Detroit shall, between the hours of 5 and 8:30 a. m., 11:30 a. m. and 2 p. m. and 4:30 and 6:30 p. m., except on Sundays, provide a sufficient number of cars of sufficient capacity to accommodate and provide for the transportation of passengers, so that no car, in consequence of the failure to so provide, shall carry a greater number of passengers than the seating capacity of said car and one-half as many more; provided, that it shall not be lawful for any car, when it is filled with passengers to or in excess of the number herein specified, to pass by without stopping for additional passengers or decline to receive passengers, whenever so signaled, unless another car on said line and following in its rear is within a distance of 200 feet; and, provided, further, that the terms hereof shall not apply to any extraordinary condition that could not with reasonable care have been foreseen; and, provided, further, that this section shall not apply to any line that is maintaining continuously, during the time herein named, a service where the cars are 20 seconds apart; or on any line that traverses any street upon which there is maintained continuously during the time herein named a service where the cars are 20 seconds apart.

Certain outlying lines are exempted from these provisions. A fine of \$100 for each violation is imposed.

The company, in its complaint, says that to comply with the ordinance:

Instead of less than 1,000 cars now owned the company would have to have 7,847 cars on the tracks during the hours of 20-second service, and to allow for breakdowns and repairs the company would have to keep on hand 9,600 cars.

It would be necessary to increase the force of conductors and motormen from 1,400 to 19,075 to man the cars and allow for sickness, etc.

An increase of 11,300 employes in other departments of the service would be necessary as follows: Mechanical department, 3,500; transportation, 500; track, 6,400; power, 400; miscellaneous, 500.

The total number of employes would have to be brought up to 34,000, an increase of 29,035 men.

The company asks the court to declare the ordinance unconstitutional and void and of no force or effect whatever, and that the city, the mayor and the corporation counsel be temporarily and permanently enjoined from enforcing or attempting to enforce the ordinance either by suits or prosecutions or otherwise.

The company says that it is now providing more than a sufficient number of cars for the comfortable carriage of all passengers if the passengers would wait for the short period of time between cars and not all rush on the first cars. It is said that every passenger could have a seat by waiting a few minutes, the seating capacity of the cars run at all hours of the day being in excess of the number of passengers carried during those hours.

The order for the city to show cause why the injunction should not be made permanent is returnable on May 13.

Mr. C. C. Cokefair of Duluth and Mr. A. S. White of New York have made application to the courts of Minneapolis for the condemnation of tracts of property along the Mississippi river that are required in connection with the water-power rights secured by them for the power development between St. Cloud and Minneapolis. The distance by the river is 125 miles, although the railroad route between St. Cloud and Minneapolis is only 65 miles. The available fall in this portion of the river is 100 feet, and the only points along this route where water power is available are at Otsego, Clearwater and Monticello, which are those now held by the company in which Mr. Cokefair is interested. It is intended to use the water power available by the installation of a large electric plant for lighting and power purposes, and is also intended to furnish power for the street railways from the new power house when it is completed.

INDIANA TAX HEARING.

The Indiana state board of tax commissioners on April 22 began a series of hearings for representatives of traction companies of the state who desire to present arguments showing why their tax assessments should be reduced or at least not increased. In the course of the hearing testimony was presented giving interesting facts in regard to the condition of Indiana traction lines.

J. Levering Jones, president of the Ft. Wayne & Wabash Valley Traction Company, did not ask for a reduction, but thought there ought to be no increase. An abstract of his statement follows:

The road is spending much money in bettering its property, straightening out the curves and similar work; it is also building a line from Logansport to Lafayette, which is not in operation. When this is completed the company will have lines from Ft. Wayne to Lafayette and from Ft. Wayne to Bluffton.

The line showed a net increase in its earnings this year over last year of about 8 per cent. But even this did not provide a surplus. They had sold no bonds in the last six months because of the condition of the money market. If an increase of 8 per cent in the net earnings of the company would not provide a surplus, then it is plain to see what a shrinkage of 8 per cent would mean. If the net earnings of any of these roads were to shrink 8 per cent it would mean that they would be forced into a receivership. They could not stand it.

So when a road shows a small increase it is not a sign that it is already prosperous. Wages have increased in the last few years—in the last year 5 per cent. Material is high. The Indiana interurban roads are just now going through the transition from their infancy to maturity, and this is an expensive process. They were built independently and in pieces, each little line with its own management and administration. Each had to have its own power house, and the business was not large enough to make these individual lines profitable. Now, however, they are being taken into combinations and the management and administration are being simplified. This will be the salvation of the roads and for the greater convenience of the public.

Mr. Jones said there was no profit in the freight and express business that is now done by the interurban railroads. Interurban roads, he said, were essentially passenger roads. Therefore freight and express cars must be delayed and side-tracked so as not to interfere with the regular operation of passenger cars. But when these lines were extended into trunk lines so that cars might be run long distances, many of the difficulties in the way of freight and express traffic would be eliminated and that branch of the business would produce a profit.

Mr. Jones said that his company had a traffic agreement by which through cars were run between Ft. Wayne and Indianapolis over the lines of his company and those of the Indiana Union Traction Company by way of Peru. He said, however, that he had under consideration the idea of changing the route of those cars so as to run them through Bluffton, Muncie and Anderson and abandon the present route.

F. L. Welsheimer, secretary of the Toledo & Chicago Interurban Railway, thought the assessment of last year, \$5,000 a mile, should be reduced to \$3,000 a mile. He said the road was in bad condition and that the company had had a great deal of trouble from a sink hole. A piece of 200 feet of track sank during the night into a hole 35 feet deep and full of water.

Hugh J. McGowan, president of the Indianapolis Traction & Terminal Company and the Indianapolis & Western Railway, said:

The Indianapolis & Western or Danville line is a new line and has never been assessed. It is capitalized at \$2,500,000 so as to cover the extension to Terre Haute. The property has been under construction for two years. We have been paying 6 per cent on the money obtained for the building of the line and will get no benefit from our investment except from the two cars now running until we get the line into Brazil and Terre Haute. It is now our intention, however, to continue the Plainfield line instead of the Danville line into Terre Haute because of the expensive fills that would have to be made. We hope to get into Terre Haute by next Christmas. The Danville line, compared with the Plainfield line, is a spur and will continue such until we can get a connection between Danville and Amo. We hope to make a loop, extending the Plainfield line to Terre Haute and connecting with the Danville extension by way of Amo. This will give two

routes to Terre Haute, some of the cars running by Danville and some by way of Plainfield.

Mr. McGowan complained of the assessment against the Indianapolis Traction & Terminal Company for last year, saying that it was unfair and entirely too high. The company was assessed last year at about \$9,000,000. Mr. McGowan said that the assessment last year increased the company's taxes \$85,000, the whole tax being \$230,000, including the \$30,000 paid to the city.

REHABILITATION AND REORGANIZATION IN CHICAGO.

Bion J. Arnold of the board of supervising engineers of Chicago is planning a system of accounting to be followed by the Chicago traction companies during the period of rehabilitation. Mr. Arnold said that the board, after its organization, will probably appoint an auditing company to establish the system. When the system has been established different auditors will probably be appointed to represent the city and the companies.

Mr. Arnold wants to accept an offer to act as chief consulting engineer for the railways of Victoria, Australia, if he can do so without interference with his duties in Chicago. Mr. Arnold said he might receive some suggestions for the Chicago work from a study of conditions in Melbourne. Mr. Arnold will address the graduating class of the Armour Institute of Technology on June 13 in the Auditorium on the subject, "The Reorganization of the Traction System."

A call was issued on April 20 for the stock of the North Chicago Street Railroad Company and the West Chicago Street Railroad Company in order that the reorganization of the Union Traction lines, as provided in the new ordinance, may be completed. The call was issued by a committee composed of Frederick H. Rawson, William N. Eisendrath, Wallace Heckman, Edmund D. Hulbert, Azariah T. Galt, R. Floyd Clinch, George E. Adams, Charles L. Raymond, R. W. Hosmer, Charles W. Leland and George E. Marcy.

The call directed the attention of stockholders to the provision of the Chicago Railways Company ordinance that within 165 days after the passage of the ordinance—that is, on or before July 26—there must be deposited with the Chicago Title & Trust Company a majority of the stock of the two companies, excluding the stock held by the Illinois Trust & Savings Bank as trustee. In order that the stock which is outstanding may be assembled for this purpose stockholders are asked by the committee to deposit their holdings with the Union Trust Company of Chicago, which will issue certificates promising to return the stock in case the general deposit with the title and trust company is not made. The call says:

As to the terms of the deposit agreement, it is, perhaps, sufficient to say that the title and trust company is authorized to dispose of the shares of stock deposited with it thereunder according to the terms of a plan of reorganization, to be approved by Peter S. Grosscup and Prof. John C. Gray of Harvard University, as being based on the legal rights of the depositors as of the date of the passage of the ordinance and as being fair and just to each class of depositors relatively to the treatment of every other class of stocks, securities and judgments. The intention of the ordinance in this regard is to provide that, in the purchase of said property by the new company, such class of securities of the old companies, including stock, should receive fair and just treatment.

Protective Device for New York Subway.

A new and simple device to protect travel in the New York subway and incidentally to protect the subway itself is now being installed in the shape of steel strips connecting the supporting pillar on the sides next to the tracks, both express and local. These steel strips safeguard the cars in case a train is derailed from being raked by the pillars and wrecked by the impact. It is a danger which has long been perceived anxiously, and its obviation by this simple device, though involving heavy expense to the company, comes none too soon.

PIPING AND POWER STATION SYSTEMS—XXXVII.

BY W. L. MORRIS, M. E.

Considerable trouble is experienced with the use of metallic packing for piston rods, valve stems, etc., on account of the air leaking past them. The piston rod packing can be improved by carefully removing it from the stuffing box and marking the parts so they will go back in place. The high spots should then be carefully scraped so that they exactly fit the rod and thus assist the packing to wear down to a perfect bearing. The motion of the parts of the packing is quite slight, and as they are made to wear slowly an air tight fit may not be secured for a considerable time if the

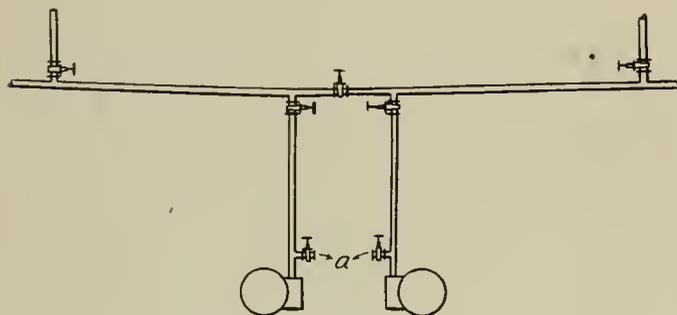


Figure 271—(J2-1).

operator waits for it to wear to a perfect fit, and if the leak is very serious, it would probably never wear tight, as the wear caused by the leakage would exceed that of the rod and therefore the leak would become larger instead of smaller. The low-pressure cylinders are subjected to such low temperatures that almost any form of fibrous packing may be used for them successfully. Fibrous packing may require more frequent attention and renewal and may eventually cost more than metallic packing, but since the loss of vacuum is often two inches in the case of metallic packings, which are apparently in good condition, the fibrous packing will probably be the most economical unless the packing manufacturers will guarantee to install and maintain the packing so that it will remain as tight as fibrous packing.

Each inch of vacuum loss is equivalent to about 1 per cent increase in the cost of operation, which would amount to about \$440 a year in the case of 1,000-horsepower engine operating 12 hours a day. The cost of packing and expense of keeping it in good condition is small compared to the loss caused by a drop in the vacuum. Stuffing boxes should be, if possible, arranged so that either fibrous or metallic packing can be used, and the pump should preferably be so arranged that the change from metallic to fibrous packing and the renewal of packing can be made without dismantling the pump or interrupting its operation. If so arranged, the loss occasioned may be readily ascertained and avoid the possibility of the packing manufacturers shifting the responsibility for air leaks on to the pipe lines, etc. It is invariably good practice to provide the operator with every means possible for determining the efficiency of apparatus so that any difficulty may be easily located in the least possible time and at the least possible expense.

Class J 2, 3, 4 and 5—Dry Vacuum Mains and Branches.

A dry vacuum main is necessary where there is more than one condenser and more than one dry vacuum pump, as it permits the use of one pump on one or both condensers. The mains should be tapped at the top for branches from the condenser and the pump connection should be taken from the bottom. This detail is quite important to insure the draining of all condensation to be removed from the main through the air pumps in a small continuous volume. There is no objection to passing the condensation through the pump if it

is in the form of mist, as it aids in reduction of the compression temperature in the air pump cylinder, but it is unsafe to allow the condensation to enter the air pump in slugs, for the air pump would undoubtedly be seriously damaged, as the piston speed is high and the clearances small. The probable result would be a broken cylinder head, valves, connecting rod or crank pin.

The dry vacuum main should have a slight uniform pitch toward the air pump opening to prevent the accumulation of condensation in pockets and a valve on the pump suction should be located directly below the main as shown in Fig. 271 (J2-1). This arrangement avoids the possibility of the branch filling with condensation down to the valve, a detail which will not permit of draining on account of the line being under less pressure than the atmosphere. The valve between the pump branches is necessary so that repairs can be made to the main while the condenser on the other side of the valve is in operation. The valves, a, located close to the air pump, should not be less than one-fourth the diameter of the pump suction, and they should be of the globe form to insure tightness. These valves are necessary in starting the pump, to permit it being brought up to speed before the full vacuum is put on it. After the pump is in operation the branch line valves should be opened slowly so as to permit the water which has accumulated above them to leak slowly past and through the pump. The temperature of the air entering the pump is generally about 120 degrees, which is increased considerably by the compression in the pump cylinder, so that water jackets are necessary to keep the cylinder cool, as previously stated, under the heading Class H 6. The discharge from the pump is quite dry, due to the heating in the cylinder, and may be discharged over an open sewer or the like, with some provision for getting rid of the oil and grease carried over by the air. As this air is objectionable in the engine room, it can be discharged into the atmospheric exhaust line, as there would be practically no saving in heat units, the temperature of the feedwater in the heater being nearly as high as the air.

The dry vacuum main and branches, as illustrated in Fig. 271, may be used for either an elevated jet or a surface condenser, the details being the same in either case. The elevated jet condenser discharges air together with the tail water whether a dry vacuum pump is used or not, the dry vacuum pump simply being more effective, keeps the condensing chamber freer from air and thus permits a higher vacuum to be maintained. The air which is discharged through the tail pipe into the hot well tends to form vapor, hence if the hot well is located in the engine room it should be ventilated, as this hot vapor is generally very foul, being largely the gas liberated by the decomposed matter carried in the injection water. Fig. 272 (J2-2) shows a well ventilated

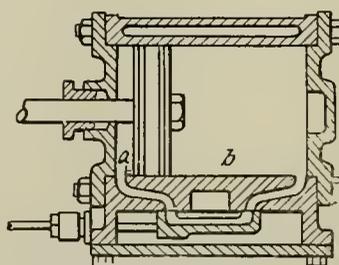


Figure 272—(J2-2).

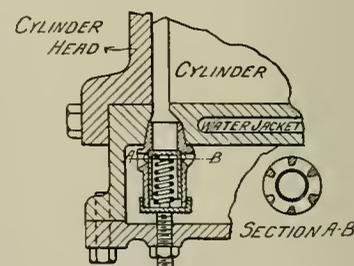


Figure 273—(J2-3).

by an air duct which is carried to the outside of the building above the grade line. The manhole cover and the tail pipe should have an air tight fit at the top of the well to prevent the discharge of gases and vapor into the engine room.

(To Be Continued.)

The Schenectady Railway Company expects to open its line between Saratoga and Ballston, N. Y., on June 1.

News of the Week

Tests of the New Haven Electric Locomotives.

The New York New Haven & Hartford Railroad began on April 19 a series of experimental runs of trains pulled by the new single-phase electric locomotives, between Larchmont and New Rochelle. The tests of the locomotives, as well as of the overhead work, supplied by current from the company's new power house at Cos Cob, Conn., are said to have proved remarkably successful and to have demonstrated that trains operated by the new system will be capable of a speed of 100 miles an hour with safety. The tests are to be continued.

Plans for Ordinance in Philadelphia.

An ordinance which will authorize the city of Philadelphia to enter into an agreement with the Philadelphia Rapid Transit Company is in process of preparation and may be ready for presentation at the next meeting of councils on May 2.

George H. Earle, Jr., a director of the Philadelphia Rapid Transit Company, said that the progress of the city greatly depended upon the passage of an ordinance which would restore the confidence of investors and give the Transit company the financial means to proceed with the needed improvements and extension of its lines.

The Trades League of Philadelphia has withdrawn its opposition to the plans for a new arrangement between the Philadelphia Rapid Transit Company and the city of Philadelphia.

Peoria-Bloomington Line of the Illinois Traction Company Opened.

The first car was operated over the new line of the Illinois Traction Company from Peoria to Bloomington, 42 miles, on April 21, and a regular two-hour service was begun on the following day. The Illinois Traction Company first built a line from Danville to Decatur. Later the line was extended to Springfield and St. Louis from Springfield to Lincoln, and from Decatur to Bloomington. The company is now preparing to build from Lincoln to Mackinaw to connect with the Peoria line. In addition contracts have been let for another line from Springfield to Jacksonville. Next year it is also planned to build from Champaign to Bloomington and from Bloomington to Joliet, thus completing the line from Chicago to St. Louis, paralleling the steam line of the Chicago & Alton.

The construction of the line from Peoria to Bloomington is especially noteworthy from the fact that the company was compelled to build a bridge across the Illinois river at Peoria at an expense of \$200,000, the first important bridge work yet contracted by that company. It is asserted that the Illinois Traction Company connects the most profitable belt of inland cities of any in the west.

Interborough Company Refuses to Bid on New York Subways.

No bids were received for the Seventh and Eighth avenue and Lexington avenue subway routes at the meeting of the New York rapid transit commission on April 25, the date set for receiving bids. The Interborough-Metropolitan Company, which operates the present subways and practically all of the city railways in Manhattan, was expected to submit a bid either for operation or construction and operation of the new routes, but instead President Shonts sent a long letter to the commission pointing out the reasons why the Interborough did not bid. He stated that there would be no profit in operating the proposed subway because of the restriction of the length of lease to 20 years imposed by the Elsborg law and because of the conditions of construction and operation imposed by the commission. The commission is in a quandary, as the four years' work spent in preparing plans, securing consents and in complying with the legal formalities necessary before advertising for bids is apparently wasted. Some of the plans for the Lexington avenue subway, as prepared by George S. Rice, chief engineer of the commission, were published in the Electric Railway Review of April 13.

The rapid transit commission, at its meeting on April 18, awarded the contract for the first section, from Canal to Pearl streets, of the subway loop to connect the Brooklyn and Williamsburg bridges to the Degnon Contracting Company, whose bid was \$2,952,000 for the subway and \$83,000 for the pipe galleries. The contract calls for the completion of the work in 21 months. Four other contracts for the other sections of the same loop are to be advertised at once. The board fixed May 9 as the date for public hearing on the form of contract. The route of the loop was shown in the Electric Railway Review of February 16, 1907, page 221.

Summer School for Artisans at the University of Wisconsin.

The seventh annual session of the summer school for artisans, held under the direction of the College of Engineering of the University of Wisconsin, begins on June 24, and continues for a period of six weeks. Courses of study are offered in the following subjects:

1. Engines and Boilers.—Lectures and laboratory courses covering the theory, construction, management and testing of steam engines, boilers, gas engines and gas producers, refrigerating machines, etc.

2. Applied Electricity.—Lectures and laboratory courses covering the theory of direct and alternating current dynamos and motors, the operation and method of testing electrical machinery, batteries, transformers and other apparatus, photometry and calibration of instruments.

3. Mechanical Drawing and Machine Design.—Elements of ap-

plied mathematics, courses in mechanical drawing and machine design adapted to the preparation of the students.

4. Materials of Construction, Fuels and Lubricants.—Lectures on the properties of materials accompanied by laboratory tests; lectures on fuels and lubricants with laboratory tests on the heating value of coals and efficiency of lubricants.

5. Shop Work.—Practice with hand tools, wood and metal working machinery, and in blacksmithing and pattern making.

6. Manual Training.—Lectures and laboratory courses adapted to the requirements of manual training teachers.

The entire laboratory and shop equipment belonging to the College of Engineering is used by the students in the summer school. The requirements for admission do not extend beyond a working knowledge of English and arithmetic, but the policy is to allow a large amount of individual work, so that the student may take advantage of all the preparation he has obtained. This school offers to those unable to take a regular four years' course an opportunity of obtaining a working knowledge of the methods of testing and the use of instruments, together with such theoretical principles in each case as the nature of the subject and the preparation of the student may permit. Correspondence students have found this school of value in giving an opportunity for laboratory practice along the lines in which they have had theoretical instruction.

A bulletin describing the work of the school for artisans in detail will be sent on application to Frederick E. Turneaure, dean, College of Engineering, Madison, Wis.

Legislation Affecting Electric Railways.

Connecticut.—Several bills affecting the electric railway interests have been considered before the legislature, most of them relating to a reduction of fare to six tickets for 25 cents. General Manager J. F. Punderford appeared before the legislature recently to oppose any reduction. He made the point that everything is going up except car fares. Even wages are going up, for there are two applications before the company for increases. Cars cost \$500 more apiece, rails and copper are more expensive. Merchants can raise prices to meet conditions, but fares cannot be raised. The alternative is to curtail the service and that the company does not want to do.—House bill No. 632 gives to electric railway companies added power in condemning right of way without the approval of the state railroad commission. Corporation Counsel Shipman has introduced a substitute bill, providing that no street railway shall condemn land for a private route until the railroad commissioners shall so authorize.—A bill requiring that all applicants for electric railway charters shall be bonded to build within a certain time has been considered in the house.

Illinois.—The house committee on corporations has reported bills providing that upon petition of 25 per cent of the voters of a city or village, any franchise ordinance passed by the council or board of trustees granting a corporation the use of the streets must be submitted to a vote of the people for ratification or rejection, requiring that in cities of 100,000 population or over all electric wires carrying 100 volts or over shall be placed underground; providing that in cities of 100,000 or over all electric trolley wires shall be placed underground before July 1, 1909; requiring that all live third rails shall be thoroughly guarded.

Massachusetts.—The senate is considering a bill to permit the joint use of tracks and cars by electric railway companies.

Michigan.—The senate has passed the Cady bill which allows interurban railways to refuse to make more than one stop in cities and villages under 20,000 population.

Minnesota.—The house on April 19 defeated the Dalzell bill, which provided that electric railways should have the right of eminent domain through unplatted portions of cities and villages and through platted portions if no franchise could be secured. Several amendments were offered in order to secure the passage of the bill but were defeated.

New York.—The assembly on April 25 passed the Wagner five-cent fare bill, which will compel the Brooklyn Rapid Transit Company to charge only a five-cent fare for a ride to Coney Island. The bill provides that no corporation controlling or operating a railroad of any kind within this state shall charge any passenger more than five cents for one continuous ride from any point on its road, line or branch operated by it or under its control by lease or otherwise within the limits of any incorporated city or village to any other point on such road, line or branch operated by it or under its control by lease or otherwise. If the bill becomes a law it will nullify the effect of the decision of the court of appeals on January 8, which permitted the Brooklyn Rapid Transit Company to charge a 10-cent fare to Coney Island on the ground that some of its lines were owned by leased corporations chartered as elevated and steam roads, and which consequently did not come under the law requiring a single fare over a continuous line of street surface railroad operated by one company.

Pennsylvania.—Governor Stuart signed on April 22 the Homsher "trolley freight" bill, permitting electric railway companies to carry light freight and do a general express business subject to the regulations of the local authorities. The bill goes into effect at once.

Tennessee.—The legislature has passed and the governor signed on March 12 a bill providing that electric railway companies may acquire land for park purposes by condemnation proceedings, in the event of inability to purchase, and that the present laws relating to eminent domain shall apply.

Electrification on the New Haven Road.—T. E. Byrnes, vice-president of the New York New Haven & Hartford Railroad, is quoted as follows: "The Stamford, Conn., electrified zone will undoubtedly be in working order by June 15. Until it has been determined by practical demonstration whether or not the system adopted is a success, we will not think about electrifying the road

so far as the proposed system from Boston to Providence is concerned."

Cannot Carry Mail Carriers at Reduced Rate.—The railroad commission has interpreted the anti-pass law passed by the legislature, which affects electric as well as steam roads, as prohibiting street railway companies from carrying policemen, mail carriers or firemen, or any other persons not exempted by the law, at a rate lower than that open to the general public. This opinion was given in reply to a question by the Lincoln Traction Company, which has a contract with the government to carry mail carriers at a reduced rate, which can only be terminated after June 7 upon 30 days' notice.

Court Upholds Elevated Platform Connecting with Store.—The Illinois supreme court on April 19, in the case of the city of Chicago against the Union Elevated Railroad Company, which owns the Chicago "Union Loop," upheld the right of the company to maintain the platform and passageway connecting the elevated loop station at State and Van Buren streets with the store of A. M. Rothschild & Co. The city had taken the position that the platforms built for this purpose were an encroachment on the street, but the court says this is not true. On the contrary, the decision says the exits are public convenience.

Davenport Commercial Club to Aid Interurbans.—The Commercial Club of Davenport, Ia., has appointed a committee to lay out a route on which interurban roads may come into the city. The suggestion was made by Henry Vollmer, who moved that the committee be appointed and that the result of its work be laid before the city council. The committee will also suggest the amount the roads should pay for the use of the streets and an effort will be made to have the council embody these suggestions in an ordinance. Several interurban roads desire to enter the city, but it is stated that they cannot finance the projects unless they are provided with an independent entrance.

Indiana Railroad Commission to Enforce Safety Appliance Laws.—The Indiana railroad commission has directed the attention of the steam and electric railroads to 13 provisions of the state railroad law, relating to the requirements in regard to safety appliances and the prohibitions against dangerous structures. The requirements include the following: Power brakes, grab-irons, hand-holds, standard drawbars, automatic couplers, safety appliances for passenger trains, air brakes on motor cars, overhead bridges with sufficient clearance above the track. The law provides that the commission may send out inspectors to look for the violation of these different provisions and the companies are required to carry the inspectors free of charge.

Pittsburg Railways Forbids Gambling, Liquor and Cigarettes.—The Pittsburg Railways Company has issued an order directed against gambling and the use of intoxicating liquors or cigarettes by its employes. The order, which is signed by Superintendent Murphy and approved by President Callery, reads as follows: "For the betterment of the service and the safety of the public it will from this date (April 20, 1907) be the policy of this company not to retain in its employ men who use intoxicating liquors or cigarettes or are in the habit of gambling. While it is the privilege of each individual to eat, drink and smoke what he pleases, it becomes the duty of this management to have in the service only men of sober and temperate habits, physically and mentally able to perform the duties to which they may be assigned."

New York Central Will Not Electrify Adirondack Lines.—The New York Central Railroad, through Chairman Chauncey M. Depew, of its board of directors, has notified J. S. Whipple, state commissioner of forest, fish and game, that it will not be possible to consider this year a suggestion offered by the commissioner that the railroad should electrify its lines running through the Adirondacks, in order to further guard against forest fires. Mr. Depew says he considers the suggestion of Commissioner Whipple a valuable one, and adds that his own personal interest in Adirondack preservation is very great, but announces that the railroad has too much other work on hand at the present time to take up with the change suggested. He declares the work of electrifying railroad lines is very expensive, and that it is yet in an experimental stage.

Buffalo Seeks Amendment of Utilities Bill.—The Buffalo chamber of commerce on April 22 passed resolutions against the enactment in its present form of the public utilities bill pending in the New York legislature and appointed a committee of five to secure the co-operation of other chambers of commerce in opposing the bill until it shall be amended in several important features. One objection which Buffalo commercial interests make to the bill is that it does not make proper provision for review by the courts of the findings of the proposed public utilities commissions. The resolution adopted states that the "purpose of the proposed bill is commendable and that a measure to accomplish the ends it aims at is desirable, but that the passage of the bill in its present form would be unjust and seriously harmful to the business interests involved."

New Brooklyn Rapid Transit Transfer Rules.—The Brooklyn Rapid Transit Company will on May 1 institute a new transfer system. Present transfer privileges at all junctions will remain unchanged, but no more than two transfers will be issued on a single fare. The main purpose of the change is to eliminate, if possible, the principal abuses that have characterized the operation of the transfer system since the privilege was accorded, on March 30, 1906, of a transfer on a transfer. The new arrangement will only affect the passengers who have availed themselves of these privileges and abused them to ride indefinitely on the lines of the system and such passengers as have manipulated transfer tickets in order to make a round trip for a single fare. Under the new system a passenger will be limited to three separate and distinct rides for a single fare, except that at feeder lines an additional or fourth ride may be obtained upon a conductor's ticket, or a transfer agent's ticket, without the payment of an extra fare.

Construction News

FRANCHISES.

Albia, Ia.—A franchise for an electric line in Albia and an interurban route to Hocking, Ia., has been granted to Calvin Manning of Ottumwa and others, who are interested in a system of interurban railways serving the coal fields and farming districts in this section.

Fresno, Cal.—The Monterey Fresno & Eastern Railroad, which proposes to build from Monterey to Fresno, Cal., has secured a franchise to enter Fresno on F street.

Montreal, Can.—A subcommittee of the road committee of the city council has submitted a report on the franchise application of the Montreal Street Railway made last June, for several extensions. The subcommittee recommends the granting of franchises for most of the extensions applied for, involving a large amount of double and single track lines, but opposes some routes on residential streets. No action has yet been taken on the report.

Owatonna, Minn.—The Minneapolis Rochester & Dubuque Traction Company, which proposes to connect Minneapolis, Minn., and Dubuque, Ia., has secured a franchise for a line through this city. Preliminary work on the survey has been started and it is stated that the line will touch Grand Meadow instead of Spring Valley, as was the original intention. The junction of the main line and the Rochester branch will be at a point midway between Oslo and Dell River. Right of way from Oslo to a point in Mower county already has been secured. The franchise provides that the road must be in operation within two years and the company must accept the franchise within 30 days.

Salamanca, N. Y.—A franchise has been granted to the Western New York & Pennsylvania Traction Company to operate its interurban line over Broad and Main streets to the West Salamanca village limits. It is stated that franchises covering its entire extension to Little Falls have been secured by the company with the exception of Little Falls itself, application for which is now pending before the village board. Work on the line will be started as soon as possible and continued until completed.

Seattle, Wash.—The Seattle Electric Company, in exchange for a franchise on Twenty-fourth avenue, has agreed to remove its car tracks on Twenty-third avenue south, from Jackson to Dearborn, and on Dearborn from Twenty-third avenue south to Twenty-fourth avenue south.

Summit, N. J.—The ordinance granting a 40-year franchise to the Morris County Traction Company for the operation of its interurban line in Summit has passed the final reading and on May 21 the final public hearing will be given.

Troy, N. Y.—The Troy Rensselaer & Pittsfield Railway, which proposes to build a line from Troy, N. Y., to Pittsfield, Mass., has applied for a franchise in Troy.

RECENT INCORPORATIONS.

Chicago Indianapolis & Terre Haute Railroad.—Incorporated in Indiana to build an interurban line through the counties of Benton, Fountain, Hendricks, Jasper, Lake, Marion, Montgomery, Newton, Park, Putnam, Tippecanoe, Vermillion, Vigo and Warren, connecting Indianapolis, Lafayette, Terre Haute, Bainbridge, Covington, Danville, Gary, Rockville, Sheffield and Williamsport. Capital stock, \$50,000, of which \$10,000 has been subscribed. Incorporators: Daniel W. Bolen, Charles M. Kiler, Frederick M. Strong, Romus F. Steward and Simeon Loftin.

Chicago Ottawa & Peoria Railway.—Incorporated in Illinois to build an interurban railway as a part of the Illinois Traction System from Chicago through the counties of Cook, Will, Grundy, La Salle, Marshall, Woodford and Tazewell, to Peoria, and from Ottawa, through the counties of La Salle and Bureau, to Princeton. The principal offices will be at Champaign. Capital stock, \$500,000. Incorporators: H. E. Chubbuck, Ottawa, Ill., and W. H. Carnahan, C. A. Wright, Charles Zilly and George Mattis, all of Champaign.

El Paso Suburban Railway.—Incorporated in Texas with a capital stock of \$10,000. Incorporators: Frank R. Tobin, John D. Tobin and Windham Camp.

Galveston-Houston Electric Railway.—Incorporated in Texas to construct an interurban line between Galveston and Houston, about 45 miles. Stone & Webster of Boston, owners of the street railway systems in Galveston, Houston, Dallas, Ft. Worth, San Antonio and El Paso, Tex., own the controlling interest in the new interurban project. The principal office will be in Houston. Capital stock, \$3,000,000. Incorporators: M. M. Phinney, Dallas; David Daly, C. R. Wharton, W. B. Chew, Jesse H. Jones, William A. Wilson and Jesse A. Baker, Jr., Houston, Tex.

Inland Electric Company.—Incorporated in Oregon to construct an electric line from Klamath Falls to Bomaza, Yonna and Merrill. Capital stock, \$25,000. Incorporators: W. H. Mason, E. J. Murray and H. L. Holgate, all of Klamath Falls, Ore.

Lake Champlain & Lake Placid Traction Company, Ausable Forks, N. Y.—Incorporated in New York to build an electric railroad in Essex county, from Westport, on Lake Champlain, to Lake Placid, and also to Ausable Forks, N. Y., 49 miles. Capital stock, \$1,500,000. Incorporators: Albert L. Washburn, Norman C. Spencer,

Wilbur T. Halliday, Elizur S. Goodrich, Henry F. Smith, Hartford, Conn.; George S. Raley, William L. Kiley, Thomas D. Trumbull, Glenn Falls, N. Y.; Richard L. Trumbull, Ausable Forks, N. Y.

Peoria Lincoln & Springfield Traction Company.—Incorporated in Illinois to build a branch of the Illinois Traction System from Lincoln, Logan county, to Mackinaw, Tazewell county, Illinois. This line will connect Springfield and the line south to East St. Louis with Peoria and the proposed line to Chicago. Capital stock, \$400,000. Incorporators: Charles Zilly, W. H. Burke, B. E. Eramble, G. A. Wright and George M. Mattis.

Plum Valley Railway.—Incorporated in South Dakota to build an electric railway, 22 miles long, from Plum City to Pepin, Wis. Capital stock, \$500,000.

St. Louis Terre Haute & Quincy Traction Company.—Incorporated in Illinois to construct an electric line from a point in Illinois opposite Terre Haute, Ind., through the counties of Adams, Pike, Scott, Greene, Macoupin, Sangamon, Montgomery, Shelby, Coles, Cumberland, Clark, Fayette, Bond and Madison to Venice and Quincy, Ill. Capital stock, \$25,000. Incorporators: Edward Yates, Pittsfield; Peter Chase, Decatur; H. T. Wilson and H. C. Simons, Virden; E. E. Barclay, Springfield, Ill.

Sonoma & Lake County Railway.—Incorporated in California to build an interurban line from Cloverdale to Lakeport, with a branch to Kelseyville. Surveys have been made from Lakeport to Cloverdale, about 27 miles. The maximum grade will be about 3 per cent. It is stated that one tunnel will be built, the exact location of which is not announced. Work will begin as soon as the weather permits. Capital stock, \$1,000,000, of which \$36,000 has been subscribed. Incorporators: President, M. C. Dickinson, Ukiah, Cal.; vice-president, J. E. Fulton; secretary, W. S. Fry; treasurer, J. R. Garner; J. W. Preston, J. A. Sparks, D. F. McIntire, W. P. Merideth and W. N. Johnson.

Toledo & Ft. Wayne Electric Railway, Ft. Wayne, Ind.—Incorporated in Indiana to build an electric railway from Ft. Wayne, Ind., to Bryan, O. The company also proposes to manufacture and sell electricity for light, heat and power purposes. This line when completed will give a through line from Toledo to Ft. Wayne. Capital stock, \$100,000. Incorporators: John H. Zimmerman, Ira Grubb, Thomas Hood, Scott Swaine, E. G. Hoffman and Granville A. Reeder.

TRACK AND ROADWAY.

Brownsville Masontown & Smithfield Street Railways.—This company, which was recently incorporated to build an electric railway from Brownsville to Smithfield, Pa., 20 miles, has organized by electing the following officers: President, W. J. Sheldon; vice-president, M. H. Cloud; treasurer, C. S. Crawford; secretary, John Lueckhart.

Calais Electric Railway.—It is reported that this company will extend this road from Calais to Woodland and Robinson, Me., the coming summer.

Catawissa & Numedia Street Railway.—This company has applied to the commissioners of Columbia county, Pennsylvania, to occupy all the bridges in the public road between Catawissa and Numedia for its proposed line.

Denton Interurban Railway & Power Plant Company.—H. M. Griffin, president, Battle Creek, Mich., writes that this company, recently incorporated, proposes to build six miles of electric line in Denton, Tex., surveys for which have been completed. Construction is expected to begin in July, or as soon as the rails arrive. Work on the power house has been started. The equipment will consist of Atlas engines and boilers and the generating equipment will be of Allis-Chalmers manufacture, including Bullock generators and complete electrical equipment. Headquarters, Denton, Tex.

Eastern Pennsylvania Railways.—F. A. Hewitt, superintendent, writes that this company will probably begin construction this summer on an extension from Middleport to Tamaqua, eight miles, via Tuscarora and Newkirk. The line has been surveyed. W. E. Harrington, Pottsville, Pa., is president.

Evansville & Eastern Electric Railway.—It is announced that the extension to Rockport, Ind., will be in operation by June 1. Tracklaying will be completed in about a week and the power house at Hatfield will be finished soon afterward.

Florence, Colo.—The Florence Business Men's Association is soliciting stock subscriptions for a company to be organized to build an electric motor line to several surrounding coal towns, including Coal Creek, Rockvale, Williamsburg and several smaller coal camps.

Ft. Wayne & Springfield Railway, Decatur, Ind.—It is reported that surveys are being made for an extension south from Decatur through Portland and Winchester to Richmond, Ind.

Fresno, Cal.—Surveys are being made for an electric railway from Fresno to the Yosemite valley.

Girard Coal Belt Electric Railway.—L. H. Phillips, secretary, Girard, Kan., writes that this company proposes to build from Girard to Mulberry, a distance of 16 miles, through a rich coal territory, including the towns of Dunkirk, Bradley, Western, Arma, Curranville and Fuller, besides a number of coal camps. The entire route has been surveyed and grading is in progress between Girard and Dunkirk, six miles. The date of letting contracts has not yet been set. James McFarland, president; F. P. Daniels, chief engineer. Headquarters, Girard, Kan.

Grand Central Traction Company.—D. W. Morgan, secretary, writes that this company, recently incorporated, will build from Indianapolis to Evansville, Ind., with a branch from Bloomington to Terre Haute, 251 miles in all. Surveys have been completed from Indianapolis to Bedford and from Bloomington to Patricksburg and surveys are now under way from Bedford to Evansville. Construction will begin soon. The third-rail system will be used. W. D. Whitney, Muncie, president; Will Duncan, Bedford, chief engineer. Headquarters, 403 State Life building, Indianapolis.

Gray's Harbor Railway & Light Company, Aberdeen, Wash.—It is reported that this company will soon begin the construction of a new line from Aberdeen to Montesano, Wash. E. A. Bradner, Aberdeen, chief engineer.

Hartford & Springfield Street Railway.—This company is surveying an extension of the Somers branch to West Stafford, Mass., four miles, to connect with the line under construction from Stafford Springs to Rockville.

International Railway, Buffalo, N. Y.—This company expects to contract, during the present summer, for about four miles of new single-track extension on its lines in Buffalo and vicinity.

Interurban Railway, Des Moines, Ia.—H. H. Polk, president, has denied the reports, founded on his recent visit to Council Bluffs, that this company contemplates building a cross-state line to connect with the lines of the Omaha & Council Bluffs Street Railway. The company has purchased the Colfax-Newton line of the Newton & Northwestern Railroad, which will be electrified and used in connection with the Interurban company's Colfax line for through service between Des Moines and Newton. The Newton & Northwestern retains trackage rights for steam service.

Jackson Ann Arbor & Detroit Railroad.—Several carloads of ties have been delivered for the construction of this line through Dearborn, Wayne and River Rouge, Mich. About 100 men are engaged in grading near Dearborn.

Johnstown Ebensburg & Northern Railroad, Johnstown, Pa.—C. R. Frederick has been elected vice-president and general manager of this company, which is promoting an electric railway to connect Johnstown and Ebensburg, Pa., succeeding W. E. Hildebrand. Another effort will be made to secure a franchise in Johnstown. If this fails it is stated that an arrangement can be made with the Johnstown Passenger Railway to enter the city over its tracks.

Lafayette & Logansport Traction Company.—It is reported that the tracklaying on this extension of the Ft. Wayne & Wabash Valley Traction Company from Lafayette to Logansport, Ind., has been completed, with the exception of a few short stretches aggregating about one-fourth of a mile. The workmen are now engaged in stringing the high-tension and telephone wires and it is expected the line will be open for traffic shortly after May 1.

Lima & Toledo Traction Company.—It is reported that a contract has been let for a reinforced concrete bridge over the Maumee river, just south of Waterville, O., on the extension from Leipsic to Toledo. The bridge will be 1,400 feet in length and is expected to be completed about the time the line into Lima is finished. F. T. Hepburn, general manager, Lima, O.

Los Angeles & Owens Valley Railroad.—It is reported that construction work on this line will begin in about three months. The line is proposed to connect Los Angeles, Brandeburg, Independence, Big Pine and Bishop. The company is capitalized at \$10,000,000 and has the following officers: President, S. P. Jewett; vice-president, George Chaffey; secretary and treasurer, A. M. Chaffey, and electrical engineer, F. B. Jewett, all of 411 South Main street, Los Angeles, Cal.

Louisville & Eastern Railroad.—Regular operation has been started on the new line between Louisville and Lagrange, Ky., over which cars have been running as far as Beard for several months. General Manager Percival Moore of Louisville states that by January 1 cars will be operated from Louisville to Frankfort, via Shelbyville.

Marengo & Midland Railway.—D. M. Rowland, secretary and treasurer, Marengo, Ia., writes that surveys are about to commence on this proposed road from Fairfield to Cedar Rapids, Ia., 96 miles, with branches from Millersburg to Oskaloosa and from Marengo to Midland, 78 miles additional. H. H. Brimmer, Marengo, president; J. W. Andrews, Fairfield, chief engineer.

Missouri Central Electric Railway.—This company proposes to build an electric railway from St. Louis to Kansas City, Mo., through St. Charles, New Florence, Fulton, Columbia, Marshall and Higginsville. The route has been surveyed and grading has been completed for 25 miles between Glasgow and Higginsville. George B. Harrison, Glasgow, president; W. B. Cawthorne, Columbia, chief engineer. Headquarters, Glasgow.

Missoula-Bitter Root Traction Company.—This company, recently incorporated to build from Missoula to Hamilton, Mont., has organized by electing the following officers: President, J. L. Humble of Corvallis; vice-president, P. J. Shannon of Hamilton, secretary, E. O. Lewis of Stevensville; treasurer, O. C. Cooper of Hamilton. One-third of the right of way has been secured.

Monroe (La.) Street Railway.—The city council has passed an ordinance authorizing the Jackson street extension of the Monroe municipal street railway. The property owners along the line are to loan the city \$25,000 for 10 years, without interest, for building the line, and it has been decided to ask for bids for construction in a short time.

Monterey Fresno & Eastern Railway.—H. H. Sanborn, assistant to the president, writes that this company proposes to build a line

from Monterey to Fresno, Cal., 110 miles, via Salinas, San Juan, Tres Pinos and Panoche, with a branch to Watsonville, 15 miles. The route has been surveyed from Monterey to Panoche, 80 miles, and surveys are in progress from Panoche to Fresno, 60 miles. Grading has been completed from Monterey to Salinas river, 10 miles, and work will be resumed about May 1. Contracts are to be let shortly. A. D. Bowen, San Francisco, president; F. M. Fairchild, Monterey, chief engineer. Headquarters, San Francisco.

New Jersey & Pennsylvania Traction Company.—It is announced that this company will build an electric line from Princeton to Somerville, N. J., a distance of 18 miles, during the coming summer. T. G. Kitchen, the engineer in charge of the surveys, says that part of the railway will be on private right of way from 50 to 100 feet wide and some distance from the public roads. There will be no grade crossings at any railroad. The road will carry freight at night, and freight and passenger stations will be established in all towns along the line. There will be numerous bridges along the line, the largest being across the Raritan river, where the bridge and its approaches will exceed 1,500 feet in length. Charles Serfass of Yardley, Pa., chief engineer. The company now has a line in operation between Newtown, Pa., and Trenton, N. J.

Oklahoma City Railway.—John W. Shartel, vice-president, has announced that this company has appropriated \$665,000 for improvements and extensions to be built this year to its Oklahoma City system.

Pacific & Oregon Railway, Falls City, Ore.—This company is reported in the market for 60-pound steel rails, locomotive, cars and other materials and supplies for about 50 miles of new electric and steam railway. C. A. Barnum, general manager.

Pittsfield (Mass.) Electric Street Railway.—This company is planning to build four miles of new track, using 75-pound T-rail.

South Shore Traction Company.—This company, which is building an electric line on Long Island, connecting Islip, Babylon, Amityville and other towns, has been enjoined from proceeding with its work in Islip, pending a settlement of a right of way dispute with the Suffolk Traction Company. The New York railroad commission will this week hold a hearing for both companies in regard to applications for certificates of necessity. The South Shore and Cross Island Traction companies have been reorganized under the name of the latter and at a meeting in New York last week elected James T. Wood of Sayville, L. I., president, and James A. Hawes vice-president.

Spokane & Inland Empire Railroad.—It is reported that this company will make a preliminary survey of the branch line to Rockford and through Rock Creek Valley into the Coeur d'Alene reservation.

Spokane, Wash.—F. A. Blackwell, formerly general manager of the Spokane & Inland Empire Railroad, is reported to have begun the construction of a railroad from a junction with the Spokane International, at or near Rathdrum, Idaho, to Spirit Lake, thence to Newport and a considerable distance down the Pend Oreille river.

Springfield Troy & Piqua Railway, Springfield, O.—It is reported that this company expects to build a branch line to St. Paris, O., about five miles.

Texas Traction Company.—This company has put an additional grading outfit at work on the line between Sherman and Dallas, Tex. There are four grading outfits now at work on the Sherman-Dallas interurban. One of the outfits is operating between Sherman and Howe; one between Howe and Van Alstyne, another between Anna and Melissa, and the fourth between Melissa and McKinney. The fifth will establish camp at Caruth Switch and work northward. Rapid progress is being made on the grading and the ties are being delivered. Rails will be delivered in July, by which time it is expected to begin tracklaying. The apparatus for the power plant at McKinney will be delivered in July.

Toledo Bucyrus & Columbus Electric Railway.—An engineering corps in the employ of this company has begun making surveys for a line from Bucyrus to Tiffin, O., via Oceola, Benton, Plankton and Melmore, 25 miles.

Toledo Fostoria & Findlay Electric Railway.—It is announced that this company expects to extend its line north from Pemberville to Toledo, O., 17 miles, this summer. The company will also make improvements to Reeves Park, a resort between Fostoria and Findlay. J. E. Reeves of Canal Dover is president.

Tri-City Railway, Davenport, Ia.—President J. F. Porter and Manager J. F. Lardner have made a compromise with the city council whereby an ordinance will be introduced permitting the sale of the Davenport & Suburban Railway to the Tri-City company, releasing the company from building certain extensions required by the D. & S. ordinance, and giving the company the right to do away with the six tickets for 25 cents on the D. & S. line. In return the company is to extend the D. & S. line from Eleventh and Le Claire streets to Eastern avenue and provide increased service in several particulars.

Union Street Railway, New Bedford, Mass.—This company is planning to build one and one-half miles of track extension this spring, in addition to rebuilding considerable track. The new Arnold street line will be in operation this summer.

United Railways, Portland, Ore.—C. E. Loss of Los Angeles, president, has disposed of his holdings in this company to C. G. H. MacBride of San Francisco, who proposes to carry on the work to completion. It is stated that the Front street line in Portland will be completed within 30 days and that work will then begin on the line to Hillsboro.

Wagner Lake Shore & Armour Traction Company, Wagner, S. D.—It is reported that this company expects to begin grading about May 1 for a line 25 miles long to connect Wagner and Armour, S. D. A summer resort will be established at Andes.

Walla Walla Valley Traction Company, Walla Walla, Wash.—The first car was operated over this line from Walla Walla to Free-water and Milton, Ore., on April 17.

Washington Spa Springs & Gretta Railroad.—This company, recently incorporated to build from the Maryland-District of Columbia line near Bladensburg to Gretta, Md., has organized by electing the following officers: President, B. D. Stephen; vice-president, S. S. Yoder; secretary, Fillmore Beall; treasurer, R. N. Ryon, and general counsel, James C. Rogers. These officers and William W. Poultney, William P. Magruder, J. Enos Ray, Jr., and J. Harris Rogers will constitute the board of directors.

Washington Water Power Company.—This company is building a double-track line to connect its Maple street line and Pacific avenue line on Maple street, Spokane, Wash.

Winnipeg Selkirk & Lake Winnipeg Railway.—This company is now building an electric line between Winnipeg and Selkirk, Man., 22 miles. Power will be derived from the plant at Lac du Bonnet. Equipment is being furnished by the Canadian General Electric Company.

Yakima Intervalley Traction Company.—This company, which was incorporated last year and has secured several franchises for the use of the county highways, proposes to build about 60 miles of line this year, radiating from Yakima, Wash., according to a recent announcement by E. M. Kenly, chief engineer. Gasoline electric motor cars will be used. It is stated that the full capital stock of \$250,000 has been subscribed. The officers of the company are: President, H. B. Scudders; vice-president, W. A. Bell, and treasurer, W. L. Steinweg, all of Yakima, Wash.

Yellville, Ark.—Several business men of this city are raising subscriptions and securing the right of way for an electric line to run from Yellville to the mouth of Cedar Creek, along the Buffalo river, about 20 miles south of Yellville.

Youngstown & Ohio River Railroad.—Actual construction on this line between West Point and East Liverpool, O., is to begin at once and is expected to be completed this year. The grading between Washingtonville and West Point will probably be completed by June 1. In connection with the Youngstown & Southern this company will connect Youngstown and East Liverpool.

POWER HOUSES AND SUBSTATIONS.

Consolidated Railway Company.—It is announced that this company is considering plans for the construction of a power house at Thamesville, Conn., to furnish power for operating the electric railways in New London, Montville, Norwich and Willimantic. It has not been definitely announced when work will be begun on the power house.

Frederick (Md.) & Middletown Electric Railroad.—It is announced that this company will probably build a new power house, located at some point in Frederick, during the coming summer, to avoid the expense of hauling coal to the present power house in Middletown Valley. The system has outgrown the capacity of the present plant and the new plant will be built with a view to meeting the requirements of future extensions, which the company has under consideration, but has not yet determined upon.

Galveston-Houston Traction Company.—It is announced that Stone & Webster of Boston have practically completed plans for this line and all surveys of all possible routes and entrances into Galveston and Houston have been completed, but the exact location of the power house has not yet been determined, as fuel is high and it is desirable to have a power house located on deep water, so that the coal can be unloaded directly from schooners into the coal hoppers. The locations which have been examined for the power house are Texas City and Harrisburg, Tex., and one or two other points.

Kansas City & Olathe Electric Railway.—It is announced that this company has received a grant of two acres of land from Benjamin Earnshaw of Shawnee, Kan., which is to be used for the erection of a power house. The entire community through which this line runs is anxious to have the line completed, and it is probable that work on the new power house will begin at an early date.

Norfolk & Portsmouth Traction Company.—This company has announced that power was first generated in its new \$1,000,000 power plant at Brambleton, Va., on April 10. Only one generator was started at that time, but it is expected that the remaining portion of the plant will be in operation in the near future.

Toronto Railway Company.—It is announced that this company has ordered a chloride accumulator from the Canadian General Electric Company, which will have a capacity of about 1,500 horsepower for two hours. This battery will be installed to take care of the peak from 5 to 7 p. m., and thus the installation of the new generating machinery has been avoided and a very much higher load factor will result.

Wilmington (Del.) City Railway Company.—The engines and generators at the power house of this company have been nearly erected and as soon as the machinery of the Brandywine plant is placed in regular operation the Delaware avenue plant, which adjoins the main power house of the company, will be dismantled and the power house converted into additional quarters for the storage of cars. This change will permit the company to store all its cars under cover.

Personal Mention

Mr. E. R. Gilbert has resigned as manager of the New York & Port Chester Railway, Port Chester, N. Y.

Mr. J. M. Atkinson has resigned as vice-president of the Chicago & Southern Traction Company of Chicago, Ill.

Mr. George A. Murch has resigned as superintendent of the Atlantic Shore Line Railway, with office at Kennebunkport, Me.

Mr. E. J. Rauch has been appointed superintendent of car repairs of the Old Colony Street Railway, with office at Fall River, Mass.

Mr. A. R. Piper has been appointed general freight agent of the Brooklyn Heights Railroad, Brooklyn, N. Y., effective on April 15.

Mr. Uriah Foss has resigned as superintendent of transportation of the Connecticut Railway & Lighting Company, New Britain, Conn., and that position has been abolished.

Mr. Bertram E. Wilson, park manager of the Rochester Railway Company and the Rochester & Suburban Railway, has been appointed general passenger agent of the Rochester & Eastern Railway, Rochester, N. Y.

Mr. William H. Dunkerley, heretofore connected with the accounting department of the Utica & Mohawk Valley Railway, Utica, N. Y., has resigned to become auditor of the Rockford & Interurban Railroad of Rockford, Ill.

Mr. E. J. Wilcoxon, superintendent of transportation of the Rochester (N. Y.) Railway Company, has been appointed general superintendent and will take over many of the duties of the general manager, Mr. R. E. Danforth, resigned.

Mr. M. H. Brondson, chief engineer power stations of the United Railroads of San Francisco, has been appointed chief engineer of the Rhode Island Company, Providence, R. I., succeeding Mr. Fred N. Bushnell, who resigned some time ago.

Mr. Matthew Slush of Detroit has been elected president of the Chicago & Southern Traction Company of Chicago, succeeding Mr. W. S. Reed, who has been elected vice-president. Mr. C. J. Reilly of Detroit has been elected secretary and treasurer.

Mr. Samuel P. Hunt, heretofore connected with the electrical engineering department of the Boston & Northern Street Railway, Boston, Mass., has been appointed assistant general manager of the Manchester Light & Power Company, Manchester, N. H.

Mr. Clement C. Smith, president of the Columbia Construction Company of Milwaukee, Wis., and a director of the Sterling Dixon & Eastern Electric Railway, has been elected a director of the Fidelity Trust Company of Milwaukee and president of the Citizens' Gas Company of Kankakee, Ill.

Mr. Louis Russell Gaw, formerly master mechanic of the Toledo & Indiana Railway, resigned his position on March 15, to become master mechanic of the Ohio Central Traction Company at Galion, O., as noted in the Electric Railway Review of April 6. Mr. Gaw was born in 1872 and at the age of 18 years entered the shops of the Toledo Consolidated Street Railway, where he remained for several years, mastering the details of the different departments until qualified to fill the more important position of master mechanic, which was offered to him by the Toledo Traction Company. He held this position until 1899, when he resigned to become master mechanic and chief electrician of the Atlantic Coast Electric Railroad at Asbury Park, N. J. He remained with this company for four years, resigning in 1903 to accept a similar position with the Toledo & Indiana Railway Company at Delta, O. During the last



L. R. Gaw.

two years of his service with this company Mr. Gaw supervised the installation of its rotary-converter substations and was given entire charge of the power house, substations, line and cars. The Ohio Central Traction Company is now controlled by the Cleveland Southwestern & Columbus Railway and operated as a division of that company.

Mr. William A. House, who has been acting president and general manager of the United Railways & Electric Company of Baltimore, Md., since the death of Gen. John M. Hood last fall, has been elected president of the company. Mr. Thomas A. Cross, superintendent of overhead construction, has been elected general

manager to succeed Mr. House. Mr. Frank A. Furst has been elected first vice-president, succeeding Mr. George C. Jenkins, resigned, and Mr. William Early has been elected secretary, succeeding Mr. H. C. McJilton.

Mr. D. H. Sawyer, heretofore superintendent of the Springfield & Northeastern Traction Company, at Decatur, Ill., has been appointed superintendent of the Peoria Bloomington & Champaign Railway, the new line of the Illinois Traction System between Peoria and Bloomington, with headquarters at Peoria, effective on April 13.

Mr. Edward G. Connette, general manager of the Worcester (Mass.) Consolidated Street Railway Company, has had his jurisdiction extended over the Worcester & Southbridge Street Railway, the Worcester & Webster Street Railway and the Webster & Dudley Street Railway, which have been consolidated with the Worcester Consolidated Company, as noted in the Electric Railway Review of April 6, 1907. Mr. Connette's early railroad experience was obtained in the engineering and transportation departments of various steam railroads. About 17 years ago he became identified with the street railway industry, when he was appointed general manager of the street railways of Nashville, Tenn., where he remained for eight years. When the street railway and the lighting systems of this city were merged Mr. Connette retained his position as general manager of the combined properties, resigning after two years of service with the merged companies to become vice-president and general manager of the Syracuse (N. Y.) Rapid Transit Company. During his five and one-half years' management of this system several important extensions were planned and built and the service and equipment noticeably improved. During his connection with this company Mr. Connette served for one year as president of the New York State Street Railway Association of the State of New York. In June, 1905, he was offered the position of general manager of the Worcester Consolidated Street Railway and on October 1 of that year assumed active charge of the property.



E. G. Connette.

The following appointments were recently announced by the Boston Elevated Railway: George R. Tripp, superintendent of division 6, is appointed superintendent of transportation, in place of Julius E. Rugg, who is appointed superintendent of employment and discharge. Mr. Karl S. Barnes is appointed superintendent of division 4 and Mr. Lemuel T. James is appointed acting superintendent of division 6, succeeding Mr. Tripp.

Mr. A. E. Reynolds of Crawfordsville, Ind., heretofore general manager of the Indianapolis Crawfordsville & Western Traction Company, has been elected president, succeeding A. F. Ramsey, who died recently. James Lucas of Frankfort, Ind., has been elected a director to succeed Mr. Ramsey. Mr. A. M. Hewes, secretary and treasurer of the Electrical Installation Company of Chicago, has been elected general manager in place of Mr. Reynolds.

Mr. B. I. Budd, heretofore purchasing agent of the Metropolitan West Side Elevated Railway of Chicago, has been appointed general manager of that company, effective on April 15, with headquarters at Chicago. Mr. Budd will have direct charge of all matters pertaining to operation, including the purchase of supplies. The office of purchasing agent has been discontinued. Since the resignation of Mr. H. M. Brinckerhoff as general manager, in September, 1905, most of the duties of that office have been conducted by Mr. H. G. Hetzler, president. Mr. Budd has been connected with the Metropolitan company for 14 years, starting as a clerk in the storekeeper's office. For five years he was storekeeper and in 1898 was appointed purchasing agent, which position he has held until his present appointment.

Mr. W. M. Kessler, who recently was appointed chief dispatcher and assistant superintendent of the Pittsburg & Butler Street Railway, as previously noted in the Electric Railway Review, was born in Kessler, O., in 1876. At the age of 22 years he entered the service of the Cincinnati Hamilton & Dayton Railway as telegraph operator, where he remained for 4½ years. In 1902, concluding that the electric traction field offered better opportunities, he became connected with the Dayton & Troy Electric Railway, first as motorman and conductor, then as dispatcher and later as chief dispatcher of this road, with entire charge of all trainmen and of the operating department of the system. While serving in this capacity he organized a complete system of operation with written train orders, timetables and book of rules similar to those used on steam roads. During the last year of his service with this company he was assistant superintendent, resigning that position to become chief dispatcher and assistant superintendent of the Pittsburg & Butler Street Railway.

Financial News

Anderson (S. C.) Traction Company.—It is reported that interests identified with the Columbia (S. C.) Electric Street Railway Light & Power Company have secured control of the Anderson Traction Company.

Boston Elevated Railway.—Shareholders will meet on April 30 to authorize the proposed issue of \$8,000,000 stock and \$5,800,000 bonds, referred to in the Electric Railway Review of April 20 last.

Calumet Electric Railway, Chicago.—The following officers and directors have been elected: President, Ira M. Cobe; vice-president, J. W. McKinnon; secretary and treasurer, Frank H. Murray; directors, L. E. Meyers, B. F. Harris, G. F. Shaw, J. W. McKinnon and Ira M. Cobe.

Chicago & Southern Traction Company, Chicago.—At the annual meeting of shareholders on April 19 Matthew Slush, C. J. Reilly and John M. Mulkey of Detroit and W. S. Reed, W. H. Conrad and Fred G. Marbois of Chicago were elected directors. Matthew Slush was elected president, W. S. Reed vice-president and C. J. Reilly secretary and treasurer.

Chicago Subway Company.—Plans are said to be under way for the formation of the holding company which will acquire the properties of the Chicago Subway Company and the Chicago Edison Company.

Cleveland Southwestern & Columbus Railway, Cleveland.—It is announced that the securities of this company will be listed on the New York stock exchange.

Illinois Traction Company, Champaign.—A press dispatch from Montreal says that a Montreal syndicate has offered the Sun Life Insurance Company \$65 a share for the \$6,359,500 outstanding common stock of the Illinois Traction Company and that the offer was refused.

Montreal (Que.) Street Railway.—Earnings of this company for the six months ended March 31, with a comparison, follow:

Six months—	1907.	1906.	Increase.
Passenger earnings	\$1,568,204.88	\$1,390,915.29	\$177,289.59
Miscellaneous earnings....	30,843.57	15,407.10	15,436.47
Total	\$1,599,048.45	\$1,406,322.39	\$192,726.06
Operating expenses.....	1,073,656.96	928,631.56	145,021.40
Net earnings	\$ 525,391.49	\$ 477,690.83	\$ 47,700.66
Rent of leased lines.....	1,019.88	.....	1,019.88
City percentage of earnings	69,788.36	58,686.72	11,101.64
Interest on bonds and loans	88,326.99	85,590.54	2,736.45
Contingent for renewals...	79,743.19	34,347.65	45,395.54
Total charges	\$ 238,878.42	\$ 178,624.91	\$ 60,253.51
Surplus	286,513.07	*299,065.92	.....
Expenses, per cent of car earnings	67.14	66.03	.....

*Decrease, \$12,552.85, equal to 4.20 per cent.

Philadelphia & Western Railroad, Philadelphia.—A plan of reorganization is announced, which is designed to permit expansion and the admission of new interests into a one-third ownership in the property. Announcement that the property will be sold at West Chester, Pa., on May 20, has been made by the Trust Company of North America, Philadelphia, which was recently appointed trustee under the mortgage. It is stated that George J. Kobusch of St. Louis, the president of the company, will dispose of his interests to a banking firm which represents capitalists who are largely interested in electric railways in Indiana, Virginia and other states. It is reported that George R. Sheldon of New York will be elected president and that William H. Sims, the superintendent of construction, will be made general manager of the road. The sale will not conflict with the proposed opening of the road on May 1. The road is completed from Sixty-ninth and Market streets, Philadelphia, to Strafford, 12½ miles. The company holds franchises permitting it to extend its line from Parkesburg, and also to construct a line from Philadelphia to Norristown. Regarding the reorganization Joseph S. Clark, second vice-president of the Trust Company of North America, said: "All the members of the old company will be in the new, but the company will be larger and broader. This foreclosure is merely a matter of form in connection with a reorganization scheme. We are expanding, and this step is a formal necessity. The reorganization syndicate is in possession of all the bonds and stock of the old company. Of the authorized issue of \$15,000,000 first mortgage bonds, \$2,149,000 are outstanding. Besides this, there are debts of \$1,500,000. The company's capital stock is \$900,000. This will be increased to between \$3,000,000 and \$4,000,000. About the same amount of the proposed authorized issue of \$50,000,000 bonds will be actually issued. Owing to certain peculiar provisions in the laws of this state, the foreclosure plan is the most advantageous method of attaining the results at which we aim."

Rutland (Vt.) Railway Light & Power Company.—Supplementing the figures given in last week's issue of the Electric Railway Review, the following information, contained in a report of G. T. Rogers, the president, to the underwriters and bondholders, is presented: "The combined properties are at present earning sufficient to pay interest not only upon the present bond issue, but upon the prospective increased bond issue of \$300,000, for the completion of the purchase of the electric light company, leaving a surplus

of \$15,000 in net earnings to be applied upon the capital stock of the consolidated companies. The consolidation of the various public utilities of Rutland with the electric light company is well under way and will soon be consummated. The bond market still remains in an unsettled and somewhat uncertain condition; therefore no determined effort has been made to dispose of the bonds, we believing it to be to the advantage of all parties concerned to await the coming of a more settled and active market, thereby assuring a more advantageous price for the securities when offered."

Schenectady (N. Y.) Railway.—The report of this company for the quarter ended March 31, with a comparison, shows:

Quarter ending March 31—	1907.	1906.	Increase.
Gross	\$230,056	\$192,187	\$37,869
Expenses	182,494	140,925	41,569
Net	\$ 47,562	\$ 51,262	*\$3,700
Other income	1,933	615	1,318
Total income	\$ 49,495	\$ 51,877	*\$2,382
Fixed charges	29,881	55,056	*\$25,175
Surplus	\$ 19,614	†\$ 3,179	\$22,793

*Decrease. †Deficit.

United Railways Company of St. Louis.—This company has listed on the New York stock exchange \$4,000,000 additional 5 per cent cumulative preferred stock, making a total outstanding of \$16,983,200. The additional preferred stock was used in the purchase of the St. Louis & Suburban Railway, which was acquired by a deed of conveyance dated December 31, 1906. The St. Louis & Suburban stock was deposited with the Mississippi Valley Trust Company, as trustee for the St. Louis & Suburban shareholders. The trust will continue until January 15, 1908. The stock in the hands of the trustee is not to accumulate or accrue dividends until after that date, unless the Suburban Railway Company's shareholders deposit with the trustee cash to the amount of dividends that would accrue to January 1, 1908, and thereupon receive a certificate of stock which will be on a parity, when registered, with all the preferred stock of the United Railways Company of St. Louis previously outstanding. The report of the St. Louis & Suburban, including constituent companies, for the year 1906, was as follows:

Gross earnings	\$1,141,540
Operating expenses and taxes	833,577
Net earnings	\$ 307,963
Charges	404,772
Deficit for year.....	\$ 96,809

The report for the quarter ended March 31, with comparisons, follows:

	1907.	1906.	1905.
Gross earnings	\$2,494,162	\$2,286,291	\$1,843,022
Expenses, taxes, etc.....	1,722,595	1,475,738	1,298,702
Net earnings	\$ 771,567	\$ 810,553	\$ 544,320
Charges	693,734	695,521	598,472
Surplus	\$ 77,833	\$ 115,032	*\$ 54,152

*Deficit.

For the purpose of comparison the figures for 1906 also include earnings of the St. Louis & Suburban Railway, acquired by the United Railways Company in October, 1906. Gross earnings also include the item "other income," amounting to \$2,190 in 1907 and \$4,546 in 1906.

United Railways Investment Company.—This company has issued \$2,400,000 additional 5 per cent collateral trust bonds, making a total outstanding of \$18,150,000. The additional bonds were issued in exchange for stock of the Philadelphia Company of Pittsburg.

United Traction Company, Albany.—Authority has been given to this company by the New York state railroad commission to issue \$500,000 additional consolidated mortgage 4½ per cent bonds, to provide for improvements and additions. This will increase the outstanding bonds to \$1,729,000, exclusive of the \$3,912,000 which are reserved to retire underlying bonds at maturity. There are still available for future improvements \$859,000 of the total issue of \$6,500,000 bonds.

Winnipeg (Man.) Electric Railway.—In addition to the figures published in the Electric Railway Review of last week, the annual report for 1906 gives the following:

	1906.	1905.	1904.
Operating expenses, per cent of earnings	49.56	51.42	51.47
Average capital	\$4,144,480	\$4,000,000	\$2,099,723
Net income, per cent of capital.....	11.17	9.86	12.77
Transfers	3,109,094	1,682,685	2,497,952
Railway earnings per capita, on basis of 90,000, as against 80,000.....	8.30	6.80	5.51

William Mackenzie, the president, said: "The roadbed, rolling stock, buildings and other properties of the company have been efficiently maintained."

Dividends Declared.

Central Traction Company, Pittsburg, 1½ per cent.
Consolidated Traction Company, Pittsburg, preferred, 3 per cent.

Manufactures and Supplies

ROLLING STOCK.

Columbus Railroad, Columbus, Ga., has ordered three 12-bench open cars from The J. G. Brill Company.

International Railway, Buffalo, N. Y., has placed an order with the G. C. Kuhlman Car Company for 50 cars.

Dallas Consolidated Electric Street Railway, Dallas, Tex., has ordered five 12-bench open cars from The J. G. Brill Company.

Indianapolis & Cincinnati Traction Company, Indianapolis, Ind., is having one express car built by the Cincinnati Car Company.

Pittsburg & Westmoreland Railway, Pittsburg, Pa., is reported to have placed orders for a number of cars for delivery on June 15.

Lafayette & Logansport Traction Company, Ft. Wayne, Ind., is having six city and five interurban cars built by the Cincinnati Car Company.

Consolidated Railway, New Haven, Conn., has placed an order for 20 double-truck vestibule cars for use on the Providence & Burrillville Street Railway.

Springfield Railway & Light Company, Springfield, Mo., expects to place an order shortly with the St. Louis Car Company for four closed cars and two open cars.

Sarnia Street Railway, Sarnia, Ont., has recently placed an order with the Ottawa Car Company for one double-truck car. It will be equipped with Taylor trucks and Westinghouse motors.

Radford Water Power Company, Radford, Va., has placed an order with The J. G. Brill Company for one new semi-convertible car, to be 37 feet 5 inches long over all, and to be equipped with four Westinghouse 101-B motors.

York Street Railway, York, Pa., has under consideration the purchase of four large combination passenger cars with smoking compartment and one snow plow and baggage car. We are advised that no bids have yet been asked.

Mineral Wells Electric System, Mineral Wells, Tex., has placed an order for six semi-convertible cars with the St. Louis Car Company. This road is being built and its equipment purchased by the Howard-Burke Engineering Company of New York.

Columbus Traction & Light Company, Columbus, Miss., will place contracts within the next few weeks for two combination summer and winter cars, three trailers, double-truck equipment for three 35-foot cars, shades for six summer cars, and other equipment.

New York & Queens County Railway, Long Island City, N. Y., as reported in the Electric Railway Review of April 13, will soon ask bids on 40 all-steel cars. These cars are to be 38 feet in length, equipped with automatic air brakes and cross seats and to accommodate 40 passengers.

Chicago-New York Electric Air Line Railroad, Chicago, has purchased from the Niles Car & Manufacturing Company two combination passenger, baggage and express cars. These cars are 49½ feet in length, seats upholstered in leather, weigh about 35 tons and will be put into service at once upon the track west of La Porte, Ind.

Pittsburg Railways, Pittsburg, Pa., was reported in the Electric Railway Review of April 6 as having been authorized by its board of directors to purchase additional rolling stock. We understand that this company has placed an order for 100 semi-convertible double-truck cars with the St. Louis Car Company. They will be 50 feet in length and equipped with high-speed motors and air brakes.

Consolidated Railway, New Haven, Conn., as reported in the Electric Railway Review of April 6, has placed an order with the Cincinnati Car Company for five double-truck closed cars with 30-foot bodies and 41 feet in length over all, to be equipped with Brill 27-E1 trucks, four Westinghouse 101-B motors, Christensen AA4 air brakes, Providence fenders, Sterling-Meaker No. 5 registers and Consolidated Car Heating Company's heaters.

SHOPS AND BUILDINGS.

Cincinnati Georgetown & Portsmouth Railroad.—The car barns at Cincinnati, O., were totally destroyed by fire on the night of April 23. The loss, which is fully covered by insurance, is estimated at \$80,000.

Duluth (Minn.) Street Railway.—This company has applied for a building permit for a two-story brick office building, 40 by 80 feet, to cost \$17,000, to be erected on Twenty-sixth avenue west, and a contract has been awarded to Alexander Roberts. The structure is to be ready for occupancy by October 1. The present offices, located in the power station at Eleventh avenue west, will be removed to the new building, where facilities will be had for all departments. The company now owns the entire block bounded by Twenty-sixth and Twenty-seventh avenues west and Superior and First streets, and intends to assemble its entire plant, with the exception of the Eleventh avenue west power station, on the west end block. Between the office building and First street will

be constructed a long one-story building with an extension roof on the inner side, covering the work car track. In this building will be located a waiting room, blacksmith shop, stables, wagon room, etc. Between the office building and the woodworking shop will be constructed nine new storage tracks running the entire length of the block. These tracks will have sufficient length to accommodate about 50 cars.

Illinois Traction Company.—This company has purchased a tract of land, 100 by 120 feet, at Carlinville, Ill., upon which will be erected a combination passenger and freight station, with office rooms.

Los Angeles-Pacific Electric Railway.—Surveys have been completed and plans accepted for the combination passenger and freight station which will be erected at Los Angeles, Cal. Work will commence at once. The company is also making extensive improvements at Sherman, Cal., including the erection of a new repair shop of brick, one story high and 140 feet square, which is nearly completed. A brick car shed, 100 by 350 feet, is also in the course of erection.

Utah Light & Railway Company, Salt Lake City, Utah.—Plans have been prepared for completely renovating the old Tribune building on West Temple street, Salt Lake City, and converting it into an office building for all departments. It is expected that the offices may be moved in three or four months.

Vallejo Benicia & Napa Valley Railroad.—It is reported that this company has decided to erect a new \$10,000 car barn and repair shop at East Napa, Cal. L. J. Perry, Napa, general manager.

TRADE NOTES.

American Mason Safety Tread Company, Lowell, Mass., will soon begin the erection of a three-story factory building, 50 by 100 feet.

Ford, Bacon & Davis, engineers, now located in the Blair & Co.'s building, 24 Broad street, New York, on May 1 will move their offices to 115 Broadway.

Wendell & MacDuffie, 26 Cortlandt street, New York, have been appointed eastern sales agents for the Russell Car & Snow Plow Company, Ridgway, Pa.

Westinghouse, Church, Kerr & Co., New York, has been incorporated in Canada under the name of Westinghouse, Church, Kerr & Co. of Canada, Limited.

C & C Electric Company, of Newark, N. J., has been incorporated in Chicago, with a capital stock of \$25,000. The capital stock of the Newark company is \$1,400,000.

Stone & Webster Engineering Corporation, 84 State street, Boston, announces the opening of its Chicago office on May 1 in the First National Bank building, in charge of Arthur J. Veitch.

The J. G. Brill Company, Philadelphia, has declared its first dividend of 1¼ per cent on its new preferred stock, payable on May 1, and 1 per cent on its new common stock, payable on June 1.

Green Fuel Economizer Company, 90 West street, New York, has removed its Chicago office from the Monadnock block to the Old Colony building, where larger quarters have been secured.

Security Register & Manufacturing Company, 42 Broadway, New York, has moved its offices from the nineteenth floor of this building to the fourth floor, where it has secured rooms better fitted to its needs.

Clarence E. Delafield has resigned as St. Louis manager of the Wagner Electric & Manufacturing Company and has been appointed manager of the high-tension insulator department of the Ohio Brass Company of Mansfield, O.

Chicago Pneumatic Tool Company has removed its Philadelphia office to 820 Arch street. G. A. Barden, who is in charge of the Philadelphia branch, reports splendid business and the necessity for larger quarters as determining the change.

Wagner Electric Manufacturing Company, St. Louis, Mo., announces the appointment of F. Johnson as district manager of the St. Louis territory, with headquarters in the Frisco building. Mr. Johnson was formerly connected with the sales department of the General Electric Company at St. Louis.

McLeer Engineering Company, 338-340 Pearl street, New York, dealer in electric railway supplies and equipment, both new and second-hand, reports that it has had a large sale this season for second-hand cars and has disposed of all of its stock in this line with the exception of a few 8, 9 and 10 open-bench cars, which may be used as trailers or may be fully equipped as motor cars.

Blake Signal & Manufacturing Company, 246 Summer street, Boston, announces the establishment of the following agencies for its Blake tube flux: George F. Schoen, 108 South Forsyth street, Atlanta, Ga.; Syles R. Fralick, 269 South Canal street, Chicago; Wesco Supply Company, St. Louis; Brooks-Follis Electric Corporation, 212 First street, San Francisco, and the Norton System Telephone Company, Toronto, Can.

B. F. Sturtevant Company of Boston, Mass., reports recent sales of generating sets to the Alton Paving, Building & Fire Brick Company, Alton, Ill.; Minneapolis St. Paul & Sault Ste. Marie Railway, Minneapolis, Minn.; Votey Organ Company, Garwood, N. J.; Hermann Manufacturing Company, Evansville, Ind.; H. J. Kunzig, Philadelphia, Pa., and Polson Iron Works, Toronto, Ont. Sales are reported of Sturtevant high-pressure rotary type blowers to the

Otis Elevator Company, Chicago, Ill.; Macallen Company, South Boston, Mass.; United Oil & Refining Company, Beaumont, Tex.; Lunsden & Van Stone Company, Boston, Mass.; Johnson & Blanding, Providence, R. I., and Sharpless Separator Company, West Chester, Pa.

John W. Seaver, one of the founders of the Wellman-Seaver-Morgan Company of Cleveland, O., has severed his active connection with the company and has opened offices as consulting engineer at 519 Caxton building, Cleveland. Mr. Seaver will devote his personal attention to the design and construction of manufacturing and power plants, iron and steel foundries, buildings and special cranes and appliances for handling machinery.

Westinghouse Companies, Pittsburg, have been awarded the contract by the United States government for the complete electrical equipment for the new power station to be erected in connection with the congressional buildings at Washington, D. C. The contract calls for four Westinghouse-Parsons and four Westinghouse generators, all of 3,000-horsepower capacity. All of the machinery is now under construction and will be delivered before the end of the year.

Chicago Pneumatic Tool Company, Chicago, has issued a statement of profits for the quarter ending on March 31, which shows an earning on the stock of 2.8 per cent. The profit for the first quarter was \$255,528.82 which after deducting cost of depreciation, development of new tools and bonded interest, the profit available for dividends was \$171,561.45. A quarterly dividend amounting to \$61,087.83 was paid, leaving a balance of \$110,473.62 to be added to the previous surplus, making a total surplus to be carried forward of \$988,883.06.

Noiseless Car Wheel Company has been incorporated with a capital stock of \$1,000,000 for the purpose of manufacturing a noiseless car wheel for street railways. The directors of the company are: George H. Bryant, August Ziesling, Bethune Duffield, J. L. Carleton and Fred M. Delano. The officers are: President, George H. Bryant, at present western representative of the Krupp Company; vice-president, August Ziesling, president of the American Bridge Company; treasurer, Bethune Duffield, Detroit, and secretary, W. F. McCorkle, Detroit.

Central Inspection Bureau, New York, has received an order from the Newburg & South Shore Railway for the inspection of 100 all-steel gondola cars, which will be built by the Pressed Steel Car Company. An order has also been received from J. G. White & Co. for the inspection of a large number of dump cars for export shipment and an order from the Philadelphia Rapid Transit Company for the inspection of a large amount of lumber. The company has thoroughly equipped itself with competent inspectors for the inspection of all classes of railroad and builders' equipment.

Allis-Chalmers Company, Milwaukee, has received an order from the Elkins Coal & Coke Company of Morgantown, W. Va., for new machinery, comprising a 300-kilowatt Allis-Chalmers alternator, a 200-kilowatt rotary converter, three 75-kilowatt transformers, a 27½-kilowatt exciter, standard induction motors of 20 to 150 horsepower capacity, with switchboard equipment. An order has also been received from the Jones & Langhlin Steel Company of Pittsburg for two direct-current generators, with a capacity of 1,000 kilowatts each, for installation in its Ahiquippa (Pa.) plant.

TRADE PUBLICATIONS.

Allis-Chalmers Company, Milwaukee, Wis.—Leaflet No. 2002 consists entirely of illustrations of the valve gear, piston details and governor of the Reynolds Corliss engine.

Alliance Machine Company, Alliance, O.—An imposing list of users of electric cranes who placed orders with Alliance Machine Company in 1906 has been published in pamphlet form.

Sprague Electric Company, 527 West Thirty-fourth Street, New York, N. Y.—Catalogue No. 315 is a 36-page publication listing a large number of types of electric fans for both direct current and alternating current.

C. W. Leavitt & Co., 220 Broadway, New York.—A four-page leaflet offers advice regarding the deoxidation of brass and bronze alloys by the use of magnesium and states how this deoxidizing agent should be handled as distinguished from other deoxidizers.

Wickes Brothers, Saginaw, Mich.—This company issues monthly stock lists of boilers, engines, dynamos, motors and machinery. The list of April 15 shows a large stock on hand of tubular, water-tube and upright boilers, Corliss engines, and other horizontal automatic engines, vertical engines, throttling governor engines and gasoline engines. Pumps, condensers, feed-water heaters, locomotives and metal-working machinery are also listed.

General Electric Company, Schenectady, N. Y.—An extensive line of fan motors, both alternating and direct current, are the subjects of an illustrated catalogue. Bulletin No. 4393C is devoted to small, moderate-speed, engine-driven, revolving-field alternators. Electric pumping plants are the subject of Bulletin No. 4496, which describes the 25,000,000-gallon municipal plant at Buffalo, N. Y., and the 172,000-gallon electric pumping plant recently completed for the village of Scotia, N. Y.

Western Electric Company, Chicago.—A pamphlet which should be of interest to those having to do with the installation and maintenance of telephone machines is that published by the Western Electric Company under date of April 11, 1907. The various features of installation are considered and are conveniently indexed for reference. Another recent publication of the company is a

pamphlet giving facts regarding the immensity of its organization and plants. Two mailing cards call attention to ceiling fans and ventilating fans.

Browning Engineering Company, Cleveland, O.—An eight-page pamphlet has been issued to introduce to investors \$250,000 of 7 per cent cumulative preferred stock. This increase in stock is to provide for the rapid increase in the business of the company.

Hill Publishing Company, 505 Pearl Street, New York, N. Y.—This company has just issued a book catalogue of 168 pages, 3½ by 6 inches, containing a comprehensive list of books on civil, mechanical and electrical subjects and scientific works of every description. The book is conveniently arranged, enabling the location of a work in any class an easy matter.

TRACK-CLEANING BROOMS.

The equipment of a wagon as employed on street and inter-urban railways for cleaning track on frogs and curves consists of a steel wire broom, a corn broom and a can of oil. The steel broom is for cleaning out refuse and obstructions which have become tightly impacted in grooves by the passage of many wheels, the corn broom for the finishing touches and the can of oil for administering lubricant upon the rail on curves. The J. W. Paxson Company, 1021 North Delaware avenue, Philadelphia, manufactures the wire broom illustrated herewith and makes the claim that this broom is an indispensable part of such an outfit. The broom, as shown, is made of such a width as to fit into the groove on frogs and curves and the wire is of sufficient stiffness to remove any ordinary obstruction even when solidly packed. The corn broom will not do this; hence the claim for the indispensability of the wire broom as made by the manufacturer.

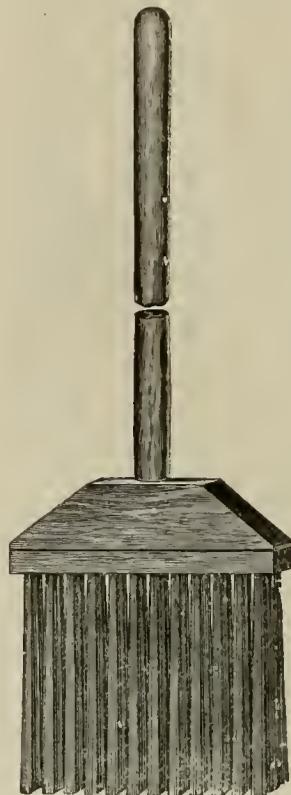
It is of interest to note that the use of the wire broom for this purpose was suggested by its efficiency in the foundry for cleaning sand from castings, the Paxson company also manufacturing foundry facings, supplies and equipment. The brooms are inexpensive and durable.

THE VICTOR PORTABLE COMBINATION METER.

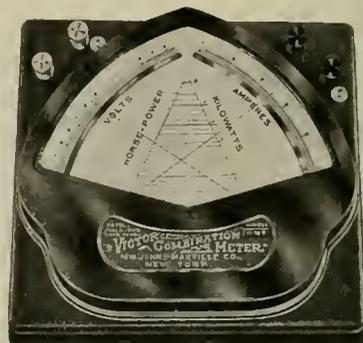
The desirability of being able to tell at a glance exactly the kilowatt or horsepower output of a generator is well recognized by most engineers, as it saves the trouble of making mental calculation required in multiplying the volts pressure by the ampere output to obtain kilowatts and then dividing by 746 to obtain the horsepower of an electric circuit. The convenience

of being able to read the horsepower and kilowatts directly is shown by the favorable reception which was given to the Victor combination switchboard power meter, introduced a year or so ago. The combination meter, an illustration of which is presented herewith, consists of two separate instruments, a voltmeter and ammeter mounted within the same case. The scales for reading the two instruments are so located that the needles of the two instruments cross each other. It is evident that no matter in what position the two needles may be, the point located by their intersection may be taken to represent the product of the volts by the amperes, or the product of the volts by the amperes divided by 746. The instruments, after being carefully calibrated by hand to read volts and amperes accurately, are then calibrated for the central triangular graduations, which give the power readings direct. These are clearly shown in the accompanying illustration. The horsepower readings are taken from one side of the triangular scale and the kilowatt readings from the other. The instrument, therefore, serves the purpose of voltmeter, ammeter and wattmeter and has an additional advantage of giving the reading reduced to horsepower.

To meet the great demand for a portable instrument of this type the H. W. Johns-Manville Company of 100 William street,



Wire Track-Cleaning Broom.

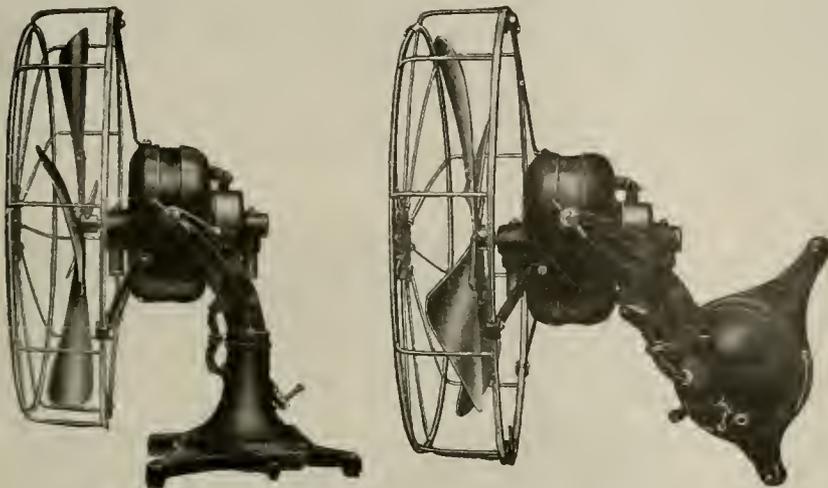


Portable Combination Meter.

New York, has placed a portable Victor meter on the market, which has all the advantages of the station type meter, combined with portability. These instruments are particularly useful for making such tests as in calibrating recording wattmeters and lamps, and are particularly useful and convenient for the testing of electric cars and electric elevators. The advantage of being able to read the power direct in making elevator tests and car tests where the current consumption fluctuates rapidly will be evident, and in cases where it is desirable to read both the volt and ammeters separately the convenience of having the two readings on the same dial, which facilitates the rapidity with which readings can be taken, will no doubt also be found of value in testing work. As shown in the illustration the volt and ammeter scales are provided with mirrors directly below the scale, which permit obtaining accurate readings. Extra shunts and multipliers can be furnished with these instruments, which extend the range of the readings.

NEW ALTERNATING-CURRENT FAN MOTOR.

There is probably no piece of electrical machinery which so thoroughly illustrates the great advance made in the design and



New Alternating-Current Fan Motor Used as a Desk Fan. New Alternating-Current Fan Motor Used as a Wall Fan.

manufacture of electrical apparatus as does the fan motor, which has been developed from the crude, inefficient toy to a highly efficient piece of machinery, being in detail of design and manufacture the counterpart of the larger motors. The latest development and improvement, marking one of the greatest steps of advancement in the fan motor industry, are shown in the alternating-current commutating fan motor of high efficiency, with great starting torque and sparkless commutation, recently developed and placed on the market by the Western Electric Company of Hawthorne, Ill.

This fan motor is illustrated in the accompanying view, showing one of its unique features, a diagonal joint, which permits it

either direct or alternating current. It is therefore unnecessary to purchase a new motor should the service be changed from direct to alternating, or alternating to direct current.

It is stated that the blades are of new construction, following specially designed lines, thereby furnishing maximum breeze with minimum current consumption.

THE KEARNEY CABLE CLAMP.

One of the great difficulties which has been experienced in constructing overhead lines with heavy cables has been that of making turns and fastening up the dead ends of cables. To overcome the difficulty experienced at these troublesome points W. N. Matthews & Brother, 217 North Second street, St. Louis, have designed the Kearney cable clamp, which is of extreme simplicity and of highly satisfactory construction.

The Kearney cable clamp is designed to supplant the extra joints and fastenings necessary in the ordinary methods of cable suspension at angle poles and dead ends. As will be seen from the accompanying illustration, which shows it applied in making a right angle turn of heavy wire cable, the clamp consists essentially of two wrought-steel plates with four clamping bolts. The two parts of the clamp are designed to fit the bare surface of the cable and when the nuts on the four bolts joining the two parts are tightened the clamp grips the bare cable so that the strain is transmitted through the upper plate to a globe strain or similar insulator fastened to the pole at the curve. By the use of two of these clamps, one holding the cable in either direction from an angle pole, the curved portion of the cable between the two clamps may be made short and relieved of any great amount of strain. This method of construction does away with the necessity for serving the heavy cable about an insulator at an angle pole, and then making a joint to continue the cable after it has turned the angle. The Kearney cable-clamp is made in but one size, suitable for cables from 600 to 2,000,000 circular mills. The great advantage of using these clamps is that they do away with cutting the cable at angle poles, and thus, should it at any time be decided to change the location of the pole or remove the cable, the cable can be made as good as new by simply taping the portion of the cable where the insulation was removed to attach the clamps. As compared with the old method of constructing corner turns it is claimed that these clamps save cable, time, labor and material.

Savannah Blow Pipe Company, Savannah Ga., has been awarded a contract for the blow pipe system for the new shops of the Atlantic Coast Line at Waycross, Ga. This company, during the past few years, has equipped many of the large planing mills and woodworking plants in the south, and was awarded the contract for equipping the Waycross plant over many of the leading manufacturers of blow pipes in the United States.

Heine Safety Boiler Company, St. Louis, has recently received a large number of orders for boilers, a partial list of which is as follows: Asano Cement Company, Tokio, Japan, four boilers aggregating 900 horsepower; Atlantic Gulf & Pacific Company, four 200-horsepower boilers, to be installed on two hydraulic dredges; American La France Fire Engine Company, Elmira, N. Y., two 230-horsepower boilers; American Locomotive Company, Richmond, Va., four 400-horsepower boilers; Bridgeport Forge Company,



The Kearney Cable Clamp.

to be changed in a few moments, and with very little trouble, from either a desk to a wall fan or vice versa.

The motor is of the usual Western Electric high-standard construction, with a multipolar laminated sheet steel field magnet, and a specially constructed commutator, which entirely eliminates the sparking caused by faulty commutation in the older types of commutating alternating-current fan motors.

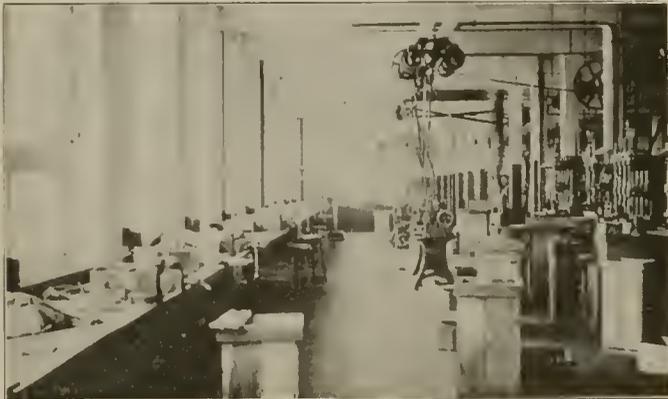
The character of the motor is similar to that of an ordinary series-wound direct-current motor, having a high starting torque, which causes it to start as readily as an ordinary direct-current motor, but it has the additional advantage that it can be used on

Bridgeport, Conn., three 250-horsepower boilers; Crown Cotton Mills, Dalton, Ga., two 400-horsepower boilers; Home Brewery, Columbus, O., three 200-horsepower boilers; Hudson Companies, two 316-horsepower boilers, making a total to this company of 4,513 horsepower on 11 orders; Independence (Kansas) Cement Company, Independence, Kan., three 400-horsepower boilers; James S. Kirk & Co., Chicago, two 500-horsepower boilers; Joseph J. Little building, New York, three 275-horsepower boilers; Quincy Horse Railway & Carrying Company, Quincy, Ill., three 316-horsepower boilers; City of New York, for Ridgewood pumping station, eight 300-horsepower boilers.

NEW PLANT OF THE O. M. EDWARDS COMPANY.

The O. M. Edwards Company has recently erected a new plant at the corner of Plum and Solar streets, Syracuse, N. Y. The location is within the half-mile circle from the business center of

The main entrance and reception room for visitors, which is 16 by 18 feet, is handsomely finished and furnished. A main corridor connects the offices and the stock room. This is 80 feet in length and 8 feet wide. The main office is of generous proportions, being 55 by 40 feet. Adjoining this office is a fireproof vault, 24 by 12 feet,



O. M. Edwards Company's Plant—Machine Shop.



O. M. Edwards Company's Plant—Main Office.

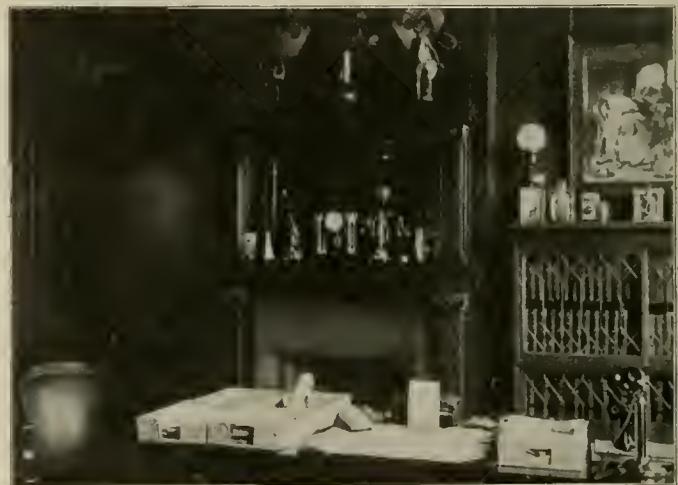
the city, which has at the present time a population of about 130,000. No expense has been spared in the building and equipment and the result is a model in the matter of efficiency.

The buildings are located upon a plot of ground consisting of four acres, with a frontage of 575 feet upon Plum street and 350

feet upon Solar street. The factory building stands 20 feet from the line of each of the streets. The main factory building is 211 feet long, 55 feet wide and is five stories in height. A wing, which is used for woodworking purposes, is 80 by 40 feet, and the wing



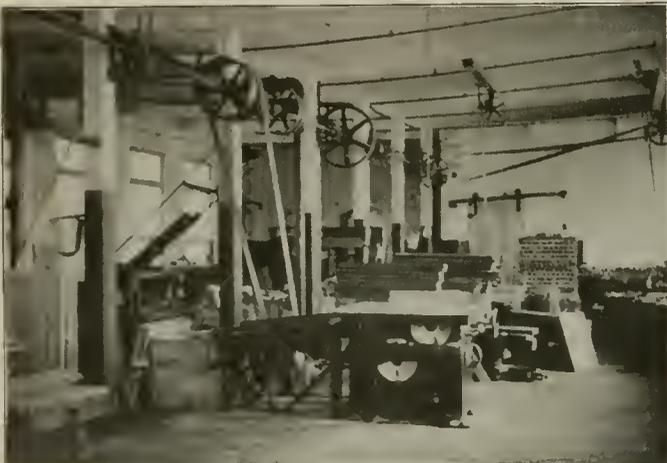
O. M. Edwards Company's Plant—Main Building.



O. M. Edwards Company's Plant—Private Office.

feet upon Solar street. The factory building stands 20 feet from the line of each of the streets. The main factory building is 211 feet long, 55 feet wide and is five stories in height. A wing, which is used for woodworking purposes, is 80 by 40 feet, and the wing

apartment. Connecting with the private office is the reception room. The finish of the offices throughout is in weathered oak and the walls are handsomely decorated in oil finish. The drawing room is a well-lighted apartment, 28 by 32 feet. Connecting with



O. M. Edwards Company's Plant—Woodworking Department.



O. M. Edwards Company's Plant—Brass Foundry.

devoted to the brass foundry is also 80 by 40 feet. There is also connected with the plant a detached building, 55 by 115 feet, one end of which is used as a stable for trucks and the opposite end for tinning and tempering work. The central portion is occupied by dry kilns.

this room is a fireproof vault, 8 by 12 feet, for the safe keeping of tracings and other drawing room records.

An interesting part of the plant is the model or sample room, the walls of which are surrounded with mahogany models, showing the various designs of windows, platform trap doors and other

parts manufactured by the company. The size of this room is 16 by 28 feet. The main stock room is 88 by 55 feet and has an additional room adjacent, 80 by 40 feet. One of the accompanying illustrations shows a portion of one of the woodworking rooms. This is devoted almost exclusively to the making of exhibition

nished by a "Straight-Line" engine direct-connected to a general electric generator having a direct-connected exciter. The power is transmitted to the various line shafts by means of motors, driving groups of machines. In the principal machine rooms there are four line shafts, each run independently by a separate motor. The



O. M. Edwards Company's Plant—General View.

models and sample parts, which are sent out in the interests of the salesmen's department. This room is 80 by 40 feet. The first floor of the main building is used for manufacturing purposes. The size of the room is 211 by 55 feet. The third floor is of the same dimensions, 211 by 55 feet, and is arranged for machine work. The brass foundry, 80 by 40 feet, has in connection a fireproof vault for the safe storage of patterns. This vault is 24 by 12 feet.

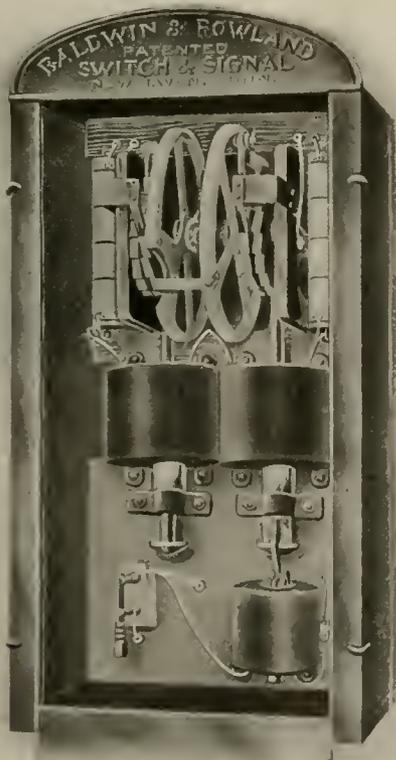
As shown in the general illustrations, the plant is substantially built and well arranged for its intended purposes. The electric wiring throughout the building is in iron conduits and was in-

generator is three-phase alternating current and furnishes 124 volts for the lighting system and 220 volts for the power circuits.

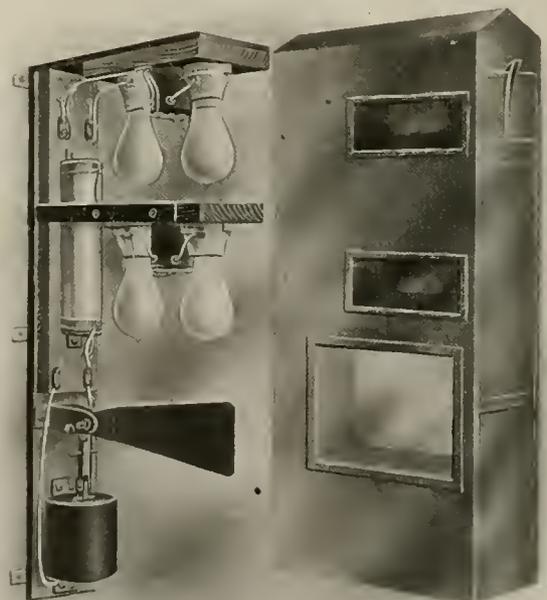
The accompanying illustrations will give a satisfactory idea of the general appearance of the plant and a few of the more interesting features of the interior arrangement and equipment.

A MULTIPLE INTERLOCKING RECORDING BLOCK SIGNAL.

The Baldwin & Rowland multiple interlocking block signal is both a position and light signal. As the name suggests, it is capable of protecting any number of cars passing in the same direction through the block up to 17 in number. The first car sets the signal and automatically locks it, so that a car approaching



Multiple Interlocking Recording Block Signal—Signal Movement.



Multiple Interlocking Recording Block Signal—Semaphore Arrangement.

stalled by the Wheeler-Green Electric Company of Rochester, N. Y. The plant is equipped throughout with an automatic sprinkler system and steam-heating apparatus, both of which were installed by E. P. Bates of Syracuse. The specifications for the power plant were drawn by Prof. John E. Sweet of the Straight-Line Engine Company, Syracuse, and the engine and boiler rooms are a model in the matter of appointments and equipment. The power is fur-

in the opposite direction and disregarding the signal cannot change the signals that are set, neither can it set a signal of its own. Every succeeding car entering the block is recorded and protected by signals set by the first car, while the last car leaving the block clears the signal and unlocks it. The signals are all equipped with auxiliary lights, so that if the active light burns out the second light takes up the work of the first. They are also equipped with

a fusible link that opens the circuit before any harm can be done to magnets should a live wire become crossed with the signal circuit. All magnets used in this mechanism are of the solenoid type, made of large size wire, automatically wound, put up in Sterling insulating varnish and incased in cast-iron shells. While all parts are perfectly protected from weather conditions, the case can be removed so that access to all parts is easy. Provision is made on resistance tubes to accommodate varying voltages of the line. Sleet and snow are no liable to cover the semaphore cases so that light or arm is hidden.



Multiple Interlocking Recording Block Signal—Overhead Contact.

Realizing the absolute necessity to the successful operation of signals for a trolley contact that will not only be absolutely reliable but capable of operating under a high rate of speed, without liability of throwing the trolley or be subject to mechanical injury, the company, after a working experience of two years, has adopted the contact illustrated, which is guaranteed to meet all requirements. This is made in three different lengths to accommodate different speeds. It is reported to have worked successfully for a year on roads that maintain a speed of 55 miles an hour. These signals are now operating on the following named railroads: Consolidated Railway Company, New Haven, Conn.; Rochester Syracuse & Eastern; Auburn & Syracuse Electric; Syracuse Rapid Transit; Altoona & Logan Valley; Central Pennsylvania Traction; Farmington Street Railway, Hartford, Conn.; International of Buffalo, N. Y.; Bay Shore Terminal and Norfolk & Portsmouth Traction of Norfolk, Va.

INDESTRUCTIBLE FIBER.

Three varieties of indestructible fiber, known as "Fibrite," "Durite" and "Kantlite," for use in steam and street railway car headlinings, steamboat panels and partitions, are manufactured by the Indestructible Fibre Company, the sole agents of which in the transportation field are Wendell & MacDuffie, 26 Cortlandt street, New York. The very satisfactory appearance of this material when used for car headlinings is shown in the accompanying engraving of the interior of a car built by the American Car &



Indestructible Fiber—Interior of Long Island Railroad Coach with Indestructible Fiber Headlining.

Foundry Company for the Long Island Railroad. The material is light, strong and durable and it is claimed that it is economical to decorate and finish and will not blister or splinter. Fibrite is considered especially adapted for the headlinings of old cars which have become leaky, because it is not liable to blister under the severest conditions. The material is as light as ordinary soft wood veneer and its strength is claimed to be 75 per cent of that of hard wood of the same thickness. It is said to retain its shape perfectly and can be made to conform to any contour specified.

Durite is not recommended for marine work on account of its weight, which is 10 per cent greater than that of oak and is of the

same strength for the same thickness. This is not fireproof, but slow-burning, and is susceptible to the same degree as is wood veneer. It is capable of a high finish and the cost of decorating is the same as on wood veneer.

Kantlite is especially intended for steel cars and marine work, partitions and panels of steamboats, where fireproofing qualities are required. The fireproofing ingredients are applied to the raw wood pulp before the material is worked into boards, and it is said that the fireproofing qualities are retained almost indefinitely. It is claimed that it will not retain a flame and that under the heat

of the severest tests it will not carbonize. The several brands are made up in sheets of various sizes and thicknesses.

NEW STANDARD PORTABLE MULTIMETER.

As electric railways are becoming more and more extensive and are reaching into the field formerly occupied by steam railroads, the demand for the utmost refinement in all matters pertaining to the operation and testing of materials and machinery is becoming daily of greater importance, so that it is now the custom on even the smallest roads to carefully test all new apparatus which is purchased and that which is already in operation, in order to furnish the management with exact knowledge of its efficiency and condition.

On many of the smaller roads, no doubt, the testing of electrical apparatus has been considerably neglected because the number of instruments required to cover the field of electrical testing has been so great that many of the smaller companies could not afford to purchase all the instruments necessary; but in spite of the large investment required when separate instruments were needed for each test, it is a question whether even on small roads it was not near-sighted economy to hesitate to make the investment in instruments necessary for carrying out thorough tests on all electrical apparatus at regular and frequent intervals. The obstacle of so large an investment in a great number of instruments has been almost completely surmounted by the Weston Electrical Instrument Company of Newark, N. J., in placing upon the market a new instrument—the Weston multimeter—which is illustrated in the accompanying engraving. This instrument should receive a hearty welcome from street railway managements in that it combines in practically one instrument all the instruments necessary for making electrical tests. It may be used as a voltmeter, milli-voltmeter, ammeter or mill-ammeter, ohmmeter, ground detector and wheatstone bridge. The range of the instrument is as follows:



Weston Portable Multimeter.

Voltmeter.	Ammeter.
.075 volt	.015 ampere
3. volts	1.5 amperes
150. volts	15. amperes
750. volts	150. amperes

The bridge with three dials measures to 999 ohms, with even ratio arms. Inside of the case there are also contained 12 silver chloride cells, bridge resistance coils and shunts for the volt and ammeter.

A special feature which has been carefully considered in the construction of this instrument is the insulation, which is of highest type, and is so constructed that the rubber is not exposed to the deteriorating effects of light, dirt and moisture. This instrument, which is thoroughly portable, is well adapted for making practically all the tests required in electrical railway work. The manufacturers, however, call special attention to the fact that, while this instrument combines a number of separate instruments, and is capable of a very high degree of accuracy, it, of course, cannot embody the same degree of accuracy for each separate part as could be secured by the use of the separate Weston instruments covering the same range of operation, but for practical street railway work it is sufficiently accurate.

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In acquiring rights of way when the Puget Sound Electric Railway was built the company purchased considerable timber land. To utilize this timber the company erected a sawmill, which has been in operation for the last three years, cutting timber for commercial purposes. As this mill is located near the line of the company the shipments of lumber have formed a part of the freight business of the road, but only a comparatively small part. Ownership of the land and mill, therefore, gives an additional source of revenue to the company and adds to its receipts from freight.

Recent progress in the development of large producer gas engines has brought the status of these engines to a point that units of even 6,000 horsepower, suitable for electric railway service are operating satisfactorily with a reduced cost of maintenance over that of prime movers of the same power operated by steam. One of the disadvantages for city plants, however, of a producer gas plant and gas engines is the large floor space required, and when this is taken into consideration it may be questioned whether the saving of one-half the fuel required by a steam plant will, in the case of cities where land is of great value, be sufficient to counterbalance the difference in interest depreciation and taxes on the extra ground and increased size of building required by the producer gas plant. At a regular meeting of the Western Society of Engineers, held on Wednesday, May 1, 1907, an exceptionally interesting paper on "The Present Status of the Producer Gas Power Plant in the United States," was presented by R. H. Fernald, who is in charge of the producer gas test of the United States geological survey fuel testing plant. Mr. Fernald's paper presented the results of a large number of tests on producers and comparisons with a non-condensing Corliss engine of practically the same power and showed the coal consumption of the producer engine was practically only one-third of that of the steam engine. Another

interesting part of Mr. Fernald's paper was the result shown in burning various kinds of low-grade fuel, including peat, lignite and low-grade coals, many of which it would be practically impossible to burn in an ordinary furnace. Although the test showed that it is at present impossible to burn certain grades of fuel in the gas producer the number of different fuels which could not be burned in the furnace and could be used in the producer is much greater than the number of fuels which can be burned on the grate and cannot be burned in a producer, and, as Mr. Fernald stated, had the producer employed by the geological survey been specially designed, there is no doubt that even those fuels which were unsuccessfully tried could have been successfully and economically employed.

The Interborough-Metropolitan Company of New York has wisely refused to construct the proposed Lexington avenue and Seventh and Eighth avenue subways under the conditions imposed by the rapid transit board. In taking this step, which was not wholly unexpected by the city representatives, the company shows that before entering into an irrevocable enterprise, it has counted the cost of construction and the chances of adequate interest and the return of principal. The weakness of some companies in ignoring these fundamental facts contributes to the public fallacy that street railways in large cities will gladly accept franchises founded on any rigorous terms that may be framed. The tendency of municipalities in this day is to exact much and to concede little, and it is refreshing to find one company with sufficient courage to withstand the temptation to build for present revenue and to let the future take care of itself. A franchise which does not provide for proper allowance for depreciation and amortization of investment is elusive and deceptive; but municipalities will continue to grant such franchises so long as companies can be found to accept them. In his letter Mr. Shonts made it plain that the company desires to construct the subway, if accept-

Timber Lands Aid Railway Revenue.

Producer Gas Plants.

Must Profit on Subway Contract.

able conditions can be arranged. Among other things, he points out the need for provision for depreciation.

ADVANTAGES OF TRAILER OPERATION.

The problem of properly handling rush-hour traffic demands the best energies of any operating organization. How to carry the excessive passenger increase each morning and evening and how to supply not only the equipment but the men and power to operate the cars comprise the essential demands. The trackage facilities are usually ample if the cars can be kept moving. This requirement for comparatively excessive seating capacity during the short periods is met in different ways. The usual practice is to have extra motor cars and arrange the runs so that crews will be available to operate part of the cars during the day and practically all the equipment at rush hours. The labor conditions and crowded streets in some localities warrant the operation of some cars in multiple units. This practice is observed by the Columbus (O.) Railway & Light Company. Still another method of providing for rush-hour traffic and one which has been widely discussed, pro and con, is the use of trail cars attached to the regular motor cars.

The latter method of employing trail cars has been developed to a successful stage by the Denver City Tramway Company, as is evidenced by the description of this company's methods of operation described elsewhere in this issue. Compared with the practice of providing separate motor car units for handling rush-hour traffic the use of trail cars of suitable design offers several advantages.

The question of idle investment is always an interesting one. The type of motor car used for single-unit operation during the middle of the day and for hauling trailers during rush hours seats 52 passengers and weighs 38,000 pounds as equipped with four 43-horsepower motors. The cost of such cars is about \$6,000. The trail cars seating 46 passengers and weighing 13,000 pounds cost but \$2,000. Thus it is seen that if sufficient motor cars are provided to handle the midday loads the idle investment for rolling stock, which is seldom, if ever, called into use except for rush-hour traffic, is a considerable amount. Trailers not having motors to be affected by severe changes of weather may safely be stored in open yards. The insurance rates on trailers thus stored and with no electrical equipment should afford a considerable saving when compared with similar charges for motor cars of like seating capacity. A secondary advantage is exhibited in the increased motive power available for use during the middle of the day when speeds may be increased and fewer units used.

The expense of maintaining a trail car which has practically no apparatus on it except the brakes is said to be less than one-tenth that for motor cars of the same size. The low weight per unit seating capacity of the Denver type of trailer, which is 282.6 pounds, demands but light service from the wheels and brakes, therefore the repair and maintenance of these parts is slight. The low weight has another desirable resultant in the reduced wear and tear on track structures.

As regards the details of operation when trail cars are used, there are several features afforded which are quite desirable. The presence on the streets of only a uniform number of trains or units assures that accidents will be less frequent than when the number of units is doubled during rush hours. It is more economical to move the crowds on the same number of units with normal headway than with an increased number of units and decreased headway. And the adding of trailers need in no way interfere with the regular schedules which obtain throughout midday, thus relieving the transportation department of the duty of supplying competent motormen for rush-hour work on single units.

The changing of a large number of runs and sending out "trippers" is done away with when, as traffic demands, a

trailer is coupled to a motor car whose crew has been operating during the hours of light traffic. The addition of the trailer requires but one extra man qualified to act as a conductor. Thus it is seen that but 50 per cent is added to the labor cost for handling approximately 100 per cent more passengers.

Next to the saving in platform labor the greatest direct financial saving appears in the reduced current consumption. It has been found at Denver that wattmeter readings on a large number of cars, observed for several months, show the additional power consumption required for doubling the load by adding a trail car to be only 35 per cent of that required to operate the motor car as an independent unit during the day. In the descriptive article, earlier referred to, the results of wattmeter readings taken during the month of January are exhibited in detail. For a railway system that is now demanding the highest available overload capacity of its generating station, this method of reducing the peak loads by the use of trailers is very desirable. Thus the purchase of additional electrical machinery may be postponed.

It is our opinion that the near future will see many street railways equipped for train operation. Not perhaps as is practiced at Denver with trail cars in the strictest sense of the word, but with multiple unit control, mounted either on all motor cars so that they may be coupled for operating in the heavily traveled streets or on motors and trail cars, so that the latter may serve as a control equipment and be operated ahead, thus doing away with the necessity for loops in the centers of business districts. Such careful study as is being given the subject by the management of the Denver City Tramway Company must result in substantial advancements.

SPECIFIC HEAT OF SUPERHEATED STEAM.

From the time Regnault made his classic experiments on the properties of steam until recently the specific heat of superheated steam as determined by him was accepted as correct almost without question. Though some investigators doubted the correctness of Regnault's experiments, and though later experiments were made, the question was not seriously taken up till it was found that steam turbines operated with superheated steam showed a greater increase in economy than theory demanded. The same had, it is true, been found to be the case in reciprocating engines, but this was easily explained by considering the reduced cylinder condensation. In the turbine, however, where there is not the constant heating and cooling of the parts, the gain in economy exceeding that demanded by theory could not be so easily explained. Even granting that the skin friction was reduced was not sufficient to satisfy engineers with an investigating turn of mind.

It is interesting to note how the viewpoint of the user affects the specific heat, now that it is definitely known that it is not constant. On the one hand, the manufacturer of boilers with superheaters, in stating the results of tests, assumes a value ranging from 0.7 to 0.8, while, on the other hand, the engine and turbine manufacturers assume values suitable to their purposes, generally from 0.48 to 0.55, and between the two extremes are found the values of disinterested investigators. At first thought the question may be asked why there should be such a difference of opinion as between the manufacturers of boilers and manufacturers of engines, and the answer is simply that it is a matter of personal interest.

The assumption of a high value for the specific heat of superheated steam favors the manufacturers of superheaters, in that the efficiency of the boiler and superheater is apparently higher than it actually is. A low specific heat favors the prime mover, in that apparently a greater proportion of the heat is being turned into work than is actually the case.

The determination of the specific heat of superheated

steam is very difficult, and, so far, judging from the great variation of the values obtained by different experimenters, it seems evident that the question is far from being definitely settled. One of the greatest difficulties in such experiments is the accurate determination of the temperature, and in many methods the slight inaccuracies of the steam tables make it impossible to get accurate results no matter how carefully and accurately the tests may be carried on. Methods which have been tried are the cooling of the steam by the injection of a known weight of water, passing superheated steam through a condenser and measuring the heat taken up by the water, throttling steam from one superheated condition to another (thus avoiding inaccuracies of the steam tables) and heating the superheated steam to a still higher temperature by a measured amount of electrical energy.

The latter method, it seems, should give the most accurate results and least difficulty of manipulation. A method which, to our knowledge, has not been tried and seems to offer certain advantages, is the determination of the ratio of the specific heats at any given temperature and pressure by finding the velocity of sound in the superheated steam. If the ratio of the specific heats and the density are known, the specific heat at constant pressure can be easily calculated. This method has the advantage that a slight error in the temperature readings would not affect the results appreciably, and the velocity of sound in the steam as well as its density can be more easily determined than the heat measurements of the present methods can be made.

All of the more recent experimenters agree that the specific heat at constant pressure increases, and nearly all agree that it varies practically directly as the pressure varies. A great difference of opinion is, however, shown regarding the specific heat at constant pressure with varying degrees of superheat. Some experimenters found from their tests that the temperature does not influence the value of the specific heat. Others found that the specific heat increases with increase of temperature, while still others find that it decreases with an increase in temperature.

The latest experiments by Messrs. Knoblauch and Jakob show that the specific heat increases with the pressure, and that it first decreases and then increases with rising temperature. Further, they have shown by extrapolation that the specific heat at zero pressure is not constant, but increases with increasing temperature. If this is true, as indications tend to show, the widely divergent results of nearly all the investigators agree fairly well.

The average specific heat, according to the results obtained by Knoblauch and Jakob, at pressures of 100 to 200 pounds per square inch absolute and a range of 200 degrees F. superheat, would be about 0.59, and the average specific heat for all pressures from 0 to 200 pounds and 200 degrees superheat would be about 0.5.

In support of the general trend of their experimental values, Messrs. Knoblauch and Jakob advance the considerations that, in monatomic gases, the specific heat should be independent of the pressure and temperature, while in polyatomic gases the specific heat should increase with rising temperature, as work is done in separating the atoms even before disassociation begins to take place. Change of pressure in this case should not effect the specific heat. In monatomic vapors, however, both pressure and temperature should influence the specific heat, as the molecules in easily condensed vapors must exert a considerable attraction for each other. As the force of attraction varies inversely as the square of the distance between the molecules, the force of attraction increases directly with density, and hence the specific heat should increase with the pressure, and decrease with the temperature when the pressure remains constant.

The behavior of polyatomic vapors, such as water, is the complex effect resulting from the combination of the characteristics of the monatomic gas and vapor, and the resultant would depend entirely upon which predominated. In general, the tendency is for the specific heat to increase with the

pressure and decrease with temperature until the disassociation effect exerts the prepondering influence, after which the specific heat again increases till disassociation has completely taken place, after which the fluid approaches the condition of a perfect gas and the specific heat remains constant.

These facts explain the divergence which is found in the results obtained by different experimenters, and may, in a small measure, be of value in interpreting the results which have been published. At present it seems hardly advisable to accept any of the results as final, but, if properly considered, they will serve reasonably well until more accurate information is available.

THE PROTECTION OF LIFE AND PROPERTY.

Almost daily our attention is called to the unnecessary loss of life and the destruction of property by accidents in power plants, the most common accidents being the explosion of boilers and the bursting of flywheels. There are also many others of such frequent occurrence that it seems time that both the designers and owners of power houses should stop and consider the subject carefully, with a view to making every effort to prevent the occurrence of accidents, and, what is far more important, to protect the men who would be endangered by them. How often, for instance, are seen plants which have been so arranged that in case of a break in the main steam pipe, escape in time to avoid serious, if not fatal, injury would be impossible. Or, again, men are sent to work in a boiler which is to be cleaned and repaired, and no safeguard is provided to prevent steam from other boilers being turned in on the men who are at work inside the boiler.

Likewise, engines are seldom provided with automatic stops to prevent a flywheel bursting from overspeeding. True, the engine is provided with a governor which may itself have a safety-stop attachment, but if the safety of life and property is duly regarded, those who are responsible will not depend upon the governor—the duty of which is to regulate the speed of the engine—to act as a safety stop as well. Unguarded flywheels, connecting rods, high-tension lines, etc., are other frequent sources of danger which could be easily eliminated.

The dangers to which engineers, firemen and other employes of a power house are constantly necessarily exposed, under the most favorable circumstances, when all possible precautions have been taken, are so great, that no reasonable expense should be spared which would tend to reduce the possibility of accidents. In many cases the safety of employes could be assured without the expenditure of money if sufficient forethought were given to the subject. For example, it would cost no more to provide swinging doors opening outward from the fire room, than to provide heavy sliding or lifting doors which it is impossible to open quickly in an emergency.

Neither would it in general be more costly to arrange the steam piping so that the steam could be shut off in the engine room from the boiler room, and vice versa, non-return stop valves on the boilers and a sufficient number of generous sized exits from the boiler and engine rooms could do much to lessen the danger to employes when an accident happens, and their presence would be of no avail. When men are compelled to work in a boiler that is connected to others which are in operation, the valve should be fastened down with a chain and lock to prevent the steam from being accidentally or thoughtlessly turned into the boiler undergoing repairs, as so often happens. There are many accidents which could be as easily prevented as those here mentioned, which are cited to call attention to the needless sacrifice of life and loss of property which is constantly occurring, largely through thoughtlessness in design and unwillingness to spend a small amount of money.

Fuel containing excessive quantities of sulphur can be used in producer gas engine plants absolutely without injury to the cylinder, provided they are kept free from moisture.

THE SUCCESSFUL OPERATION OF TRAIL CARS IN DENVER.

The operation of trailers during the hours of heavy traffic has been shown to be economical by the Denver City Tramway Company. John A. Beeler, general manager of this company, and his assistants have developed types of trail and motor cars designed particularly for combined operation during a part of the day, which form a train unit affording especially satisfactory results as regards the service offered the public and financial returns. It is the purpose of this article to describe the types of motor and trail cars used in this service at Denver. The article also includes detail statements of the current consumption of the two types of cars when operated singly and as train units. It is thought that these data

a motorman who is well acquainted with his work, the plan of regular meets and stops is not interfered with and there is only one train unit, consisting of two cars, to negotiate its way through a crowded street, in contrast with two units, the extra one of which is frequently manned with an inexperienced crew.

The original investment for rolling stock is considerably lessened when trail cars of an acceptable design are used. In Denver, the 4-motor cars, seating 52, which are standard, cost about \$6,000 each, and the trailers, which seat 46 passengers, cost \$2,000 each. It is thus seen that if a property has a sufficient number of motor cars to handle its mid-day traffic, a considerable original investment for rolling stock is avoided if preparation for the handling of the rush-hour traffic is made by the purchase of properly designed trail cars, which



Trail Cars in Denver—Motor Car and Trailer In Service.

will be found of especial interest at this time when such thorough consideration is being given the problem of train service for rush-hour traffic in metropolitan districts.

Advantages of Train Operation.

The apparent advantages which are to be gained by the use of motor cars hauling trailers during the hours of rush-hour traffic, and which advantages have shown themselves to the management of the Denver City Tramway Company as worthy of careful consideration, may be enumerated briefly. There appears a marked advantage as regards freedom from accidents to passengers and employes. Probably this freedom results from the use of a uniform number of car units on the streets during the entire day. This uniformity is especially noticeable at the rush-hour periods in contrast with the plan of single-unit operation, when the downtown districts in most cities are well crowded with single cars on much shorter headways than exist during the middle part of the day. With the use of trailers to accommodate the extra night and morning traffic the daily service can be offered with a constant number of train units. Thus it is seen that the same headway exists during the entire day; all cars are operated with

can be operated in train units, including the same motor cars. With such cars for handling the rush-hour traffic a considerable amount is saved in insurance charges, which amount, combined with the saving in interest charges on the idle investment, makes a sum worthy of consideration.

As regards the repair and maintenance of the trail cars used in Denver, which will be described later, it is stated that although these cars when in service are practically always fully loaded and at other times are stored out of doors, the average charge for repairs is less than one-tenth that for motor cars. There are very few of the usual repairs that are necessary. It is found that practically nothing on the car is subject to wear or disorder except the brakes and wheels. Owing to the especially low weight per unit of seating capacity of these Denver-type trailers, 282.6 pounds, the wear on the wheels and brakes is very light.

Another advantage of using light trail cars for handling the rush-hour traffic is the increased acceleration of the motor cars which is available for maintaining close schedules during the middle of the day, when trailers are not used.

As will be shown later, the results of wattmeter readings taken over extended periods and on a generous number of

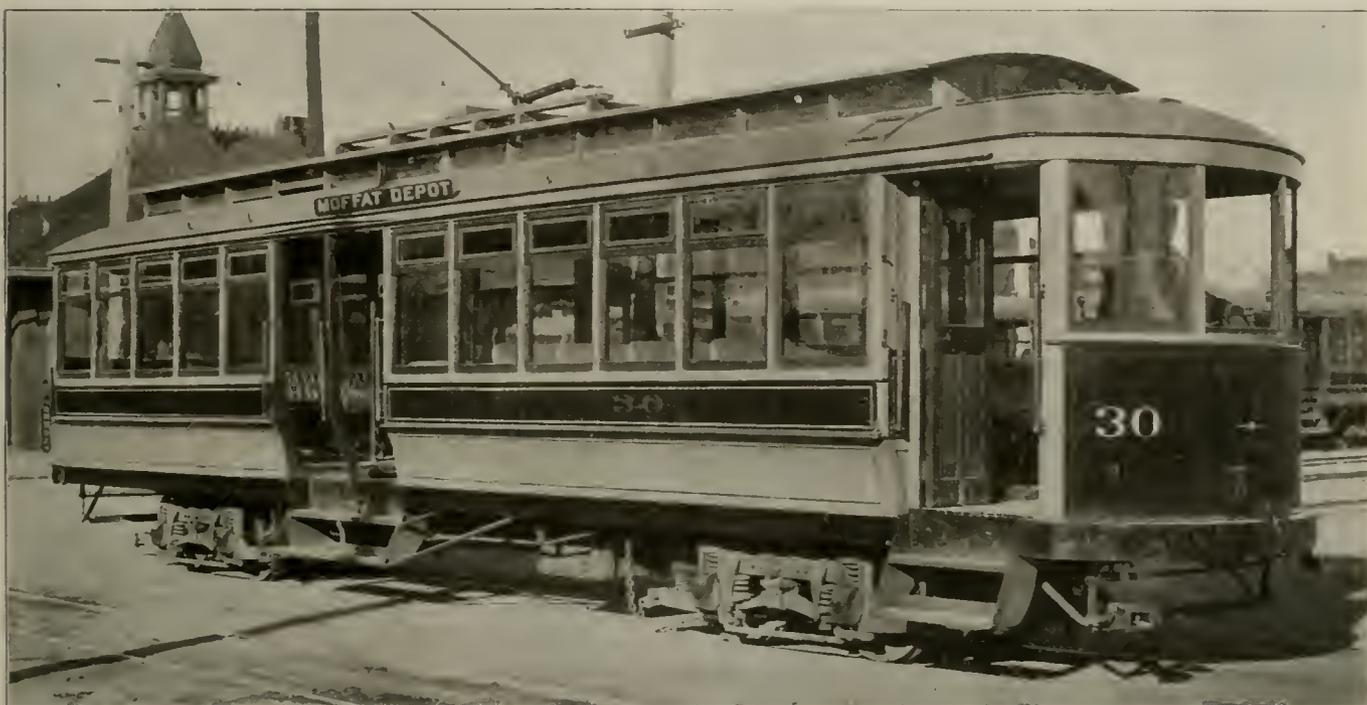
cars, prove that the increased power consumption necessary to haul almost double the load carried by the motor car ranges from 27 to 41 per cent. Therefore it is easily seen how effective the use of trailers may be in reducing the peak loads on a power generating equipment. This necessarily results in one of two things: if in originally designing the road the use of trailers were considered, then the fixed charges for the power plant installation could have been reduced; and, secondly, if trailer operation is begun at a later date, when the power equipment is fully loaded, it will be found that by the reduction of peak loads the existing plant is made capable of handling a heavier average service.

The labor question, which is usually more or less a delicate one when considering the handling of rush-hour traffic, is more easily solved by the use of trailers since they require but one additional man, a conductor. In Denver the average cost for platform labor on a motor car is 50 cents per car hour, and therefore the addition of a trailer makes possible

senger's never have to walk more than one-half car length to reach the door. The forward end of the car may easily be set apart for non-smokers and the rear part for smokers, the bulkhead in the middle of the car forming a positive division between the two classes of passengers.

These cars are mounted on two substantial trucks with 33-inch cast-iron wheels and 5-inch axles. The electrical equipment consists of four motors, each of a rated capacity of 43 horsepower. To facilitate safety in train operation both the motor cars and trailers are equipped with the Westinghouse SME schedule straight air brakes provided with emergency features. To permit the saving of time and afford a freedom from accidents when cars are being coupled for the rush-hour service all motor and trailer units are provided with Tomlinson automatic couplers. The air hose is brought out from under the car attached to the drawbar, so that the operation of coupling may be made a simple one.

This type of motor car, seating 52 passengers and pro-



Trail Cars In Denver—Exterior Standard Four-Motor Car.

the doubling of the passenger carrying capacity at an increase of but 25 cents per car hour.

Types of Motor Cars and Trailers.

The accompanying illustrations reproduced from photographs and drawings will serve to show the general appearance and construction details of the standard motor cars and trailers of the Denver City Tramway Company. By reference to the illustrations of the motor car, it will be noted that the car body is 43 feet long over all and 8 feet 4 inches wide at the belt. The seating capacity is sufficient for 52 passengers, the seats being arranged as shown in the plan view. It will also be noted that this car is provided with a center entrance on the right-hand side. This entrance is 5 feet 2 inches wide, the width of two window sashes.

There are several advantages claimed for the center side entrance, among which may be enumerated the following:

As the entrance is at the middle of the car the conductor is at all times within one-half car length of the door and thus more able to keep close watch of his passengers. The conductor's station is normally at the door, where he can best watch the loading and unloading. It is thought that with a center entrance the time of stops is greatly shortened, because in contrast with cars having but one end door the pas-

senger's never have to walk more than one-half car length to reach the door. The forward end of the car may easily be set apart for non-smokers and the rear part for smokers, the bulkhead in the middle of the car forming a positive division between the two classes of passengers.

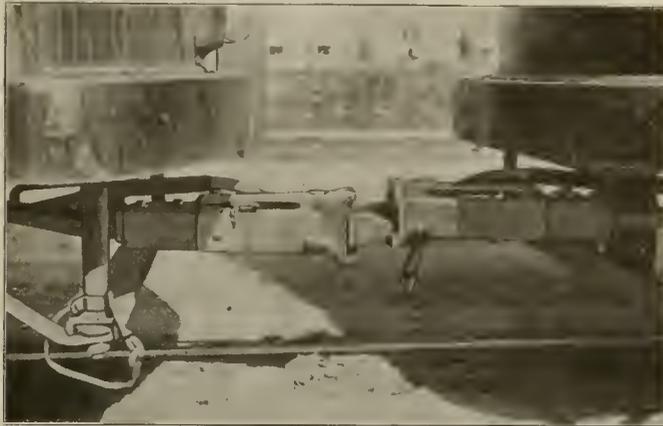
Trail Cars.

The trail cars, which have been developed along individual lines, suggested as suitable for use in Denver and cities demanding similar service, are of an especially interesting design, as will be noted by reference to the illustrations. The standard car is 38 feet long over all and 8 feet 2 inches wide over all; the center entrance has the width of three window sashes, 8 feet 2 inches in all. This extra width over that of the motor car entrance is given the trailer with a view to facilitating the loading so that when stops are made the trailer will not delay the starting of the train. It will be noted that the car has a roof without deck, thus saving greatly in the weight. The seating capacity of this standard trailer is sufficient for 46 passengers, and when equipped with air and hand brakes the car complete weighs but 13,000 pounds.

Current for lighting the trailer is obtained by means of a bus wire connected to the motor car through a plug and socket. It is stated that no trouble has ever been occasioned by this method of lighting. The bell cord on the trailer is arranged to ring a signal bell at the rear end of the motor

car so that the starting and stopping signals for the motor-man at the head of the train must be given by both conductors.

The accompanying drawings of the trailer car truck illustrate how particular care has been taken to design a truck having sufficient mechanical strength and yet carrying no idle metal. This same principle is exhibited throughout the



Trall Cars in Denver—Tomlinson Automatic Couplers Used on Cars.

entire car, and all material not absolutely necessary has been left out of the design.

Methods of Operation.

Under normal operation the schedules of the Denver City Tramway Company during the rush hours require the use of 23 trailers. During the middle of the day these cars are stored in yards at the car houses, which are situated at about

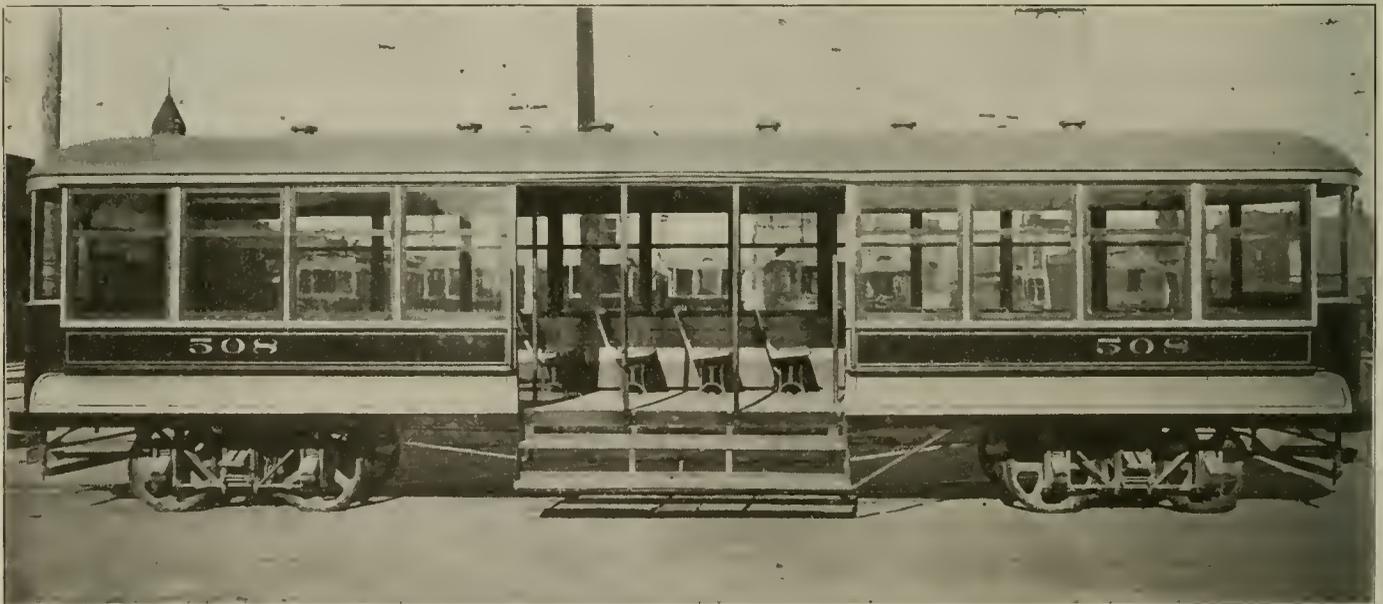
and connecting the bell cord, are performed by one man who has these tasks as his regular duty.

When a motor car has taken one trailer from the waiting line the remaining trailers are moved ahead with the switching car so that the end trailer is in readiness for the next coupling. At one of the car houses the sidetracks are on a



Trall Cars in Denver—Interior Standard Four-Motor Car.

grade, so that the entire number of trailer equipments can be let down by gravity to the coupling track and the use of a switching car dispensed with, except after the rush hour, when the trailers are to be uncoupled and again stored in the yard. It is found that by these methods trailer cars can be attached to motors on lines having 4-minute service, and no time allowance be included in the schedule for the coupling. The methods for uncoupling the cars after the rush-hour pe-



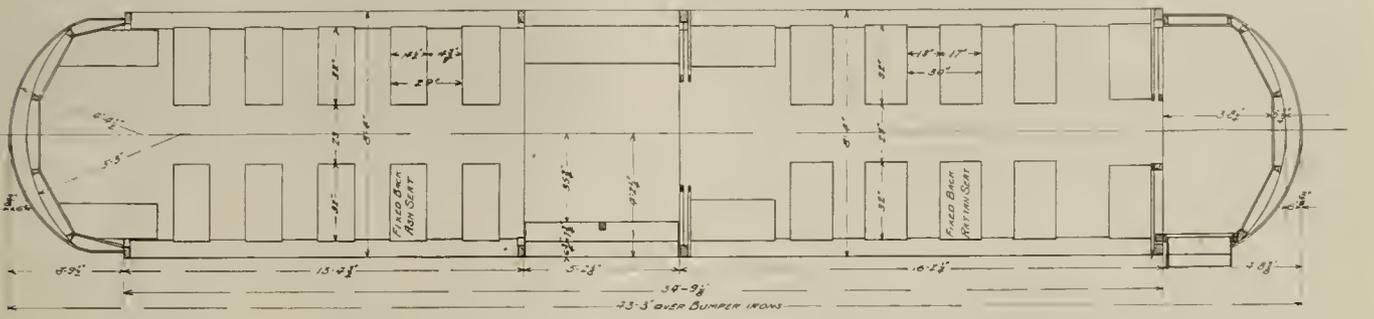
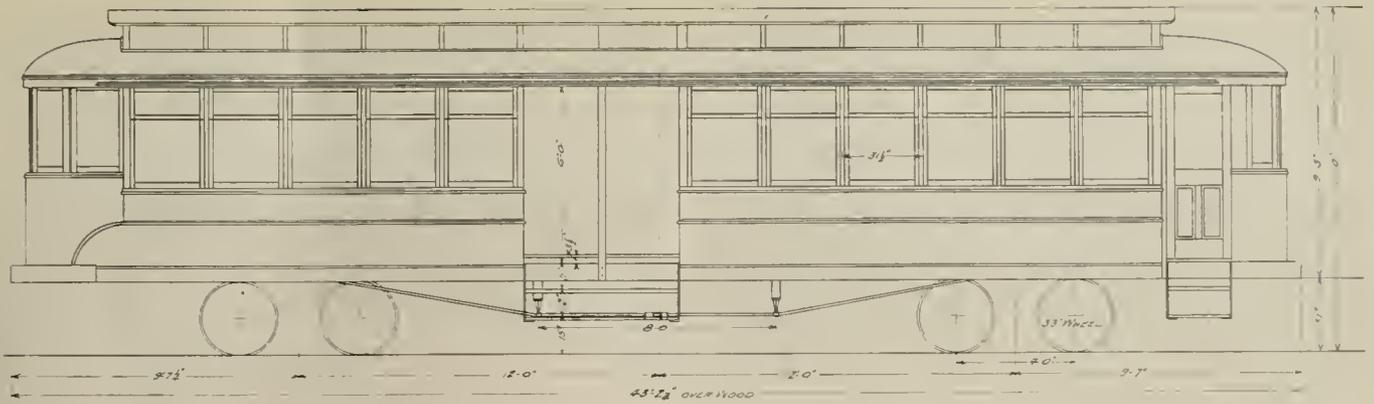
Trall Cars in Denver—Exterior of Standard 13,000-Pound Trailer.

the middle of the lines on which trailers are used. When in the yards the cars are coupled in trains so that just before the rush-hour periods a train of trailers may be taken to a siding close to the main line on which the motor cars are operating. When the loads on the motor cars begin to increase instructions are given for certain of these cars to pick up trailers as they pass the car houses. As a motor car reaches the siding on which the trailers stand it backs in on the siding and couples with the first car of the string of trailers standing there in readiness. The regular train crew is not called upon to do this coupling, but all the details of joining the two cars ready for train operation, such as coupling the air hose, inserting the plug of the lighting bus

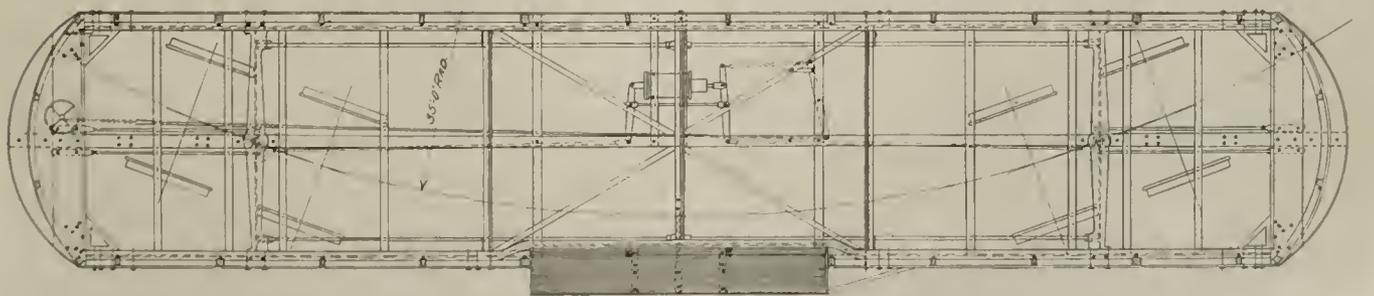
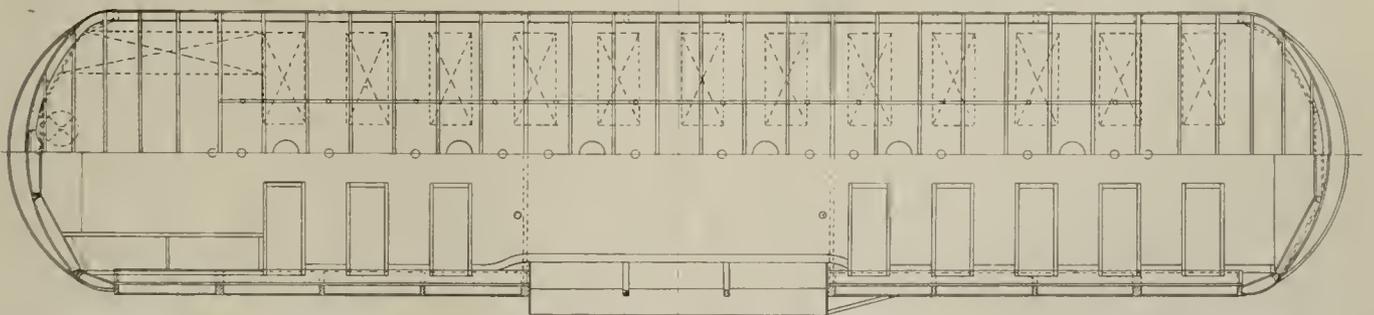
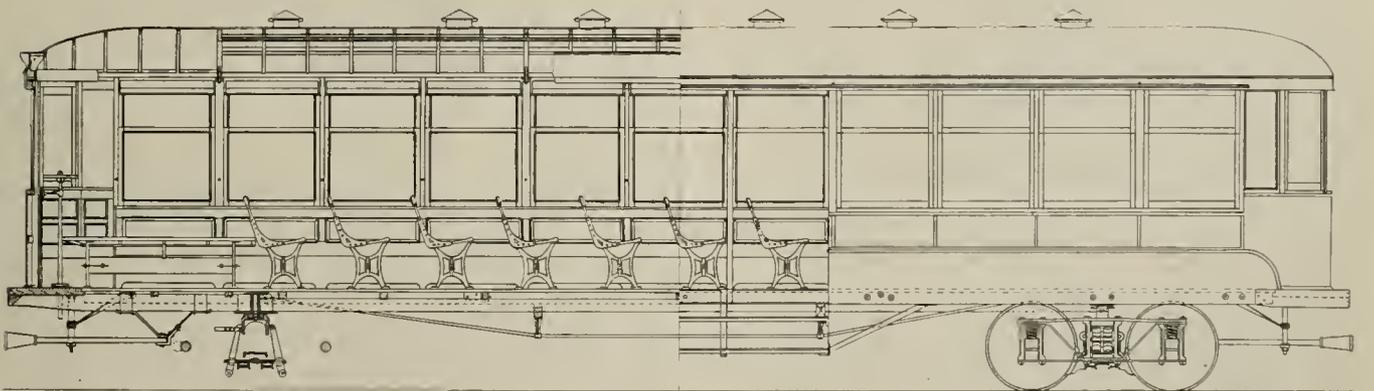
rod are exactly the reverse of those used when making up the train units.

Interurban Cars with City Trailers.

An advantageous feature of this system of trailer operation is illustrated by the method pursued in handling city traffic with the interurban cars that reach the center of the city during the rush-hour periods. There are three such lines which operate from nearby towns to a terminal loop in the center of Denver. The route of two of these lines of cars as they enter the city is past the "North Division" car barns, located well toward the edge of the city. When an interurban car reaches these barns on a trip that will take it to the busi-

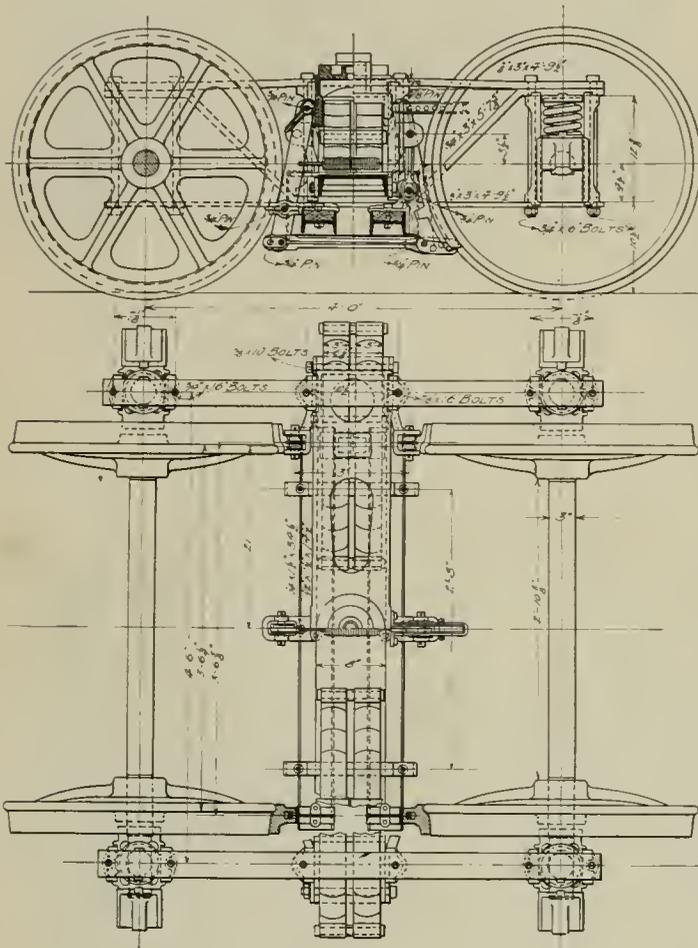


Trail Cars in Denver—Elevation and Seating Plan of 43-Foot Four-Motor Car.



Trail Cars in Denver—One-half Vertical Section and Elevation, Seating Plan and Framing Plan, Showing Standard Trail Car on 35-Foot Radius Curve.

ness district during a rush-hour period, a standard trailer is coupled to the rear of the interurban car, so that it may be loaded there for the return trip. In this way service is offered to city passengers in the trailer and to suburban passengers in the interurban motor car. Before this method was put into practice the passengers who rode between the edge of the city and the business district crowded the interurban cars during the rush hours, but since, they have found it to their advantage to use the trailer, which practice is also to the advantage of the railway company. These trailers are drawn by the interurban cars only as far as the edge of the city, where a man is stationed who disconnects them from the out-



Trail Cars in Denver—Details of Light Truck for Trail Car.

going interurban cars and connects them with the next incoming car, leaving them ready for a similar duty.

On some of the long city lines the motor cars haul trailers for only a portion of their routes, and on one line in particular by thus adjusting the service to satisfy the needs of the traffic six trailer cars are found sufficient to operate in connection with 10 motor cars.

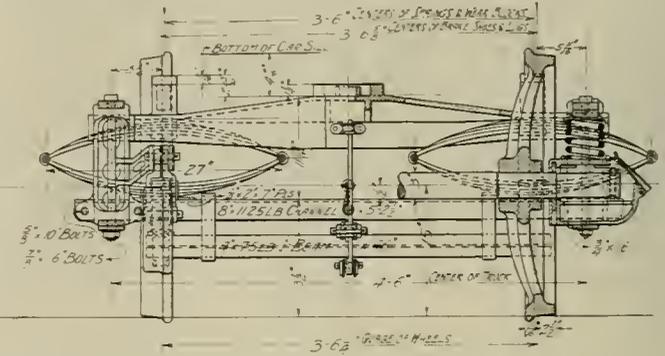
It is specially interesting to note that although trail cars were operated under these various methods of service during the past year, the actual speed for all the cars of the entire Denver City Tramway system averaged 9.85 miles per hour throughout the year 1906. This commendable average speed included all lay-overs at the ends of lines and, in fact, all delays of any sort to any equipment throughout the year.

Power Consumption of Cars.

Believing that there are advantages in knowing the current consumption of individual rolling stock equipments the Denver City Tramway Company has equipped 13 of its motor cars with wattmeters and systematically records the power consumption as measured by the meters.

An accompanying illustration is a reproduction of the blank form on which the motorman records the period during which he operated a car, the particular line over which the car was run and the instrument readings at the beginning and end of his service on that car. Under the blank spaces set aside for these records are spaces to be filled in by the auditing department. The latter exhibits totals for the power consumed during the period, the mileage performance, and the average number of kilowatt-hours used per mile.

During the year 1906 the average power consumption per car-day for the entire system, including all equipments, was 405 kilowatt-hours. The average power consumption for the



same period was at the rate of 2.32 kilowatt-hours per car-mile, and the cost of current at the power station switchboard was 0.66 cent per kilowatt-hour.

It has been found that the approximate load at the switchboard for the three standard types of cars is as follows:

	Kw.-h. per car-mile.
Two-motor car, seating 48 passengers.....	2.0
Four-motor car, seating 52 passengers.....	3.5
Trailer car, seating 46 passengers.....	1.25

The wattmeter records for the month of December, 1906, showed that the consumption at the car for a 4-motor equipment, rated at 172 horsepower, on a car weighing 43,000 pounds, was 3.24 kilowatt-hours per car-mile. The consumption for this same car, during the same period, when hauling a 13,000-pound trailer seating 46 passengers, was 4.56 kilowatt-hours per car-mile. This is an increase of 38.6 per cent in the power consumption, at a cost for which there is obtained seating capacity for 46 passengers.

Tables I and II exhibit the results of wattmeter readings on nine cars operating during the month of January, 1907, over two runs in Denver known as "Short Broadway" and "South Broadway."

The following information pertains to these runs:

Short Broadway.	
Length of run.....	3 miles
Mean average gradient.....	0.26 per cent
Schedule speed, without trailer.....	10 miles per hour
Schedule speed with trailer.....	9 miles per hour
Average number stops.....	8 per mile
South Broadway.*	
Length of run.....	6.3 miles
Mean average gradient.....	0.22 per cent
Schedule speed without trailer.....	10.3 miles per hour
Schedule speed with trailer.....	10.3 miles per hour
Average number of stops.....	5-6

*Includes run over Short Broadway.

Both of these runs serve the business district for about seven blocks of their lengths. The motor cars on which the readings shown in the tables were taken seat 48 passengers,

Form 201 B.M.

The Denver City Tramway Co.

RECORD OF ELECTRIC CURRENT CONSUMED.

Line _____

Date _____ 190__

Motor Car No. _____

Trail Car No. _____

Time off car - - - - - M.

Time on car - - - - - M.

Watt meter reading, closing No. _____

Watt meter reading, commencing No. _____

No. 1. Total current consumed..... L. V. E.

No. 2. Kilowatt performance..... Miles.

No. 3. Average L. V. E. used per mile..... L. V. E.

Signature of Motorman.....

NOTE—Items numbered 1, 2 and 3 may be used by Motorman.

Trail Cars in Denver—Blank Form Used for Recording Current Consumption.

weigh 38,000 pounds, and are equipped with four 37.5-horse-power motors, G. E. 58. The trailers weigh 13,000 pounds and seat 46 passengers. During the month of January in

Table I.
Statistics on Power Consumption on South Broadway.
Month of January, 1907.

Motor car number.	—Motor Only—		—With Trailer—		Kw.-h. used above average.	Kw.-h. used below average.	
	Mileage of car.	Av. kw.-h. per car mile.	Mileage of car.	Av. kw.-h. per car mile.			
36	203.7	2.69	89.1	3.50	.....	62.4
37	140.1	2.76	116.2	5.63	189.6	.....
40	48.4	2.85	135.8	4.89	129.6	.....
46	2,517.1	2.94	929.7	4.03	426.6	.....
48	733.5	2.97	510.4	4.28	293.9	.....
51	3,464.8	2.82	1,338.6	3.73	.....	225.6
52	1,119.3	2.79	386.4	3.62	.....	116.4
54	3,476.8	2.75	1,768.5	3.97	.....	138.4
55	1,036.5	2.60	599.6	3.68	.....	369.1
General average..2.80				3.95			

which these records were taken the heaters in the cars were not used. The weather was clear, with but little snow. However, the rails were slippery each morning due to a preva-

Table II.
Statistics on Power Consumption on Short Broadway.
Month of January, 1907.

Motor car number.	—Motor Only—		—With Trailer—		Kw.-h. used above average.	Kw.-h. used below average.	
	Mileage of car.	Av. kw.-h. per car mile.	Mileage of car.	Av. kw.-h. per car mile.			
36	2,540.7	3.37	846.4	4.58	.....	211.6
37	3,018.9	3.38	1,254.0	4.58	.....	247.3
40	2,998.8	3.65	990.4	5.10	1,105.6	.....
46	1,039.8	3.40	529.9	4.85	69.2	.....
48	1,178.0	3.72	430.7	5.15	555.8	.....
51	272.1	2.68	343.4	4.14	.....	356.7
52	521.2	3.12	300.2	4.05	.....	345.4
54	384.4	2.49	323.9	4.67	.....	360.6
55	148.3	2.96	168.8	4.08	.....	169.4
General average..3.42				4.68			

lence of frosts. The average number of passengers carried per trip may be taken as 30, not including the 2 and 3 man crews, nor children and holders of passes. It is considered

Table III.
Statistics on Power Consumption on South Broadway.
Month of January, 1907.

Motormen.	—Motor Only—		—With Trailer—		Kw.-h. used above average.	Kw.-h. used below average.	
	Mileage.	Av.kw.-h.	Mileage.	Av.kw.-h.			
J. E. H....	164.8	2.35	141.7	3.18	.....	183.2
W. C.	83.1	2.60	75.5	3.88	.....	21.8
W. J. P....	60.2	3.07	.....	.....	.....	16.2
W. C. ....	.....	.....	73.8	3.88	.....	5.1
A. M. E....	68.0	2.84	108.7	3.90	.....	2.7
W. E. O....	178.3	3.07	236.9	3.88	31.5	.....
C. P.	48.4	2.13	.....	.....	.....	32.4
W. F. P....	224.9	2.51	46.7	4.66	.....	32.1
O. P. B....	143.5	2.65	7.6	3.89	.....	21.9
R. E. H....	83.2	3.07	87.3	4.08	34.5	.....
Wm. E. E..	164.7	2.98	27.2	4.03	31.7	.....
W. F. S....	40.8	2.34	7.6	3.93	.....	18.8
C. F. S....	48.8	2.22	34.8	4.58	.....	6.1
J. K.	81.6	2.26	67.9	5.10	34.0	.....
F. W. M....	123.9	2.51	7.6	3.63	.....	38.3
C. B.	323.4	2.88	149.5	3.74	.....	5.5
R. L. B....	110.4	3.30	27.2	2.04	3.3	.....
G. H. McA.	1,423.3	2.71	971.6	3.76	.....	312.6
J. J. F....	1,569.6	2.95	562.9	4.05	291.6	.....
F. B.	943.2	2.74	468.4	3.90	.....	79.9
W. A. R....	837.5	2.84	163.6	3.75	.....	8
T. W. C....	700.0	2.76	161.5	3.87	.....	40.9
O. A. G....	34.8	2.32	27.2	3.04	.....	51.4
W. J. S....	164.7	2.94	73.9	4.70	78.4	.....
P. J. S....	134.2	3.29	75.6	3.71	47.6	.....
H. J. O....	157.0	2.50	75.6	3.59	.....	74.3
F. D. O'N..	193.5	2.89	141.8	3.38	63.4	.....
T. K.	689.8	3.02	403.6	3.47	.....	42.1
G. F. S....	386.3	2.93	211.4	3.94	48.1	.....
J. E. W....	1,816.1	2.71	849.5	4.17	23.4	.....
J. P. J....	393.1	2.93	339.9	4.03	78.2	.....
C. M.	184.1	2.57	34.8	4.04	.....	29.2
W. H. B....	256.3	2.93	.....	.....	33.3	.....
H. B. G....	34.8	2.62	27.2	3.12	.....	28.9
T. C. W....	196.0	2.97	63.6	5.07	104.5	.....
W. H. H....	54.4	2.80	54.3	4.75	43.4	.....
R. B. S....	116.3	2.81	7.6	4.13	2.4	.....
P. J. P....	54.3	2.19	33.1	4.74	.....	6.9
E. D. K....	213.8	2.72	.....	.....	.....	17.1
C. C.	54.3	2.77	.....	.....	.....	1.6
J. D. C....	27.2	2.70	.....	.....	.....	2.7
F. D. M....	48.4	2.17	27.2	11.34	171.3	.....
C. E. C....	46.7	2.80	.....	.....	Even	Even
P. E. McM..	67.9	3.07	.....	.....	18.3	.....
General av. kw.-h..2.80				3.95			

that the average length of ride was two-thirds of the run.

It will be noted from Table I that the average power consumption per car-mile, for motor car only, on South Broadway was 2.80 kilowatt-hours. With trailer this consumption was

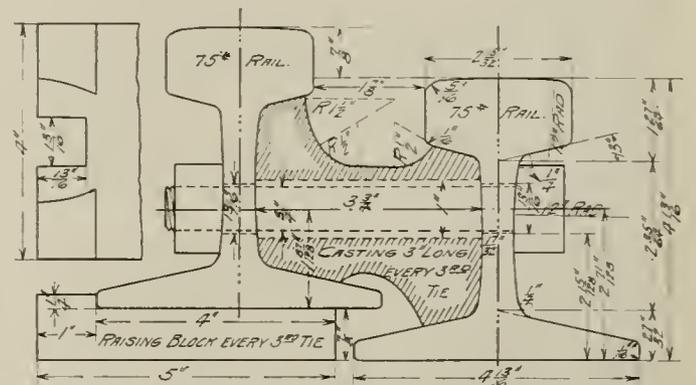
3.95 kilowatt-hours, an increase of 41.1 per cent. In Table II, for Short Broadway, the results show the consumption for the motor car only to be 3.42 kilowatt-hours per car-mile and for motor car with trailer 4.68 kilowatt-hours per car-mile, an increase of 36.9 per cent, due to the trailer.

A comparison of these results for the two runs, identical for half the length of the longer one, shows that due to the infrequency of stops on that portion of the South Broadway run not included in Short Broadway, there was a decrease in the average power consumption, for motor cars only, of 0.60 kilowatt-hours per car-mile, and for motor cars with trailer 0.73 kilowatt-hours per car-mile on the longer run.

In Table III are shown the mileage and wattmeter records of the individual motormen. This tabulation is interesting because it serves to illustrate how the personal equation enters into the operation of the ordinary controller. In the course of the month various motormen handle the different cars on different runs so that any variation from the average can hardly be said to have been caused by inequalities in the equipments or wattmeters.

GUARD RAIL CONSTRUCTION ON PITTSBURG & BUTLER STREET RAILWAY.

On the line of the Pittsburg & Butler Street Railway Company, which was described in last week's issue of the Electric Railway Review, guard rails are used on all curves



Guard Rail Construction, Pittsburg & Butler Street Railway.

greater than 9 degrees. In developing a substantial guard rail construction, Hudson F. Layton, chief engineer, designed the raising block and filler as shown in the accompanying illustration. The block and filler are inserted at every third tie. The guard rail used is of the same cross section and weight as the main rails of the track, above which it is elevated seven-eighths of an inch.

STATUS OF ELECTRIC RAILWAY CASES BEFORE INTERSTATE COMMERCE COMMISSION.

We have received from James S. Harlan, member of the interstate commerce commission, a statement giving the status of the formal complaints by or against electric railways which are pending before the commission, as follows:

Cedar Rapids & Iowa City Railway & Light Company versus Chicago & Northwestern Railway Company. Refusal to join in through routes and joint rates. Case heard and to be argued at a time to be hereafter fixed.

West End Improvement Company versus Omaha & Council Bluffs Railway & Bridge Company and others. Unreasonable passenger fare over bridge between Omaha and Council Bluffs. March 8, 1907, complaint filed. March 27, 1907, answer filed. April 22, 1907, order entered bringing in additional defendant. Case at issue, May 12, 1907.

Chicago & Milwaukee Electric Railroad versus Illinois Central Railroad Company and others. Cancellation of joint freight tariff formerly in effect, thereby depriving shippers of the benefits of competitive rates. Case at issue.

ONEROUS CONDITIONS MAKE CONSTRUCTION OF PROPOSED NEW YORK SUBWAYS UNPROFITABLE.

In his letter to the New York rapid transit commissioners, presented on April 25, Theodore P. Shonts, president of the Interborough-Metropolitan Company of New York, explained the refusal of his company to bid on the construction and operation of the proposed Lexington avenue and Seventh and Eighth avenue subway lines, as reported briefly in the Electric Railway Review of last week. As there were no other bidders the plans upon which the commission has been so long engaged may have to be abandoned or else the legislative and proposed contractual restrictions imposed upon the constructing and operating company will have to be modified considerably. An abstract of the letter of Mr. Shonts, which is addressed to Alexander E. Orr, president of the board of commissioners, under date of April 24, follows:

Ever since the opening of the existing subway this company has hoped that it would have an opportunity of completing the system of municipal rapid transit subways by continuing the east side line north of Forty-second street to the Bronx, and, by continuing the west side line south from Forty-second street to the Battery, so that there would be, as originally planned by your board, two complete longitudinal rapid transit lines, connected by a cross-town line under Forty-second street. The increasing congestion in the subway, particularly on the express trains during the rush hours, has emphasized the need of these additional lines, and this company has fully intended to submit a bid for their construction and operation.

It is, therefore, with great regret that I have now to advise you that, after very careful study by our engineers and officers of the plans and specifications and the proposed form of contract for their construction and operation, the directors of our company have concluded that the building of the proposed 4-track double-deck Lexington avenue subway, north of Forty-second street, and the 4-track west side subway south of Forty-second street, and the operation of those lines in connection with the existing subway under the burdens imposed by your proposed contract and the existing law are financial impossibilities.

Our engineering advisors, including William Barclay Parsons and John B. McDonald, agree in the conclusion that the proposed extensions (exclusive of pipe galleries), built in conformity with the plans and specifications, would, under existing conditions, cost (including an allowance for easements and interest during construction) not less than \$64,000,000, without equipment, and that the necessary equipment, including tracks, rolling stock, power plant, etc., would involve an additional expenditure of not less than \$24,000,000, making the aggregate cost of building and equipping about 39 miles (single track) approximately \$88,000,000, as compared with \$71,000,000 for building and equipping the existing rapid transit lines (including the extension to the Battery), comprising about 63 miles of single track.

This increase in cost is due partly to the requirements of the present law, the increase in the price of materials and labor, and the fact that about 14 miles (single track) of the existing line is on an elevated structure, while all the new lines are underground; but the increase in cost is chiefly due to onerous provisions (not required by the existing law) of the new contract, and of the new plans and specifications which provide, first, for unnecessary increase of cost of construction; second, for adding the cost of all easements to the cost of the subway; third, for the purchase of private property for station entrances; fourth, for a greatly increased responsibility for damages; and, fifth, for an increase in the diameter of the tunnels—an increase which will be of no value for extensions to the existing subway system. The fact that the express and local tracks on Lexington avenue are upon different levels also adds materially to the cost. The result is that our engineers estimate that the cost of the new subways fully equipped will be at the rate of \$2,250,000 per mile of single track as compared with the cost of \$1,130,000 per mile for the existing rapid transit lines.

Under the proposed form of contract and the existing law, the expenses which must be provided out of income are very much increased as compared with the original subway contract. It may be assumed that the interest upon city bonds issued for the cost of the proposed subways will be from one-half to three-fourths of 1 per cent higher than in the case of the original rapid transit bonds, and this conclusion is based on the supposition that the city can sell its bonds on a 4 per cent basis. In the second place the entire investment in the new subway, including the lessee's property in the streets and equipment, will be subject to taxation. In the third place, various advantages conferred by the origi-

nal contract are now eliminated; and, finally, the lease is limited to 20 years (subject to a renewal upon a revaluation, the terms of which cannot be fixed in advance), making it necessary to increase the annual charges by an amount sufficient to provide for the difference between the original cost of such of the equipment and other property as may be taken over by the city at the expiration of the lease and the probable value at which such property will be appraised at the end of the 20 years.

Another important consideration is the exceptionally broad power conferred by your form of contract upon the public authorities to require from time to time any changes in the construction of the subway and in the equipment and other appliances used therein, as shall to them seem proper. Such a requirement, especially in the case of a subway operated under a lease for only 20 years, creates a serious liability for additional expenditures for which adequate allowance would have to be made.

If we were to build the proposed extensions in conformity with your plans and specifications and the proposed contracts, using the city's credit for the entire cost of construction under the contract, and outside investment capital in the equipment, etc., and assuming that the new lines received all the traffic which it would be feasible for them to carry under the limitations imposed by traffic conditions in New York, it would not be possible to make net earnings above operating and maintenance expenses, sinking fund payments and taxes, sufficient to provide the interest upon the city's bonds and 5 per cent upon the additional capital invested. Indeed, a study of the reports of the Interborough Rapid Transit Company on file in your office will demonstrate that a subway costing twice as much per mile as the existing rapid transit lines, operated under a lease less than half as long, subject to much higher taxation, and operated under a distinctly less liberal contract, would not earn even the rate of interest payable upon the city's bonds.

We are prepared to enter into a contract for the construction, at actual cost, of two extensions of the existing municipal subway, one upon the west side extending south from Forty-second street to the Battery, the other upon the east side extending north from Forty-second street into the Bronx, and for the equipment and operation of such extensions, provided the cost of construction can be brought within the city's borrowing capacity, and provided the terms of the contract are such that we may reasonably expect the earnings from these additional subways to be sufficient to cover the interest and sinking fund upon the bonds of the city issued for their cost, a proper annual charge for depreciation in equipment and other property which the city may take over at an appraised value at the end of the 20 years' lease, and interest upon our additional investment for which city bonds would not be issued. In other words, we are willing to complete the existing rapid transit system so that there shall be, as originally planned by your board, two complete longitudinal lines, one upon the east side and the other upon the west side of the city, without any prospect of profit beyond a fair rate of interest upon the additional investment involved; and obviously without an expectation of such a return no capital could be secured for additional subway construction.

The estimated cost by the engineers of \$64,000,000 for construction was divided as follows: Construction, \$56,200,000; easements, \$2,500,000; terminals, \$1,300,000; interest during construction, \$4,000,000.

George S. Rice, chief engineer of the rapid transit commission, said that at the hearings held by the commission on the form of contract, the representatives of the company had never raised any of the objections outlined in the letter of Mr. Shonts.

Annual Report of Chief Engineer Rice.

Mr. Rice has just submitted his annual report to the rapid transit commission, which, in view of the foregoing, is of especial interest. This report, of which only a part has been made public, treats exhaustively of the traffic conditions in New York, with figures regarding the daily carriage of passengers on all transit lines in the city and on the remarkable increase in population and traffic, together with recommendations as to future requirements in the way of transportation facilities which will strongly emphasize the seriousness of the situation due to the non-appearance of bidders for the new subways. With reference to the increase of passenger traffic Mr. Rice says:

Considering all the boroughs grouped into one great population center, it appears that during the four years

ended June 30, 1905, the total number of paid passengers traveling on all street railways—surface, elevated and subway roads—increased practically in a straight line. During 1906, however, there was a sudden marked increase in the traffic. While the average increment for the four preceding years was only about 63,000,000 a year, during 1906 it amounted to nearly 110,000,000. No census of the population of the greater city was made in 1906. It is therefore impossible to determine whether this large additional number of riders is due to a corresponding increase in the population or to an increase in the number of riders per capita, but an increase in the population is the most probable cause.

Mr. Rice draws six important conclusions as the result of his investigation and statistics compiled from present ticket sales and population estimated. They are:

That the population of the territory comprising greater New York has practically doubled itself each 25 years during the last half century, and will probably double itself again by 1930.

That the total paid passenger traffic is increasing at such a rate that it will probably about double itself within the next decade.

That to bring about the discontinuance of the notorious overcrowded and indecent conditions now prevailing on all transportation lines in the greater city, it is imperative that the following additional subways be constructed and put in operation:

Within the next five years, or by 1911, as follows: For Brooklyn, two 4-track subways, in which 10-car trains can be operated, providing for eight additional tracks crossing East river either in tunnels or on bridges and traversing the borough; for Manhattan and the Bronx, three 4-track subways, for operating 10-car trains, traversing the two boroughs.

Within the second five years, or by 1916, as follows: For Brooklyn, two more 4-track subways; for Manhattan and the Bronx, three more 4-track subways.

Or, within the next decade altogether, for Manhattan, the Bronx and Brooklyn ten 4-track subways.

CAR PAINTING AND OTHER USES OF PAINT.*

BY J. C. LEAVITT, OF OKLAHOMA CITY, WITH SHERWIN-WILLIAMS COMPANY, CLEVELAND, O.

The rapid development of the street railway business in the United States has naturally caused a correspondingly rapid development in finishing materials, particularly paints and varnishes, for use on the rolling stock and equipment necessary for this particular class of trade. Of course, in a general way, the paints and varnishes suitable for use on steam railroads are suited for use on the equipment of electric railways, but the very fact that the motive power used by electric railroads is essentially different from the motive power of steam railroads has necessitated a rapid development along such lines as insulating varnishes, semi-solid impregnating compounds for use on dynamos and field coils and similar varnish products especially desired for electrical work.

While the painting and varnishing of street railway cars follow the general rules applicable for the painting of passenger coaches on steam railroads, yet a successful paint for street railway use must be used with particular reference to beauty of finish, durability and economy of maintenance, and to this should be added the rather rare but equally important factor of uniformity. It is now customary for each street railway company to adopt standard color shades for use not only on its rolling stock, but also on its equipment. The painting and proper finishing of street car bodies is most important.

In the exterior painting of car bodies the best colors and the most expert workmanship count for nothing unless the foundation coats or those coats that are between the wood and the first coat of color are absolutely without fault. For this reason, for the initial priming coat on such bodies, a material should be used in which the pigment is ground exceedingly fine and in which the binding vehicle is as elastic and at the same time as tough as can possibly be had. This should be followed with a surfacer but it should be so made that it can be rubbed down to a splendid surface for receiving the coats of color. This surface should dry rather slowly so as to give the fullest measure of durability, and it should present a tough and elastic surface which will for the longest time hold out the color and varnish coats. The car body colors adopted for use by a street railway company should be of such shades as will give the best service; by this I mean they should be shades which are permanent as

to color and which combine brilliancy of tone with great durability. The varnishes used over the color coats should be hard gum varnishes and should be of that class known as straight wood linseed oil and turpentine varnishes; for they must withstand extremely hard usage and should be of such a character as to stand repeated washing and scrubbing. The following are specifications for the finishing of the outside of cars as used by the larger car builders:

First day, one coat car primer. (Let stand two days.) Where the condition of weather or surface makes it necessary the primer should be thin.

Second day, putty. (If preferred, putty on first coat of surfacer.)

Third day, one coat of surfacer.

Fourth day, one coat of surfacer.

Fifth day, one coat of surfacer.

Sixth day, rub out.

Then apply two or three coats of car body color. All lettering, ornamenting and color stripes should be laid directly on the last coat of flat color. Next apply two or three coats of a durable railway body varnish.

The use of rubbing varnish has been almost discarded by all the large car shops, for the reason that more durable results are obtained without it. It will give a more glossy and sometimes smoother appearance at the start, but after a month or two in service a car usually shows very plainly the difference in value of the two methods, the difference being in favor of the use of the finishing varnish only.

Most companies allow but two coats of varnish. A car should be re-varnished every year. If this policy is not adopted true economy would demand the use of a third coat of varnish at the start.

I have been speaking of the exterior body of the car, but the careful painting of such parts of the car as the roof, the floor and the vestibule also should be carefully looked after. It is particularly desirable that for the roofs a paint should be used that is impervious to moisture and which combines with great elasticity the quality of drying very hard; for roof paint is subjected to very hard usage owing to the necessity of employes climbing on the roof to adjust the trolleys, etc. In selecting a color for roof paint due regard should be had for the color tone of the body so that the two shades will harmonize well.

For the car floors it is important that the paint shall be what is known as a varnish paint, which means a paint that contains in it some varnish gum and which will dry very quickly and at the same time very hard. The colors should be such as will not easily show dirt and which will not clash with the other interior finishing.

The fenders of the cars should be painted with a good grade of fender paint, not only for the sake of appearance, but also to preserve the life of the iron. The handrails should be painted with a lustral varnish paint in colors desired.

The interior finishing of the car is a matter largely of individual taste, but it is the custom nowadays to stain the interior woodwork with such shades as weathered oak, flemish oak, brown oak, mahogany, etc., and then to apply over this, first a coat of rubbing varnish and then two coats of finishing varnish. This results in giving very beautiful effects for the interior of cars and at the same time leaves a surface that will stand a great deal of hard wear.

Where the seats in cars are of cane or rattan they should be finished, if new, with a coat of transparent seat enamel, and, if old, they should be re-finished with a coat of seat enamel of the same shade as the original color of the rattan. A seat enamel of this character dries up very quickly and presents a very hard surface and one that will not soften under body heat.

The stations of shelter houses along the lines of electric railways usually are painted with an oil paint of a shade that will harmonize well with the body colors used on the rolling stock. The poles along the right of way also should be painted a standard uniform color. For this purpose a special pole paint should be used which will not only serve to improve the appearance of the poles, but should be of such a character as will serve to protect the poles against decay.

In certain sections of the west where the soil is full of alkali it is customary to paint the rails with a special alkali-resisting rail paint, which serves the double purpose of preventing the steel from being affected by the alkali and also of protecting it from rust.

In the power house there is a multiplicity of uses for paints. On the engines and dynamos it is necessary occasionally to re-paint with an especially prepared machine enamel, and the leading manufacturers now furnish this material in any shade desired. The enamel is composed of pigment, ground in a tough wear-resisting varnish, and can be used with entire satisfaction over work that has been painted previously.

For the steam pipes and radiators an aluminum or gold bronze paint is usually used, and on smokestacks and stand-

*Read before Oklahoma Electric Light, Railway and Gas Association, Oklahoma City, on April 23.

pipes a good metal protective paint which is intended to withstand the extreme heat and cold.

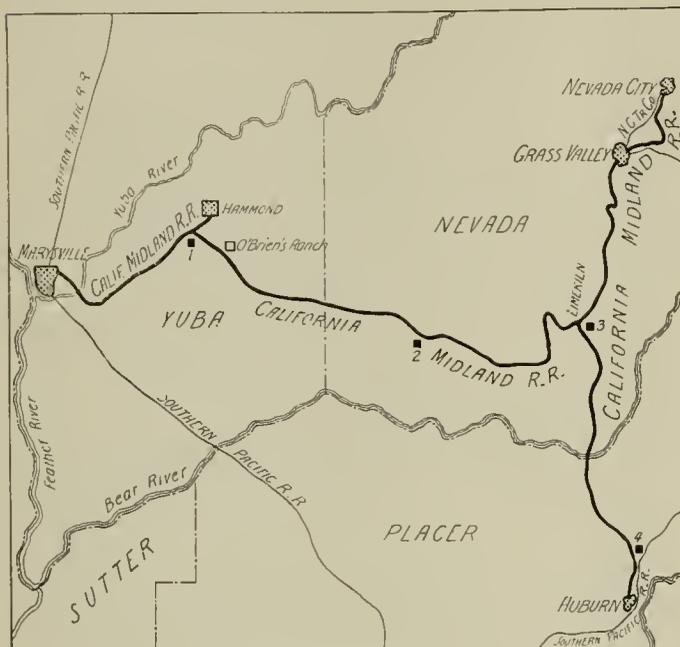
I have touched only briefly on the many paints and varnishes used in connection with railroads and street railways, but what I have said will indicate in a general way the special line and some of the characteristics of paints and varnishes that are regularly used in street railway work.

PROPOSED 1,200-VOLT THIRD-RAIL LINE IN CALIFORNIA.

Preliminary work is now well advanced toward the construction of the California Midland Railroad. The new line will include 70.5 miles of roadway, connecting Marysville, Auburn and Nevada City. It is proposed to operate the cars with 1,200-volt direct current, distributed by an underrunning third rail.

Roadway.

Marysville will be the western terminus of the present lines. This city has a population of 5,500. Here the new route will connect with the 65 miles of operating lines of the Northern Electric Company. From Marysville the new road will extend 34 miles east to Limekiln Junction. From here one branch will be built almost directly south, 17 miles, to Auburn on the Southern Pacific Railway. A second branch will



Proposed Lines of the California Midland Railroad.

extend from Limekiln Junction northeast to Grass Valley and Nevada City, 12 miles. There is now a line of the Nevada County Traction Company operating between the two latter named towns. From the main line at Marygold, 8 miles from Marysville, a spur 1.5 miles long will be built to the mining center, Hammond. The total length of route as now planned is 70.5 miles. Sidings, each 1,000 feet long, will be placed 4 miles apart.

As the locality to be served by the new line is in the mountains, heavy earthwork and several large bridges will be necessary. Near Marysville a trestle 9,000 feet long will cross the Yuba river and a marsh. The earthwork quantities for the entire project have the following totals: Excavation, 519,000 cubic yards; embankment, 1,128,000 cubic yards. The maximum rate of curvature is 16 degrees and the most severe grade will be one of 3 per cent for 7 miles. The trackwork will be of standard dimensions with 60-pound rails.

1,200-Volt Third Rail.

Direct current will be distributed between the substations through an inverted contact rail. The operating potential will be 1,200 volts. It is proposed to use a special low-carbon steel rail weighing 22.4 pounds per yard. The section will

have the form of the letter "T," and it will be inverted, being supported by channel-section brackets, spaced 12 feet apart. These channel-iron brackets will be spiked to the ties, and each will support a porcelain insulator, from which will hang a wrought-iron stirrup. The stirrups, in turn, will be keyed to the web of the inverted T-section.

It is estimated that with this light rail section, permissible on account of the high voltage, there will be a weight of but 100 pounds to be supported by each insulator. The inverted T-section may carry, if necessary, four No. 0000 auxiliary copper feeders. Owing to the peculiar shape of the rail, it may easily be protected by covering with three narrow strips of wood, normally held in place by gravity.

With low-carbon steel, having a relative conductivity of one-eighth that of the same cross-section of copper, the equivalent cross-section of the underrunning rail, without supplementary feeders, will be 345,000 circular mils, and the conductor will offer a resistance, including bonds, of 0.16 ohm per mile.

Substations.

Current for the operation of the new road will be purchased from the California Gas & Electric Corporation, which has hydraulic generating plants and 60,000-volt transmission lines in this territory. There will be four substations of reinforced concrete construction, each equipped with a 400-kilowatt capacity motor-generator set, and the necessary step-down transformers. The motor-generator sets will each comprise one 60-cycle motor, direct connected to a 1,200-volt, 400-kilowatt generator. The substations are located at the points marked 1, 2, 3 and 4 on the map.

Rolling Stock.

The standard passenger cars for the California Midland will be of the combination type, 52 feet long. The motive power will comprise quadruple equipments, of 75 horsepower, 600-volt motors, connected two in series for 1,200-volt operation. To prevent any disastrous effects from the slipping of one motor of a pair, potential relays will be shunted across the motor terminals.

Each car will have, in addition to four underrunning collector shoes, a pantagraph trolley for operation on city streets where there is trolley wire. These pantagraph collectors will be pneumatically controlled from the motorman's cabs.

It is proposed to erect a telephone line for dispatching purposes, and there is a possibility of further improving the train dispatching system by the introduction of the telautograph. A complete block signal system also will be installed.

The president of the California Midland Railroad is Mr. John Martin, who, it will be remembered, is now or has been interested in the following California electric lines: North Shore Railroad Company; Sacramento Electric, Gas & Railway Company; San Jose & Santa Clara Railway Company; Santa Cruz Union Traction Company.

The design of the electrical system is being executed under the care of Mr. C. C. Manker, electrical engineer, 925 Franklin street, San Francisco, Cal.

The steam railroads and electric railways doing business in Indiana have been notified by the Indiana railroad commission that inspectors will soon be sent out to examine the car equipment, track, rolling stock, etc., of each road, in accordance with the recent law passed by the legislature. The commission also notified the companies that blanks would soon be furnished them for accident reports. The law provides that railroad companies shall make two reports of every accident; one a preliminary report to be made within five days after the accident, which shall state the date of the accident, the probable cause, the number of persons killed or injured, etc. Within the next 20 days a second and complete report of said accident must be sent in to the commission, showing whether the accident was due to a collision, derailment or whatsoever cause, on what road and division, and near what station, the number of train or car, the names of the engineer, firemen, motormen and conductors, the exact time of the accident, etc.

NEW CARS FOR THE PHILADELPHIA & WESTCHESTER TRACTION COMPANY.

The Philadelphia & Westchester Traction Company has just received seven new cars from the Jewett Car Company of Newark, O. These cars have the same general appearance as the cars previously built for the road by The J. G. Brill



Philadelphia & Westchester Traction Company—New Car.

Company, but are 4 feet 2½ inches longer and have wider vestibules. The cars have seats for 50 persons.

The new cars are 48 feet 6¼ inches long over all and 8 feet 8½ inches wide over all, the length of the body being 38 feet 10¼ inches. The bottom framing is of extra heavy construction, the side and center sills consisting of 6-inch steel I-beams reinforced on each side with wood fillers. Intermediate sills are 4 by 6 inch yellow pine. The bolster is of the steam coach type, made up of 10 by 1 inch steel plates.



Philadelphia & Westchester Traction Company—Interior View of New Car.

The buffer is made of 6-inch steel channel and the entire bottom is covered with steel plate ¼ inch thick. The under truss is 1¼-inch round iron. The body framing throughout is of white ash, except the long plates, which are of yellow pine in one continuous piece. The roof is strengthened by 12½ by ½ inch steel car lines. The cars are equipped with Baldwin trucks with 34-inch steel wheels. The wheel base is 6 feet and the gauge 5 feet 2½ inches. The cars are designed to round a 35-foot curve. The drawbars are the Van Dorn type, 28 inches from the rail.

The new equipment is designed for operation by the

General Electric type multiple-unit control, if the traffic shall demand it, and each car has four G. E. 73 motors of 75 horsepower each. The cars are equipped with the Westinghouse automatic air brakes. End doors have been placed in the vestibule so as to permit passage from one car to another when the cars are operated in trains.

The interior finish of the car is a very handsome design and is of vermilion wood, inlaid with neat marqueterie lines and ornaments. The ceiling is of full empire type, painted light green with gold decorations. The floor side windows are made to raise to any height with the ratchet stops and locks. The gothic lights and deck lights and the transom lights present a very pleasing appearance and are of the leaded type with colored glass. The cars have been provided with seats of the Heywood Bros. & Wakefield Company walk-over type with head roll backs and corner grab handles, and are upholstered in green leather. Each car has a smoking room with a seating capacity for 12 passengers and this room has the same finish and seats as the main compartment. The trimmings of the car are of solid bronze throughout. Heat is provided by the Consolidated Car Heating Company's truss plank heaters. The windows are equipped with pantasote curtains.

The cars are provided with arc headlights and pilots of locomotive type. The exterior of the car is of very pleasing design and the railroad company and the builders should be given credit for having given prominent attention to the question of artistic outline.

We are indebted to A. M. Taylor, president of the Philadelphia & Westchester Traction Company, for the privilege of publishing this description and the accompanying illustrations.

COMMUNICATION.

Wrong Motor Connections.

To the Editors:

Some time ago I had some difficulty with a car, the details of which I present herewith. The car was direct from the shops and it seemed there could be no possible chance of wrong cable connections.

The car was of single-ended construction, with a new K-6 controller and four new 1,000 motors. There was a separate cable to each motor, which made grounds and wrong connections seemingly impossible, and, further, the cables when tested out were found clear. The symptoms of the trouble with the car were as follows: With all four motors in, numbers 1 and 4 would work, number 2 would roll along, but number 3 would lock its pair of wheels on both forward and reverse. With numbers 1 and 3 in on the ahead, number 1 would work, but number 3 would still be locked. Reversing the direction with numbers 1 and 3 in, the car would not move and the circuit-breaker opened. With numbers 2 and 4 in, number 4 did all the work, forward and reverse. The E¹ and E³ wires were in this case run from their motors to the controllers and joined in the E¹ binding post in the controller. When the E³ wire was disconnected, number 3 motor would unlock its wheels.

If any of the readers of the Electric Railway Review can tell me what the trouble was and what was wrong that caused this behavior of the car, I would be greatly pleased to have the answer appear in the paper.

Chicago, May 3, 1907.

CAR TROUBLE.

S. C. Dickey, general manager of the Winona Interurban Railway and the Winona & Warsaw Railway, controlled by the Winona assembly, has issued an official statement to the effect that under no circumstances will any car be operated on these lines on the Sabbath day during the summer. This decision has brought about a considerable disappointment because of the thousands of people who depend wholly upon the interurban line for transportation between the towns in the vicinity of Winona Lake.

CONSTRUCTION OF THE LAFAYETTE & LOGANSFORT RAILWAY.

BY R. M. FEUSTEL, ASSISTANT ENGINEER, FT. WAYNE & WABASH VALLEY TRACTION COMPANY.

In the fall of 1905 the Ft. Wayne & Wabash Valley Traction Company, which operates an interurban line between Ft. Wayne and Logansport, Ind., a distance of 76 miles, decided to extend its line from Logansport to Lafayette to connect with the city properties which it controls in Lafayette. A



Lafayette & Logansport Traction Company—Rock Creek Viaduct, 394 Feet Long.

construction company was organized under the name of the Lafayette & Logansport Traction Company for the purpose of carrying the project to completion.

After much preliminary work it was decided to parallel the Wabash Railroad between the two cities. This route reaches the following cities and towns: Logansport, Clymers, Burrows, Rockfield, Delphi, Colburn, Buck Creek and Lafayette. The road connects with the Pittsburg Cincinnati Chicago & St. Louis, the Wabash and the Vandalia railroads at Logansport, the Vandalia at Clymers, the Monon at Delphi,



Lafayette & Logansport Traction Company—Trestle Approach to Wild Cat Bridge.

the Cleveland Cincinnati Chicago & St. Louis, the Monon and Lake Erie & Western at Lafayette, Ind. Connections are also made with the Ft. Wayne & Wabash Valley Traction Company and the Indiana Union Traction lines at Logansport and with the Indianapolis & Northwestern and the Battle Ground line at Lafayette. The territory through which the road passes is the well settled Wabash valley country, and the outlook for a large business in both the passenger and express departments is bright.

The location for the entire space between the terminal points was chosen with regard to its adaptability for high-speed service, as the maximum curvature of 4 degrees and

a maximum grade of 1.5 per cent were rigidly adhered to. One special feature of the alignment was the route obtained through the city of Delphi entirely on private right of way and with a maximum curvature of 4 degrees. This is considered an exceptional feat, as Delphi is a county seat with a population of over 5,000. The passenger station is located only two blocks from the business portion of the city.

Features of the Construction.

Another feature of the location is the route by which the line passes out of Logansport. The junction of the Little Wabash and the Eel rivers at this point to form the Wabash, and the number of railroads which run into the city, make an entrance to the city rather difficult. The alignment which was chosen met with a great deal of opposition at first, but after the company made known its intentions of installing substantial construction in a first-class manner, tending to beautify instead of detracting from the appearance of the locality, the permission of the board of public works was obtained. The track is on Third street, crossing the four tracks of the Pittsburg Cincinnati Chicago & St. Louis Railroad on a curve and running upon two 144-foot through truss



Lafayette & Logansport Traction Company—South Bridge over the Wabash River.

spans across the north branch of the Wabash river. From there the line continues across Biddle island under the Wabash Railroad, which is elevated at that point. It was necessary to move the abutment of the Wabash Railroad bridge a distance of about 12 feet. In addition to this, the high water level of the river made it necessary for the company to construct a 200-foot concrete tunnel and retaining wall. This wall, coming next to a public street, was topped with a suitable iron railing, and a cement walk and combined curb and gutter was constructed along its entire length. The bottom of the tunnel consists of a layer of concrete 12 inches thick, the ties being concreted in place as in a paved street. A 12-inch Palmer non-return drain valve was placed in the lowest point in the tunnel and a drain carries the water to the north branch of the Wabash river. Continuing across Biddle island the line crosses the south branch of the Wabash river, using two 100-foot through truss spans and one 48 and one 58 foot through girder span. Both bridges across the river were constructed on substructures formed by building concrete extensions to the piers and abutments of the highway bridges at these points.

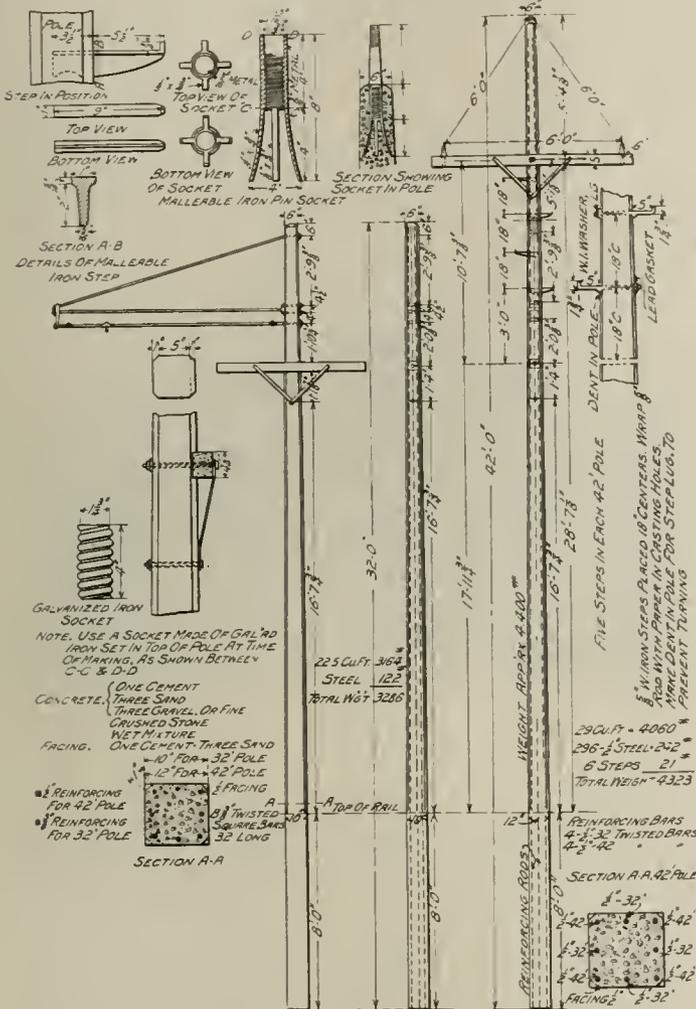
The alignment in the main consists of stretches of tangent ranging from 5 to 11 miles in length, with only light curves in and out of the smaller towns. The Wabash Railroad is crossed twice, once at Logansport with an underway and once

at Delphi with an underway. The Monon Railroad also is crossed at Delphi with a subway. The only railroad grade crossing outside of the city of Logansport is over the Vandalia Railroad at Clymers, where an interlocking switch will be operated jointly with the Vandalia and Wabash from a tower.

Materials of Construction.

Siding connections with the Wabash Railroad were obtained at Buck Creek, Colburn, Rockfield and Burrows. The shipments of all material were distributed at these four material yards. The unloading of material was assumed by a

was still incomplete in the fall of 1906, the company put its own men on the grading and started to complete the work on force account. A steam shovel equipment was put in the 34-foot cut at the Lafayette end and locomotives with Roger dump cars were used to haul the material. Gravel of a quality fit for ballasting was found in this cut and the stripings were used to make some of the high fills along the line where temporary trestles had been built. These trestles, with the exception of the decking, had been constructed of



Lafayette & Logansport Traction Company—Details of Reinforced Concrete Trolley Poles.

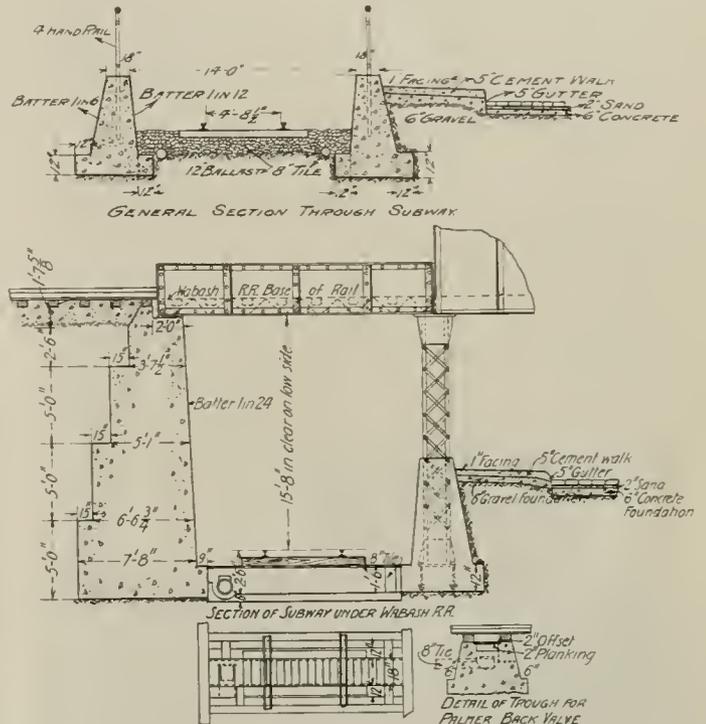
separate contractor. The distribution of the material along the line was facilitated by the use of these four storage yards.

Track and Roadway.

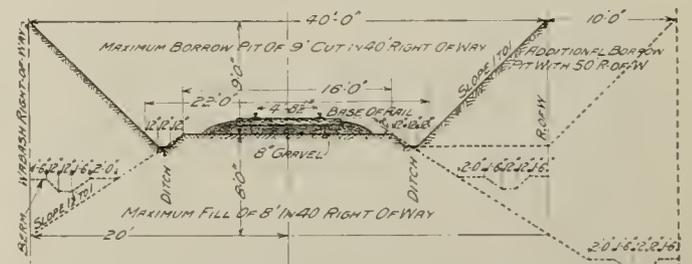
The railway is built on private right of way throughout except at the two terminal cities. The width of the right of way varies from 10 to 200 feet, as the cuts and fills required. The average width is about 50 feet. The line is laid 21 feet outside the right of way line of the Wabash Railroad, thus allowing for any future necessity for double-tracking.

The roadbed is constructed 16 feet wide on fills and 22 feet wide in cuts, with a shrinkage allowance on all fills over 10 feet. The side slopes on fills are one and one-half to one, while those in the cuts are one to one. The deepest cut is 34 feet and the highest fill is about 49 feet, both of these being just outside of the city of Lafayette.

Contracts for the grading were let in four pieces of about nine miles each, and payment was made only as one-way work, with a special allowance for overhaul. As the work



Lafayette & Logansport Traction Company—Sections of Subway Under Wabash Railroad.



Lafayette & Logansport Traction Company—Section Through Standard Cuts and Embankments.

timber cut on the right of way. In this manner a considerable saving was accomplished, as no materials were wasted. When the gravel was of such quality that it was unfit for ballasting it was used to make these fills.

The rails are 70-pound A. S. C. E., purchased from the Pennsylvania Steel Company. A 4-hole continuous joint is used throughout and these were full bolted at the time the track was laid, as brazed bonds were to be used. All sidings have stub ends and are spaced about three miles apart, being equipped with upright switch stands and electric signal lights. The ties are all first-class southern white oak, shipped by the Standard Tie Company from Joppa, Ill. In laying the rails, which was done as force account work, the best results were obtained by distributing with teams only half the number of ties needed. The rails were placed upon these ties and the remaining ties were hauled out by the work train. The rail train consisted merely of a locomotive and a number of ordinary flat cars, two of which were equipped with a homemade arrangement of spools, on which the rails were

lowered. With this simple equipment, however, and a force of 40 men an average of 6,000 feet of track a day was laid.

Bridges and Culverts.

All bridge work was let by contract, the Lafayette Engineering Company obtaining all the steel work, while the concrete substructures were let to local contractors along the line. The bridges were all designed for a loading of a standard 100-ton electric locomotive. Of the steel bridges there were five of importance. The first of these was that required by the north branch of the Wabash river, where two 144-foot through trusses were used. The south branch of the Wabash river required two 100-foot trusses, and one 48 and one 58 foot through girder. Rock creek at Rockfield required a 394-foot deck girder viaduct with a height of 40 feet above the water level. Two 75-foot through girder spans were used across Deer creek at Delphi at the point where the Wabash Railroad uses a 200-foot deck truss. Wildcat creek, at Lafayette, required three 100-foot deck trusses, with pile trestle approaches 500 and 600 feet long, respectively.

In the substructures crushed stone concrete was used



Lafayette & Logansport Traction Company—Standard Shelter Station.

except in the Rock Creek viaduct, where suitable gravel was obtained at the site of the structure. In the smaller culverts preference was given to the flat rail top arch form, which was found to be the most economical for spans up to 12 feet. This type of culvert was reinforced with old low T-rails, of which the company had large quantities on its other lines.

Two of the three subways were constructed of concrete and one of sandstone and steel. A great assistance in the subway work was the hearty co-operation which came from the officials of both the Monon and the Wabash railroads. The latter road constructed both of its subways complete. In all three of the subways the general clearance dimensions were 16 feet from the top of the rail to the trolley and 14 feet wide in the clear.

Overhead Construction.

The overhead construction consisted merely of the ordinary type of trolley bracket supports on alternating 33 and 45 foot poles. These poles were placed every 100 feet and the high tension line was carried on the 45-foot pole, giving it a 200-foot span. This high tension line is a part of the continuous line from Ft. Wayne to Lafayette, and is constructed according to the standard 6-foot triangle position adopted by the company. The special feature of the overhead work was concrete poles, which were erected for a mile as an experiment in the use of concrete for this purpose. These poles were built in lengths of 32 and 42 feet, being 12 inches square on the bottom for the 42-foot pole and 10 inches for the 32-foot pole, and tapering to a 6-inch square on top. Bolt holes were left for the brackets, cross-arms and steps, and a galvanized iron socket was placed in the top of the long pole to carry

the pin for the high tension line. Reinforcement for the poles consisted of eight $\frac{3}{8}$ -inch twisted bars running the entire length of the pole. The increased cost of these poles was not excessive and if no unexpected accidents occur to increase the cost of maintenance they will easily demonstrate their superiority over the cypress poles. The overhead work was all constructed by the company as force account work. The overhead material was furnished by the Ohio Brass Company of Mansfield, O.

Stations and Buildings.

There are three substations between the terminal points, one at Burrows, one at Delphi, and one at Buck Creek, dividing the line into about four equal stretches of nine miles each. These substations were constructed after the pattern of the standard combined substation and waiting room of the company. They are 42 by 44 feet and are constructed mainly of brick and concrete. Concrete is used for floors, pits and roof. The substation proper is absolutely fireproof and is cut off from the rest of the building by a 12-inch brick wall and a good substantial fire door. The man in charge of the sub-



Lafayette & Logansport Traction Company—Standard Waiting and Substation.

station also takes care of the ticket office and baggage room. Each substation contains one 300-kilowatt rotary of the G. E. type, and three 100-kilowatt transformers. The complete equipment was furnished by the General Electric Company. The high tension voltage is 33,000, while that of the trolley is 550.

In addition to these larger stations provision was made in the way of smaller waiting rooms to be placed at such road crossings as the expected traffic would warrant. These smaller stations were all built after the plan of the Ft. Wayne & Wabash Valley standard shelter shed. They consist of a substantial frame structure inclosed on four sides and provided with two screened windows and a door. Concrete or wooden floors are used at the discretion of the engineer and benches are provided for the accommodation of passengers. Another convenient feature of the station is the sign on each end giving the name of the stop and the mileage distance from the terminal point. About 20 of these buildings were erected, ranging in size from 8 by 8 feet to 12 by 14 feet.

The operating headquarters of the new line will be located for the present at Huntington, Ind., on the old line, although it is probable that the permanent headquarters may be moved nearer the center of the division at some later date. The Central Union telephone system of dispatching will be used as on the other lines of the company, and will be taken care of by the company's men. The rolling stock will be a part of the new equipment, which is now being operated on the old line. The cars are of the new type of combination baggage, smoking and general passenger compartment cars built by the Cincinnati Car Company. They are

61 feet in length over all and are equipped with four 75-horsepower motors and a Westinghouse pneumatic multiple control. They are geared up to 65 miles an hour, although the schedule to be operated will not call for more than an average of 35 miles an hour.

The construction work was all supervised from the chief engineer's office located at Ft. Wayne, the work being directly in charge of H. L. Weber, chief engineer, under the direction of C. D. Emmons, general manager.

CUT RATES BY STEAM ROAD COMPETING WITH ELECTRIC RAILWAY HELD DISCRIMINATION.

The Ohio railroad commission has rendered a decision holding that the Hocking Valley Railway Company has practiced unjust and unreasonable discrimination against certain localities on its line because of the fact that the company reduced rates between some points in order to meet the competition of the Scioto Valley Traction Company.

The case was brought before the commission by Aaron B. Price of Athens, O., who represented that the Hocking Valley Railway charged \$1.55 for a ticket from Athens to Columbus, a distance of 76.3 miles, or, for a round trip, \$3.10. The Hocking Valley sells "twin" tickets good for a round trip between Columbus and Logan, a round-trip distance of 99.2 miles, for \$1.60, or from Lancaster to Columbus, a round-trip distance of 63 miles, for 75 cents. One of these "twin" tickets will pay the fare of two passengers on the same train from one point to the other. The complainant charged that in making this arrangement the Hocking Valley Railway was showing undue and unreasonable preference to Lancaster and Logan, and was subjecting Athens and the immediate locality surrounding it to undue and unreasonable prejudice and disadvantage and was thereby violating the laws of the state of Ohio.

In its answer to this petition the Hocking Valley Railway stated that on or before May 13, 1905, to meet electric interurban and suburban competition between Marion and Lancaster and to preserve its local passenger business between those points, it made a schedule of commutation rates between Columbus and Marion and Columbus and Logan, and to encourage suburban residence and travel, it reduced its rates for a radius of 50 miles north and south of Columbus, and to meet the business, which had thus become highly competitive, put on additional trains. When the Scioto Valley Traction Company's line was opened it established a passenger rate of approximately two cents per mile when the maximum legal rate of passenger fare was three cents per mile, which rate the Hocking Valley Railway had been charging on this division. Soon after the opening of the Scioto Valley line the Hocking Valley reduced its fare between Columbus and Lancaster to two cents a mile and subsequently cut this rate below that established by the electric line, making it, as at the present time, 1.2 cents per mile between these points, while the rate on the electric line has remained practically unchanged, being now the maximum legal rate. Subsequent to the change in the Lancaster rate the Hocking Valley road also reduced the rate of fare between Logan and Columbus and return to approximately 1.6 cents per mile. The Hocking Valley contended that it had the right to reduce its fares to meet competition. In its decision the commission states:

It is just as essential that citizens living in one locality along the line of the defendant's railroad should be given the same proportionate rate in passenger fare to and from that particular point, as it is that shippers, at that particular point, should be given the same proportionate freight rate by the defendant company. In fact, it is more essential that passenger rates to and from different points along the line of any railroad company should be uniform, for a uniformity in passenger rates, or a discrimination against a locality, or the citizens of a locality, in passenger rates, affects more people than a discrimination in freight rates to and from the same point.

The policy of the law is, as it should be, that a carrier serving, as it is compelled to serve, the people and that

portion of the state through which the line of railroad runs, shall give proportionately equal facilities, fares and service, and when the fares and services are out of proportion, then one locality is being discriminated against and the other is receiving an undue preference, which the law, if it is intended to be effectual and enforced as intended, certainly does inhibit. It is the policy of the law, especially at the present time, that common carriers shall not create any inequalities, nor seek to make equal, persons and communities not similarly situated. Wherever conditions are similar, it is the policy of the law that rates and fares shall be similar.

What the act creating this commission seeks to do is to give each individual and each locality a "square deal," and not to permit the carrier, obligated alike to the several localities along its line, an opportunity to build up one at the expense of another, to give one a service and deny another the same service, or to give one an undue preference "in any respect whatsoever," over a locality or a person, firm or corporation along the line of its road.

The Scioto Valley Traction Company is a competitor of the defendant only in one branch of defendant's business, viz., the carrying of passengers. It is true the traction company does a light freight, or express business, but only in a comparatively small way, and does not compete with the defendant in its heavier and more important freight transportation; the traction company depending entirely upon its passenger receipts. The contrary is the case with respect to the defendant railway, its principal receipts and dependence being the revenue from the freight traffic. Thus while the traction line must have its passenger receipts to live upon, the steam line does not depend upon its passenger receipts to the same degree, but having two sources of revenue—freight and passenger—may sacrifice a portion of the lesser, if need be, without any appreciable diminution in its revenue in order to destroy its strictly passenger competitor.

Again, the traction company has but a limited line of road, one division extending from Chillicothe to Obetz Junction, where it is joined by the Lancaster division, passing on to Columbus, making in all but 70 miles. The defendant, on the other hand, has a mileage, including branch lines, of 347 miles, traversing Ohio from Pomeroy to Toledo, via Columbus.

The steam road, therefore, being the much larger system, with valuable connections, might, if permitted, sacrifice its passenger business between the competing points in order to wreck and destroy its competitor and render its property valueless while it makes up the loss elsewhere on its line. To permit such practice is contrary to public policy. The public concern is paramount. Public interest is injured by the destruction of proper competition in carriers, not to take into account the loss and injury which stockholders and investors in securities may suffer by reason of a policy which would permit the stronger corporation to use its facilities and franchises in wiping out its competitor. It is not the purpose of the law to require the state to act in a paternal manner toward its creatures, but it should be the policy of the state to prevent the destruction of one public service concern, which exercises a part of the sovereign power, at the hands of another and stronger competitor.

Competition is a natural right but when exercised by a corporation enjoying a part of the sovereign power, limits must be set to this right that no ultimate injury be done to the public. Healthful and proper competition is not denied. Such competition, however, must not disregard the rights of those whom it would serve; nor can it be permitted to destroy a competitor in whom the public has a vital interest. Service is the end desired, and when competition in rates and fares has reached the degree which prudence indicates is the proper limit in a compensatory sense, improved service and facilities are the means with which to court patronage. The public does not want destructive competition. It does, however, demand service.

The commission therefore orders that the Hocking Valley road cease from the "unjust and unreasonable discrimination," which is "found to exist."

The Des Moines (Ia.) City Railway Company obtained gratifying results last year by setting aside certain days during the park season at Ingersoll park as bargain days. No admission fee to the park is charged, but seats in the pavilion are sold for 10, 15 and 25 cents. On certain days during the park season last year it was advertised that \$25 would be distributed among the patrons of the park. This money was divided into eight packages, one containing a \$10 bill, two containing \$5 bills and five containing \$1 bills. With every admission ticket sold was given a ticket which gave the holder a chance of winning a part of the prize money. The scheme proved very successful and attracted a large number of people who otherwise would not have patronized the attractions.

FREIGHT HANDLED BY THE TOLEDO & WESTERN RAILROAD.

Figures showing the tons of freight delivered to connecting roads by the Toledo & Western Railroad Company, the tons received from connecting lines and the tons of local freight carried in the years 1905 and 1906 have been received through the courtesy of C. F. Franklin, president of the company.

On account of car shortage the amount of freight delivered to connections in 1906 was smaller than in 1905. The principal commodities interchanged, the carrying of which originated on the Toledo & Western road, are as follows: Grain, hay, sugar, live stock, stone, logs, staves, heading, paper and merchandise. The principal commodities delivered to the Toledo & Western road by connecting lines were: Flour, sugar beets, live stock, coal, stone, sand, lumber, machinery, tile, cement, plaster and merchandise. The figures are as follows:

	1906.	1905.
Total freight revenue	\$87,296.28	\$86,008.23
Total number of carloads	4,773	4,478
	Tons.	Tons.
Local freight	29,120	40,919
Freight delivered to connecting lines	17,087	30,336
Total freight originating on Toledo & Western	46,207	71,255
Freight received from connecting lines	89,830	66,705
Total freight handled	136,037	137,960

H. B. FLEMING ON BOARD OF SUPERVISING ENGINEERS, CHICAGO.

Harvey B. Fleming, chief engineer of the Chicago City Railway Company, has been appointed a member of the board of supervising engineers created by the new Chicago ordinances. Under the ordinances Bion J. Arnold becomes chairman and the city of Chicago selects a member of the board. The Chicago Union Traction Company will also probably be represented in the organization of the board. Mr. Fleming has been with the Chicago City Railway Company since 1900.

Plans for Subways in Chicago.

A conference which was attended by Thomas E. Mitten, president, and John P. Wilson, counsel of the Chicago City Railway Company, Bion Arnold, Walter L. Fisher, special traction counsel for the city, and representatives of the Commercial Club, was held in Chicago on May 1. Plans for relieving congestion on the downtown streets and for beautifying the city were discussed.

Mr. Arnold explained the plan of double-deck subways which he has developed for the central district. He said that it was his intention to urge upon the city and the companies the immediate construction of the smaller subway system contemplated by the settlement ordinances. This will consist of two east and west and two north and south tunnels in the loop district, and will be so constructed as to be incorporated in the larger plan at a later date. The smaller system will cost \$5,000,000.

It was stated after the meeting that both Mr. Arnold and Mr. Mitten said that a comprehensive system of subways would be a necessity in Chicago within the next 10, certainly within 20, years. They declared that construction plans are being made with the view eventually of running cars underground throughout the business district.

A committee of stockholders of the Chicago West Division Railway Company, an underlying company, has issued a call for deposit of the stock with the Chicago Title & Trust Company, as part of the reorganization of the Chicago Union Traction Company.

New offices have been opened for the Chicago Union Traction Company in the Borland block, in the downtown district.

James Dalrymple, manager of the corporation tramways of Glasgow, Scotland, in a letter to Thomas Hunter, chief

bailliff of the municipal court, Chicago, said: "It must be a great satisfaction to know that the traction question has now been entirely taken out of politics. I am convinced that if municipal ownership is ever to be realized in your city and the other cities of the United States the step which you have taken is the right one to bring about that result."

HEARINGS BEFORE INDIANA TAX COMMISSIONERS.

The hearings before the Indiana state board of tax commissioners for representatives of traction companies who wish to present arguments in regard to their tax assessments, which were begun at Indianapolis on April 22, were concluded on April 25. An abstract of some of the testimony was presented in the Electric Railway Review of April 27, 1906, page 561, and we present herewith extracts from some of the statements made on April 25.

Arthur W. Brady, president Indiana Union Traction Company, said that the equipment now used by his company and other lines in the state which use the direct-current system is depreciating rapidly since the advent of the more modern electrical machinery, such as that used in the single-phase alternating current and similar systems. At the same time, he said, the prices on the new equipment are so high that it is a serious question with the roads to get sufficient capital to install the more modern machinery so as to compete properly with the other electric roads and the steam roads. While he admitted that the gross earnings of his company were greater in 1906 than in 1905, he said that the surplus for that year was much less, due to the expense of taking over additional lines, taxation and other causes. He said that his company is having difficulty in raising funds for improving its lines, and he believed that the interurban companies will soon find it necessary to set aside special renewal funds in order to obtain capital with which to renew their equipment. He said that the city line in Alexandria and the line between Jonesboro and Gas City were operating at a loss, and that practically all of the company's earnings in 1906 were turned back into the property. The stockholders, he said, have taken out practically nothing. The Indiana Union Traction Company was assessed last year at \$9,600 per mile. He said the company had 329 cars of all kinds. These he valued at \$312,285 in 1906 and \$285,310 this year. He said it cost about \$105,000 a year to maintain these cars and their equipment. The gross earnings of the company during the last year were \$1,940,000, and out of this there was created a surplus of \$115,000. He asked that the assessment of the road be not raised.

George F. McCulloch, president Muncie & Portland Traction Company, Muncie, said it is the intention of the company to extend the road from Portland to Celina, O., and make it a part of a through line from Indianapolis to Toledo, Cleveland and Detroit, but the high price of material made it inadvisable to build the extension this year. Poles that cost \$7.85 each last year are now worth \$9.40; ties that were 56 cents each are now 75 cents. Copper wire for the line would have cost \$30,000 more this year than last. Common labor would cost \$2.00 a day this year. Last year it cost from \$1.25 to \$1.75. He asked that the company be assessed at a minimum figure, because the heavy cost of coal, due especially to the heavy tariff fixed by the railroads, will make it doubtful whether the Muncie & Portland line will pay the interest on its bonds during the first year.

In speaking of the Indiana Union Traction Company, which he also represented, he said he believed the road was assessed too high. Last year the board placed the assessment at \$9,600 a mile for the entire 335 miles of track. This includes all the lines, interurban and local. He said the rate was all right for the Indianapolis-Muncie and the Indianapolis-Kokomo lines, but was too high on the others.

"The interurban business," he said, "has grown beyond expectations. We didn't expect to have stations, to sell tickets or to have freight houses. But competition with the steam lines brought them and the business has grown and will continue to grow. In fact, I don't think we are yet in the beginning of it. The interurban people of today are living on hope. Improvements and changes in the equipment of interurbans are coming so rapidly that a road can scarcely keep abreast of the times. Under such circumstances a road soon becomes antiquated and must be rebuilt and re-equipped, and all this costs enormous sums of money. This constant change and improvement represents the water in the stocks of the interurban companies. People may talk all they please about the water in the stock of the Indiana Union Traction Company, but without this water the road could not have lived and been developed.

"When it comes to fixing the assessment of interurban

railroads this board should bear in mind that very few roads earn \$8,000 a mile a year. This represents the 'excellent figure' in earnings; \$6,000 is fine, \$5,000 is good, \$4,000 is fair, \$3,000 permits existence, and \$2,500 or less means a receivership."

W. G. Irwin, president Indianapolis Columbus & Southern Traction Company, Columbus, said that his company is satisfied with its last year's assessment of \$9,000 per mile, and asked that it be not increased. He said: "Our company will be running cars into Seymour within three months. Good progress is being made with the extension north from Louisville to Scottsburg, and it will be read for operation by the first of June. North of Scottsburg the workmen are compelled to use dredge boats in building 10 miles of line through the swamps. However, we expect to be running cars through from Indianapolis to Louisville by the end of the year."

PLAN FOR NEW PHILADELPHIA FRANCHISE.

The Retail Merchants' Association of Philadelphia presented to Mayor Reyburn on April 26 the plan for settlement of the traction situation. The important features of the plan are:

A contract for 50 years is to be entered into between the city of Philadelphia and the Philadelphia Rapid Transit Company, at the end of which the city may possess itself of the leases, franchises and property of the company without cost. During the 50 years the company is to maintain a sinking fund which shall extinguish its \$30,000,000 of capital. The mayor, the president of the Rapid Transit company and the president of the board of city trusts are to compose the sinking fund commission.

The mayor, the president of the board of education and the president of the board of city trusts are to compose the rectors of the company with the right to vote, but they incur no liabilities for themselves or the city. The city and the company are to share equally the net profits after a 6 per cent dividend is paid on the stock.

A fixed sum is to be paid yearly to the city for car licenses, snow removal, street paving, taxes and the like, which shall be equal to the present cost of these items. This sum is to be fixed by the city every year.

No contracts are to be made by the company extending beyond 50 years, and in this period the company shall have the right to build elevated and subway lines as they may be needed, issuing securities for no greater amount of money than is actually needed. The city is also to join with the company to have the present route of the Frankford elevated line changed so as to make its construction possible.

The ordinance of 1857 giving the city the right to take existing railway lines at their appraised value, and the ordinance requiring the company to put wires under ground when directed to do so by the authorities, are to be repealed.

The company is to call the remaining \$9,000,000 still assessable on its stock, and the money is to be used in improving the service.

During the term of the contract the city comptroller or experts in the employ of the city shall have the right to audit the company's accounts.

MEETING OF STANDARDIZATION COMMITTEE, CENTRAL ELECTRIC RAILWAY ASSOCIATION.

The standardization committee of the Central Electric Railway Association held meetings on April 25, 26 and 27 at the offices of the association in Indianapolis. The matter of standardization of equipment for electric railway cars and other equipment was carefully considered and certain recommendations were agreed upon.

The committee selected the following subjects to be considered by subcommittees, members of which will be appointed by the chairman of each subcommittee.

1. Standard height of drawbars for interurban and city cars; also standard form of coupler for interurban and city cars. R. C. Taylor, superintendent motive power Indiana Union Traction Company, Anderson, Ind., chairman.

2. Standard form of trolley base; standard length of trolley poles; standard form of trolley harp and wheel. M. Baxter, electrical engineer and master mechanic Western Ohio Railway Company, Wapakoneta, O., chairman.

3. Standard classification lights and signals and location of same on car. W. A. Gibbs, general manager eastern division, Indiana Columbus & Eastern Traction Company, Newark, O., chairman.

4. Standard foundation brake gear, brake jaws, pins,

levers and brake rods. Fred Heckler, superintendent motive power and cars Lake Shore Electric Railway, Fremont, O., chairman.

5. Car painting. Fred Heckler, superintendent motive power and cars Lake Shore Electric Railway, Fremont, O., chairman.

6. Standardization of electric equipment. Motors recommended for ton-mile speed car; detail dimensions of electric equipment and supplies which enter into the maintenance of electric car service supplies. R. C. Taylor, superintendent motive power Indianapolis Union Traction Company, Anderson, Ind., chairman.

A report was formulated, to be presented at the meeting of the Central Electric Railway Association, which will be held at Indianapolis on May 23, on the following subjects: Brakeshoes, axles, journals and journal boxes, tread and flange of wheels, rails for street and interurban railways.

CLEVELAND TRACTION SITUATION.

Following the introduction in the city council on April 25 of an ordinance granting a franchise on Central avenue and Quincy streets, on which the Cleveland Electric Railway had ceased operation on April 23, to the Low Fare Railway, the controversy between the Cleveland Electric Railway and the 3-cent fare companies took the form of a vigorous contest for the consents of the property owners on those streets. Both companies sent solicitors among the property owners, the Cleveland Electric Railway offering \$4 per front foot for consents to a renewal of its franchise or revocations of previous consents to the Forest City Railway. The Forest City company, although it already claimed to have sufficient consents, also made strenuous efforts to secure additional consents, offering \$3.00 per foot. It was claimed that city employes were used as solicitors for the Forest City consents. At the council meeting on Friday night the Cleveland Electric Railway filed several hundred consents and revocations with the city clerk, claiming to have enough to make inoperative any grant to the Low Fare Railway.

The Low-Fare franchise was passed at a special meeting of the council on Saturday morning by a vote of 21 to 9, having been railroaded through its first and second readings on Wednesday and Friday nights. An amendment requiring a bond to insure the construction of the lines was defeated. The Cleveland Electric Railway immediately secured a permit to remove its tracks without restrictions.

At the meeting on Monday night a resolution requesting the Cleveland Electric Railway to resume service on its abandoned lines was defeated and a resolution was passed authorizing the Low Fare Railway to begin laying tracks under a temporary permit to be issued by the board of public service, as soon as the Cleveland Electric Railway should remove its tracks. Councilman Felton introduced an ordinance granting the Cleveland Electric a franchise over the Central-Quincy route on the basis of seven tickets for a quarter. Several ordinances granting extensions to the Low Fare Railway were also introduced.

At Tuesday night's meeting Mr. Felton and the republican councilmen attempted to pass the Cleveland Electric ordinance. Mr. Felton declared that the residents of Central avenue and Quincy street, whom he represented, objected to being made martyrs to the 3-cent fare cause. The ordinance was made sport of by the administration party and after being loaded down with amendments which would make it impossible of acceptance, it was tabled.

The Cleveland Electric Railway on Tuesday morning, April 30, began the work of removing its tracks in Central avenue and Quincy street. The work of tearing out the special work of the crossing at Central avenue and East Fifty-fifth street was stopped by the police, but was allowed to be resumed after midnight.

The Low Fare company on Tuesday secured from the board of public service a permit to lay tracks in place of those removed by the old company.

The hearings on the several temporary injunction suits brought by the Cleveland Electric against the low-fare companies were taken up before Judge Chapman on Tuesday and resumed on Wednesday. Judge Phillips had made several efforts to induce the companies to determine upon a suit which would finally settle the principal points of difference, as the public interest was being interfered with by the continual state of unrest, but the attorneys could not reach an agreement.

The Low Fare company on Wednesday began laying tracks in Central avenue, where the Cleveland Electric had removed its rails the day before, and was immediately notified by the attorneys of the latter company that an injunction would be applied for to stop the work.

PIPING AND POWER STATION SYSTEMS—XXXVIII.

BY W. L. MORRIS, M. E.

A strong and inexpensive method of constructing the floor over the hot well is to embed rods in cement, thus making a reinforced concrete cover over the hot well. The condenser is carried on the I-beams as shown, this construction being necessary to permit the installation of the condenser before the floor is put down.

As previously stated the dry vacuum pump is a much more efficient device for removing the air from the condenser than the wet vacuum pump because of the small clearance spaces which are permissible at the cylinder ends. In addition to this they have mechanically operated suction valves, usually of the form shown in Figure 273 (J 2-3).* This valve is of the well-known Trick design, having a "flash port" passing through it. The object of this port is to reduce the pressure of the air which remains in the clearance space immediately after the completion of the compression stroke and by communicating with the opposite end of the cylinder increase the pressure on the other side of the piston shown at b, which

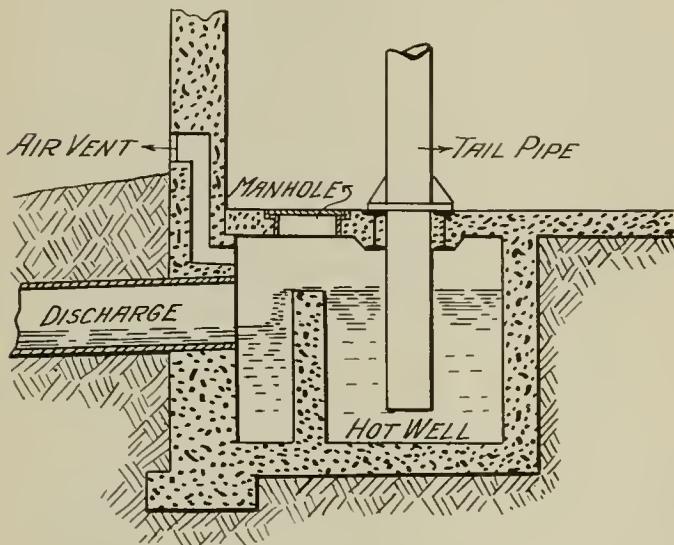


Figure 272—(J2-2).

is about to be compressed, so that the air can be discharged into the atmosphere through the poppet valves shown in detail in Figure 274 (J 2-4).*

These poppet valves should be securely held in place, but in such a manner that they will not be burned in, as would be the case if threaded and screwed into the cylinder. The valve proper should be as light and as strong as possible. The best material to use for the valves is bar steel or steel castings machined so as to reduce the weight, the shell of the moving part being about 1-16 of an inch thick. The bridges shown in the section AB, Figure 274 (J 2-4) should have at least $\frac{1}{4}$ of an inch bearing to guide the steel poppet valve. By making the poppet of steel the valve faces will wear better than if both parts of the valve are made of brass. The set screw in the cap should be set firmly against the valve and secured from movement by a lock-nut set up tight, this construction taking the strains without endangering the small bridges in the air port. The usual construction is to place the valve at the side of the cylinder lying horizontally. A better construction is to place the valve at the bottom of the cylinder in a vertical position, thereby reducing the wear of the valves and also insuring the pump against injury from water, as the valves located in this position will keep the cylinder drained of water. The admission valve shown in Figure 273 is

mechanically operated to avoid the resistance offered by the poppet valve. The area of this type of valve must be about $6\frac{1}{2}$ times that of the discharge poppet valves to avoid throttling on the suction stroke. A back pressure of one pound would hardly be noticed in the discharge, but such a drop through the suction valves would materially reduce the capacity of the pump. The capacity of the pump would be reduced fully one-half and would necessitate a 2-inch higher vacuum in the pump than in the condenser to overcome the resistance through the valves. By employing mechanically operated valves the area of the ports can be made sufficiently large and tight to avoid slippage, which would occur in large poppet valves closing slowly when lightly loaded. If a high vacuum, say 28 inches, is desired, it is necessary to use a dry vacuum pump or at least a pump with mechanically operated suction valves.

A type of pump which is now being quite extensively installed for high vacuum service, which is designed to handle air and water mixed, is that termed the suction valveless pump, of which the Edwards design is shown in Figure 275 (J 2-5). In this design the piston is pointed so that it strikes the water without shock and drives the water of condensation under the piston out through the ports of the cylinder at a high velocity, which carries the air with it on the same principle as an injector. The movement of the piston closes the

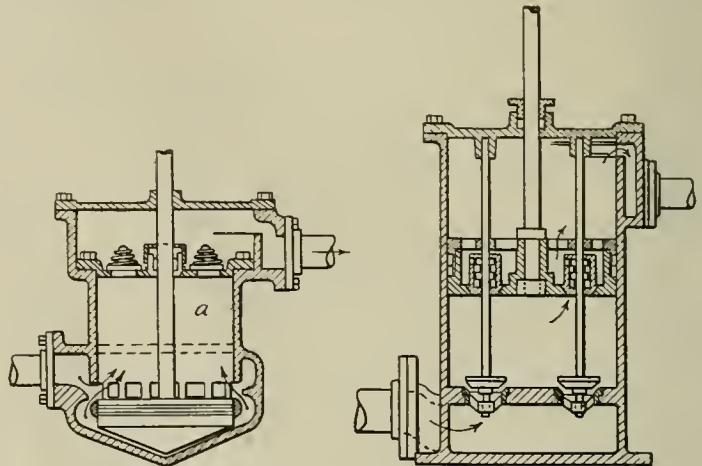


Figure 275—(J2-5).

Figure 276—(J2-6).

ports and the air and water are discharged through the head valves after compression. On the downward stroke of the pump a higher vacuum is formed in the cylinder, a, than exists in the condenser at the same instant, and the air therefore rushes into the cylinder as soon as the ports are uncovered by the piston, and this is further assisted by the injector action of the water which follows immediately, and as the piston is moving very rapidly the ports would probably be covered before any backflow from the cylinder had a chance to occur. Be that as it may, however, the high efficiency and successful operation of this type of pump is fully established and demonstrates its ability to remove air and condensation under a vacuum of 28 inches.

There are several other designs of suction valveless pumps, among which may be mentioned the Bailey and the Mullins, which are also well adapted to handle air and water in the same cylinder. The special advantages of the suction valveless pump are that it has no bucket or foot valves, which constantly need care and renewal, and are generally very difficult to get at for repair.

It is possible to use poppet suction valves, but in such cases they should be mechanically operated, as shown in Figure 276 (J 2-6). Both suction and discharge valves are mechanically operated in this pump, the operation of the valves being accomplished by the friction packing rings inside of the discharge valves. In the accompanying illustration the suction valves are shown open on the upstroke, the valve

*By an error Figures 273 and 274 were inserted in Chapter XXXVII, page 562, and numbered incorrectly 272 and 273.

rods being drawn upward by the friction, which likewise closes the discharge valves when the piston is on the upstroke. On the downstroke the friction of the packing pushes the valve rods down, thus closing the suction valves and opening the discharge valves. The friction of the packing rings must always be maintained sufficient to sustain the weight of the valves and valve rods. This arrangement of valves permits the air and water to be discharged and drawn into the pump without any appreciable loss of head.

When the piston starts on the downward stroke the discharge valves will not be seated until the pressure under the piston is nearly equal to that above it, the rods slipping through the friction or packing rings. The suction valves are closed as soon as the piston has traveled a distance equal to the travel of the valves. This arrangement may be used for either the suction or discharge valves and as all the valves are kept in perfect alignment, insures perfect valve faces. The wear on the packing rings is similar to that of any metallic piston packing. The packing rings are split, alternate rings closing against the case and rod respectively.

The air pumps shown in Figures 275 and 276 are operated with suction jet condensers taking the injection water and air from the condenser bowl. These may also be used in connection with surface condensers as they are capable of handling air and water. The pump shown in Figure 276 may also be applied as a dry vacuum pump if the cylinder is water jacketed. If a counter current condenser is used, as shown in Chapter IV, Figure 28, then it is necessary to handle the air and water separately, the air pump being in this case a dry vacuum pump and the condensation pump handling solid water, and part of the time with air and water mixed, as a certain amount of air would at times be taken in its suction.

It sometimes becomes necessary to place the dry vacuum pump in the engine room when the condensers are located in the basement. This makes an inclined pipe line necessary. Such a line can be successfully operated if the piping is laid out in such a manner that it will be impossible for water to accumulate in it. When the pump is in operation the water will be constantly carried in small particles and cause no difficulty in operation, but when the pump is out of service the pipe line should be drained of all water which may collect in it by drips properly located. The pitch of the pipe line should be such that the water will drain back to the pump when the latter is not in operation. The more regular the pitch is, the less liability there will be for water to collect in pockets at the bottom of the steep grades, which is then liable to be picked up in large quantities and discharged into the pump when it is again put in operation.

(To Be Continued.)

Chicago Elevated Traffic.

The figures for the daily number of passengers carried by the elevated railroads of Chicago for the first four months of the year all show gratifying increases over the corresponding months of last year. The Metropolitan made a new record for the month of March, with an increase of 13.67 per cent. The figures for three of the companies follow:

Metropolitan West Side Elevated Railway.				
	1907.	1906.	Increase.	Per cent.
January	150,165	129,720	20,445	15.76
February	154,444	135,570	18,874	13.91
March	154,790	138,169	16,621	12.02
April	156,275	137,477	18,798	13.67
Northwestern Elevated Railroad.				
January	\$8,632	\$1,204	7,428	9.15
February	88,435	83,572	4,863	5.81
March	89,344	85,154	4,190	4.92
April	99,134	84,244	5,890	6.99
South Side Elevated Railroad.				
January	92,411	92,406	5	0.00
February	96,094	95,077	1,017	1.06
March	100,226	95,466	4,760	4.98
April	103,152	95,756	7,396	7.72

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. ROSENBERGER, LL. B.

Equipment of Car with Powerful Searchlight.

It is no evidence of negligence, the supreme court of errors of Connecticut says, *Garfield v. Hartford & Springfield Street Railway Company*, 65 Atlantic Reporter, 598, that a street railway car is equipped with a powerful searchlight, but it may be evidence of negligence if a car, thus equipped, is run at an unlawful rate of speed, in a narrow road, with no proper lookout for travelers upon the tracks whose eyes may be so dazzled by such a light as to prevent them from seeing which way to turn in order to escape injury.

Liability for Road Officer Who Causes Wrongful Arrest.

A road officer who is shown to be the superior officer of a conductor and to have the right to take charge of his car at any point on the road, the St. Louis court of appeals holds, *Carmody v. St. Louis Transit Company*, 99 Southwestern Reporter, 495, has the same authority as the conductor to order the arrest of a passenger on the car, who refuses to pay his fare, or for other statutory causes, and the company will be liable if he wrongfully causes the arrest of a passenger by a police officer.

May Secure Use of Tracks Without Exchange of Transfers.

In the absence of an ordinance requiring street railroads in a city generally to exchange transfers, the supreme court of Ohio holds, *Interurban Railway & Terminal Company v. City of Cincinnati*, 79 Northeastern Reporter, 240, that neither section 2505c of the revised statutes of that state, nor section 3443-11 thereof, makes the power it confers upon urban and interurban street railroad companies to agree as to the use by the latter of so much of the tracks and other property of the former as may be necessary or desirable to enable it to enter or pass through the municipality conditional upon an exchange of transfers.

Drinking Water on Cars Not Required by Statute.

Section 5368 of the Alabama code of 1896 provides that railroad companies must keep a sufficiency of good drinking water on all trains, and that every conductor, who runs any train without water, as required by this section, must, on conviction, be fined, etc. The supreme court of Alabama holds, *Dean v. State*, 43 Southern Reporter, 24, that the statute does not apply to street railways, or, for that matter, to an electric railway operated between cities 14 miles apart by a street railway company, it being said that, in the absence of some affirmative evidence to the contrary, it will not be presumed the road was not a street railroad.

Power to Compel Removal of Unauthorized Railway.

The supreme court of Michigan says, in the case of *Bangor Township vs. Bay City Traction & Electric Company*, 110 Northwestern Reporter, 490, that the defendant purchased a street railway constructed in a highway, within the township of Bangor. The latter filed a bill in chancery to have the railway removed, alleging that it was built without the consent, and against the repeated protests, of the township authorities, and had been so maintained and operated ever since. The defendant maintained, among other things: (1) That the court had no jurisdiction of this cause, because there was an adequate remedy at law, if the complainant's claim was valid; (2) that it was estopped from asking the relief sought, because of the acquiescence of its officers in the building and maintenance of the road. But the supreme court holds against these contentions. It says that a railway which is built in a highway without authority of law is not rightfully there, and the public has a right to have it removed, whether it be called an encroachment, an obstruction, or a nuisance.

The defendant appeared to contend that this was neither an obstruction nor a nuisance, for the reason that this court

has held that the use of public highways, by street railway companies, is a legitimate use of the highway, and does not create an additional servitude upon the land of the adjoining proprietor, and that it must, therefore, be an encroachment or a trespass; if the former, not the subject of equitable relief; and, if the latter, waived by the conduct of the officers. However, while a railroad lawfully constructed on a highway, and rightfully there, cannot be held to be an unlawful obstruction of, or encroachment upon, the highway, it is an obstruction in the sense that any structure or new use may be an obstruction to its use by the public generally to a greater or less extent.

This defendant was not an adjacent land owner, and has no color of right to occupy the street, except such as the statutes then in force conferred, and, in building its line, placed an obstruction in the way, of which the township authorities had a right to complain and to take measures to remove, and the court hesitates to say that it may not have been a nuisance which they might ask equity to abate, for it thinks that it does not follow, from the recognition of a lawful street railroad, as a proper adjunct to a highway, that an unlawfully constructed one cannot be a nuisance. If it was so claimed, equity had jurisdiction to try the question, and the township might bring the suit.

The defendant's alleged estoppel could not be sustained. If private persons can create easements by estoppel, under the statute of frauds and decisions of the state, or if a license may be implied from the acquiescence of a private person, who stands by and sees, without protest, his land used for a railway, the same cannot be said of township officers, who have no authority except such as the statute gives.

Rights as to Switch to Haul for Express Company.

The primary purpose of the bill in the case of Dulaney and others v. United Railways & Electric Company, 65 Atlantic Reporter, 45, the court of appeals of Maryland says was to procure an injunction restraining the said United Railways Company, of Baltimore, from constructing and maintaining a switch from its main track across a sidewalk to a warehouse owned and used by a city and suburban express company. But the court holds that the city, in permitting the United Railways Company to lay and maintain the proposed switch to connect its lines by a curved track, as shown on a plat referred to in the ordinance, with the express company's warehouse, to facilitate conducting an express business by hauling freight and express only in cars used for the business of such express company, was appropriating the public street to legitimate uses for the benefit of the community at large, and that it did not exceed its powers in so doing. Assuming that the United Railways Company was authorized to transact an express business on the street in question and other lines formerly operated by the Baltimore Consolidated Railway Company, there was good authority for holding that it would have the right to limit the express business on its lines to a single express company, if it thereby afforded to the public reasonable express facilities.

When the proposed switch is constructed, neither the United Railways Company nor the express company, the court says, will have any exclusive or superior right to use or occupy the portions of the street or sidewalk over which the switch runs. The right of the complainants as property owners in that connection, as well as those of persons passing along the street, will be the same after the switch is made that they were before. The railway company and the property owners have equal rights to the use of the public streets, which each must exercise reasonably with respect to the right of the other. Cars cannot be permitted to so stand upon the switch as to prevent other vehicles from passing. The portion of the ordinance imposing a penalty for hindering or delaying the cars by the use of other vehicles on the switch must be construed to relate only to an unreasonable hind-

rance or delay, and cannot be held to have been intended to prevent or punish the reasonable use by adjacent property owners or persons having business with them of the public streets in front of their premises.

Both the railway company and the express company must so use the switch, when constructed, as not to unnecessarily or improperly interfere with the rights of the public or the adjacent property holders, and if they fail to do so, and injury results from such failure, the proper tribunals will afford relief to the injured persons. But the court cannot anticipate defaults or acts of negligence or abuse on the part of the companies in maintaining and using the switch, or in the storage or handling of such inflammable or explosive substances as may be lawfully committed to them for transportation.

Liability for Injury by Crowd at Subway Station.

While attempting to enter one of the defendant's cars at a subway station the plaintiff in the case of Kuhlen v. Boston & Northern Street Railway Company, 79 Northeastern Reporter, 815, was injured by the pushing of the crowd at the station. The supreme judicial court of Massachusetts, in overruling exceptions to a verdict for damages in her favor, holds that an instruction could not have been given that, if it was not practicable for the defendant to carry on its business without the crowding of its platforms and cars at certain hours of the day, it was not negligence on its part to fail to employ a large force of men at those hours to prevent jostling and crowding at the entrance to the cars. It was for the jury to say whether or not, if the crowding of its platforms and cars at certain hours of the day was unavoidable in carrying on its business, that the high degree of care which it was bound to exercise called for the employment of an increased number of men to prevent such jostling and crowding at the entrance of the cars as would involve danger to passengers, and whether or not it was reasonable, in view of the nature and extent of the defendant's business, to require this precaution to be taken.

It could not have been said as a matter of law that the plaintiff herself was not in the exercise of due care, or that she had assumed the risk of the injury that was done to her. She had been in similar crowds before, and the circumstances were important to be considered by the jury in passing upon the question of her due care. But they were not conclusive against her as a matter of law. The jury might say that in spite of the failure of the defendant's servants and agents to control the crowd on previous occasions she might depend somewhat on the hope that they would not continue to fall short of their duty.

Instructions could not have been given the jury, as the defendant requested, that, on all the evidence, the plaintiff was not entitled to recover; that the plaintiff was not in the exercise of due care; the plaintiff assumed the risk of being jostled and all danger and inconvenience incident thereto when she entered the crowd endeavoring to get upon the car; that in choosing to travel on a street car when the same was crowded, the plaintiff assumed the risk of injury incident to such crowding.

Furthermore, in view of the fact that the defendant held this out as the proper place for its passengers to come for the purpose of taking its cars, so that its passengers had a right to regard themselves as having come thither by its invitation, the court does not see that the defendant was injured by the exclusion of the agreement showing the conditions of its occupation of the subway. The general principle has been established that one who, though not strictly in control of a defective thing or dangerous place, yet uses it for his own benefit and for his own purposes invites another to enter it, may, if the other elements of liability concur, be held responsible for an injury caused by the defect or danger.

News of the Week

Decision Against City of Toronto in Service Regulation Suits.

The judicial committee of the privy council of Great Britain on April 26 gave a decision in the cases of the city of Toronto versus the Toronto Railway Company, appealed from the supreme court, and the Toronto Railway Company versus the city, appealed from the court of appeal for Ontario. The decision states that under the agreement between the city and the company neither party has any street railway powers over the streets within new territorial additions to the city; that to grant privileges to new companies is the only remedy the city has for failure of the company to build extensions and extend its service; that it is for the company, not the city engineer with the approval of the city council, to determine what routes shall be adopted by the company; that it is for the company, not the city engineer, to determine where cars shall be stopped; and that the city is to pay the company the costs of these appeals.

Salt Lake City Strike Settled.

The strike of motormen and conductors of the Utah Light & Railway Company, Salt Lake City, which was declared on Sunday morning, April 28, was settled late Monday night and service was resumed on Tuesday morning. The strike affected about 450 men and caused nearly a complete tie-up of the street railway service of the city while it was in progress. Scenes of disorder were numerous. The strike was caused by the refusal of the company to grant the demands of the men for a wage scale of 25 cents an hour for the first year and 30 cents an hour thereafter, recognition of the union, plan for arbitration of grievances, 10 per cent increase for barn and shop employes, and several other minor matters, and followed several attempts at arbitration. After the strike was declared the company gave former Congressman Brigham H. Roberts full powers to effect a settlement and an agreement was reached whereby the men were granted the wage scale they had asked for and the other matters were to be arbitrated.

Michigan Supreme Court Decides Against Municipal Ownership for Detroit.

The Michigan supreme court on May 1 decided by a vote of 5 to 3 that the city of Detroit has no constitutional right to build a street railway line to be leased to an operating company. The case is the outcome of the municipal ownership agitation several years ago. The city council on October 31, 1905, ordered the department of public works to lay tracks on several streets and appropriated \$10,000 for beginning the work. This step was taken as a part of the fight against the Detroit United Railway, and was begun as an experiment, the idea of the city being that if it could build tracks to be leased to a competing company or to the Detroit United Railway as its franchises expired, it could more effectually contend for a reduced fare. The circuit court enjoined the city from putting its scheme into operation and the city appealed to the supreme court. The case was argued before the full bench and the circuit judges granted the petition, but recommended that the supreme court be given an opportunity to pass on it. The case was argued before five of the supreme court judges last spring and before the full bench in December, and the decision now handed down is the result of that hearing.

Labor Troubles in San Francisco.

A strike of conductors and motormen of the United Railroads of San Francisco is said to be threatening. On April 19 President Calhoun of the company announced that the scale recently decided upon by the arbitration committee of \$3.10 per 10-hour day for the men in their first year's service, \$3.20 for the second year and \$3.30 for the third year, which took effect as of September 5, 1906, would be continued for the year beginning on May 1, although this scale, which represented an increase of about 20 per cent over the previous scale, was based on the extraordinary conditions of last year. On April 27 the executive committee of the car men's union called upon President Calhoun and presented a demand for an eight-hour day at a flat rate of \$3.00 per day, with one and one-half times the regular rate for overtime. President Calhoun has announced the determination of the company not to recede from the position taken in the announcement of April 19, pointing out that a further increase is financially impossible. He states that materials and labor are now higher than ever, that since the fire the number of fares has decreased, and that the company is now paying higher wages than are paid in any large city in the country. The men have not yet decided what action shall be taken on the company's refusal and the company is making preparations to meet a strike.

New England Street Railway Club.

James F. Jackson, chairman of the Massachusetts railroad commission, gave the members of the New England Street Railway Club an informal talk at the monthly meeting of the club in Boston, on April 30. President H. C. Page of Springfield presided and a brief business meeting followed the usual dinner at the American house.

Mr. Jackson's subject had to do with the public service aspects of the street railway business. He emphasized the cordial relations which have existed between himself and the street railway officials of Massachusetts during his seven years' tenure of office, contrasted old and recent methods of street railway operation and advanced two suggestions in the way of improving present

conditions. It was pointed out that it is most essential to ideal railway service that all officers and subordinate employes of transportation companies shall realize the distinction between an ordinary private business and their own. In steam railroad circles particularly this appreciation is not always in evidence, although the courts have held over and over again that a railroad is a public highway. Mr. Jackson urged that a broader attitude than that which looks upon transportation as merely something to be sold, like any other merchantable commodity, is desirable. Complaints may be avoided in some degree by improved equipment, but more is likely to result from tactful and courteous work by conductors and other employes than from mere machinery.

The concluding suggestion favored a dominant personality in each of the executive chairs of street railway companies, which will foster increased efficiency, loyalty and pride in the service by the individual employe. Men prefer to work for a man rather than a board of directors or a system. The realization of the brotherhood feeling in street railway work is most desirable.

Legislation Affecting Electric Railways.

New York.—Governor Hughes on April 29 signed the Miller bill, which prohibits electric railway companies operating wholly or in part in cities of 1,000,000 population, from collecting fare from a passenger more than once during a continuous ride on a single car, except that a fare may be collected once within the city and once outside.—Senator Cassidy has introduced a resolution providing for the appointment of three senators and three members of the assembly for the purpose of making an investigation into the merger of the New York City street railways by the Interborough-Metropolitan Company.

Pennsylvania.—The senate committee on city passenger railways on April 30 decided to report favorably on the Homsher eminent domain bill for electric railways, in the form in which the bill was passed by the house. This action was taken after a hearing in which representatives of the Property Owners' Association of Philadelphia presented numerous amendments to the bill, imposing restrictions, and members of the Temporary Street Railway Association, composed of 75 electric railway companies of the state, presented arguments for the passage of the bill in its present form.

Missouri.—The senate has passed a bill giving cities the right to regulate rates for public service corporations. The bill was amended to provide for a court review of the legality of proceedings and the reasonableness of the rates fixed.

Rhode Island Company Increases Wages.—General Manager A. E. Potter of the Rhode Island Company of Providence, R. I., which controls most of the electric lines of the state, has announced a 10 per cent increase in wages, based on a 10-hour day, for trainmen, effective on April 28. The increase affects 615 motormen and 598 conductors.

T-Rail Hearing in Columbus.—The new board of public service of Columbus, O., on April 26 held a hearing for the purpose of listening to arguments on the subject of T-rail construction in the city streets. The old board refused to permit the use of T-rail but many of the merchants of the city who are interested in securing as many electric railways as possible for the city are seeking to induce the new board to favor the T-rail, which is desired by the interurban companies. The hearing was asked for by the Interurban Loop Association, an organization of business men, and several members spoke in favor of the T-rail.

Detroit United Railway in Court.—The Detroit United Railway was found guilty on 20 charges of violations of the city ordinances, by Judge Conolly in the recorder's court on May 2. The cases are a part of the campaign which Mayor Thompson has been waging against the company for several months. Thirteen cases were for violation of the ordinance requiring the company to post time schedules in its cars, which has never been enforced, five were for failing to maintain certain red lights and two were for failure to file with the city treasurer quarterly reports on the company's freight traffic. The matter of sentences was taken under advisement by the court.

Twin City Trolley Trips.—A. W. Warnock, general passenger agent of the Twin City Rapid Transit Company, Minneapolis, Minn., has recently issued the 1907 edition of its well-known booklet, "Twin City Trolley Trips," which describes and illustrates the many interesting trips which may be taken on its suburban lines and contains much useful information in regard to the numerous amusement resorts in the vicinity of Minneapolis and St. Paul. The booklet has 24 pages and contains excellent maps, timetables, rates of fare and a large number of halftone illustrations of beauty spots reached by the company's lines. The company has also issued another excellent folder describing and illustrating the attractions of Big Island Park, the company's new amusement resort at Lake Minnetonka.

Trolley Trip Story Contest.—The report of the judges in the prize trolley trip story contest, which was conducted by the passenger department of the Boston & Northern and Old Colony Street Railway companies during the winter months, has been announced. The department offered a prize of \$25 in cash for the best story of the best trolley trip taken on the lines of either of these two companies, \$15 for the second best and \$10 for the third best. The response to this offer was very general, a large number of excellent and interesting stories being received by the department from all over the district covered by these lines. The first prize has been awarded to Katherine Keefe of Danvers, Mass.; the second to Mary I. Coggeshall of Melrose, Mass., and the third to Ellen M. Dole of Salem, Mass. The winning story is printed in this month's issue of the Tri-State Tourist, the monthly publication of the passenger department.

Construction News

FRANCHISES.

Battle Creek, Mich.—The Michigan United Railways Company has applied for a 30-year franchise, and it is stated will apply for a similar franchise in Kalamazoo. The company's present franchises in those cities run for 17 or 18 years more, but it is desired to float a new 30-year bond issue.

Bridgeport, Ala.—A franchise has been granted to T. W. Pratt, Huntsville, Ala., to build and operate an electric railway, light and power plant in Bridgeport. The line also will connect Bridgeport with Copenhagen and South Pittsburg, and ultimately will be extended to Jasper, Ala., on the north and Huntsville, Scottsboro and Stevenson on the south, with Bridgeport as headquarters for the company. Work is to begin within six months and must be prosecuted continuously until completed.

Detroit, Mich.—The Detroit United Railway, through its general manager, F. W. Brooks, has applied for a franchise to build a line from the city limits to the site of the Ford Motor Company's new plant in Highland Park and a cross track on some street near the Ford site to Woodward avenue in order to allow the Oakland avenue cars to make the Palmer park run. A 20-year term is asked for the Woodward avenue franchise in Highland Park, which would overlap the Oakland avenue franchise about four years. The Oakland avenue line is a part of the so-called "3-cent system," on which tickets at the rate of eight for a quarter are good the greater part of the day, with six tickets for a quarter the rest of the time. The application has been referred to a committee.

Fairfield, Ia.—A franchise has been granted to the Iowa-Missouri Traction & Power Company, which proposes to build from Memphis, Mo., to Iowa City, Ia. J. W. Andrews of Fairfield is the promoter.

Lawrence, Kan.—The city council has granted a franchise to the Lawrence Electric Transportation Company, which is to build a trackless trolley line in this city. O. W. Murphy of Lawrence is interested.

Salt Lake City, Utah.—The Utah Light & Railway Company has applied for an amended franchise in place of the present blanket franchise, under which it is operating. The principal feature of the new grant is the provision permitting the company to use a large number of streets and portions of streets not now covered by a franchise. Another feature is that all wires must be placed underground by 1910. As amended the franchise also provides that the company, in addition to its present right to haul gravel and crushed stone, may haul freight between the hours of midnight and 6 o'clock a. m., or at any other hours which may be specified later by the council. No action has been taken.

Seattle, Wash.—The Seattle Renton & Southern Railway has been granted a franchise for the extension of its line to the northern part of the city. The company is to pay 2 per cent of the gross receipts of the line to the city until 1920 and 3 per cent from 1920 until the expiration of its franchise. W. R. Crawford, Seattle, president.

Syracuse, N. Y.—The Syracuse Rapid Transit Company has applied for a franchise for extensions to its present system, including the laying of additional track in Court and Butternut streets and Cortland avenue; also commencing at Gifford and West streets, through South West street, south one block, connecting with the present tracks at that point. The petition has been referred to the highway committee.

RECENT INCORPORATIONS.

Buffalo Rochester & Eastern Railroad.—Incorporated in New York to operate a standard-gauge railroad by steam, electricity or gasoline. The road will run from Buffalo to Rochester and Troy, about 300 miles. The principal office will be at Rochester and the line will pass through Erie, Genesee, Orleans, Monroe, Wayne, Cayuga, Onondaga, Madison, Oneida, Herkimer, Montgomery, Schoharie, Schenectady, Albany and Rensselaer. Capital stock, \$3,500,000, of which \$1,835,000 has been subscribed by Ralph D. Gillett of Westfield, Mass. Incorporators: Ralph D. Gillett, Henry W. Ely, Archie D. Robinson, Westfield, Mass.; Arthur W. Eaton, Pittsfield; Franklin Weston, Dalton; Harry W. Bowman, Fred L. Ley, Springfield; Joseph O. Skinner, Holyoke; James H. Caldwell, Troy; John J. Whipple, Brockton; James F. Shaw, Manchester, Mass.

Columbus Marysville & Bellefontaine Railway.—Incorporated in Ohio to build a line from Columbus to Marysville and Bellefontaine, O. The route will parallel the Toledo & Ohio Central steam road and interests identified with the Findlay-Marion Railway & Light Company are interested in the project. Capital stock, \$25,000. Incorporators: R. P. Hankey, Detroit; G. W. Meeker, Columbus; Emmitt Tompkins, Eugene Gray and W. A. France.

Mentor Street Railway.—Incorporated in Pennsylvania to construct 10 miles of electric road in Elizabeth, Pa. Capital stock, \$60,000. Incorporators: D. B. Neagley, president; F. L. Kern, J. K. Neagley, George McKain and N. F. Bicking, all of Pittsburg.

Perkiomen Valley (Pa.) Traction Company.—Incorporated in Pennsylvania to build a line from Collegedale to Schwenksville, Pa. The line will be 11½ miles long, from Collegedale to Green Lane, via Schwenksville and Perkiomenville, and will use the Perkiomen

turnpike part of the way. I. H. Bardman, Schwenksville, is president.

Redlands Central Railway.—Incorporated in California to build 25 miles of electric railway from Redlands east to Craftonville and from Redlands west to Riverside. This is the company which recently obtained franchises in Redlands. Capital stock, \$25,000. Incorporators: A. G. Hubbard, J. H. Fisher, O. T. Higgins, E. S. Graham and F. E. Sanford.

Sand Mountain Electric Company.—Incorporated in Alabama, with offices at Montgomery, to build a hydro-electric plant on Short creek, in Marshall county, and build a railway from Gadsden to Scottsboro, Ala. Capital stock, \$50,000. Incorporators: Edgar O. McCord, Rena B. McCord, Leon C. McCord, G. M. E. Mann, W. E. Snead, J. B. Roberts and the Albertville Realty Company.

Tri-City Traction Company, Champaign, Ill.—Incorporated in Illinois to build a line from Edwardsville to a point on the Mississippi river near Venice, where the proposed bridge of the Illinois Traction Company to St. Louis is to be located, and from Granite City to East St. Louis. Capital stock, \$1,000,000. Incorporators: Charles Zilly, B. E. Bramble, C. A. Wright and George M. Mattis, all of Champaign, Ill., and all associated with the Illinois Traction Company.

TRACK AND ROADWAY.

Albany & Hudson Railroad, Hudson, N. Y.—It is reported that this company is considering the construction of a line from Nassau to Brainard Station, N. Y.

Allentown & Reading Traction Company, Allentown, Pa.—It is reported that this company is planning to build an extension from East Texas to Emaus and Lyons, Pa.

Atlantic City & Ocean City Railroad, Philadelphia, Pa.—An official report from this company states that it is now building an extension of the Atlantic City & Shore Railroad from Somers Point to Ocean City, N. J., about two miles. The line passes across the Great Egg Harbor bay; about half is trestle work built of creosoted piles, with two steel drawbridges and one fixed span. The remainder of the line passes across several islands in the bay, on which embankments have been formed by pumping in beach sand. Current for the operation of the line will be taken from the substation of the Atlantic City & Shore Railroad at Somers Point, and the latter company's cars will be used. The Atlantic City & Shore now connects Atlantic City, Pleasantville and Somers Point.

Atlantic Northern & Southern Railroad.—J. W. Cuykendall has been elected president of this company, which proposes to build an electric line from Atlantic to Villisca, Ia., 72 miles, succeeding J. A. McWaid, resigned. Headquarters, Atlantic.

Belmont Electric Railway.—We are officially advised that the Riggs & Sherman Company of Toledo, O., is making preliminary surveys for an electric line from Bellaire to St. Clairsville, O., 12 miles, via Neff. J. F. Anderson of Bellaire is president.

Canandaigua Southern Electric Railroad.—This company has completed the preliminary surveys for its line from Canandaigua south to Atlanta, N. Y., via Centerfield, South Bloomfield, Bristol Center and Naples, 33½ miles. George H. Switzer, 42 Broadway, New York, is president and chief engineer.

Center & Clearfield Street Railway, Phillipsburg, Pa.—It is reported that this company expects to place contracts within the next few weeks for the construction of about 4½ miles of track from Phillipsburg to Osceola, Pa.

Central Texas Traction Company, Corsicana, Tex.—It is reported that the rails have been ordered for the line from Corsicana to Palestine, Tex., 52 miles, and that contracts are to be let at once for the ties. It is the intention to begin construction in June. T. J. Galvin, superintendent of construction; M. P. Taret, chief engineer.

Chambersburg & Southern Railway, Chambersburg, Pa.—This company has completed surveys for its proposed road from Chambersburg to Marion and Greencastle, Pa., and it is stated that contracts will be awarded soon. T. M. Nelson, president; William McGowan, chief engineer.

Chicago Ottawa & Peoria Railway.—This company, whose incorporation was noted in the Electric Railway Review of April 27, 1907, page 564, will build to connect the Peoria lines of the Illinois Traction Company with the Illinois Valley Railway, and will give a Chicago connection for the Illinois Traction system. W. B. McKinley is president and H. E. Chubbuck general manager of the Chicago Ottawa & Peoria.

Duquoin Belleville & St. Louis Electric Railway.—It is reported that this company has made all of the preliminary arrangements for building its electric line from Zeigler to Belleville, Ill., and St. Louis, Mo., via Benton and Duquoin. The following officers have been elected: President, William R. Hayes; vice-president, Thomas H. Davison; secretary, Thomas J. Howell; treasurer, Harry E. Ross; general manager, J. Henry Ward. Surveys for the line have been completed, and it is expected to enter St. Louis over the tracks of the East St. Louis & Suburban Railway.

Evansville & Southern Indiana Traction Company, Evansville, Ind.—This company has nearly completed the work of rebuilding and improving its track between Evansville and Princeton. Considerable regrading is being done to eliminate steep grades so as to permit of faster time and it is expected to make the run to Princeton, 28 miles, in one hour.

Falkenau Construction Company, Chicago, Ill.—This company

has secured the right of way and will build an electric line from Benton Harbor to Coloma and Paw Paw Lake, Mich.

Fayetteville (N. C.) Street Railway & Power Company.—The James D. Lator Company, Washington, D. C., is preparing plans and specifications for the construction and equipment of this company's 20-mile line at Fayetteville, including a power house.

Georgia Railway & Electric Company, Atlanta, Ga.—This company has filed an amendment to its charter authorizing the building of the extension from East Point to Hapeville, Ga.

Hanover & York Street Railway, York, Pa.—A charter has been granted this company for an extension of 1½ miles in the township of Penn and the borough of Hanover, which was authorized at a meeting of the stockholders on April 20. L. C. Mayer chief engineer, York, Pa.

Indiana Columbus & Eastern Traction Company.—J. C. Carland of Toledo, O., the general contractor for the construction of the Lima-Bellefontaine line, has sublet the work to W. F. Gibson of Toledo.

Indianapolis & Louisville Traction Company, Louisville, Ky.—It is now stated that the line between Indianapolis and Louisville, which will be operated by this company, the Indianapolis Columbus & Southern Traction Company and the Louisville & Northern Railway & Lighting Company, will be opened for traffic about August 1. The Louisville & Northern is now operating as far north as Sellersburg. Between Sellersburg and Scottsburg the track is practically completed, but the power house at Scottsburg is not yet ready for operation. The construction force between Scottsburg and Seymour is to be doubled this week and the track should be completed in July. The Indianapolis & Louisville is building the line from Sellersburg to Seymour and the Indianapolis Columbus & Southern, which has a line in operation from Indianapolis to Columbus, is extending south to Seymour, 18 miles. Of this distance track has been laid and the rails bonded for seven miles south of Columbus and nearly all the grading is completed.

Ithaca & Seneca Falls Interurban Railway.—This company, which was incorporated in January, is making preparations for beginning construction in July on its proposed line from Ithaca to Seneca Falls, N. Y., 47 miles. The power station and repair shops will be located at Ithaca. Jacob Rothschild of Ithaca is president.

Kansas City St. Joseph & Excelsior Springs Electric Railway.—The city council of Kansas City, Mo., on April 25 voted a franchise to the Kansas City St. Joseph & Excelsior Springs Electric Railway for the construction of its railway, wagon and foot roadway bridge across the Missouri river at Kansas City, with a south approach on Locust street, which will serve as an entrance to the city for the company's proposed double-track line to St. Joseph and Excelsior Springs. The company was also granted franchises for the use of certain streets in order to connect the interurban tracks with those of the Metropolitan Street Railway. The company has a permit from the federal government for the construction of the bridge, with a provision that work must be started by May 16. The company has already secured the right of way for the line and is ready to begin work both on the bridge and on the roadbed at once. A contract for the four piers of the bridge was let some time ago to the Kansas City Construction Company. Plans have also been prepared for a subway under Locust street, from Fourth to Twentieth streets. Ira G. Hedrick, Kansas City, is consulting engineer.

Kansas Traction Company.—S. D. Frazier, secretary and treasurer, Coffeyville, Kan., writes that this company has been incorporated to build an electric line from Coffeyville to Lawrence, Kan., with branches from the latter point to Topeka and Kansas City, a total distance of 225 miles. The route includes Coffeyville, Parsons, Chanute, Iola, Colony, Garnett, Ottawa, Lawrence, Rosedale and Argentine. Final surveys are to be commenced by May 1 and contracts are to be let as soon as surveys are completed. It is intended to build a road of the highest type of construction for high-speed passenger, freight, mail and express service. Eighty-pound rails will be used. The power house is to be located at Coffeyville. F. E. Shirley, president, Coffeyville.

Lake Erie & Youngstown Railroad, Youngstown, O.—This company, recently incorporated to build an electric or gasoline motor railway between Conneaut, Ashtabula and Youngstown, O., has organized by electing the following officers: President, John H. Ruhlman; vice-president, George J. Chapman; second vice-president, W. F. Stanley; secretary, W. H. Ruhlman; treasurer, G. M. Brown; general counsel, A. W. Jones. Surveys have already been started.

Lake Shore Electric Railway.—This company is reballasting its entire road between Cleveland and Toledo, O., in preparation for the expected heavy summer traffic. It is announced that the Sandusky-Fremont cut-off will be ready for operation by June 1.

Louisville & Southern Indiana Traction Company, New Albany, Ind.—It is reported that this company is considering an extension from Jeffersonville to Madison, Ind., via Charlestown or Scottsburg.

Macon Americus & Albany Electric Railway, Macon, Ga.—This company, recently incorporated to build from Macon to Atlanta, Ga., has organized by electing the following officers: President, Joseph S. Davis; first vice-president, W. J. Kincaid; second vice-president, John T. Moore; secretary, N. J. Cruger; treasurer, W. J. Massee; assistant secretary and treasurer, Stuart C. Davis, and general counsel, M. Felton Hatcher. The surveying, engineering and other preliminary arrangements which have been going on as rapidly as possible for the last six months are now nearing a state of

completion and at an early date the actual construction of the railway will be begun.

Marion-Logansport Traction Company.—It is reported that this company has secured most of the right of way for its line between Marion and Logansport, Ind. J. O. Wilson of Marion is secretary of the company.

Maryland Electric Railways, Baltimore, Md.—This company, acting for the United Railways & Electric Company of Baltimore, has closed a contract with J. G. White & Co. of New York for preparing plans and supervising the work of electrifying the Baltimore & Annapolis Short Line between Baltimore and Annapolis.

Mexico Perry & Santa Fe Traction Company.—This company, which proposes to build an electric railway from Mexico to Perry, Mo., has organized by electing the following officers: President and general manager, S. L. Robinson, Belleville, Ill.; first vice-president, C. W. Gaither, St. Louis, Mo.; second vice-president, W. W. Mundy, Mexico, Mo.; third vice-president, J. D. Bates, Centralia, Ill.; secretary and treasurer, H. D. Ahlbrandt, St. Louis. It is stated that work on the line will begin shortly. The power house is to be located at Mexico.

Mineral Wells Electric Railway.—The Howard-Burke Engineering Company, Mineral Wells, Tex., has the contract for building this company's 10-mile street railway system in Mineral Wells, also car barns, power house and ice plant for the company.

Mt. Hood Railway & Power Company, Portland, Ore.—F. C. Finkle, consulting engineer, Portland, writes that construction will begin about July 1 on this proposed line from Portland to Bull Run, Ore., 25 miles, via the most direct route. Surveys are now in progress, with the first 20 miles, from Portland to Sandy, completed. Bids have been received for a power house and substation. E. P. Clark, Los Angeles, president.

Nashville Interurban Railway.—H. H. Mayberry, president, Nashville, Tenn., writes that this company's proposed line will extend from Nashville via Franklin, Spring Hill and Columbia to Mt. Pleasant, Tenn., a distance of approximately 60 miles, through an excellent territory, with a population of 45,000, exclusive of Nashville. The maximum grade will be 1½ per cent and there will be few curves, as the line is to be built for high-speed service. The Interurban Company, Patrick Hirsch, manager, 25 Broad street, New York, has the contract. The final surveys and the work of securing the right of way are expected to be completed by May 10 and May 25 has been announced as the date of beginning actual construction. The officers of the railway are: President, H. H. Mayberry; vice-president, Nat Baxter, Jr.; secretary, C. R. Cockle; treasurer, Joseph Frank, and chief engineer, D. A. Proctor, all of Nashville, where the company's offices are located in the First National Bank building.

Northwestern Ohio Electric Railway.—E. C. Bell, Toledo, O., a director of this company, writes that it is proposed to build an electric railway from Defiance to Montpelier, O., 34 miles, via Bryan and Evansport. Surveys have been made and contracts for the construction are to be let at once. Grading is to begin on May 20. President, G. A. Rigrish; chief engineer, M. Steinberg, Defiance, O.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—This company has been authorized by the city engineer of Omaha to build a double-track line on Fortieth street, from Dodge street to Cumming street, and work is to begin at once. Work is also to begin on a new line from Thirteenth to Fifteenth streets, on Davenport street.

Omaha & Nebraska Central Railway.—The contract for grading this road between Omaha and Hastings, Neb., has been let to C. D. Conover of Omaha and work is to begin at the Hastings end of the line at once.

Philadelphia & Western Railroad.—The first train was operated over this road on Saturday, April 27, from the terminal station at Sixty-third and Market streets, Philadelphia, to Strafford, Pa., 12½ miles, carrying a party of officials. The current was turned into the third rail on Thursday and it is the intention to run trains each day for the purpose of training the crews and testing the equipment. Work is now in progress on the station at Beechwood Park, a large new amusement resort, which will be opened about the time the road is completed. It is now announced that regular operation will probably be started about the last of the month.

Pittsburg & Butler Street Railway.—This new line between Pittsburg and Butler, Pa., which was described at length in the Electric Railway Review of April 27, 1907, is expected to be opened for traffic on May 2. The first car was operated over the road on April 24, carrying a party of officials.

Puget Sound Electric Railway, Tacoma, Wash.—It is reported that Stone & Webster of Boston propose to double-track this line between Tacoma and Seattle, Wash. W. S. Dimmock, manager, Tacoma.

Rockford Oregon & Southern Railway.—This company is now making a preliminary survey from Rockford to Oregon, Ill., for the proposed line which is to connect those towns with Dixon, Ill. F. G. Jones of Oregon is interested.

Rock Island Southern Railroad, Monmouth, Ill.—It has been announced that this company has decided not to build the proposed line between Rock Island and Monmouth, Ill., this summer, on account of the high prices of construction materials. The project

has not been abandoned, but will be postponed until the fall or next spring.

San Francisco Vallejo & Napa Valley Railway.—General Manager L. J. Perry, Napa, Cal., states that this extension of the Vallejo Benicia & Napa Valley Railroad from Napa to St. Helena, Cal., 18 miles, will probably be in operation by the end of summer. A shipment of 900 tons of rails is expected from the east this month and a shipment of Japanese oak ties is expected daily. Work on the grading, bridges and culverts is progressing rapidly and the poles and wires have been ordered.

Shore Line Street Railway.—This company has been organized at New Bedford, Mass., to build an electric railway to Horse Neck Beach and Westport, Mass., 13 miles. Capital stock, \$75,000. The directors are the following: Charles F. Parkerm of Woonsocket, R. I.; A. C. Ralph of Taunton; Andrew H. Sowle of Westport; B. W. Gleason of Boston; J. M. Shorrocks of Westport; Jeffers F. Richardson of Albany, N. Y.; N. L. Sheldon of Boston.

Southwest Missouri Railroad, Webb City, Mo.—Surveyors have been locating a change of route on the Lakeside Park-Carthage line north of Lakeside Park, in order to avoid two sharp curves at a crossing over the Missouri Pacific tracks. The steam road would only permit a right-angle crossing when the line was built. The new line will pass under the Missouri Pacific tracks and by straightening the line will save a considerable distance between Webb City and Carthage. A. H. Rogers, president, Webb City.

South Texas Traction Company.—James T. Sanford, J. T. Gossett, O. B. Greeves and I. D. Polk of Beaumont, Tex., are interested in the construction of an electric line from Beaumont to Port Arthur, Tex., 19½ miles, which has been surveyed by Mr. Sanford. The promoters recently made a trip of inspection over the line and it seems probable that the construction will begin at an early date.

Terre Haute Indianapolis & Eastern Traction Company, Indianapolis, Ind.—H. J. McGowan has announced that the line will be extended from Danville to Amo, Ind., as originally planned, but that instead of extending the Danville line to Brazil, where connection can be made for Terre Haute, the Plainfield line will be extended to Brazil and also connected later with the Danville line at Amo, making a loop, so that there will be two entrances to Indianapolis from Terre Haute, one via Danville and the other via Plainfield. Work has been started between Danville and Amo, seven miles, in preparing the grade for tracklaying.

Utica Southern Railroad.—The New York railroad commission has granted this company a certificate of necessity for its line from Clinton to Hamilton, Norwich and Waterville, N. Y., 26 miles. At a recent hearing it was shown that the road is generally desired by the citizens of the towns through which it will pass. Practically all of the right of way has been obtained. Frank H. Baxter of Utica, N. Y., is chief engineer.

Vincennes Washington & Eastern Traction Company, Vincennes, Ind.—This company has filed copies of a mortgage for \$1,250,000 on its property, right of way, etc., between Vincennes and Washington, Ind. W. H. Schott of Chicago is president.

West Penn Railways, Pittsburg, Pa.—A contract will soon be let for the construction of the last five miles of the Brownsville extension, from Orient to Brownsville.

Yakima Intervalley Traction Company.—This company, which proposes to build a system of electric railways radiating from North Yakima, Wash., has begun grading at that point, under the direction of E. M. Kenly, chief engineer.

POWER HOUSES AND SUBSTATIONS.

Indianapolis & Cincinnati Traction Company.—It is reported that this company is installing a 1,000-kilowatt turbine at its power house in Rushville, Ind. This will produce sufficient additional power for the operation of all the divisions of this road.

Indianapolis Columbus & Southern Traction Company has decided to build two substations, one at Columbus, Ind., and one at Redding, six miles south, and will construct an addition to the Edinburg power plant.

Kokomo Marion & Western Traction Company.—This company has recently installed a new 2,000-horsepower turbine in its power plant at Kokomo, Ind., and another of the same capacity has been ordered.

Omaha & Council Bluffs Street Railway.—It has been announced that this company has been authorized to spend about \$300,000 in improvements to its power house at Omaha, Neb. The contract for laying the new underground conduit and high-voltage cables for transmitting energy from the new plant to outlying stations has been awarded to James Jensen.

Portland (Ore.) Railway Light & Power Company.—It is stated that this company has secured a right of way for a transmission line to Salem and another right of way to the Oregon Electric Railway in order to supply the latter railway with current for operating its cars.

Tri-City Railway & Light Company, Davenport, Ia.—It is announced that work on the erection of a new substation for this company has progressed favorably and the concrete floor of the station has now been put down and machinery is being installed.

Twin City Rapid Transit Company.—This company has recently installed in its substation at College avenue and Wabasha street, St. Paul, Minn., one complete battery, consisting of two oil switches, three transformers and one rotary converter.

Personal Mention

Mr. John F. Rutherford has been elected president of the Citizens' Light & Transit Company of Pine Bluff, Ark., to succeed Mr. J. B. York, resigned.

Mr. Robert Dunbar has resigned as superintendent of the Haverhill and Salem divisions of the New Hampshire Electric Railways, Haverhill, Mass., to engage in other business.

Mr. Frank J. Doyle, whose appointment as master mechanic of the Schenectady Railway Company was noted in the Electric



Frank J. Doyle.

Railway Review for April 6, 1907, was born in Buffalo, N. Y., and received his education in the public schools of that city. In 1894 he entered the service of the General Electric Company at Schenectady, where he remained for seven years, receiving practical training in its armature, railway motor-testing and experimental third-rail track departments. In 1901 he became connected with the Schenectady Railway as instructor of motormen; was later barn foreman and more recently general foreman of the operating barns and repair shops. Upon the resignation of Mr. L. L. Smith as master mechanic, Mr. Doyle was appointed his successor and assumed the duties of this office on April 10, as previously announced.

Mr. C. C. Long, manager of the Tazewell Street Railway, has been appointed superintendent of the Accomac Traction & Power Company, organized to build a line from Ocancock to Occomac Court House, Va., with office at Ocancock. Mr. Long will also retain his position with the Tazewell Street Railway, with office at Tazewell, Va.

Mr. Edwin J. Wilcoxon, heretofore superintendent of transportation of the Rochester Railway, the Rochester & Suburban Railway and the Rochester & Sodus Bay Railway, has been appointed general superintendent of those companies, with headquarters at Rochester, N. Y. Mr. Wilcoxon was born in Seneca Falls, N. Y., on April 27, 1871, and was educated in the public schools of that city. In 1888, after completing a course in the Mynderse Academy and the Taylor Business College at Rochester, he entered the car service department of the Buffalo Rochester & Pittsburg Railway, having headquarters at Bradford, Pa., and later at Buffalo, N. Y. He was afterward given a position in the office of the superintendent, but resigned to become connected with the Wagner Palace Car Company of Buffalo, as secretary to the assistant manager.



Edwin J. Wilcoxon.

In 1896 he was appointed general passenger agent of the Geneva & Cayuga Lake Railroad. During his connection with this road it was converted from steam to electricity and it was here that he obtained his first experience in electric railway work, devoting the years 1898 and 1899 to the study of electrical operation in the company's shops and power house. In 1900 he was appointed assistant superintendent of construction of the Rochester & Sodus Bay Railway and after its completion was successively assistant superintendent and general freight and express agent. Two years later he was made general superintendent of this company, then division superintendent of the Rochester Railway and more recently superintendent of transportation, which position he has held for about a year.

Mr. F. T. Buchanan, heretofore superintendent of the railway and amusement department of the Key West (Fla.) Electric Company, has resigned, effective on May 1, and will return to his former home at Woburn, Mass., in the hope of regaining his health. He was formerly general superintendent of the Cape Breton Electric Company at Sydney, N. S., which is managed by the Stone & Webster interests of Boston, Mass., but more recently was trans-

ferred, for the benefit of his health, to the Key West property of the company. Mr. N. B. Rhoads of Savannah, Ga., has been appointed his successor.

Mr. F. J. Hanlon, whose portrait is presented herewith, is well known to the street railway circles of the middle west by reason of his long service with the Mason City & Clear Lake Railway, and by his connection with the Iowa Street and Interurban Railway Association since it was first organized. At its third annual meeting Mr. Hanlon was elected president and that his successful management during his term of office was appreciated by his associates is evidenced by his re-election as president of that body at its fourth annual meeting, held at Clinton, Ia., on April 19 and 20, 1907. Mr. Hanlon was born on August 12, 1876, and at the age of 15 years he entered the general freight department of the old Mason City & Ft. Dodge Railway, now a part of the Chicago Great Western system. After two years of service with this road he resigned to become chief clerk in the general superintendent's office of the Iowa Central Railway at Marshalltown, Ia., where he remained for four years. At this time, like other well-known managers of electric railway properties whose early experience was obtained in the service of steam roads, Mr. Hanlon became convinced of the great opportunities afforded in electric railway work, and, in 1897, resigned his position to become connected with the Mason City & Clear Lake Railway, then under construction. This road operates in Mason City and reaches Clear Lake Park, a resort about nine miles from Mason City, and under his efficient management has developed into one of the important interurban properties of the state of Iowa. In connection with his duties as vice-president and secretary Mr. Hanlon also has entire charge of the traffic department, which the rapid growth of the company's interurban freight business has recently made necessary.



F. J. Hanlon.

Mr. L. D. Mathes, who was re-elected secretary and treasurer of the Iowa Street and Interurban Railway Association at its fourth annual meeting, held at Clinton, Ia., on April 19 and 20, has held this office since the association was first organized, and has contributed in no small measure to its rapid growth from a new and necessarily small organization to its present size and standing among the street railway associations of the country. Mr. Mathes is about 35 years of age and is a native of the south. After graduating from the University of Tennessee he entered the shops of the Memphis & Charleston Railroad at Memphis, Tenn. He left this company shortly after to take up electrical work with the Edison General Electric Company (now the General Electric Company) and later with the Westinghouse Electric & Manufacturing Company, with which companies he was engaged in the construction and equipment of electric railways in various sections of the country for about five years. Deciding to familiarize himself with the details of operation he accepted a position as general foreman of the Buffalo & Niagara Falls Electric Railway, later resigning to become superintendent of the Norfolk (Va.) & Ocean View Railway, then in the hands of a receiver. During his two and one-half years of service with this company, during which he developed a considerable freight business, his successful financial policy resulted in the restoration of the road to the original owners and the placing of its finances on a sound basis. He subsequently became general superintendent of the Charleston (S. C.) & Seashore Railway, resigning at the end of a year to accept a similar position with the Norfolk & Atlantic Terminal Company, which, in addition to its freight and passenger business, also operated a line of steamers. Deciding later, however, that more important work commensurate with his wide experience in all branches of the electric railway field was afforded in the west, Mr. Mathes severed his connection with this property and is now general manager of



L. D. Mathes.

the Union Electric Company of Dubuque, Ia., which position he has held for several years.

Mr. O. D. Collins, superintendent of the Home Gas & Electric Company, Redlands, Cal., has resigned to become superintendent of the Redlands & Yucaipa Railroad at Redlands, Cal. Mr. Collins was formerly superintendent of the San Bernardino Traction Company.

Mr. N. B. Rhoads, formerly with the Savannah Electric Company at Savannah, Ga., has been appointed superintendent of the railway and amusement department of the Key West (Fla.) Electric Company, succeeding Mr. F. T. Buchanan, recently resigned on account of ill health.

Mr. Edwin E. Johnson has been appointed to the newly created position of manager of the publicity department of the Georgia Railway & Electric Company, Atlanta, Ga. Mr. Johnson is well known in newspaper circles in Atlanta, having been connected with local papers for about six years.

Mr. A. R. Whaley, superintendent of the New York division of the New York New Haven & Hartford, has resigned to accept a position with the New York Central & Hudson River as manager of the Grand Central station and general superintendent of the electric zone, succeeding Mr. I. A. McCormick.

Mr. E. W. Robertson of Columbia, S. C., has been elected president and treasurer of the Anderson Traction Company, Anderson, S. C. Mr. William Elliott, Jr., has been elected vice-president and general manager. Mr. J. A. Brock, heretofore president of the Anderson company, has resigned to devote his attention to his cotton mill interests.

Mr. Dewitt C. McMonagle has been appointed general manager of the Walkkill Transit Company, Middletown, N. Y., succeeding Mr. E. C. Folsom, who has gone to Bay City, Mich., as general superintendent of the Saginaw-Bay City Electric Railway & Light Company. Mr. William N. Gould has been appointed superintendent, succeeding Mr. J. P. Beale, who has been appointed superintendent under Mr. Folsom at Bay City.

Obituary.

L. P. Huntoon of Ft. Wayne, Ind., died in that city on April 16. He had been connected with railway engineering work in the central states for several years and at the time of his death was chief engineer of the Ft. Wayne & South Bend Railway.

Thomas Whinston Peoples, formerly for many years chief engineer of the Manhattan Elevated Railway, New York, died at his home in East Orange, N. J., on Saturday, April 28, after a brief illness, aged 77 years. He was born in Harrisburg in 1830 and at the early age of nine years entered the shops of the Pennsylvania Railroad, where he remained until his appointment 12 years later as master mechanic of the Harrisburg division of the road. At the opening of the civil war he organized a company of volunteers from among his railroad associates and accompanied it to the front.

David Willcox of New York, N. Y., who resigned on April 9 as president of the Delaware & Hudson Company, committed suicide on April 24 on board the North German Lloyd steamship Barbarossa, while returning from a trip abroad for his health. Mr. Willcox was also president of two prominent electric railway companies controlled by the Delaware & Hudson Company, the United Traction Company of Albany, N. Y., and the Hudson Valley Railway of Glens Falls, N. Y. He was succeeded as president of the Delaware & Hudson by Mr. L. F. Loree, formerly president of the Baltimore & Ohio and the Chicago Rock Island & Pacific railways.

Electric Railways in New Jersey for 1906.

The annual statement of the New Jersey state board of assessors for the year 1906 shows an increase in the gross receipts of the 68 companies reporting, of \$2,471,815 over the previous year. The aggregate figures of all the companies reporting show the following: Trackage, 1,060.982 miles; capitalization, \$98,377,860; funded debt, \$97,152,087; other debts, \$28,132,749; cost of roads and equipment, \$178,420,733; cost of repairs and operation, \$7,289,409; gross receipts, \$12,209,733. Only nine of the 68 companies which filed reports paid dividends last year, the total payments under this item amounting to \$885,890. The tax is based on the gross receipts of each company. Under the Voorhees franchise tax law the tax was 2 per cent, but under the act of 1906 the amount is increased one-half of 1 per cent each year until it reaches 5 per cent in 1912. Thereafter it is to remain at that figure. This year the total tax in the state will be \$305,243.

Service on Ft. Dodge Des Moines & Southern.

J. L. Blake, manager of the Ft. Dodge Des Moines & Southern Electric Railway has completed the preliminary schedule for the interurban service on the new line. The Boone-Des Moines line will be in operation during the first week in June, the Ames-Des Moines service will start about July 1 and the Ft. Dodge-Des Moines service about August 1. In the Boone-Des Moines service cars will leave Boone and Des Moines every hour and 50 minutes, starting at 6:55 in the morning and continuing until 11:30 at night. The Ames-Des Moines service will consist of cars leaving each town about every hour and 30 minutes between 6:55 a. m. and 11:30 p. m. It is expected to have cars leave Ft. Dodge and Des Moines every two hours. The Boone and Ames services will be kept separate, that is, cars will run direct from Boone to Des Moines and return and from Ames to Des Moines and return. This will make double service between Des Moines and the junction where the Boone and Ames lines meet. At present 2 cents per mile will be charged on one-way tickets, but a rate of 1½ cents will be made on round trip tickets. Mileage books will be sold at a lower rate.

Financial News

Berkshire (Mass.) Street Railway.—Authority has been given to this company by the Massachusetts railroad commission to issue \$250,000 additional capital stock, which will be offered to stockholders at \$100 a share. The proceeds will be used for retiring floating debt and for the purchase of additional property.

Cleveland Southwestern & Columbus Railway, Cleveland.—This company has filed a mortgage securing the issue of \$10,000,000 of 5 per cent bonds. The Cleveland Trust Company is trustee.

Columbus (O.) Railway & Light Company.—David E. Putnam, vice-president of the Commercial National Bank of Columbus, has been elected a director to succeed Charles H. Lindenberg, resigned.

Consolidated Railway Company, New Haven, Conn.—It is announced that about \$12,000,000 of the \$21,000,000 outstanding 4 per cent debenture bonds have been exchanged for the stock of the New York New Haven & Hartford Railroad Company. The property owned by the Consolidated company, it is stated, will be formally acquired by the New York New Haven & Hartford road.

Detroit United Railway.—Earnings of this company for the three months ended March 31, with comparisons, are as follows:

Quarter ended March 31—	*1907.	*1906.	1905.
Gross earnings	\$1,437,727	\$1,235,164	\$1,048,018
Expenss and taxes	941,542	760,084	676,453
Net earnings	\$ 496,185	\$ 475,080	\$ 371,565
Other income	13,624	11,285	12,077
Total	\$ 509,809	\$ 486,365	\$ 383,642
Fixed charges	332,677	288,314	276,693
Surplus	\$ 177,132	\$ 198,051	\$ 106,949

*Figures for 1907 and 1906 include operations of the Rapid Railway System, the Sandwich Windsor & Amherstburg Railway and the Detroit Monroe & Toledo Short Line Railway.

Duquoin (Ill.) Belleville & St. Louis Electric Railway.—This company has given a mortgage to the Carnegie Trust Company of New York, as trustee, to secure an issue of \$2,000,000 of 20-year 5 per cent bonds, dated February 1, 1907.

International Railway System, Buffalo.—The earnings for the quarter ended March 31 were as follows:

Quarter ended March 31—	1907.	1906.	1905.
Gross earnings	\$1,173,170	\$1,065,546	\$933,169
Operating expenses	764,831	686,609	589,748
Net earnings	\$ 408,339	\$ 378,937	\$343,421
Other income			13,064
Total	\$ 408,339	\$ 378,937	\$356,485
Fixed charges	295,054	285,430	402,828
Surplus	\$ 113,285	\$ 93,507	*\$46,343

*Deficit.

Eastern Ohio Traction Company, Cleveland.—An order permitting the sale of the property of this company was entered by Judge Ford in the common pleas court at Cleveland on April 30.

Ft. Wayne & Wabash Valley Traction Company, Ft. Wayne, Ind.—Hugh J. McGowan of Indianapolis has been elected second vice-president to succeed W. Kelsey Schoepf of Cincinnati. Other officers were elected as follows: President, J. Levering Jones of Philadelphia; first vice-president, Charles Murdock of Lafayette, Ind.; secretary, S. B. Fleming, Ft. Wayne, and treasurer, H. C. Paul, Ft. Wayne. The officers, together with Randal Morgan, Bayard Henry and H. H. Kingston of Philadelphia, form the board of directors.

Kenosha (Wis.) Electric Railway Company.—This company has increased its capital stock from \$150,000 to \$1,000,000.

La Crosse (Wis.) City Railway Company.—This company has increased its capital stock from \$250,000 to \$500,000.

Lewiston (Me.) Augusta & Waterville Street Railroad.—This company has purchased control of the Augusta Winthrop & Gardiner Railway of Augusta, Me., and is negotiating for the purchase of control of the Lewiston Brunswick & Bath Street Railway.

London (Ont.) Street Railway Company.—It is reported that negotiations are under way for the purchase of this company by the city of London. The property is controlled by the Everett-Moore syndicate. The London company has \$550,000 capital stock and \$500,000 bonds outstanding, and operates 33½ miles of road. It controls the Springbank Park Railway and Springbank park.

Memphis (Tenn.) Street Railway.—The earnings for 1906, with comparisons, were as follows:

	1906.	1905.	1904.
Gross	\$1,428,931	\$1,114,022	\$979,513
Expenses and taxes.....	838,227	578,289	483,781
Net	\$ 590,708	\$ 535,733	\$495,732
Interest, etc.	372,783	349,154	311,451
Surplus	\$ 217,925	\$ 186,579	\$184,281

After allowing for the 5 per cent dividend on the \$2,500,000 preferred stock, the balance of surplus shows 3.72 per cent earned on the \$2,500,000 common stock outstanding.

Milwaukee Northern Railway Company.—This company has given a trust deed to the Fidelity Trust Company of Milwaukee to secure an issue of \$4,000,000 bonds, maturing in 30 years. The road is projected from Milwaukee to Sheboygan and Fond du Lac, and construction is now in progress between Milwaukee and Port Washington.

Northern Ohio Traction & Light Company, Akron, O.—Earnings for the three months ended March 31 compare as follows:

Quarter ended March 31—	1907.	1906.	Increase.
Gross earnings	\$375,882	\$334,607	\$41,275
Operating expenses	235,506	224,371	11,135
Net earnings	\$140,376	\$110,236	\$30,140
Fixed charges	124,029	119,841	4,188
Surplus	\$ 16,347	*\$ 9,605	\$25,952

*Deficit.

Philadelphia Company, Pittsburg.—Earnings of the company for the three months ended March 31 were as follows: Gross earnings from operators, \$5,102,113.89; expenses and taxes, \$2,947,214.74; net earnings from operations, \$2,154,899.15; miscellaneous income, \$89,077.71; total earnings and income, \$2,243,976.86; fixed charges, \$1,072,574.82; balance, \$1,171,402.04; dividend on preferred stock, \$75,000; surplus, \$1,096,402.04; proportion due to other owners of common stock of affiliated corporations, \$13,012.92; available for Philadelphia Company, \$1,083,389.12.

Philadelphia Rapid Transit Company.—The recent call of \$5.00 per share upon the capital stock will net \$3,000,000 approximately. Upon payment of the present call a total of \$21,000,000 will have been paid in on the 600,000 shares of the company. Each assessment since organization of the company has been \$5.00 per share. The various dates upon which they have been made are given below:

Date of call—	Total assessment.
July, 1902	\$3,000,000
July, 1903	3,000,000
January, 1904	3,000,000
January, 1905	3,000,000
July, 1906	3,000,000
December, 1906	3,000,000
April, 1907	3,000,000
	\$21,000,000

Portland (Ore.) Railway Light & Power Company.—This company has given a mortgage to the Trust Company of North America of Philadelphia, as trustee, to secure an issue of \$15,000,000 general mortgage bonds, of which \$1,500,000 will be issued at present. The \$1,500,000 bonds will be used as collateral security for an issue of \$1,000,000 of 3-year 5 per cent notes dated March 1, 1907.

Rochester Corning & Elmira Traction Company.—This company, which has been given authority by the New York railroad commission to construct a road from Rochester to Elmira, has asked the commission for authority to issue \$8,000,000 first mortgage bonds.

Twin City Rapid Transit Company, Minneapolis.—Earnings for the quarter ended March 31, with comparisons, were as follows:

Quarter ended March 31—	1907.	1906.	1905.
Gross earnings	\$1,355,941	\$1,206,500	\$1,034,303
Operating expenses	694,296	592,418	518,361
Net earnings	\$ 661,645	\$ 614,082	\$ 515,942
Charges, taxes, etc.	345,775	329,125	291,975
Surplus	\$ 315,870	\$ 284,957	\$ 223,967

United Railroads of San Francisco.—Ernst Thalmann of New York, president of the United Railways Investment Company, which controls the United Railroads of San Francisco, denies that it is proposed to sell the San Francisco properties.

West Penn Railways Company, Pittsburg.—The report for the year ended March 31, 1907, compares as follows:

	1907.	1906.	1905.
Gross earnings	\$1,449,408	\$1,116,333	\$934,917
Expenses and taxes.....	806,515	600,535	522,645
Net earnings.....	\$ 642,893	\$ 515,798	\$412,272
*Charges	382,596	326,675	325,625
Balance	\$ 260,297	\$ 189,123	\$ 86,647
Dividends	137,500	137,500	.....
Surplus	\$ 122,797	\$ 51,623	\$ 86,647

*Charges include subsidiary company's charges and interest on West Penn Railways Company bonds.

Dividends Declared.

Ohio Traction Company, Cincinnati, preferred, quarterly, 1½ per cent.
 Union Street Railway Company, New Bedford, Mass., quarterly, 2 per cent.

Manufactures and Supplies

ROLLING STOCK.

Topeka Railway, Topeka, Kan., will soon purchase eight new cars.

Cincinnati Georgetown & Portsmouth Railroad, Cincinnati, O., is in the market for 10 new cars.

Louisville & Eastern Railroad, Louisville, Ky., is in the market for new equipment on one work car.

Jacksonville Electric Company, Jacksonville, Fla., has ordered eight additional cars for delivery by July 1.

Danville Car Company, Danville, Ill., has contracted with A. S. Partridge for rebuilding twelve 12-bench open cars.

Indiana County Railways Company, Indiana, Pa., is in the market for four 50-foot double-truck cars and one gravel car.

Bellaire Southwestern Traction Company, Bellaire, O., recently purchased five semi-convertible cars from The J. G. Brill Company.

Nashville Interurban Railway, Nashville, Tenn., is reported to be placing orders for a number of interurban cars, a chair car and dining car.

Chicago & Milwaukee Electric Railroad, Chicago, has ordered two switching locomotives of the 0-6-0 type, with cylinders 17 by 24 inches, from Hicks Locomotive & Car Works.

Portland Railway Light & Power Company, Portland, Ore., is reported to have placed an order for 40 flat cars of 60,000 pounds capacity with the American Car & Foundry Company.

Anaconda Copper Mining Company, Anaconda, Mont., is in the market for one motor car, to be equipped with four 50-horse-power motors and to weigh approximately 60,000 pounds.

Tampa Electric Company, Tampa, Fla., has ordered twelve 12-bench open cars from The J. G. Brill Company. These are double-truck cars and will be equipped with two GE-67 motors.

Amarillo Street Railway, Amarillo, Tex., has placed an order with the Danville Car Company for four 22-foot car bodies, to be equipped with Brill 21-E trucks. The cars are for August delivery.

Illinois Traction System, Champaign, Ill., has placed an order with the American Car & Foundry Company for six motor express cars, 20 trailers for express service and four refrigerator cars. This road has also placed an order with the Niles Car & Manufacturing Company for two cars.

Pennsylvania Railroad has placed an order for 200 all-steel passenger cars as follows: With the American Car & Foundry Company, 90 coaches, 75 feet in length; with the Pressed Steel Car Company for 60 coaches, 75 feet long, 20 baggage and 5 combination cars 60 feet in length, and with the Altoona shops of the company for 25 coaches, to be 75 feet in length.

SHOPS AND BUILDINGS.

Detroit United Railway.—This company is said to be preparing plans for a new terminal station in Highland Park, on North Woodward avenue, on property purchased three years ago.

Indiana Columbus & Eastern Traction Company.—It is reported that this company has secured an option on property at Wayne and Second streets, Defiance, O., and will purchase it for a site for an interurban passenger station.

International Railway, Buffalo, N. Y.—This company has begun work on the new car house on Broadway, east of Bailey avenue, Buffalo, the preliminary plans for which were announced in the Electric Railway Review of March 16, 1907. The new car house will be of concrete and steel construction, 561 feet long and 148 feet deep, and will accommodate 108 46-foot cars. The storage yard along the south side of the building will accommodate 135 46-foot cars. Work is also to be started soon on the remodeling of the Hertel avenue barns. New tracks are to be constructed which will give a total storage capacity of 250 cars.

Interstate Traction Company, Duluth, Minn.—It is reported that this company will erect a car house to cost about \$10,000. O. C. Hartman, general manager.

Portland Railway Light & Power Company.—F. I. Fuller, vice-president, writes that the plans for the new terminal station and office building to be erected at Portland, Ore., are not yet fully prepared and consequently no details are available at the present time. The general plan is for a building which will include a steam-heating plant, distributing and transformer station, union depot for suburban lines, with waiting rooms and accessories, the offices of the company and several floors for general office purposes. The building will be 200 by 200 feet and probably six or seven stories in height.

St. Louis Electric Terminal Railway.—This company, which is securing terminal facilities in St. Louis for the Illinois Traction Company, which soon proposes to build a bridge across the Mississippi river from Venice, has completed the purchase of the property at the northeast corner of Twelfth street and Lucas avenue, with a 160-foot frontage, for its terminal station. The site will be used

for car sheds, waiting rooms, offices and a depot for handling freight and express. R. D. Smith, manager, St. Louis.

Toledo Railways & Light Company.—The city council has refused to grant a permit for the tracks required for the proposed interurban terminal station on Huron and Superior streets.

United Railways & Electric Company, Baltimore, Md.—This company has commissioned Baldwin & Pennington, architects, Baltimore, to prepare plans and specifications for a car barn, to be erected at the corner of Fulton and Druid Hill avenues, Baltimore; one story, 576 feet frontage, reinforced concrete construction, sprinkler system, metal frames and sashes, electric wiring and fixtures, sanitary plumbing, heating system, steel rolling doors.

Utica & Mohawk Valley Railway, Utica, N. Y.—Plans are being considered for the erection of an express depot and storehouse at the corner of Broadway and Lafayette streets.

Washington Baltimore & Annapolis Railway.—This company has commissioned Simonson & Pietsch, architects, Baltimore, to prepare plans and specifications for a railway station, to be erected at the corner of Park avenue and Liberty and Marion streets, Baltimore; two stories, 75 by 100 feet, brick with stone and ornamental terra cotta trimmings, electric wiring and fixtures, sanitary plumbing, heating system.

TRADE NOTES.

Pressed Steel Car Company has declared its regular quarterly dividend of 1 3/4 per cent on its preferred stock, payable on May 22.

Nathan C. Grover, formerly assistant chief hydrographer of the United States geological survey, has been appointed assistant hydraulic engineer of J. G. White & Co., New York.

Seattle Frog & Switch Company, Seattle, Wash., has been incorporated in the state of Washington with a capital stock of \$20,000 by Martin J. Henehan and James McDonough.

Warren Electrical Manufacturing Company, Sandusky, O., is in the market for about \$8,000 worth of machine tools, including a boring mill, radial drill, grinders, 35-inch lathe and a shaper.

Electric Storage Battery Company, Philadelphia, announces the removal of its sales office from Oakland, Cal., to 11 Hawthorne street, San Francisco, Cal., where it will occupy temporary quarters.

Blake Signal & Manufacturing Company, 246 Summer street, Boston, announces that it has appointed the Erner & Hopkins Company of Columbus, O., agents in the state of Ohio for the sale of its Blake tube flux.

Northern Engineering Works, builder of cranes, Detroit, Mich., has furnished the plant of the Edison Sault Electric Company, Sault Ste. Marie, Mich., with a second 15-ton alternating-current electric traveling Northern crane.

C. W. J. Neville, formerly engineer for the Expanded Metal Fireproofing Company, has been appointed manager of the southern district of the General Fireproofing Company of Youngstown, O., with headquarters at 409 Hennen building, New Orleans, La.

Railway Traction Construction Company, New York, has been incorporated with an authorized capital stock of \$100,000 to do a general contracting business. The incorporators are: Robert Gerbracht, Jr., 85 Taylor street; Martin A. Schenck, 50 Willow street, both of Brooklyn, and Kenneth R. Shand, Montclair, N. J.

The J. G. Brill Company, Philadelphia, which, as reported in the Electric Railway Review of April 13, lost its foundry building, located at Sixtieth street and Woodland avenue, Philadelphia, has awarded the contract to Henry E. Baton for the erection of a new building at that place. It will have ground dimensions of 109 by 240 feet and will be a steel frame and galvanized iron structure.

Indianapolis Switch & Frog Company, Springfield, O., lost by fire on April 23 the main building of its machine shop. This building, which was 400 by 225 feet, will be rebuilt at once as a fire-proof structure. The company has made arrangements to finish all unfilled orders and will, upon the completion of its new building, install new machinery and facilities, resuming operations on a much larger scale.

C. C. Long, general manager of the Tazewell Street Railway Company, Tazewell, Va., who has also been appointed superintendent of the Accomac Traction & Power Company, with offices at Onancock, Va., desires to have manufacturers of street railway equipment and appliances send him advertising literature. The Accomac Traction & Power Company has recently been organized to build a line from Accomac to Onancock.

Allison, Campion, McClellan Company, successors to the John W. Allison Company, has been organized to engage in general engineering work, with offices at 1623 Land Title building, Philadelphia, and 205 West Street building, New York. The members of the company are: H. T. Camplon, William McClellan and H. N. Twells. The company announces that it is prepared to carry a project through the periods of design, construction and successful operation.

National Railway Equipment Company, 1 Exchange place, Jersey City, N. J., has been incorporated under the laws of New Jersey, with a capital stock of \$10,000, for the purpose of manufacturing passenger and freight cars for steam roads and street cars for electric railways, all kinds of steel castings, journals, bearings, air

brakes and safety appliances. The incorporators are: Charles R. Barnes of Rochester, N. Y., and P. Anthony Brock and Howard C. Griffith of Jersey City.

Atha Steel Casting Company of Newark, N. J., manufacturer of railway steel castings, has recently opened several branch sales offices. An office has been opened in the Board of Trade building, Boston, in charge of George T. Paraschos as New England sales agent. R. N. Barrows, southern sales agent, is in charge of the Richmond, Va., office, located in the American National Bank building, and C. W. Gennet, Jr., is western sales agent, with offices in the New York Life building, Chicago.

J. M. Carpenter Tap & Die Company, Pawtucket, R. I., has commenced work on a new factory building that will add 24,000 square feet of floor space to its present plant. It will be a brick fireproof structure and will increase its manufacturing facilities 75 per cent. This company, whose products have been standard for nearly half a century, is the pioneer machine screw tap maker in this country, and upon completion of its new building will be in a position to serve its patrons promptly.

J. H. Wagenhorst & Co., Youngstown, O., manufacturers of the Wagenhorst electric blue-printing machine, announce a partial list of recent sales as follows: S. M. Green, Holyoke, Mass.; Monongahela River Consolidated Coal & Coke Company, Pittsburg; George S. Mills, Toledo, O.; Eugene Dietzgen Company, New York; Babcock & Wilcox, Barberton, O.; J. W. Gaddis, Vincennes, Ind.; Multicolor Copying Company, Detroit, Mich.; American Steel & Wire Company, Joliet, Ill.; Thomson Stationery Company, Vancouver, B. C.

James Ohlen & Sons Saw Manufacturing Company, Columbus, O., is building an addition to its plant, 125 by 140 feet, to be two stories in height and of fireproof construction. It will be equipped with new machinery for the manufacture of band and cross-cut saws. The demand for saws manufactured by this company has been rapidly increasing and the company is now contemplating the erection of additional buildings during the coming year for the purpose of providing more floor space to be devoted to the manufacture of band saws.

Paterson Brass Foundry has been incorporated under the laws of the state of New Jersey, with a capital stock of \$25,000, as manufacturer and furnisher of brass castings for general use and mixers of metals for special requirements, including brass, bronze, babbitt, composition and aluminum. The castings works and general office will be located at 42 Van Houten street, Paterson, N. J., and the New York office at 10 Wall street. The officers of the company are: President, P. O. Dixon; vice-president and general manager, Samuel Hart; secretary and treasurer, O. O. Dixon.

Bidwell Electric Company, 133-139 South Clinton street, Chicago, has purchased property at Chicago Heights, Ill., upon which it proposes to erect a new plant. The main building will be 80 by 500 feet, equipped with a 15-ton electric traveling crane and in which new machinery will be installed. An office building and a large blacksmith and forge shop will also be erected. In addition to this the company will erect in the near future another building, approximately 150 by 500 feet, and will also equip it with new machinery suitable for the manufacture of electric machinery and supplies.

General Electric Company, Schenectady, announces that its San Francisco office is now permanently located in the Union Trust building, San Francisco, Cal. The company has recently received an order from the Chicago City Railway for 1,200 direct-current railway motors with controlling apparatus, to be used for the operation of 300 new cars. Power for the new rolling stock will be supplied by additional electrical generating machinery aggregating 6,000 horsepower. Each car will be equipped with four motors of 40-horsepower capacity each, this size of motor being the standard for urban railways.

Allis-Chalmers Company, Milwaukee, during the month of March received more contracts for turbo-generator units than for any similar period since the building of turbines was begun by the company. As a result of this increased volume of business every effort is being put forth by the company to insure prompt delivery. Some of the orders received for turbo-alternator units include the following: Virginia Passenger & Power Company, Richmond, Va., one of 3,250 kilowatts capacity; Citizens' Light Heat & Power Company, Johnstown, Pa., one of 1,000 kilowatts capacity; Delaware Lackawanna & Western, one turbine unit of 2,000 kilowatts capacity for the Hampton Collieries, Scranton, Pa.

Silliker Car Works, Limited, Halifax, N. S., which has been incorporated with a capital stock of \$500,000 for the purpose of manufacturing street cars, has prepared plans for the erection of the following buildings: Woodworking shop, 75 by 200 feet, with dry kiln, paint shop and warehouse; car shop, 80 by 160 feet; machine shop, 75 by 150 feet; blacksmith shop, 75 by 125 feet; molding shop, 75 by 200 feet; erecting shop, 100 by 300 feet, and a central power house. These buildings will be equipped with modern tools and all machinery will be motor driven. As reported in the Electric Railway Review of March 16, the plant will be erected on a site of 25 acres recently purchased in Halifax, and will cost when completed about \$200,000.

Westinghouse Machine Company, Pittsburg, completed its third fiscal year on March 31 as a regular business organization marketing and selling its own product. Until 1904 the Westinghouse Machine Company was a manufacturing concern, its product being made for another company. It is interesting to note that during the last three years the business of the company has been trebled in orders and output. Many additions to the plant have been made and the manufacturing facilities have been repeatedly increased

to meet the growing demands for its product. The greatest impetus to the company's business was given when the Westinghouse-Parsons steam turbine was placed upon the market and when the company entered upon the manufacture of gas engines in large units. The orders which the company has secured during the first three months of the present year exceeded by far the aggregate of the business for the same period of last year and there is every indication that the Westinghouse Machine Company's business during 1907 will show a steady increase.

Underfeed Stoker Company of America, manufacturer of the Jones stoker, Marquette building, Chicago, desires to announce the appointment of Paul M. Chamberlain, M. E., as chief engineer. Mr. Chamberlain was graduated in engineering at the Michigan Agricultural College in 1888 and at Cornell University in 1890. After several years spent in practical work with the Brown Hoisting & Machinery Company of Cleveland, O.; the Frick Company, engineers, of Waynesboro, Pa., and the Hercules Iron Works of Aurora, Ill., he accepted the assistant professorship of mechanical engineering at the Michigan Agricultural College. At the opening of the Lewis Institute in Chicago he took charge of the engineering work and brought it up to its well-known degree of excellence. During his connection with the Lewis Institute he carried on much consulting and testing work, with special reference to power production. For the last year he has devoted his time to consulting work in Los Angeles, Cal., from where he comes to accept his present position. Mr. Chamberlain is a member of the American Society of Mechanical Engineers, also of the American Society for the Advancement of Science. His wide experience in both the practical and theoretical sides of his profession qualifies him in every respect to fill his new position with great credit, and, because of his wide acquaintance in the engineering fraternity the Underfeed Stoker Company considers him a valuable acquisition to its working force.

Heine Safety Boiler Company, St. Louis, Mo., reports the following recent sales: Asano Cement Company, Tokio, Japan, four boilers, aggregating 900 horsepower; Atlantic Gulf & Pacific Company, four 200-horsepower boilers for two hydraulic dredges, fifth order; American La France Fire Engine Company, Elmira, N. Y., two 230-horsepower boilers; American Locomotive Company, Richmond, Va., four 400-horsepower boilers; Bridgeport (Conn.) Forge Company, three 250-horsepower boilers; Crown Cotton Mills, Dalton, Ga., two 400-horsepower boilers; Home Brewery, Columbus, O., three 200-horsepower boilers; Hudson Companies, two 316-horsepower boilers, making a total to this company of 4,513 horsepower on 11 orders; Independence (Kan.) Cement Company, three 400-horsepower boilers, second order; James S. Kirk & Co., Chicago, two 500-horsepower boilers; Joseph J. Little building, New York, three 275-horsepower boilers; Quincy Horse Railway & Carrying Company, Quincy, Ill., three 316-horsepower boilers; City of New York for Ridgewood pumping station, eight 300-horsepower boilers; Pueblo & Suburban Traction & Lighting Company, Pueblo, Colo., one 378-horsepower boiler; Denver (Colo.) Gas & Electric Company, three 524-horsepower boilers; Texas Company, Beaumont, Tex., thirty-two 200-horsepower boilers for eight pipe-line oil-pumping stations in Texas; Victor Talking Machine Company, Camden, N. J., two 316 and two 270 horsepower boilers; Warren (R. I.) Manufacturing Company, one 323-horsepower boiler, making a total of 2,881 horsepower on six orders; Willamette Pulp & Paper Company, Oregon City, Ore., one 250 and two 366 horsepower boilers, third order; United States navy department, for Norfolk Navy Yard, two 428-horsepower boilers and four 350-horsepower boilers; United States navy department, for Charleston Navy Yard, through Muralt & Co., New York, four 350-horsepower boilers; Philadelphia House of Refuge, Glens Mills, Pa., four 250-horsepower boilers.

ADVERTISING LITERATURE.

Allis-Chalmers Company, Milwaukee, Wis.—Construction Book No. 5009 contains directions for the installation and operation of Allis-Chalmers direct-current motors and generators, type "K."

W. N. Matthews & Brother, St. Louis, Mo.—A conveniently arranged catalogue, well printed in two colors, gives the net prices on the line of electric specialties handled by this company. The line includes the Stonbaugh guy anchor, Kearney cable clamp, which was described in the Electric Railway Review of April 27, 1907, Lima jack box and plug and other well-known devices.

Massachusetts Chemical Company, Walpole, Mass.—A substantial catalogue, arranged in loose-leaf style for future additions, has been issued to describe the long line of insulating materials manufactured by this company. The company advocates the liquid and heat method of impregnating armature and field coils and offers a comparative treatise of that method of impregnation, as compared with the vacuum impregnation system.

Indestructible Fibre Company, 45 Broadway, New York, N. Y.—Wendell & MacDuffie, 26 Cortlandt street, New York, sole selling agents for this company, have just issued a 4-page pamphlet describing the material manufactured by it for car headlinings and marine work. There are three grades made up in various qualities for these classes of work and sold under the trade names of Durite, Fibrite and Kantlite.

Western Electric Company, Hawthorne, Ill.—Bulletin No. 4007 is devoted to the line of fan motors manufactured by this company. It shows the good things included in the 1906 line and embodies descriptions of motors, showing a number of new points of construction. The line includes alternating-current and direct-current wall bracket and desk fans; ceiling fans, for both alternating and direct current, the Hawthorne Universal fan and a number of fan-motor accessories.

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Failure on the part of the public to appreciate the difficulties which continually harass operating officials of electric railways is responsible for much of the unwarranted criticism of companies that is current in large cities. In places where unjustified criticism prevails it might be advisable for companies to give the fullest

publicity to the rules which have been formed as a result of the experience of many years to lead conductors, motormen and other employes to treat the public with courtesy and to do all in their power to prevent accidents. People who are not familiar with the inner workings of street railways do not always realize that stringent rules exist to prevent inconvenience to the public, and that if all rules were followed at all times, many happenings which are now the cause of complaint would never occur. Such rules as directly affect the relations of employes with patrons could be brought to public attention in different ways. The daily newspapers might consider the information of sufficient interest to justify publication. It is doubtful if anyone could read thoughtfully the rules of the Denver City Tramway Company, which are referred to on another page of this issue, without feeling convinced that this representative company is doing all it can to assure the safety and comfort of those who travel on its lines.

On some interurban railways, and especially those built more than five years ago, the duties of the substation attendants include only the operation of the rotary converters and their auxiliary machinery. Unless a substation attendant has, as a part of his work, some duties other than these, he must be idle a large portion of his time. It frequently is the practice to have a substation inspector or repair man who may be called upon by substation attendants to put in operating condition damaged apparatus in any station. The Pacific Electric Railway, Los Angeles, Cal., with a view to economy and to the keeping of its employes interested in their work, hires for its sub-

station operation only men who are competent or can soon learn to repair any of the apparatus in the substations. The employes in each substation are held responsible for the good operating condition of their equipment, and additional help is called for only when time is an important element. This practice seems to appeal to the employes, as is shown by their desire not only to learn to operate the apparatus so that it will give the least trouble, but to know its constructional details so that they can make the repairs in the cheapest and best way. There is also the additional and very desirable feature that the attendant's time is more fully occupied and he therefore does not become anxious to leave substation work.

The cars of the San Francisco Oakland & San Jose Railway, known as the "Key Route," are of the large interurban type, but differ from the more usual high-speed car in that the platforms are longer and the steps wider. This change of design was required on account of the quick loading and unloading necessary at the ferry terminal common for all of the radiating lines. The schedules are arranged so that trains from each of the several lines arrive at the ferry terminal at about the same time, meeting there one of the company's large ferry boats which transfer the passengers across the bay between Oakland and San Francisco. Directly after a boat has left for San Francisco another lands its passengers coming from across the bay, and it is necessary quickly to reload the same trains. As a means of lessening the accidents, which it is well recognized occur most frequently at the steps, incandescent lamps are used to illuminate the grab handles and the steps. One 16-candle-power lamp with a reflector is supported above the door. The second lamp is placed under the supporting framework of the stanchion which divides the length of the steps in half. The bulb is thus protected from injury and illuminates the steps and the ground near the car. It has been found that this special illumination is highly appreciated by pas-

Publicity for Rules of Operation.

Lamps over Car Steps.

Keeping Busy in Substations.

sengers, as it affords on dark and rainy nights a well-lighted area on the street surface within which they may alight. The commendation from the public, together with the tendency of well-lighted steps and platforms to prevent accidents, should warrant consideration of this simple scheme not only for other interurban roads, but for cars operating in suburban and city service.

LABOR CONDITIONS IN SAN FRANCISCO.

After firmly refusing to grant the very extraordinary and seemingly unwarranted demands of the labor unions the United Railroads of San Francisco now faces a very serious strike condition. The management has announced that it will no longer recognize the unions and will attempt to operate its cars peaceably; but that if this is not possible the rights of the company will be defended by force. Much credit is due the management of the United Railroads for the firm stand it has taken against the exorbitant demands of the unions.

The various controversies between the labor organizations and the United Railroads led to the appointment on September 18, 1906, of a board of arbitration. The board considered the grievances of the several unions separately and listened to a very considerable amount of testimony. The hearing was commenced on October 31, 1906, and was not completed until January 9, 1907. As the result of the evidence presented, both by the unions and by the railway company, the arbitrators made the following awards, effective September 6, 1906, to May 1, 1907: Armature winders and electrical machinists to receive \$4.00 per day; station operators, \$96, \$102 and \$108 per month; dynamo tenders, \$2.50 per day; linemen, \$4.00 per day; car barn and truck men, \$100 and \$85 per month. Except in the case of the station operators, eight hours was defined as a day's work and the men working overtime were to receive time and a half up to 12 o'clock midnight, and double-time wages after midnight. Work on holidays was to be paid for at double-time rates. In the case of the station firemen an 8-hour day was decided upon and water-tenders and wipers were to receive \$3.00 and \$2.50 per day, respectively. The grievances of the street railway construction men, whose union included those engaged in track work, were adjusted by awarding day laborers \$2.25 per day during the first month of their employment and \$2.50 per day afterward; pavers, \$3.50 per day, and night watchmen, \$2.50 per day. In each of the classes of workmen just referred to, all three arbitrators concurred, but in the case of the members of the street railway and electric employes' organization, which demanded an 8-hour day and a flat wage of \$3.00 for the platform men, with a proportionate advance amounting to 40 per cent for all other employes who were members of the union, the board disagreed.

Briefly stated, the award of the majority of the board, which was binding for the period between September 6, 1906, and May 1, 1907, was as follows: Platform men were to be paid at the rate of 31 cents per hour, with 37.2 cents per hour for overtime during the first year; the same employes were to receive 32 cents per hour, and 38.4 cents per hour for overtime during the second year; for the third and following years of service the same employes were to receive 33 cents per hour and for overtime 39.6 cents per hour. No changes were made in the existing arrangements based on the 10-hour division of the day. These agreements as to wages and hours terminated on May 1, 1907, and the unions again demand from the United Railroads of San Francisco an 8-hour day and a flat wage of \$3.00 for all platform men.

The testimony before the board of arbitration which temporarily settled the last dispute brought out several interesting facts. It will be remembered that there were two questions, which, as regards the operation of the road, were to be considered by the board: (1) The employes' claim that the work required of them had very materially increased since

the fire of April, 1906; (2) the earlier mentioned demand for a day of eight hours and a wage of \$3.00.

In reply to the first claim Mr. E. D. Hibbs, general superintendent of the United Railroads, introduced in his testimony some interesting statistics comparing conditions before and after the earthquake. During the period from March, 1906, to July, 1906, the trackage had been reduced from 257 to 182 miles, a reduction of about 29 per cent. The track destroyed, however, represented the lines most heavily traveled. In March, 1906, the number of passengers per car-mile was 10.69, while after the earthquake, in July of the same year, the average was 12.42 passengers per car-mile, or an increase of 1.73 passengers. This increase of an average of less than two passengers per car-mile undoubtedly afforded a strong argument against the claim of the employes that their work had been much more severe since the fire.

Comparing still further the conditions before and after the fire it was noted that the concentration of traffic on a few of the lines now operated has been caused by the shifting of the centers of population, brought about by the moving of the shopping district. Before the earthquake the average increase in seating capacity necessary to accommodate the rush-hour traffic was 53.19 per cent and since the earthquake, owing to the lack of equipment, the number of extra cars available has permitted an increase of but 12.46 per cent in the seating capacity during the time of rush traffic. It was pointed out to the arbitration board by representatives of the railway that since April, 1906, the class of passengers handled consisted of a larger proportion of mechanics and laborers than before and that at least 90 per cent of these classes persist in riding on the platforms. This, it is seen, will give a crowded appearance to a car when there may be seats available inside. The regularity of operation also is greatly hampered, first, by the conditions of the streets in general, a large proportion of which are as yet impassable, except on the railway company's tracks, and second, by the character of the teaming in the burned district, which consists largely of heavily loaded trucks conveying building materials.

The testimony which tended to show the unreasonableness of the wage demand of the platform men also included some interesting comparisons and other information. As a basis for the arguments it was stated that no large electric railway system in this country operates on a flat 8-hour basis. The reasons for this are various and apply largely to cities of a class in which the traffic increases considerably during the rush hours. The normal car-day in San Francisco is 20 hours, which may conveniently be divided into two periods of 10 hours each. If the 8-hour day, as demanded, were granted, it would mean dividing the car-day into two periods of eight hours each and one 4-hour period. This in turn would result in so many short runs that even at the excessively high wage scale demanded it would be impossible for a part of the men to earn living wages. To illustrate how different an organization would be required to operate the equipment of the United Railroads of San Francisco on an 8-hour as compared with a 10-hour basis, maintaining the same headway, running time, trips, etc., it was stated that under such conditions an increase of 57 per cent in the number of employes would be necessary.

Compliance with the demand for a flat wage of \$3.00 per day for all platform men, it is thought, would work greatly to the disorganization of any large body of men such as that employed by the United Railroads for operating its cars. On the lines of this company almost 66 per cent of the car employes have been in service for more than two years and the gradual increase in the rate of pay is an inducement for them to remain permanently with the company. Another logical reason for a graduated scale is that the company provides penalties for offenses against good discipline, and it is only fair that the employe should have a reward for good service, which would be offered him if the wage scale in-

cluded the raising of his pay after a certain length of continued service.

MUNICIPAL OWNERSHIP.

The members of the committee on municipal ownership of the American Street and Interurban Railway Association are under no illusions regarding the extent of the sentiment in the United States in favor of public ownership. This is shown by their able report presented at the meeting of the association in Columbus in October, 1906, extracts from which are published on another page. Out of 159 replies which the committee received to its circular letter of inquiry to members of the association regarding municipal ownership, only 27 stated that there was agitation for municipal ownership in the localities of the writers. Of these 21 indicated that the agitation was but "slight." But figures such as these, as the committee evidently recognized, are apt to be misleading. Every person who keeps his finger on the public pulse knows that there has grown up in this country within the past decade a widespread sentiment for public ownership. This sentiment has developed into actual agitation in only a comparatively few communities, because in only a few have there occurred expirations of franchises or other events which have afforded opportunity for those favoring municipal ownership to attempt to crystallize their theoretical views in practical political and economic changes. These facts must be candidly recognized if the growth of the sentiment for public ownership is to be arrested.

The replies to the committee's question as to the causes of the agitation leave much to be desired. It is not surprising that none of the 58 companies responding held itself responsible for the municipal ownership sentiment in its community. Corporations, like men, usually feel that they safely can leave to others the task of pointing out their faults and mistakes. But no intelligent and candid person will deny that for the public opinion adverse to private ownership of public utilities which exists the managements of public utility corporations are themselves in considerable degree responsible. A large majority of these corporations have been conducted honestly and with a view no less to the best interests of their stockholders than to the rights of the public. But here and there corrupt bargains have been driven with city councils and legislatures anxious to be debauched. Here and there poor service has been given. Bad financial methods, involving in some instances excessive capitalization, and in many more the payment of excessive dividends and failure to charge proper sums to depreciation, have tended to cripple the companies and to give the public an exaggerated idea as to their earnings.

But, while these and other mistakes of public utility corporations unquestionably have helped foment the agitation for municipal ownership, it is equally indubitable that in the main, and fundamentally, this agitation has its roots in the socialistic sentiment which within recent years has spread so rapidly throughout the United States. The most marked characteristic of the socialistic propaganda is its tendency utterly to ignore practical facts and conditions; and doubtless there would have been agitation for municipal ownership, although it would not have grown so widespread and dangerous if every public utility corporation in this country had been managed as faultlessly as, humanly speaking, was possible.

The committee's recommendations regarding the best methods to adopt to arrest the growth of sentiment for municipal ownership are excellent. Giving the best service practicable and wiser methods of financing will contribute potently toward this end. The contrast between the progressive and efficient methods of private management and the slothful and inefficient methods of public officialdom should be made so great and so conspicuous that the least observant cannot fail to be impressed. The policy of giving

entire publicity to the facts as to the operation and position of the various companies, which many corporations favor, may then be adopted with the confident expectation that it will produce beneficial results from the standpoint of both the stockholder and the public.

The vital, fundamental need in the United States now, however, as the committee on municipal ownership evidently recognizes, is a thorough campaign of education on the subject of socialism in all its phases. From the time of the foundation of American institutions until within recent years the keynote of economic policy in this country, national, state and municipal, was encouragement to private initiative and enterprise. It was believed that the true interests of both individuals and the public would be best subserved in the long run if governments refrained from entering the fields of production and transportation except for the purpose of compelling the private individuals engaged in cultivating those fields to do justice to one another. The wonderful industrial progress which America has made—a progress which, both in its rapidity, and in the material blessings which it has brought to all classes, is without precedent or parallel in the history of mankind—should be ample vindication of this policy. That it is not accepted as such the widespread agitation for governmental interference with and regulation of businesses of all kinds, for public ownership and operation of public utilities of many kinds, and even for socialism in its most revolutionary form, makes only too clear. So far as reason and the entire experience of the human race are capable of demonstrating anything, they demonstrate that, while unfettered private initiative and enterprise promote the economic welfare of both individuals and the public, governmental management of industry, and excessive governmental interference with private management of industry, produce economic stagnation or paralysis. The check which would surely be caused to the development of the traction business in this country by the general adoption of municipal ownership is indicated by statistics given by Prof. H. R. Meyer in his work on "Municipal Ownership in Great Britain." Professor Meyer says:

"In the United States in the year 1902, in a total of 530 cities, groups of cities and towns, and groups of towns, there was, in 24.7 per cent of the cases, more than one mile of street railway track for each 1,000 people; in 32 per cent of the cases, one mile of street railway track for each 1,000 to 1,499 people; in 21.9 per cent of the cases, one mile of track for each 1,500 to 1,999 people; in 10.7 per cent of the cases, one mile of track for each 2,000 to 2,599 people. In the United Kingdom, on the other hand, there was, in 1903, no case of one mile of track for each 1,500 people or less. The most common ratios between street railway trackage and population were one mile of track for each 5,000 to 5,999 people, and one mile for each 7,000 to 7,999 people. The next most common ratios were one mile of track for each 1,000 to 4,999 people, and each 13,000 to 19,999 people. The third most common ratio was one mile for each 3,000 to 3,999 people, and the fourth most common ratio, one mile for each 11,000 to 11,999."

The managers of public utility corporations who shall contribute through educational and other legitimate means to stay the spread of socialistic sentiment will have the satisfaction of feeling that they not only are protecting the rights and interests of their stockholders, but also are performing a patriotic duty as citizens; for the growth of this sentiment is the most serious menace today, not only to the continued prosperity and progress of the United States, but to the very existence of modern civilization.

The Kokomo Marion & Western Traction Company, Kokomo, Ind., is making extensive improvements on both its city and interurban lines. The tracks in Kokomo will be entirely rebuilt, and the interurban line will be straightened and ballasted with stone between Kokomo and Marion.

THE CAZADERO GENERATING STATION OF THE PORTLAND RAILWAY LIGHT & POWER COMPANY.

The Portland Railway Light & Power Company of Portland, Ore., has recently placed in operation a large water-power generating station at Cazadero on the Clackamas river. The new station is near the terminus of one of the company's interurban lines and 40 miles from the center of the city. This interesting installation comprises a dam across the Clackamas river, a flume and waterway 1.7 miles long, the generating station and, across the river from the latter, a step-up transformer station.

Water Supply.

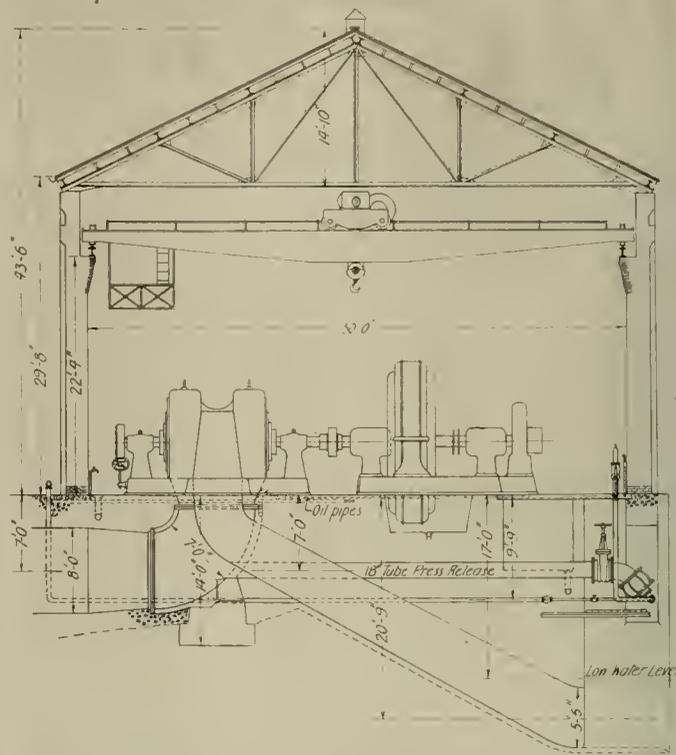
The watershed of the Clackamas river and its tributaries includes about 900 square miles. An abundant supply of water during the summer months is assured by the melting snows of the Cascade mountains, near which is the main source of the river.

As originally built for a former plant the dam consisted of a wedge-shaped structure of rough logs, each about two feet in diameter, laid across and in the line of the stream. This structure inclosed vertical pockets approximately 15 feet square, which were filled with clay and broken stone. During the summer of 1906 the old dam was strengthened by a rock fill and additional crib work. The reinforcement also included five rows of steel-capped piles across the stream at the upper edge of the dam. The dam is now 230 feet long and 176 feet wide on the base, and has a total length of 400 feet. A spillway 153 feet wide is provided, its crest being 51 feet above low water below the dam. An accompanying illustration shows a view of the crest of the dam and the four headgates of the flume.

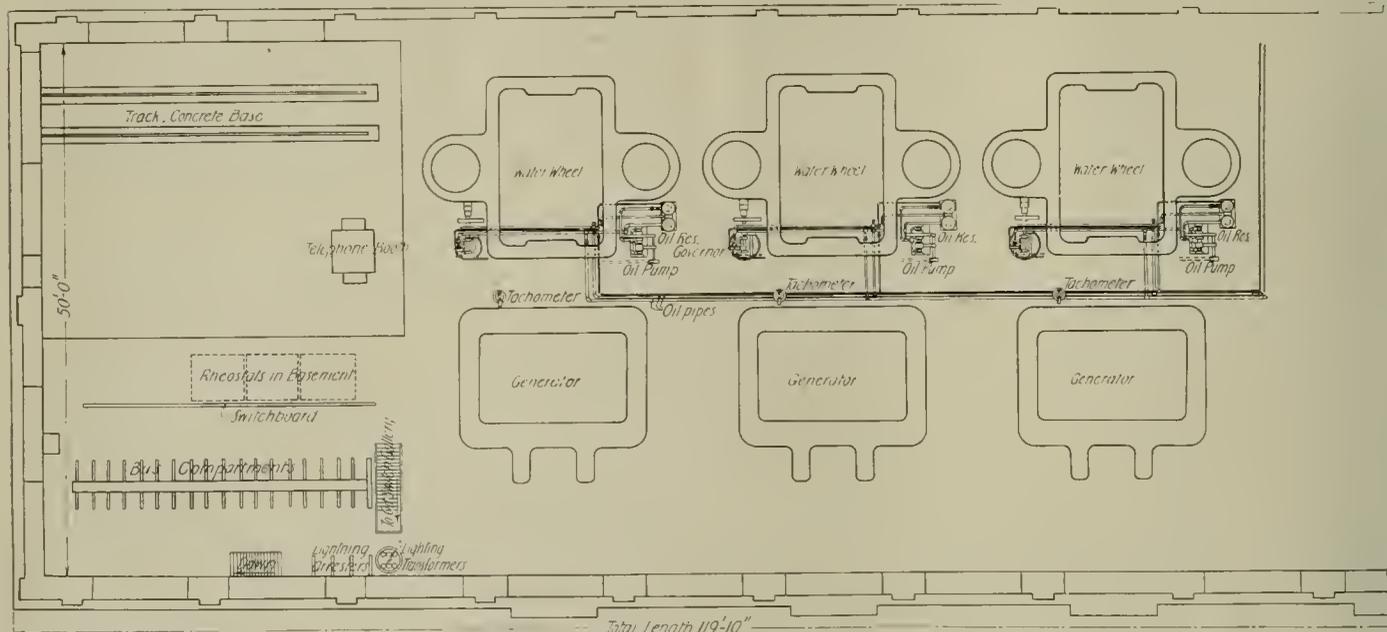
Leading from the gates at the dam is an open timber flume which follows the contour of the river bank for a dis-

large a volume should afford a valuable factor for continuous operation at such times as repairs must be made to the flume, ditch or dam.

The forebay gates which control the supply of water



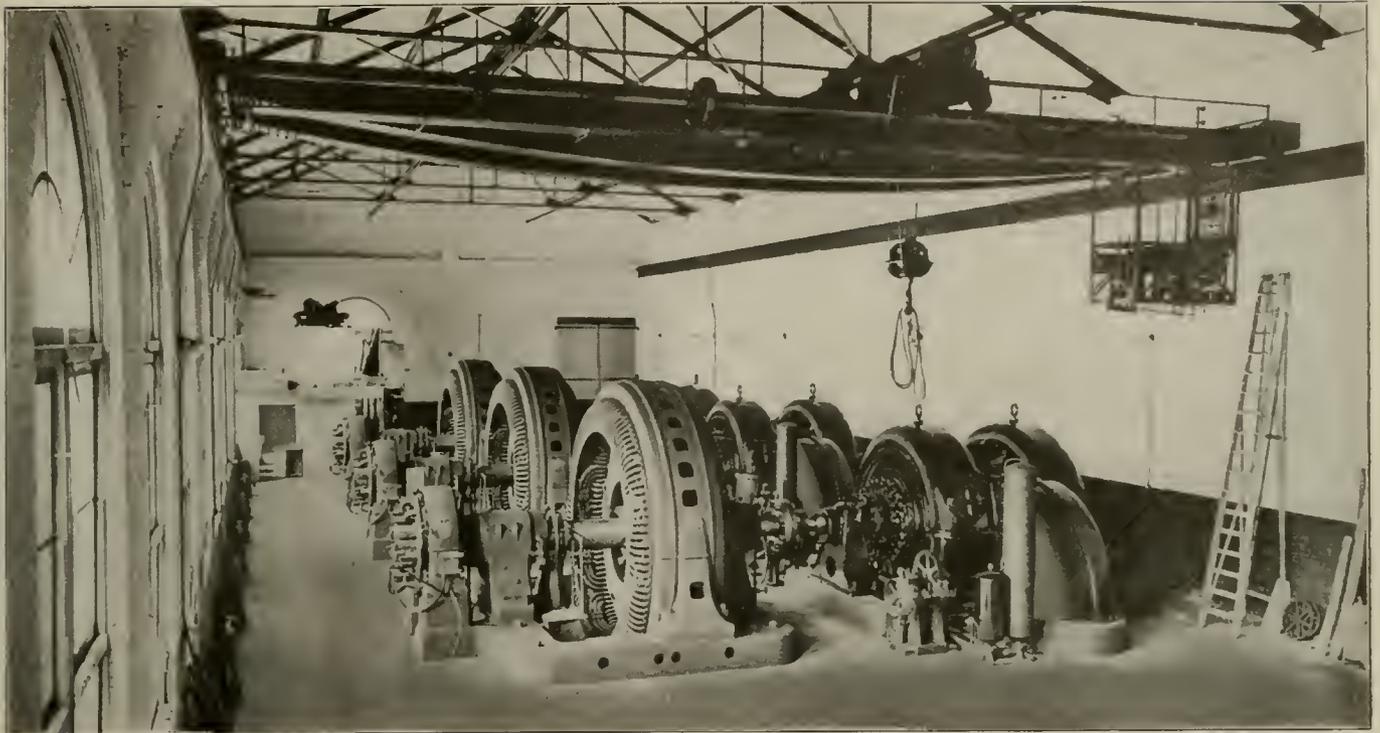
Cazadero Station of the Portland Railway—Vertical Cross Section, Showing Arrangement of Turbine Wheels and Generators.



Cazadero Station of the Portland Railway—Plan of That Part of Station Now Utilized.

tance of 2,622 feet, where it empties into a ditch 2,898 feet long, which in turn discharges water into a storage lake near the power station. At the inlet and outlet of both flume and ditch are protecting walls and aprons of concrete. The lake, into which the supply water discharges and from which water is taken through steel penstocks to the wheels, covers an area of 50 acres, and when filled as under normal operating conditions has an average depth of 20 feet. The volume of water thus stored close to the power station is sufficient to operate the plant for six hours after the headgates at the dam have been closed. This immediate supply of water of so

at the top of the penstocks are set in a heavy reinforced concrete wall on the river bluff. An accompanying illustration shows the forebay side of this wall before the gates were placed. At the left-hand side of the wall will be noted the sectional openings for the spillway gates, by which the water level in the reservoir may be regulated. The concrete wall, which retains the lower end of the reservoir and the penstock and spillway gates, is 290 feet long, 20 feet thick at the bottom, 8 feet thick at the top and 33 feet high. The wall itself rests on a foundation 47 feet wide, built into the sandstone bedrock. This foundation extends as an apron 27 feet



Cazadero Station of the Portland Railway—Interior of Power House, Showing Generators and Water Wheels.

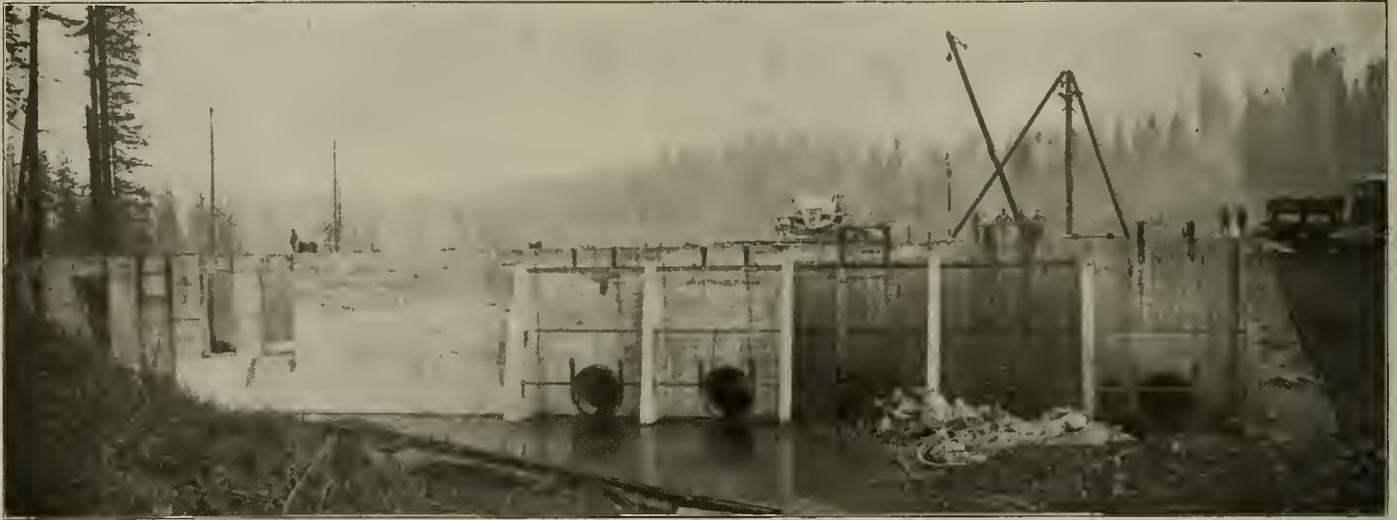


Cazadero Station of the Portland Railway—General View from Opposite Bank of River.

upstream from the gates. The fine penstock gates, protected by iron gratings, are interconnected by gears and shafting so designed that the gates may be operated by hand from a runway above or by a motor controlled from the power station

Niles traveling crane, motor-operated and having a span of 47 feet, serves the interior of the entire building.

The penstocks leading from the intakes above enter the building from the land side and, as shown in the sectional

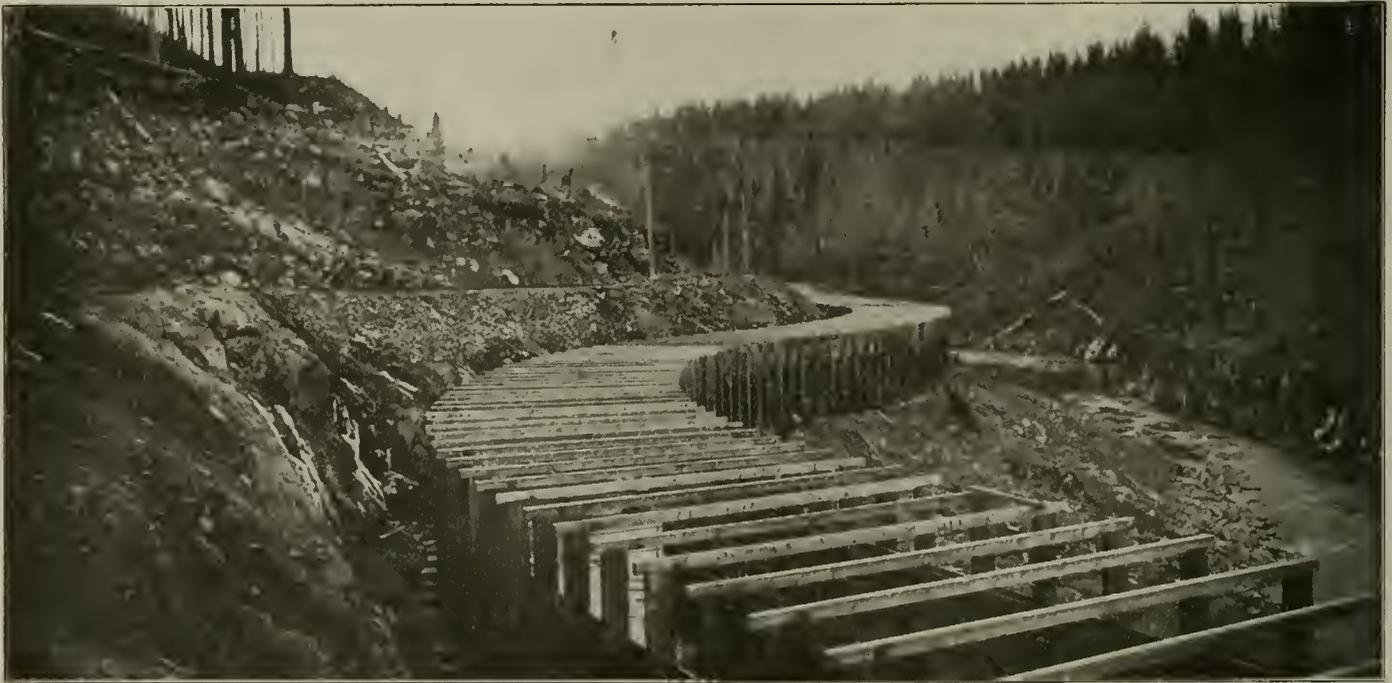


Cazadero Station of the Portland Railway—Forebay Wall and Penstock Openings During Construction.

below. There are five gate openings and five penstocks, but three of which are now in use.

Each of the forebay gates controls the entrance of water to a steel penstock eight feet in diameter leading down at an angle of approximately 45 degrees to the wheels in the power station below. The steel penstocks are supported at

elevation, connect with the under side of the wheels. At present there are in operation three Victor turbines, each comprising two 41-inch wheels on one shaft. These pairs of turbines are rated to develop 5,000 horsepower each, with a head of 125 feet. However, as now installed, there is an available head of 138 feet at low water, with the lake full, or



Cazadero Station of the Portland Railway—Open Flume Along River Bank.

frequent intervals by concrete piers resting on bedrock under the bluff.

Power Station.

The power station building has a brick superstructure 180 feet long and 50 feet wide resting on concrete foundations extending to bedrock. An accompanying illustration taken from across the stream shows the power house close to the stream and the penstocks extending up the bluff to the retaining wall of the reservoir.

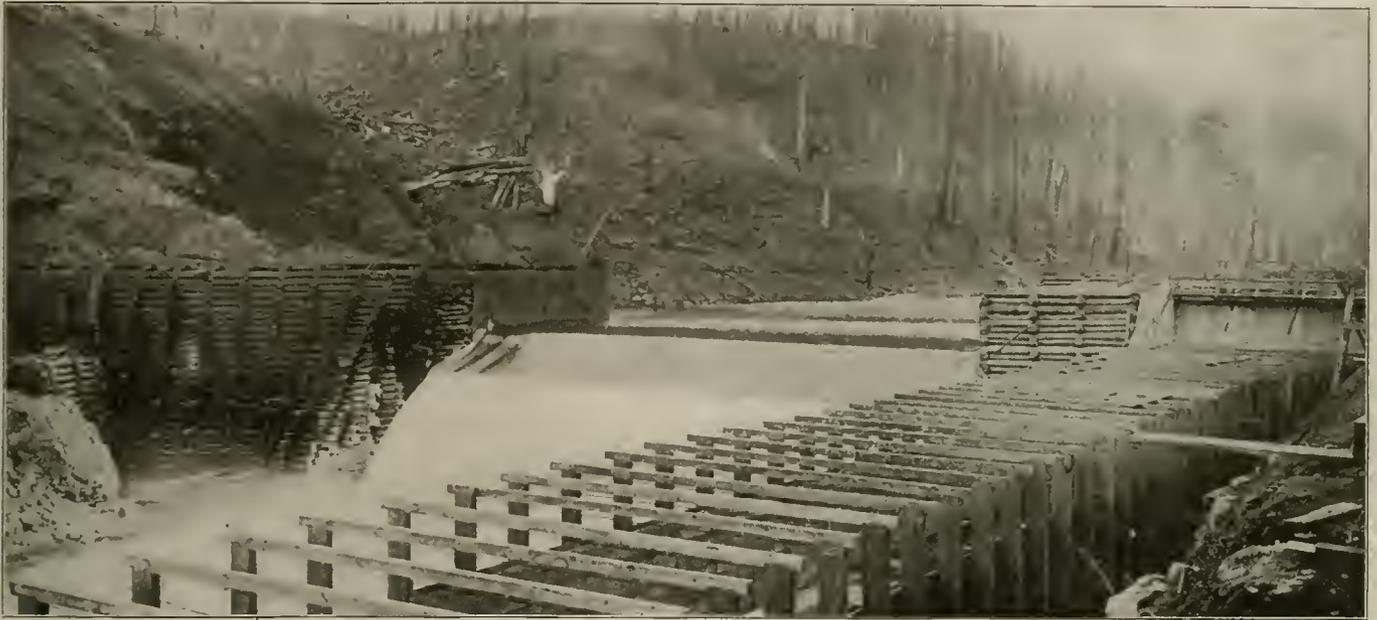
The buildings is well lighted by 13 arched windows 8 by 14 feet, on the stream side and lower end. A 20-ton

13 feet greater head than that for which the units were designed. Each pair of wheels is controlled and regulated by a Lombard governor, and is protected against severe water-hammer by a Lombard relief valve discharging in a line with the entering penstock. The waterwheel governors are driven by belts over the main shaft and are also controlled electrically from one of the main switchboard panels.

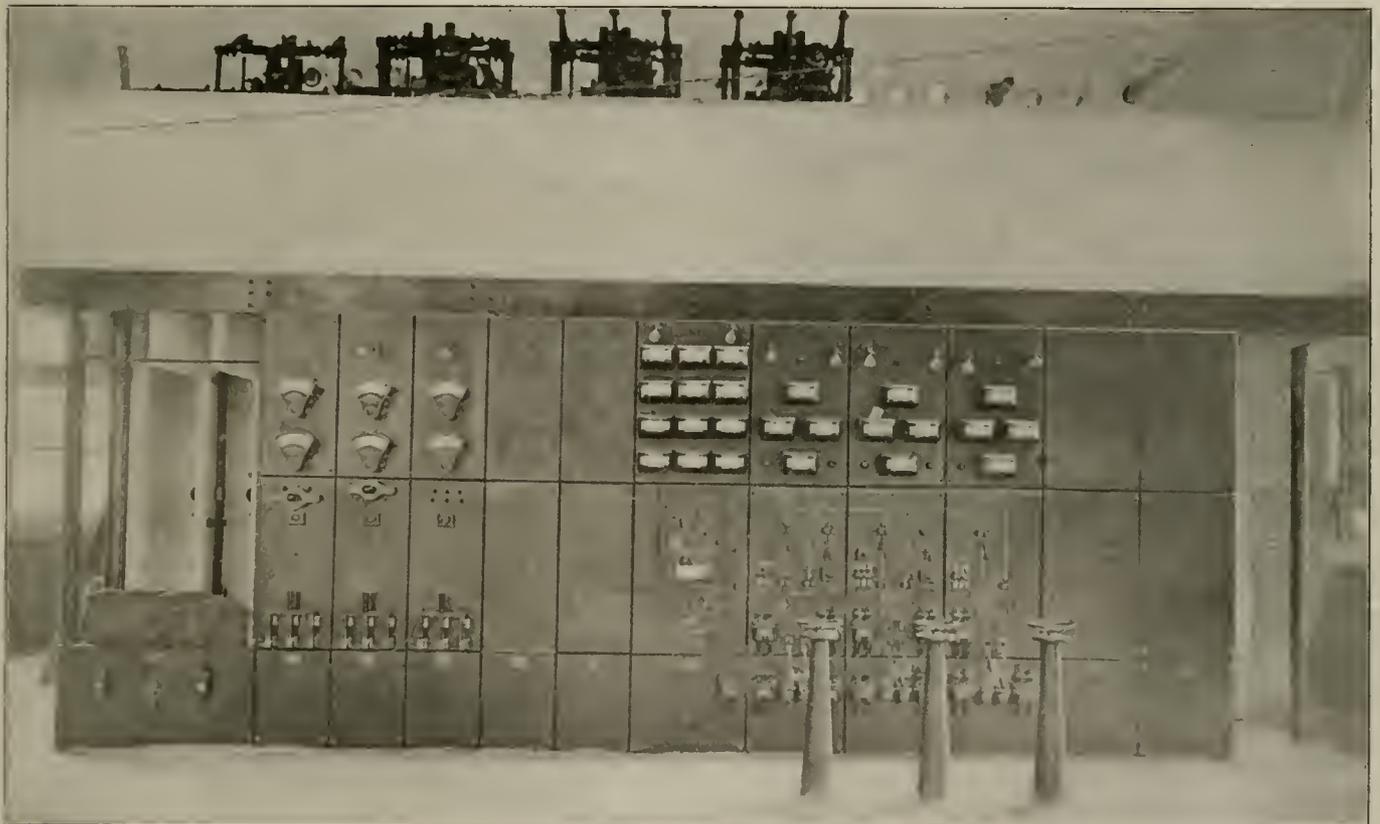
Each pair of wheels is direct connected, as shown in the accompanying illustration, to one Allis-Chalmers-Bullock 3-phase, 33-cycle, 10,000-volt generator, operating at 330 revolutions per minute, and having as its rated normal load 131

amperes at the stated voltage. Exciting current for each generator is furnished by a 120-volt, 625-ampere generator, with its armature mounted on an extension of the main generator shaft. The present building includes ample space and

The output of the generators, which is at 11,000 volts potential, is taken through cables to busbar compartments made of concrete. A portion of this structure is shown at the rear of the switchboard. Here there are two sets of buses



Cazadero Station of the Portland Railway—Crest of Dam Across Clackamas River.



Cazadero Station of the Portland Railway—View of Incomplete Switchboard, Showing Busbar Compartment at the Left and Oil Switches Above.

the penstocks and foundations have been placed for two additional units.

The bearings of the waterwheel, generator and exciter are piped for lubrication with oil circulated under pressure. A supply of oil is furnished by a triplex pump, belt driven from the main shaft. The suction for each of these oil pumps is taken direct from a closed storage reservoir standing on the machine floor near the water wheels.

so interconnected with remote-control, oil-break switches and air-break, hand-throw switches that either or all of the machines may be connected with either bus. Connecting with each set of buses is a line switch. From these line switches there are two 3-wire transmission lines, which span the river and enter a brick transformer station on the opposite side. In this building are nine 850-kilowatt oil and water cooled Stanley transformers, which raise the potential from that of

generation, 10,000 volts, to that of transmission, 30,000 volts. From this transformer station there are two 30,000-volt transmission lines on individual pole lines leading to Portland, 40 miles distant.

There is also a third transmission line which is fed through a line switch from the machine buses. This line



Cazadero Station of the Portland Railway—Gates Leading to Penstocks and Spillway.

follows the railway track to Portland, serving the substations of the railway.

The main switchboard of the power station, illustrated herewith, presents a very neat appearance. The board comprises three generator panels, three exciter panels, one house panel, one high-tension control panel for 10,000-volt line to



Cazadero Station of the Portland Railway—Step-up Transformer Station.

intermediate substations along the railway line to Portland and two control panels for 10,000-volt lines across the river to the step-up transformer station. There are also five blank panels to accommodate the switches and instruments for new generating units. At the rear of the switchboard and behind the busbar compartments are General Electric curve drawing wattmeters and recording wattmeters for each outgoing line.

F. G. Sykes, general manager of the light and power department of the Portland Railway Light & Power Company, has been in general charge of the entire work, and, with the engineers in direct charge of the various features of construction, has assisted in carrying to completion the plans of the

entire plant at Cazadero. T. W. Sullivan, hydraulic engineer of the Portland Railway Light & Power Company, has had charge of the construction of the dam, reservoir, and all hydraulic work connected with the new plant. The electrical construction and operation of the plant are in charge of O. B. Coldwell, operating engineer of the company, while the work of constructing the lines for the transmission of current to Portland was executed by H. S. Sladen, transmission engineer of the company.

STRIKE IN SAN FRANCISCO.

A strike of the conductors and motormen of the United Railroads of San Francisco was declared early on Sunday, May 5, after the company had repeatedly refused to grant the demands of the men for a flat wage scale of \$3.00 for an 8-hour day. This is the same demand that precipitated the strike of last summer, which lasted from August 26 to September 5, and which was settled by the appointment of a board of arbitration. The board reported on February 28, 1907, in favor of a scale of \$3.10, \$3.20 and \$3.30 per 10-hour day, for the first, second, third and following years of service, respectively. This scale was put into effect as of September 5, 1906, and on April 19, 1907, President Calhoun of the United Railroads offered to continue the rate for the year beginning on May 1, although it was based on the unusual conditions of last year following the earthquake. This offer has been refused by the men, who have repeated their demands of last year for a flat \$3.00 scale for eight hours. Several conferences have been held between representatives of the carmen's union and the officers of the company, but the company has declined to make any further concessions.

The strike has completely tied up the street railway service of the city, whose situation is further complicated by strikes of the telephone operators, stationary firemen and structural iron workers. No attempt was made by the company to run cars on Monday, May 6, but that night President Calhoun issued an order for all the men to return to work at 8 o'clock on the following morning or to consider themselves discharged. In anticipation of a strike the company had imported several hundred non-union men and on Tuesday seven cars, manned by armed guards, were run out of the car house at Turk and Fillmore streets. These cars were immediately attacked by the strikers with bricks and stones and the guards fired several shots into the crowd. The rioting lasted several hours and two men were killed and several injured. The guards were arrested by the police, acting under instructions from Mayor Schmitz to arrest any one carrying arms. The cars, badly wrecked, were finally allowed to return to the car house. On the following day, Wednesday, two cars were sent out and operated over about six miles of track in the residence district and the protection of the police was sufficient to prevent serious violence or bloodshed, although the cars were attacked by the mobs several times. The men on the cars were not armed. Mayor Schmitz has given orders to the chief of police to swear in more officers if such a step is found necessary and special reserves of police have been stationed near the car barns. The mayor has declined to call upon the governor for state troops or to station policemen on the cars, stating that their presence would only inflame the rioters.

The company has announced through Thornwell Mulally, assistant to the president, that it would no longer recognize the union. President Calhoun issued a statement that the company would attempt to operate its cars peaceably, but that it would not hesitate to defend its rights. Mayor Schmitz on Wednesday declared that he would appoint a committee of 50 citizens to pass upon the questions at issue. This statement was made following a conference between the mayor, President Calhoun and President Cornelius of the carmen's union. Neither side would agree to abide by a decision of the committee.

MUNICIPAL OWNERSHIP.*

Report of the Committee on Municipal Ownership of the American Street and Interurban Railway Association.

Out of 164 companies, we find that the franchises under which they are operating are derived as follows:

State	9
United States government	1
City	44
City and state	36
Government and city	1
City and county	44
State, city and county	23

Total 158

The bearing of this mixed parentage with reference to a possible attempt on the part of cities to take over the business of the companies is obvious.

In answer to the question, "What municipally-owned utilities are now in operation in your city or field or operation?" 158 replies were received as follows:

None	58
Waterworks	51
Electric lighting	14
Waterworks and electric lighting	21
Electric lighting and gas	1
Waterworks and gas	1
Waterworks and sewers	2
Waterworks, electric lighting and gas	4
Waterworks, electric lighting, gas, sewer and electric railway ..	1
Waterworks, electric lighting and electric railway	1
Waterworks, electric lighting and sewer	1
Ferry	1
Bath houses	1
Waterworks, ferry, subways and tunnel	1

Total 158

The municipal electric street railways reported in the above list are one in West Seattle, Wash., 1½ miles long with 2 cars, and the other in Guelph, Ont., with 7½ miles of track and operating 11 cars. Within the last month the electric railway at West Seattle has been sold to the Seattle Electric Company, a privately owned corporation.

One hundred and fifty-nine answers were received to the question, "Has there been any agitation in your locality for the municipal ownership of street railroad properties?" as follows:

No	132
Yes	6
Slight	21

To the question, "What have been the causes of such agitation?" the companies apparently found difficulty in replying, since out of 164 only 58 responded. Of these 33 asserted that there was no definite cause, and the others assigned as reasons, socialistic movements, the general municipal ownership wave in the country, political and newspaper agitation, and disagreements growing out of attempts at franchise renewal.

In answer "To what extent does this movement prevail today?" 75 companies replied as follows:

No agitation at present	54
Slight	15
Growing	2
Active	3

To the question as to the sentiment of the local press in regard to the movement, 116 companies answered that the movement was not receiving support by the newspapers, 10 that it was advocated to some slight extent, and 8 that the press in their vicinity was pronouncedly in favor of the doctrine.

One hundred and fourteen companies stated that the municipal ownership movement was not a feature in the politics of their city or town, two that it entered into same to some slight extent, while by six it was pronounced a prominent factor in the work of political organizations.

One hundred and thirty-one replies were received to the effect that there had been no expression regarding the doctrine by the voters or taxpayers of the city or county, one that it had been quite openly advocated and three that it had been made a subject of referendum.

To the question as to whether the city charters or any legislative enactment required a referendum of the question of the municipalities acquiring or owning and constructing street railways, out of 103 answers it appeared that about one-half of the municipalities or towns are required to refer such a question to the voters, and the others are free to take action as the civil authorities may desire, subject, of course, to general restrictions with reference to the issue of securities for municipal undertakings.

One hundred and thirty-two of the companies stated that there had at no time been any very complete discussion of the question of municipal ownership in their locality, and that no presentation of the arguments for or against the proposition had been made in the local press by any civic body or in any public assembly; while eight replied that the matter had been the subject of popular discussion. From Halifax, N. S., it was reported that the conclusion of a general and public consideration of the subject in that city had resulted adversely to its trial.

To the question "Has your company made any public statement of its position, either in the papers or otherwise, in regard to the question?" 132 companies replied, "No," and 3, "Yes."

It will be interesting to carefully note the answers received to the following question: "What, in your opinion, is the best method of meeting and controverting the sentiment for municipal ownership?" Of the 110 replies, five methods were especially emphasized:

(1) Education. (2) Good service. (3) Publicity as to facts of company's operation and position. (4) A liberal policy in the matter of extensions, rates, etc. (5) Square treatment of everybody.

From these replies, it is evident that as regards the electric street railroads in this country the movement for their municipalization has not as yet assumed any very grave proportions, but we cannot be blind to the fact that a strong sentiment in that direction has developed which will sooner or later threaten our investments and as well our rights as citizens and taxpayers, as we hold them. If we concede that this condition exists, the most important answer to the questions submitted to the companies would seem to be that last cited, namely, "What is the best method of meeting and opposing this sentiment of municipal ownership?" and we cannot do better than to take for discussion in this report the suggestion embodied in the replies received from the members of the association, which, in brief, is covered by the term "education" or the phrase "public enlightenment upon the subject."

We may utter only a truism when we say that he who would ascertain the truth or falsity of a proposition or in the study of one that is complex accurately separate the true from the false, the material from the immaterial, must needs as a precedent to any permanent and safe result be furnished with an open mind, an honest purpose and a courageous resolve, but especially is such an attitude on our part absolutely essential in the present instance, for if we believe the discoverable truth as to this question of the municipal ownership of public and quasi-public utilities, such as transportation, both as to facts, methods and results, will lead to the safeguarding of the business interests, we represent and our own, as citizens and taxpayers, we ought heartily to urge our fellow citizens to join with us in a patient, comprehensive and honest study of the question and the conditions which have given it life and force. Invective and violent declamation will not prevail to stop its progress; its promoters cannot be frightened from their purpose by superficial criticism or political strategy. We must meet them in the field of open discussion and argument, prepared to reason together honestly and fairly as to the merits of the proposition.

When equilibrium is delicately poised a minute and perhaps an unobserved change of a few ounces of weight may precipitate an avalanche, so in a society like ours, moving with unprecedented rapidity, unintelligent conservatism is dangerous, and in these days we cannot afford to be superficial observers of the progress of this socialistic question, pregnant as it is for good or evil.

The proximate causes of this socialistic agitation in our land are conspicuous and easy to name—the underlying and more permanent reasons may possibly escape the notice of an unthoughtful observer. The former find their most clamorous exponent in the political demagogue or professional agitator who shouts, "Down with corporations," "Death to monopoly," "Smash the trusts." Of the same class and kind is the newspaper that in chromo type and with cartoon and caricature holds up to calumny and ridicule the fortunate and prosperous and declares that capital is the implacable foe of labor.

But state and municipal socialism also derive stimulus and support from a class of good citizens, sane and conservative, who in this land of equal political rights view with alarm the inequality of social conditions and note with resentment and dissatisfaction the open abuses of great wealth and corporate power, so that without a clear idea of the true reasons for the prevalence of these conditions or of proper methods for the amelioration of the evils of our complex society, they are well disposed to change in governmental relations as a panacea for all these ills. To these proponents of the socialistic movement must be added the taxpayer who

*Abstract of report presented at Columbus, O., on October 13, 1906.

believes under municipal or state ownership his taxes would be lowered and his outgo for service would be cheapened, and also the laborer who imagines that state or municipal ownership of public utilities will provide more opportunities for the sale of his labor, and that, too, at a higher rate measured by wage or hours of work.

Modern industrialism, despite its sins and mistakes, was the crowning glory of the last century, and properly guided and controlled will extend its blessings and repeat its triumphs in this one. To estop individual initiative and stimulus to genius and industrial development is to call a halt in state or municipal progress, and we contend rather that to multiply the opportunities for individual effort and to safeguard the results of same should be an important work of government and society.

We believe, then, that a safe and defensible position for us to take in the discussion of this question is that so clearly put by President Eliot of Harvard, who declares: "If the government enters a field which individuals or a voluntary association of individuals could till, it diminishes by so much the range or reach of the great school of self-governing free men, namely, the school of creative and constructive industry under liberty and with responsibility."

The more popular and usual reasons, aside from the general statement that corporations are acquiring too great control and political power, given by political orators and socialistic propagandists in support of the extension of municipal functions to cover water, light and transportation, are that these public utilities are natural monopolies, and as such belong to all the people for their use and convenience. The sanest and clearest statement made on this point we have seen is that of Samuel Chisholm, lord provost of Glasgow. He says: "In my opinion there are three conditions which should meet, or at least two of which should meet, before a municipal corporation should be authorized to take over any public enterprise: (1) That it is more or less practically a necessity. (2) That it is practically a monopoly. (3) That it requires the use of the streets."

As to the element of necessity, is light or transportation any more a necessity to the people of a city than bread, clothes or boots? Why should the supplying of the latter be given over to private enterprise and the former be taken in hand by the city?

But these public utilities are natural monopolies and use the public streets. Is it true that our rights under charter in the cities of this country have protected us from competition? Do not the major portion of our franchises distinctly state they are not exclusive? Appeals to courts on the question of exclusive franchises have resulted in decisions to the effect that it is "ultra vires" for a common council to grant an exclusive privilege in a public street. Our critics argue, however, that our occupancy of a city street with our tracks prevents of necessity the incoming of a competing line. If one consults the maps of the cities of the United States, he will find that there are but few in which a competing line of street railroad could not find unoccupied streets upon which, from the centers of the business section to the residential quarters, a line might be laid with some fair degree of prospective profit. But a few years have elapsed since the present apostle of municipal ownership, Mayor Johnson of Cleveland, was granted a franchise in the streets of Buffalo for approximately 100 miles of track, and was only prevented from construction by the railroad commissioners of the state, who, after a careful investigation of the matter, refused Mr. Johnson such a right on the ground that the new road was uncalled for, as the local company was already giving all the service and facilities the city's needs required. Evidence of the presence of competition is to be seen in not a few of our cities today where applications are before the councils for new and competing lines.

But if we are monopolizing the surface of the streets we cannot lay claim to the space above or below such streets, and neither in New York nor Chicago did the averred occupancy of the streets prevent the competition of elevated or subway lines, a kind of competition that is not far distant in many other cities.

Last of all we are exposed to the threatening competition of the cities themselves engaging in the business by the building of municipal lines, and with the strong arm of legislation compelling "joint user" clauses in any new extensions granted, giving them the right to run their cars over parts, at least, of our lines already built.

But distrust of so-called exclusive proprietorship of public utilities lies, we are often told, in the belief that they are immensely profitable, and, therefore, that the state or municipality, in granting charters for the private ownership and conduct of public utilities, have improperly parted with a valuable asset which they should in some way recover. This statement is notably the favorite allegation of agitators and demagogues, but it is as well a part of the faith of many

people who have never taken the time to study the matter with any degree of care or accuracy.

From the United States census bureau's special report on street and electric railways for 1902, some interesting and instructive statistics bearing on this matter of the value of our franchises may be obtained. By the report in question it appears that the total amount of dividends and interest actually going to stockholders and bondholders of the street and electric railways in the country, as a whole represents less than the current rate of interest on an amount equal to the face value of their outstanding securities. Of \$17 operating companies in 1902 with 22,576 miles of track, and 60,290 cars carrying 4,774,211,904 fare passengers, but 286 paid any dividend on any or all classes of stock securities. The total ratio of dividends paid to total capital stock was 2.6 per cent; the ratio of total dividends to total dividend bearing stock was 5.1 per cent. The full amount of dividends paid during the year was \$33,039,171, and the same year the companies distributed in interest to bondholders and creditors \$46,462,470, paid to wage earners, \$80,770,449, and to the commonwealths in taxes \$13,366,335. If to this latter item be added the personal taxes assessed against the individual holders of street railway securities, on the low basis of three-fourths of 1 per cent on the face value of their securities, the item of taxes turned into the state and municipal treasury during the year amounts to approximately \$20,562,516. The rate of net return to stockholders would not indicate any especially great profit at present being derived from the chartered rights the companies possess, and the rate of return, considering the menaces and hazards of the business, surely cannot be regarded as excessive. It is notable as indicating the estimate of value placed upon street railroad securities that the stock issues of a comparatively few of the companies represented in this association sell at par. The bonds of our companies are not permitted as investments by savings banks, and in the list of investments by banks, trust companies and insurance companies few if any street railroad securities are to be found.

To a statement of our dividend paying results, our municipal ownership friends may reply that our security issue is inflated, and thus good, divisible earnings are precluded. Meeting this allegation, we point to the facts as they appear in Massachusetts, an old and populous commonwealth and one in which, by law, the security issue of a company must not exceed the actual cash invested. Everett W. Burdett in his admirable recent address on "Municipal Ownership," points out that "The state of Massachusetts has 98 electric railways, operating 2,688 miles of track, transporting over 500,000,000 passengers by the use of 7,341 cars, and that only about one-third of them paid a dividend in 1905. Sixty-three paid no dividends at all, while the other 35 paid from 2 to 10 per cent with an average dividend of $4\frac{1}{2}$ per cent, which, if applied to the capital of all the companies in operation, would have yielded an average dividend of less than $2\frac{1}{2}$ per cent. At the same time these companies paid into the public treasury in the form of taxes nearly \$2,000,000. It thus appears the tax gatherer, the employe and the general public have each and all reaped rewards much greater than have been realized by the stockholders in these enterprises." Verily the monopoly we enjoy is neither to be feared nor greatly to be envied.

Giving further consideration of this monopoly cry, we may point out that the great danger of monopoly is the absence of the stimulating and controlling power of competition. In the granting of our franchises, both the state and city authorities seemed to have this fear, for not only in these charters, but by ordinances of constant and regular sequence we are required to do this or that, or refrain from sundry and imaginary actions, with elaborate legal refinement. We are directed as to opening the streets, the kind of rails and crossings which shall be employed, the style of overhead construction we shall use, the kind of cars we may provide and how they shall be run, the signals to be used, the time to put on vestibules, when to take them off, where we shall stop to take on or let off passengers, the fare we may charge and the transfers we must give; how we must adapt our business to other users of the street; these and a hundred other regulations are duly set forth for our guidance. No other public utility is regulated and controlled to a similar extent. Nor do we complain of this careful and watchful supervision—a supervision the penal clause of which reads nullification of privileges or severe fines.

To turn over such a regulated and controlled monopoly to an uncontrolled one, as would be the case were the city to assume the ownership and operation of its street railroads, would, to put it mildly, be open to great question. All the evils laid at the doors of monopoly of indifference to public wishes and comfort and the like, would surely be heightened and aggravated by such a transfer, and a little study of the usual conduct of public and municipal affairs would, we think,

evoke a decided negative to the proposition, unless, we are sometimes promised, vital changes are made in the usual make-up of municipal responsibility.

As to the point that as our roads in using the public streets thus trench on the proper sphere of municipal functions, we answer that as we construct our lines and operate them in accordance with and under the rule of the city's agents, the municipality could do no better.

Evidently back of a programme of municipal activity stands the question of taxes and their equalization in such way as that they shall bear justly upon the rich and the poor, the capitalist and the laborer, the professional man and the tradesman, with such equal weight that none may complain of his apportionment.

If the city, therefore, engages in a business for the service of which charge is to be made to users, and further, if this city business is instituted in the face of offers on the part of private corporations to assume all risk and under regulation by the proper authorities to give the service for a specific charge, justice to taxpayers and respect for fair business conditions demand that from the income of said business all charges should be paid. In other words, such business should be self-supporting, and this is manifestly true in consideration of the advantage which is claimed by the proponents of municipal ownership, that no dividends should be distributed by a municipally-owned enterprise of any sort.

That such should be the basis of the financing of a city's remunerative public utilities is becoming generally recognized and has been adopted in the case of municipal waterworks. The mayor of Chicago, in his scheme for the municipal ownership of the street railroads of that city, proposes to issue bonds or certificates of indebtedness against the properties and their earnings and against these alone. The citizens of Seattle, Wash., were recently called upon to vote upon a scheme for the construction of a system of municipal street roads in that city. The financial basis of the proposition is set forth in the ordinance authorizing the same, as follows: "To ratify or reject the proposition of incurring a general bond indebtedness bearing interest not exceeding 4 per cent per annum in the sum of \$1,272,000, together with the proposition of incurring a special bond indebtedness bearing interest not exceeding 5 per cent per annum in the sum of \$3,000,000, to be an obligation against not to exceed 20 per cent of the gross revenue or proceeds to be derived from the plan or system." This rather unique financial scheme, while it smacks very strongly of a municipality trading on margins, evidently recognizes the injustice, in part at least, of loading the general taxpayer of a city with the burden of a municipal public utility.

A city, therefore, establishing a business on such a basis has no advantage over that of a private corporation in the matter of securing capital, and public service utility bonds and certificates of indebtedness secured by mortgage on the property and its revenues will not sell in the open market at any higher prices than those of a private corporation. In fact, we believe it can be demonstrated that capitalists, by reason of having less confidence in the progressiveness, accurate accounting and the skill of municipal management, would regard less favorably such a security of a city road than they would that of a corporation.

As to the partnership of the people in the enterprise, it is but fair to say that the average man desires the liberty to choose for himself as to the investment of his money and business associates, and for every taxpayer in the city, whether he will or no, to be compelled to take shares in a business over which he has no control, and especially managed by men of whose capacity he has no proof, is a proposition which, while it may from a sentimental point of view have some force, surely from a business one, is of no weight.

As it is a notorious fact that private enterprise is ambitions and progressive, ever seeking extension for its efforts and multiplying its activities, while business interests in the hands of the government are quite the reverse in their policy, the suggestion that the municipalization of our street railroad systems would in the long run increase the opportunities for the working classes, is evidently untrue.

It is hardly necessary for us to take time to discuss the claim of the municipal ownership promoters that the city-owned road could be managed cheaper than is that of the private corporation; so universally is it acknowledged that public work of all kinds is less economically handled than that of corporations where responsibility is directly traceable and the directors or managers of which can be readily brought to book for negligence or incapacity.

As we have before stated in this report a considerable number of those advocating the municipal ownership of public utilities have been led to do so by their distrust and disgust at the relations which have existed between legislators having in their power the granting of public franchises, and the officials and promoters, or political bosses, who have

acted as the henchmen of public service corporations. Your committee hold no brief for the defense of corporations who have debauched councils, and by the use of bribes in the shape of securities or of cash have secured privileges, even though the request for such privileges in and of itself was often entirely proper. But we aver that graft is confined to no department, no locality, no party, no corporation or no individual. In the public revelations which have been made of late of the existence of this evil in this country, it appears in the federal government, in the city governments, in the postoffice department at home and in the consular service abroad, in public and private business circles; and wherever it is seen it is revolting to honest business enterprise, and injurious in the extreme to all our interests and desires. It is an evil which must be extirpated, or reduced at least to its lowest terms, and we believe we may say that no class of business men or business interests would be more pleased to see this evil uprooted than would the street railroad companies, their managers and directors. If the inner history of the companies represented by this association could be accurately written and spread in full upon the public books, it would cover a list of refusals to purchase privileges, or rather, in many instances, permission to do that which was altogether advantageous to the city in which the company operated and to the people whom it desired to serve, even at the risk of attack, misunderstanding and unpopularity, that would be surprising in number, and well-nigh continuous. We go farther and aver that the street railroad companies of the country, as a body, are honestly conducting their enterprises. They have no reason to be ashamed of the business in which they are engaged, or of the service which they give. They have played no unimportant part in the wonderful growth of urban life and what opportunities in this country during the past 25 years, and what they have accomplished in the introduction of electricity and its uses for public transportation is a source of pride and of self-congratulation. The use of improper or underhanded methods in the securing of rights or the enforcement of privileges already granted is as distasteful to the street railroad manager as it is to any citizen or business man; and we are sure that we will join hands most gladly in every movement looking toward the extirpation of such a practice of evil.

PROVISIONS OF NEW PHILADELPHIA ORDINANCE.

The new ordinance for the Philadelphia Rapid Transit Company, which was framed by the Retail Merchants' Association of Philadelphia, was presented to city councils on May 2. The main provisions of the ordinance are as follows:

Fifty-year profit-sharing contract, to take effect on July 1, 1907, between city and Rapid Transit company, superseding and canceling all existing contracts, agreements and bonds between them or between the city and the subsidiary companies.

Company to establish a sinking fund to extinguish its present capital stock of \$30,000,000 at the end of 50 years.

Company to call in within 30 days its unpaid capital stock by \$5.00 instalments so that the whole shall be paid up by December 31, 1908. Proceeds to be expended upon completion of present transportation projects, and upon additional improvements and betterments.

City reserves right to purchase all the property of the company, subject to all indebtedness now existing or hereafter lawfully created, upon July 1, 1907, or upon any July 1 thereafter by serving six months' notice and paying an amount equal to par for the capital stock of \$30,000,000, plus any additional capital stock which may be issued with the consent of the city.

Nothing in the contract is to make the city liable for any of the debts, obligations or liabilities of the company.

Broad street subway franchise is canceled. Frankford elevated franchise confirmed and time for construction extended for three years from June 1, 1907.

Underground trolley and other regulating ordinances repealed, but the city retains the right to make all rules and regulations for operation and management of the lines necessary for public health and safety.

When the sinking fund reaches \$5,000,000 the company is required to pay the money to the city treasury, and it is to become the property of the city.

In lieu of car licenses, the company is to pay a fixed amount to the city annually; and is also to pay a fixed sum per square yard of streets occupied by track in lieu of paving and repairing such streets.

The company is prohibited from assuming further leases, obligations or guarantees, or parting with any of its stocks, leaseholds or franchises without consent of the city.

Councils may determine upon routes of new surface,

elevated or subway lines, and if the company fails to accept them within 90 days the city may offer the franchises to any who will undertake their fulfillment.

The mayor, the president of the board of city trusts and the president of the board of education, without incurring any liability as directors, are to be members of the company's board of directors.

City to receive an amount equal to one-half of all dividends paid by the company in excess of 6 per cent per annum on the actual amount of capital paid into the company's treasury.

City comptroller to have access to the company's books, accounts and vouchers in order to verify its financial statements by examination and report the result to councils.

The company is to be prohibited from further increasing its capital stock or funded indebtedness without the consent of councils.

All certificates of stock and leases held by the company to be stamped across the face that they are held subject to the terms of the contract.

Morris L. Clothier, president of the association, said in a letter which accompanied the draft of the ordinance: "We are assured of its acceptance by the company."

Mayor Reyburn will hear the opinions of citizens representing various interests on the bill.

PRODUCER GAS ENGINES.*

BY G. W. BISSELL.†

Attention is invited to certain tests made by the United States geological survey during the period of the Louisiana Purchase Exposition and at the government testing plant established there.

Table I.

Samples—	British thermal units per pound dry coal.		Average k.w. hours at switchboard.		Dry coal per k.w. hour.		Rates of economy.
	Steam plant.	Producer plant.	Steam plant.	Producer plant.	Steam plant.	Producer plant.	
Alabama, No. 2.....	12,555	13,365	158	148	5.50	2.21	2.48
Colorado, No. 1.....	12,577	12,245	115	148	6.51	2.30	2.83
Illinois, No. 3.....	12,857	13,041	147	148	5.85	2.41	2.43
Illinois, No. 4.....	12,459	12,834	145	148	6.47	2.37	2.73
Indiana, No. 1.....	13,377	13,037	163	148	5.56	2.60	2.14
Indiana, No. 2.....	12,452	12,953	142	149	5.85	2.08	2.81
Indian Territory, No. 1.....	12,834	13,455	143	152	5.44	2.46	2.21
Kentucky, No. 3.....	13,036	13,226	155	148	5.68	2.57	2.21
Missouri, No. 2.....	11,500	11,882	152	128	6.62	2.30	2.88
West Virginia, No. 1.....	14,198	14,396	146	148	5.25	2.12	2.48
West Virginia, No. 4.....	14,002	14,202	157	148	4.87	1.74	2.80
West Virginia, No. 9.....	14,616	14,580	151	149	4.66	2.14	2.18
West Virginia, No. 12.....	15,170	14,825	151	148	4.75	2.02	2.35
Wyoming, No. 2.....	10,897	10,656	135	149	7.94	2.78	2.85
Averages	13,037	13,192			5.71	2.29	2.49

In Table I is shown the principal results of steam and producer gas engine tests of certain soft coals, some of which are comparable with Iowa coals. Fourteen tests are here quoted. The favorable showing of the producer gas engine in these tests is significant. While it is true that the steam engine used was a simple non-condensing engine having a water-rate of 23.6 pounds, it is also true that the gas engine in the large sizes is still in an experimental stage, especially in those features of its design and operation which affect its utility in plants where only ordinary skill can be expected to be exercised.

Of the coals listed in Table I, Missouri No. 2 resembles most closely the Iowa coals—its principal properties being:

	Missouri No. 2.	Average of Iowa coals.
Moisture	11.60	13.16
Carbon, volatile	35.28	33.36
Carbon, fixed	38.28	39.69
Ash	14.84	13.76
Sulphur	4.56	4.65
Calorific value	11,500 to 11,882	10,019 to 11,027

The lack of correspondence between the relative values of the several coals in Table I for steam and producer tests indicates that a given producer may be better adapted for handling a wide variety of coals than is a given boiler furnace.

*Abstract of a paper read before the Iowa Electrical Association, Clinton, Ia., on April 19, 1907.

†Professor of Mechanical Engineering, Iowa State College, Ames, Ia.

The table also shows that for these tests and conditions the percentage of saving in fuel of the producer over the steam plant is greater for the poorer coals, and this is an entirely reasonable view because the volatile constituents of the coal in the producer escape only through the engine cylinder in which their combustion is completely effected; whereas, with steam generation with volatile fuels under a boiler, various and large proportions of the volatile matter escape to the chimney unburned.

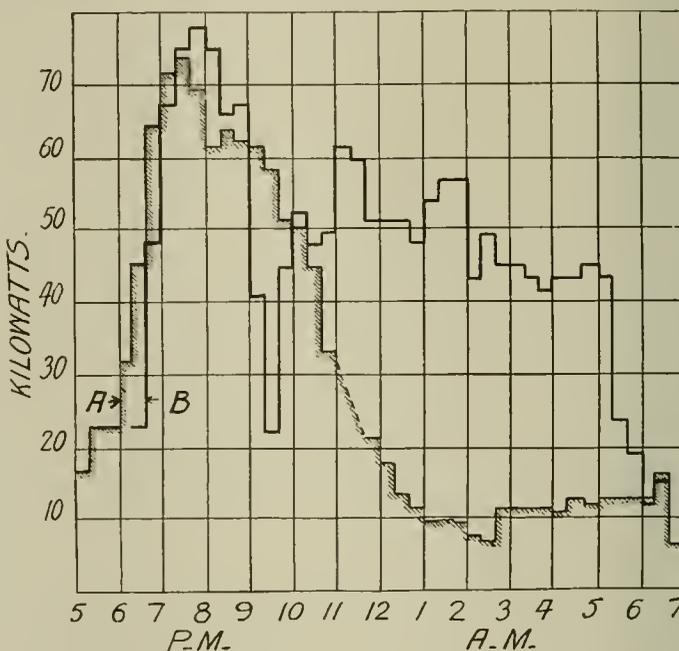
The tests above quoted were largely in the nature of preliminary tests and considerable difficulties were met with in obtaining reliable results.

In the year following the exposition, viz., 1905, better arrangements were available for the tests, and the matter was again entered into much more thoroughly. A notable change in the conditions surrounding the second series of tests was in their length. It was possible to secure continuous periods of operation for each test of from 40 to 60 hours, which was not possible in the earlier tests.

Table II.

Samples—	British thermal units per pound dry coal.	Ash.	Sulphur.	Dry coal per k.w. hour, steam producer.		Ratio.
Illinois, No. 9.....	12,438	11.5	4.92	7.00	2.38	2.94
Illinois, No. 19.....	13,000	9.4	0.53	5.65	1.79	3.16
Indiana, No. 5.....	12,600	11.50	5.00	6.41	2.20	2.92
Wyoming	10,518	15.3	7.36	7.96	2.40	3.31
Brazil	9,900	23.4	2.94	8.85	3.12	2.84
Average						2.92

Table II gives a comparative summary of a number of soft coals tested in 1905, both on the steam plant and the



Curve Showing Day Load on Steam and Producer Gas Plants.

producer plant. The results are very interesting and confirm in a general way the advantages of the producer plant indicated by the earlier tests. In the earlier tests, as shown in Table I, the ratio of economy of the producer to the steam plant was 2.49. In the tests of 1905, the average ratio for the Illinois coals was 2.92, and for sundry other coals used, 2.99, and for the 19 coals, as shown in Table II, the average was 2.93.

As it was found that purifiers are useless when the sulphur in the coal exceeds about 1 per cent, purifiers were discarded. In spite of the fact that some of the coal contained over 8 per cent of sulphur, it has been found after several months' operation that no ill effects were discernible in the engine cylinders.

Additional data are herewith presented, being the principal results of a test of a hard coal producer gas engine made under the direction of the writer in the spring of 1906. The engine was a 3-cylinder, vertical, Fairbanks-Morse engine, using gas generated from anthracite pea coal in a suction gas producer, also manufactured by Fairbanks, Morse & Co. The unit is rated at 150 brake horsepower at 250 revolutions per minute, and was guaranteed to give one brake horsepower-

hour for not to exceed 1½ pounds of anthracite pea coal for all loads above 75 brake horsepower.

Table III.

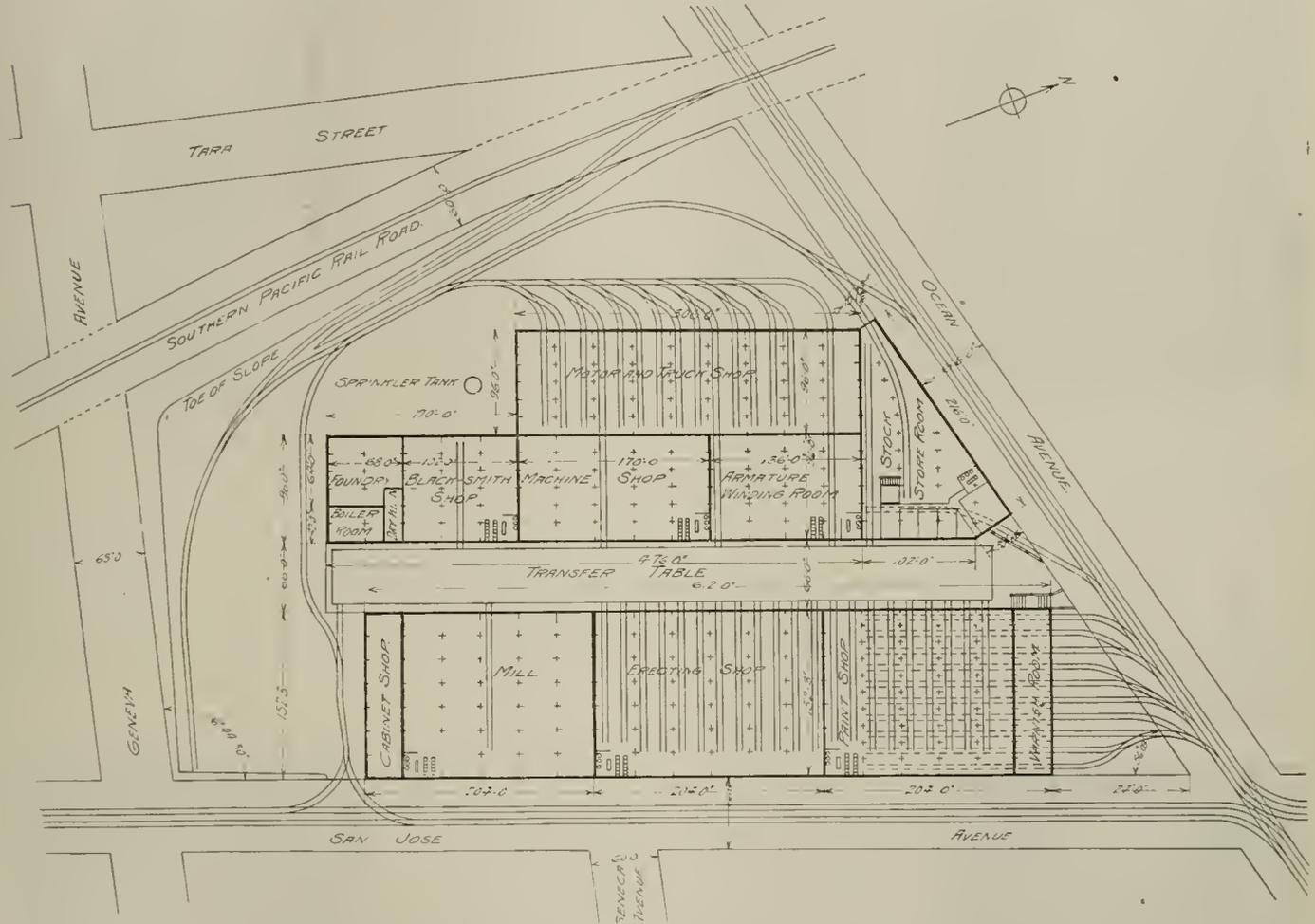
Revolutions per minute.....	250	250	250
Brake-load horsepower	40.1	82.7	156.9
Pounds coal (as fired) per brake horsepower per hour	1.511	1.157	0.999
Cost per brake horsepower-hour at \$6.00 per ton.....	\$0.00453	\$0.00347	\$0.00299

Two tests were also made on this engine under service conditions, viz., belted to a 75-kilowatt alternating current generator. In addition to the lighting load, electrically driven pumping machinery can be operated from this generator.

Figure 1 shows the load curve (A) during a service run with lighting load only, and the load curve (B) for the com-

type of prime mover is destined to be a formidable rival of the steam engine, and as the price of fuel increases the field for the producer gas engine will enlarge. At present there is a question whether it will pay to install a producer gas engine where coal is cheap. The only advantage would be the compliance with the smoke regulation, but as a financial proposition it may be stated that owing to the fact that a producer gas engine installation costs probably from 50 per cent to 60 per cent more than a steam engine plant, which would be its alternate, it will not pay to consider the installation of the gas producer plant with coal costing \$1.50 or less per ton.

The question of the mechanical and operative advantages and disadvantages of the gas engine will not be discussed here except to say that there is no reason why the gas engine



United Railroads of San Francisco—General Layout of New Shops.

bined load, the usual operating conditions, stand-by losses included.

At \$6.00 per ton the cost of fuel per kilowatt-hour at the switchboard for the load A was \$0.01207, including fuel for banking and starting, and for the load B was \$0.00639, including also the stand-by losses.

Soft coal from Illinois, which was used for a Corliss engine unit in the same plant, cost \$3.40 per ton.

A.—Load curve of Algona producer gas engine, on March 15-16, 1906. Fourteen-hour test. Output, 409 kilowatt-hours. Anthracite pea coal per kilowatt-hour=4.10 pounds. Fuel cost per kilowatt-hour=\$0.0123. Load factor, 18 per cent.

B.—Load curve of Algona producer gas engine, on March 16-17, 1906. Twelve-hour test. Output, 589 kilowatt-hours. Anthracite pea coal per kilowatt-hour=2.23 pounds. Fuel cost per kilowatt-hour=\$0.00699. Load factor, 27 per cent.

For the purpose of comparison with this test, we may consider the case of a simple Corliss engine similar to that used in the government tests at St. Louis. The average coal consumption of that engine, according to Table I, was 5.71 pounds per kilowatt-hour. If this coal cost \$3.00 per ton the cost of the coal per kilowatt-hour would be \$0.008565, which can be compared directly with the values given in connection with the Algona test.

It is difficult at this time to predict the immediate future of the producer gas engine, but the writer believes that this

cannot be used satisfactorily for the generation of electrical current for light and power.

NEW SHOPS FOR SAN FRANCISCO.

The United Railroads of San Francisco have recently completed the general designs for an extensive shop layout. By reference to the accompanying general arrangement drawing it will be noted that the buildings will comprise two groups with a transfer table track between them. The drawing also exhibits the horizontal dimensions of the various shops. As yet the construction details for the entire shops and their equipment are not complete. At first some of the buildings will be of temporary construction, but as fast as conditions warrant permanent structures of either concrete or mill construction will be erected. The present demand for shop facilities necessitates the immediate erection of some of the buildings, this being a result of the losses to shops and equipment resulting from the earthquake and fire of April, 1906.

A mono-rail car holding a vertical position by two gyroscopes has been invented by L. Brennan.

BOARD OF SUPERVISING ENGINEERS, CHICAGO
RAILWAYS.

Charles V. Weston was appointed by Mayor Busse on May 6 as the third member of the board of supervising engineers which will have charge of the rehabilitation of the traction properties in Chicago. The board comprises, in addition to Mr. Weston, Bion J. Arnold, who was named in the ordinances as chairman, and Harvey B. Fleming, who was appointed to represent the Chicago City Railway Company.



Bion J. Arnold.

ing and living expenses while away from home and engaged upon the work, the total compensation to be not less than \$3,600 nor more than \$10,000 a year.

Bion J. Arnold.

Bion J. Arnold, president of The Arnold Company and well-known authority on engineering and traction matters, was born in Casnovia, Mich., on August 14, 1861. In 1880 he entered Hillsdale (Mich.) College, where he graduated in 1884 with the degree of bachelor of science, and later, after a post-graduate course, with the degree of master of science and master of philosophy.



Charles V. Weston.

the civil engineering department of the Chicago Great Western Railway, and later, as mechanical engineer of this company, he redesigned some of its locomotives and prepared drawings for new equipment.

At this juncture, recognizing the rapid growth of electricity and its ultimate destiny as the probable solution to many problems, Mr. Arnold entered Cornell University for the purpose of specializing in this particular line of work, remaining there for one year. Immediately upon leaving college he

The ordinances provide that the chairman shall receive \$15,000 per annum compensation and shall also act as chief engineer of the work of rehabilitation, for which he shall receive an additional compensation of \$15,000 per annum. Each of the other two members of the board, according to the ordinances, shall attend monthly meetings and such other meetings as may be called by the chairman, and shall be paid for his services at the rate of \$100 per day, and travel-

accepted a position as manager of the Thomson-Houston Electric Company's St. Louis office, and for three years acted as consulting engineer for this company. During this time he also acted as consulting engineer for the elevated road constructed at the Columbian exposition in Chicago in 1893. In 1893 he opened an office as an independent consulting engineer and in 1894 built the St. Charles Street Railway, New Orleans, La. One of his earlier successes in electric railway work was the equipment in 1897-98 of the Chicago & Milwaukee Electric Railroad. Since 1901 Mr. Arnold has served upon the electric transit commission of the New York Central & Hudson River Railroad. In 1902 Mr. Arnold was commissioned by the city of Chicago to make an exhaustive study and report upon the traction system of the city. His recommendations have been followed and form the basis of a comprehensive system of surface, elevated and underground railways now being developed.

Aside from his extensive work on electric railway problems Mr. Arnold is the inventor of a number of valuable devices in connection with the magnetic clutch and storage battery for electric railway work. He also has achieved some highly satisfactory results from a series of experiments conducted at Lansing, Mich., from 1900 to 1904, upon an electro-pneumatic system of his own invention. These experiments have given an impetus to the development of the single-phase motor and have resulted, by reason of a material reduction in the cost of building electric railways, in its successful application to electric railway operation.

The Arnold Company, of which Mr. Arnold is the president, does a large engineering and construction business with both steam and electric railways throughout the United States. This company built the recently completed Elgin & Belvidere Electric Railway, described in the Electric Railway Review of March 9, 1907. Mr. Arnold is the principal owner of this road and is the vice-president and half owner of the Kentucky Valley road. He is a consulting engineer for many steam railroads and is now acting in a similar capacity for the Wisconsin state railroad commission and for the city of Toronto, Can., both of which are engaged in the readjustment of municipal arrangements with street railway companies.

Mr. Arnold is a member of the American Society of Civil Engineers, the American Society for the Promotion of Engineering Education, the American Institute of Electrical Engineers and the Western Society of Engineers. In 1903 and 1904 he was president of the American Institute of



Harvey B. Fleming.



George Weston.

Electrical Engineers, as well as first vice-president and chairman of the executive committee of the International Electrical Congress of St. Louis.

Charles V. Weston.

Charles V. Weston is chief engineer of the South Side Elevated Railroad of Chicago, a position which he has held since 1903. Mr. Weston is 50 years old and has been a civil engineer throughout his business career. Early in the eighties he was chief engineer of various railroads in Texas and Kansas, and came to Chicago later as engineer for the Chicago & Northwestern road. Shortly after coming to this city he constructed the Lake View intake crib and water tunnel. In 1894 he completed the Van Buren street tunnel for the West Chicago Street Railroad, and later became, in turn, chief engineer for the Northwestern and the Lake Street Elevated roads and the Union Loop. Mr. Weston is a member of the American Society of Civil Engineers, the Western Society of Engineers and the American Railway Engineering and Maintenance of Way Association.

Harvey B. Fleming.

Harvey B. Fleming, who has been appointed as representative of the Chicago City Railway Company on the board of supervising engineers, is chief engineer of that road. Mr. Fleming was born in Newburgh, N. Y., in 1873, and received his early education in New York state. He received a bachelor's degree in engineering from Washington University in 1896 and an honorary degree in engineering from the same university in 1903. He was assistant engineer in the United States government testing laboratory in St. Louis under J. B. Johnson, and was also assistant engineer in the water department in St. Louis. During the time Mr. Fleming was in St. Louis he was engineer for the National Railway Company and the St. Louis Transit Company of that city. In 1900 he came to Chicago to accept the position of superintendent of ways and structures of the Chicago City Railway Company. Mr. Fleming is a member of the Western Society of Engineers and the executive and the standardization committees of the American Street and Interurban Railway Association.

George Weston.

George Weston has been appointed assistant chief engineer of reconstruction and will have general charge of rehabilitating the tracks and properties and will report to Mr. Arnold. All other engineers will report to Mr. Weston.

George Weston was born in Kalamazoo, Mich., on January 30, 1861. After finishing the high school course in Kalamazoo he took special courses in chemistry, higher mathematics and mechanical drawing. In 1880 he joined the engineering corps of the Missouri Kansas & Texas road as rodman, and assisted in the work of construction on the line extending south from Ft. Worth, Tex. Between 1882 and 1885 he was engaged in mercantile business, but in the fall of the latter year he entered the employment of the Gulf Colorado & Santa Fe Railway as rodman with the engineering corps. While with this company he was advanced to instrument man and assistant engineer in charge of construction, remaining in the employment of the company until the spring of 1887, when he resigned to come to Chicago, where he entered the service of Charles T. Yerkes, who had then begun the work of constructing the north side cable lines. Mr. Weston had entire charge of the construction of the Clybourn avenue, the Milwaukee avenue, the Blue Island avenue and the Halsted street cable lines. Under his supervision, 75 miles of horse-car lines of the West Chicago Street Railway were rebuilt into electric lines.

Mr. Weston retired from the street railway company in July, 1896, and took a position as manager of the construction department of Naugle, Holcomb & Co., promoters and builders of electric and steam railroads. While he was associated with this firm in 1896 and 1897 he had charge of construction of the Suburban Railroad. This work involved the

electrical equipment of several miles of steam road, besides a long line of heavy electric road of street railway type. Mr. Weston also had charge of the operation of this road, and while engaged in its construction he had charge of the suburban passenger service to Oak Park and Harlem of the old Chicago Terminal Transfer Railway, the greater part of which was changed at that time from steam to an electric road. In 1898 Mr. Weston was given the general management for Naugle, Holcomb & Co. of all construction work of the Tennessee Central Railway, which was completed in Monterey, Tenn., in October, 1900. Since completing that work he has been engaged principally as a consulting engineer, and for the last two years has been continuously identified with Mr. Arnold's work. Mr. Weston was engineer in charge during the work of the traction valuation commission, which made a report to the committee on local transportation of the Chicago city council on the values of properties of the Chicago City Railway Company and the Chicago Union Traction Company. This commission was composed of Bion J. Arnold, Mortimer E. Cooley and A. B. du Pont. He is chief electrical inspector of the Wisconsin state board of assessment, which is now engaged in valuing the properties of the Milwaukee Electric Railway & Light Company and the Milwaukee Light Heat & Traction Company.

Work of the Board.

Various departments will be created by the board in order to carry out the work planned. Separate divisions will be formed to take charge of the subjects of track, cars, operation, power, power house construction and accounting.

Robert W. Hunt & Co. have been engaged as inspectors of the first 5,000 tons of rails to be used in the reconstruction.

F. K. Parke has been appointed accountant to formulate the new system of accounting, and Marwick, Mitchell & Co. are the general auditors.

The Chicago City Railway Company will keep in a separate bank account the funds which are to be used in rehabilitation of the property. The company has already placed \$5,000 to the credit of the board, which will be used for the immediate needs of the organization. Headquarters have been established on the tenth and eleventh floors of the Board building.

New Equipment Ordered.

During the past week the Chicago Union Traction Company has secured options for considerable new equipment for the rehabilitation of its lines representing an expenditure of approximately \$2,000,000. These include an option with the General Electric Company on 1,600 motors of 40 horsepower each, to be used in equipping 400 new cars, options upon which have been secured from the St. Louis Car Company. The contract with the Lorain Steel Company for 10,000 tons of grooved steel rails provides for delivery early next fall. The additional electric power necessary will be purchased from the Chicago Edison Company at the rate of 6,000 kilowatts per day.

Types of Track Approved.

One of the first acts of the board was to approve the different types of track which had previously been prepared by Mr. Arnold in order to facilitate the work of rehabilitation. The three types which were approved are as follows:

1. With steel ties four feet center to center in concrete.
2. With wood ties four feet center to center in concrete.
3. With wood ties two feet center to center on broken stone.

The first two types will be used for permanent roadway, the location of the respective types to be determined by local conditions. The third type is intended for use as a form of semi-temporary track where permanent improvements beneath the surface of the street have not yet been made. The structure of the track has been divided into two parts, the lower part to be permanent and the upper renew-

able. With the steel type construction, in order to permit the relaying of rails without disturbing the permanent foundation, clips and tieplates, which have been specially designed, will be used.

With the wood tie construction flat tieplates will be used and will be held in place by small lag screws, while the rails will be fastened by screw spikes.

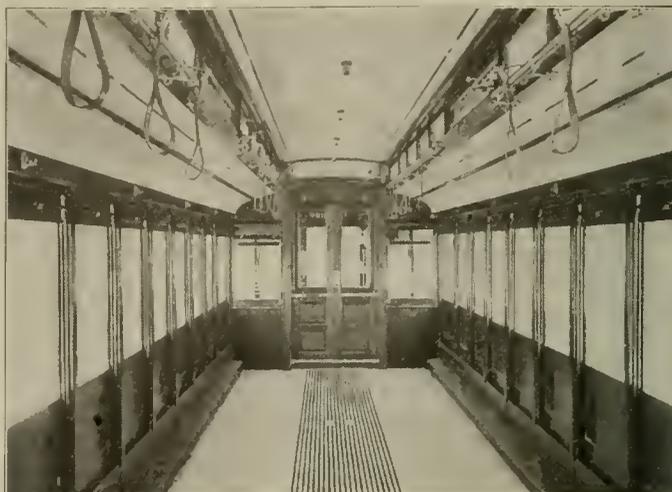
NEW ALL-STEEL CAR FOR BROOKLYN.

The Brooklyn Rapid Transit Company has just received from the Pressed Steel Car Company, for use on the surface lines, the first all-steel car to be purchased by the company. This car is of the same type as the especially designed semi-convertible wood and steel car adopted by the company as a standard. The steel car has a total weight of 50,800 pounds, or considerably less than wooden cars, designed for conditions of traffic similar to those in Brooklyn. The car is 42 feet 6 inches long over all and the car body is 31 feet 5 1/4 inches long. The length inside is 30 feet 7 1/4 inches and the car has a total width of 8 feet. The seats were manufactured by Heywood Brothers & Wakefield. The car has a seating capacity for 48 persons.

In adopting a standard for rolling stock the congestion of traffic and the limited headway made it necessary to design cars with as great capacity as could be operated on the city streets in Brooklyn, while at the same time providing comfort. The cars were designed on the basis of rush-hour conditions and are therefore larger and more costly to operate than is required by the traffic during the greater part of the time. The cross seat and center aisle arrangement was adopted with a view to the comfort of passengers riding considerable distances. For summer use the car does not unload so quickly as the ordinary open car, but this disadvantage is offset by the greater safety and comfort of the new car for use under congested traffic. The determination of the maximum practical size of car also required a great deal of engineering investigation on account of the extent

horsepower capacity, and Westinghouse multiple-unit control. The car also has the Westinghouse traction brake with cylinders 8 by 12 inches in diameter. The equipment of the car includes the Dressel headlight, Empire fender, Consolidated 192-W heaters and Pantasote curtains. The car is lighted with 27 incandescent lamps.

The car is painted in accordance with the Brooklyn Rapid Transit practice for standard cars. In order to avoid so far as possible the interior appearance resulting from the use of steel, the interior has been finished in mahogany effect in accordance with the company's standard practice. The



All-Steel Surface Car, Brooklyn—Interior, Without Seats.

ceiling is finished a light color, which presents an attractive appearance.

The Brooklyn Rapid Transit Company will give the new all-steel car a thorough trial on the surface lines and will also have an all-steel car built for test purposes on the elevated lines.



All-Steel Surface Car, Brooklyn—Exterior.

of the system, the presence of elevated structures, short radius curves and intricate interconnections of lines, etc.

These dimensions have been followed in constructing the steel car, for which no elaborate plans have been made, as the car is more or less an experiment. The car is framed with cross framing of 5-inch standard channel beams with steel side plates 18 inches by 5-16 inch, fastened to the channel beams with 3 1/2 by 7-16 inch angles. The flooring consists of steel plates fastened to the cross framing and these in turn are covered by 5/8-inch wooden flooring with the customary center aisle rack. The car is mounted on standard M. C. B. trucks with 33-inch rolled steel wheels on 4 3/4-inch axles, having journals 3 3/4 by 7 inches. The motor equipment includes four Westinghouse 101-B2 motors, each of 40

ANNUAL REPORTS OF RAILWAYS.

United Railways Investment Company.

The principal announcement in the annual report of this holding company for 1906 is the statement that an issue of \$5,000,000 of first preferred stock has been authorized by the United Railroads of San Francisco. This stock will bear dividends at the rate of not less than 6 per cent per annum, and \$1,500,000 of the issue will be taken by the United Railways Investment Company. The latter company owns all the stock of the United Railroads of San Francisco and a controlling interest in the Philadelphia Company of Pittsburgh.

The income account of the United Railroads of San Francisco for the year, with a comparison, makes the following showing:

	1906.	1905.	1904.
Gross earnings	\$5,955,786	\$7,066,892	\$6,652,630
Operating expenses and taxes...	3,114,590	3,617,821	3,676,438
Net earnings	\$2,841,196	\$3,449,071	\$2,976,192
Other income	89,360	43,757	30,670
Total income	\$2,930,556	\$3,492,828	\$3,006,862
Charges, etc.	1,617,933	1,805,348	1,790,467
Net earnings	\$1,312,623	\$1,687,480	\$1,216,395
Improvements, betterments, sinking fund requirements, etc..	435,478	353,345	249,339
Surplus	\$ 877,145	\$1,334,135	\$ 967,056
Operating expenses and taxes—percentage of gross earnings.	52.2	51.1	55.2

The president, Ernst Thalmann, discusses the great loss which the United Railroads of San Francisco suffered in the earthquake, which caused the destruction of the cable power houses and severe injury to the cable conduits. The balance sheets of the United Railroads of San Francisco

show that between December 31, 1905, and March 1, 1907, there had been expended in the restoration and reconstruction of its lines and plant, including improvements and betterments and the physical loss resulting from the earthquake and fire, a total of over \$4,000,000. Over 91 per cent of the mileage of the company is now in operation, and the officers of the company expect to place the balance of 9 per cent in operation as rapidly as the city completes certain necessary street improvements. All expenditures for betterments and improvements made to March 1, 1907, had been financed by that company, and its current liabilities did not on that date, Mr. Thalmann says, exceed the amount usually carried. The strike of the employes of the United Railroads occasioned, both directly and indirectly, considerable financial loss to the company.

The annual report of the Philadelphia Company, covering the operations for the year ended March 31, 1907, gives the income account of the Pittsburg Railways Company for that year, as follows:

Gross earnings from operations.....	\$10,232,619.88
Operating expenses—	
General expenses	\$ 851,908.59
Conducting transportation	3,243,327.51
Maintenance of way and structures	511,037.46
Maintenance of equipment	632,981.99
Park expenses	132,237.96
Total operating expenses	\$5,371,513.51
Bridge tolls	108,732.98
Taxes	291,711.11
Total operating expenses and taxes	5,771,957.60
Net earnings	\$ 4,460,662.28
Other income—	
Rent of buildings and real estate...\$	47,875.88
Interest and discount	5,013.68
Miscellaneous	31,013.36
Total other income.....	83,902.92
Total income	\$ 4,544,565.20
Deductions—	
Rentals of leased properties.....\$	2,178,252.86
Miscellaneous interest and discount	278,514.60
Tenement expenses	2,693.37
Total deductions	2,459,460.83
Balance	\$ 2,085,104.37
Fixed charges	1,734,199.71
Balance	\$ 350,904.66
Extraordinary maintenance expenditures	\$ 300,131.26
Car trust notes issued December 1, 1905, retired	40,000.00
.....	340,131.26
Surplus	\$ 10,773.40
Passengers carried	203,411,809
Car-miles	36,125,014
Earnings per car-mile.....	\$0.2791
Expenses per car-mile (including taxes).....	0.1552
Net earnings per car-mile.....	0.1239
Operating expenses—percentage of gross earnings.....	52.4

J. H. Reed, president of the Philadelphia Company, states in the report of that company that there were sold during the fiscal year 230 second mortgage bonds and 64,800 shares of the common capital stock. The proceeds were applied in retiring the one-year collateral gold notes, issued on October 1, 1906, in payment for the Beaver Valley Traction Company capital stock, the purchase of the Washington & Canonsburg Railway Company capital stock, and in advances to the underlying companies to be used for improvements and extensions.

The income account of the Philadelphia Company and affiliated operating companies for the year ended March 31, 1906, shows gross earnings of \$18,538,606. Operating expenses and taxes were \$9,340,325, leaving net earnings of \$9,198,281.

The combined statement of earnings of the United Railroads of San Francisco and the Philadelphia Company for the calendar year 1906, which is the period covered in the report of the United Railways Investment Company, shows

gross earnings of \$23,785,596. The net earnings were \$11,404,529, and the balance after the payment of fixed charges and other deductions, including \$1,595,627 for sinking funds, improvements and betterments, and after the payment of dividends on the preferred stock of the Philadelphia Company, was \$3,548,615. Of this sum \$877,145 represented earnings of the United Railroads of San Francisco, and \$2,671,469 earnings of the Philadelphia Company. The proportion of earnings applicable to the Investment company on the basis of its present holdings of Philadelphia Company stock was \$2,821,975.

In his report as president of the Investment company Mr. Thalmann speaks of the purchase of \$24,200,000 par value of the common stock of the Philadelphia Company, or approximately 72.8 per cent of the amount outstanding. Of this stock \$21,000,000 was deposited by stockholders in the Philadelphia Company under the plan ratified on April 5, 1906. These shares were then deposited under the agreement securing the 5 per cent prior lien collateral trust bonds of the Investment company. The remaining stock, amounting to \$3,200,000, was acquired later in the year. Before the end of the year \$2,690,000 of this latter amount had been paid for, and the balance was paid for in January, 1907. The money required for the purchase of this stock was derived in part from the sale of \$2,400,000 of the 5 per cent bonds of the Investment company at 90, and the balance was paid from earnings and other available cash assets. This change accounts for an increase in funded debt to \$18,150,000, as compared with \$15,750,000 in the previous year.

According to the report the floating debt amounted at the close of the year to \$2,090,000, but this has since been repaid, and the floating debt when the report was presented amounted to approximately \$135,000, which will be increased presently, as the directors have arranged to provide funds which will enable the United Railroads of San Francisco to continue the reconstruction and improvement work.

The book value of the investments of the Investment company amounted at the end of the year to \$53,126,482, of which approximately one-half represented the company's interest in the United Railroads of San Francisco and the other half the holdings of Philadelphia Company stock.

Of the prospects for stockholders of the Investment company in the future Mr. Thalmann said:

When it is considered that in the course of the year 1906 the earnings of the United Railroads of San Francisco have been subjected to the earthquake, the resulting conflagration and all its consequences, the strike of its employes, and the consequent general demoralization, they offer a most encouraging promise for the future, and justify the hope that at no distant date payment of cash dividends may be resumed.

Some Interesting Facts.

It is estimated that about six billion passengers were carried by the trolleys of the country last year, about four or five billion more than traveled by steam. This means that at this rate every man, woman and child, white, black, yellow and brown, might have had three rides or more each during the year. An average of something like 17 millions of people were carried daily. Nearly a third of a million people have their names on the payrolls of the trolley companies of the country. In spite of the rapid development of the electric street railways, there are still operated in this country 260 miles of horse car lines and 240 miles of cable lines.

In view of the talk prevalent today about the dangers incident to travel, it is interesting to note that statistics show that on the street railways but one person is killed in 26,000,000, and but one person is hurt in 900,000 of those carried.—Trolley Talks.

The Los Angeles-Pacific Company, operating electric railways to several beach resorts near Los Angeles, Cal., has imported 60,000 ties from Formosa. These are of hardwood, most of them being of narra, a wood much used in the orient for interior work. The cost of the ties at Los Angeles after tariff duty is paid is reported to be but slightly in excess of Oregon pine.

CAR INSPECTION AT WHEATON (ILL.) SHOPS OF THE AURORA ELGIN & CHICAGO RAILWAY.

James Doyle, master mechanic of the Aurora Elgin & Chicago Railway, has developed several unique practices in car inspection and in keeping records of the same. The shops in which the car inspection and repair work are done are located at Wheaton, Ill.

The Aurora Elgin & Chicago Railway Company has an equipment of 47 cars, which are used in maintaining the schedule on its third-rail system. About 30 of the cars are in regular service and are operated on an average about 300 miles daily. Each car is given a thorough inspection every other night.

The master mechanic keeps a complete record of the miles traveled by each car. Every night cards are posted in the shop designating the cars that should be placed over the pits. One of these cards is reproduced herewith. It contains the date, the car number, the date and time the car was taken from its run, and the respective heads under which the various car equipments are grouped. After an inspector has thoroughly inspected and repaired the equipments for which he is responsible, he signs his name in the blank space provided on the card opposite the general head under which his work is classed. He is then held responsible for the work.

The cards are gathered up each morning and sent to the master mechanic's office, where they are recorded. If for any reason a car is not inspected after having run 600 miles, the card bearing its number is filled out in red ink, which indicates that the equipment should be inspected more thoroughly than usual.

This company has found it profitable to overhaul the triple, engineer's and feed valves of its cars every 60 days. The journal boxes are thoroughly cleaned and repacked every 45 days. When the valves or journals have been in service the allotted time a cross is placed on the inspection card in the square opposite the respective parts, which indicates to the repairman that the part of the equipment thus marked should be overhauled or replaced by new parts. After the work has been done the employe places a circle around the cross.

The inspectors are divided into six classes. The men of each class have their duties definitely arranged according to a bulletin of instruction that is posted in the shop. The substance of the bulletins is as follows:

Whenever it is necessary to adjust or change triple valves, engineer's valves and feed valves, a cross will be marked on the card in the square opposite the name of the respective part. Should a valve be reported as defective on the trainmen's daily car report or by an inspector, the valve so reported may be changed by an employe, who must indicate the same by marking a circle in the space provided on the card. At no other time are the valves to be changed.

The employe who inspects and repairs controllers, controller circuit wires, switches and fuses, light circuits, switches and fuses, heaters, heater circuits, switches and fuses, com-

pressor governors, air gauges, signal bells, emergency valves, train line and bus line sockets, motor and bus line fuses, and who looks after all carpenter and trimming work, must sign his name in the space allotted on the inspection card provided for each car. This will indicate that he has completed the necessary inspection and repairs to each of the above car parts.

The employe who inspects the contactors and reversers must sign his name in the proper space on the card provided for each car. This will indicate that he has done the necessary work on the parts coming under his supervision.

The employe who inspects and repairs motors, commutators, brush holders, motor leads, grid and control rheostats, gear cases, brakes and brake rigging, air hose and piping, reservoirs, drawbars, trucks, wheels and safety chains, will sign his name in the allotted space on the card provided for each car, thus signifying that he has thoroughly inspected and adjusted the respective parts.

The employe who inspects and repairs air compressors, trolley stands, poles and wheels, third-rail shoes, fuses and brake release springs, will sign his name in the space allotted therefor on the inspection card provided for each car, thus indicating that he has done the necessary work.

The employe who inspects and oils armature, axle and journal bearings, sector bars, chafing plates and gearing will when he has completed his work on each car, sign his name in the allotted space on the card provided for each car. When the bearings are to be repacked, the inspection card will be marked with a cross in the square opposite the name of the bearing requiring attention. No bearing will be repacked otherwise unless in bad order. Armature clearance will be taken whenever bearings are to be replaced.

HOW TO INSULATE ARMATURE COILS.*

Armature coils are made in so many different varieties that several different methods of varnishing are necessary in order to secure the best results with each different kind. For the insulation of direct-current motor and dynamo armature coils, it is advisable to use what is known as the "double-dipping" method, as all coils of this kind are usually form-wound and are, therefore, readily adapted for this treatment.

The treatment is as follows:

After the coils are formed, they are clipped together at the corners, and dipped right into the varnish compound, and then allowed to dry. When the coils are thoroughly dry, they should then be taped and again dipped in the varnish compound—and dried. To get the best results on this class of work, particularly when handled in quantities, the varnish must have great plasticity, and good insulating and quick-drying properties.

The varnish should also be a combined baking and air-drying varnish, as quick-drying varnish is often an absolutely necessary factor—in many cases, the varnish must be thoroughly dry from one to two hours after baking.

The varnish which has great plasticity is also of vital importance on this class of work, because in making up the standard types of machines, it is often desirable and economical to make up at one time enough coils to provide for the entire output of each size machine for a long while ahead—in many cases, for six months or even a whole year.

Great plasticity is, in this way, of great value to the coil manufacturer, as it enables him to make up a big lot of coils and stock them, without any fear that the coils will harden, or that the insulation will break when the coils are finally assembled in an armature later on, as so often happens when a hard-drying varnish is used on the coils.

On armature coils of street railway motors, the great essential is durability and water-proofing qualities. The test of time has shown that the varnish which best accomplishes the desired results is a varnish of hydrocarbon base, which dries quickly and remains indefinitely soft and plastic. This quality enables a varnish to withstand the contraction and expansion always present in a street railway motor, and prevents the breaking of the insulating film from vibration and heat, thus absolutely and indefinitely repelling moisture, which, in a majority of cases, is the direct cause of short circuits and burn-outs. The "double-dipping" method described above is absolutely essential in the treatment of street railway motor armature coils.

In street railway work it is also essential that a finishing coat of varnish be given the armature after the coils are assembled, as very often injury to the insulating film results from placing the coils into the slots. This coat of varnish not only serves to remedy any defects of this nature, but also

*[From "The Insulator," published by the Standard Varnish Works.]

24 Hrs. ending at 6 p.m. on		A. F. & C. Form 59 3m 10-01 W	
Car			
		DATE	TIME
OUT SERVICE			M
IN SERVICE			M
TRIPLE VALVE			
ENG'NRS "			
FEED "			
CONTROLLERS ETC			
CONTACTORS ETC			
BRAKES, MOTORS, ETC			
COMPRESSORS, TROLLEYS, ETC			
JOURNALS			
AXLES			
ARMATURES			
REMARKS:			

Form for Recording Car Inspection.

provides an additional waterproof coating to the whole armature. A varnish of this nature to be successful should have in a great degree the qualities of dipping varnish, such as ability to withstand long continued heat and vibration without becoming brittle and absolute water-proofing qualities.

TESTS OF A 500-KILOWATT TURBO-ALTERNATOR.

As the results of comparatively few tests of turbo-generator units have been published, those recently conducted by H. L. Rice, general manager, and W. M. Willett, electrical engineer of the Western United Gas & Electric Company of a standard 500-kilowatt turbine and generator in the company's plant at Aurora, Ill., will no doubt be of interest.

Description of the Unit.

The steam end of the unit is an Allis-Chalmers-Parsons horizontal turbine, designed to operate with dry saturated steam at 140 pounds pressure per square inch, gauge, at the turbine throttle, and a vacuum of 28 inches of mercury, referred to a 30-inch barometer, at the exhaust nozzle. With steam under these conditions the unit is designed to carry an overload of 50 per cent, the power factor being 100 per

tioned. The lower barrels were connected with each other by a large horizontal pipe near their bottoms, and the suction pipe of the feed pump was brought into one of the barrels.

Two Stirling boilers of 250 boiler horsepower each supplied steam to the turbine during the test. Each of the six drums of the two boilers was provided with a gauge glass and readings of the water levels in all six drums were taken at the commencement and end of the test, and also during the test. The blow-off pipes were blanked off, as were also the feed connections to the other two boilers in the station.

The auxiliary steam header for the feed pumps, etc., was disconnected from the main header. That portion of the main header receiving steam from the two boilers not used during the test was separated from the portion receiving steam from the two boilers which furnished steam to the turbine during the test by means of a gate valve, which was closed tightly during the test. In order that there might be no leakage of steam through this valve, the pressure on all boilers was maintained about the same throughout the test, so that both sides of the valve were under approximately the same pressure.

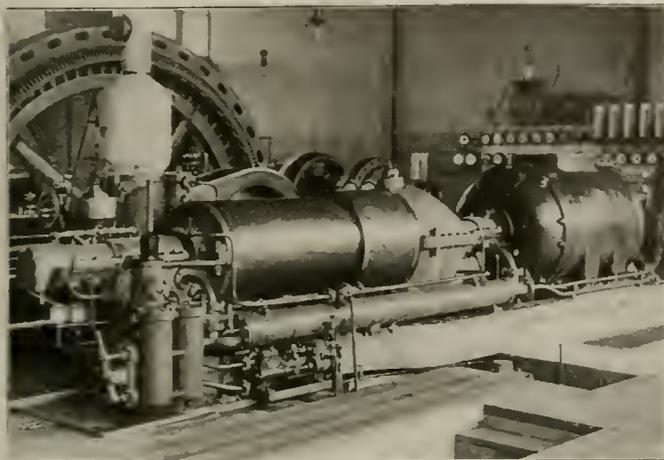
The condensed steam from the steam header, and also that from the steam separator near the turbine throttle, was discharged into barrels filled with a weighed quantity of cold water. As the water accumulated it was taken out and weighed, and when the water in the barrel became sufficiently hot to vaporize, a weighed quantity of cold water was added. At the end of each test the water in the barrel was brought back to its original quantity. The feed pump for supplying the measured feedwater to the boilers was a duplex outside-packed plunger pump. The leakage from this pump was caught and returned to the lower feedwater supply barrels. It was not necessary, therefore, to keep records of this leakage.

The steam gauges were checked by an inspector's test gauge, which had been verified shortly before. The quality of the steam during the test was determined by a throttling calorimeter introduced into the steam pipe just below the separator at the turbine. A water rheostat was used for loading the turbo-unit. Electrical readings were taken from the regular switchboard instruments in the station, and also from a set of calibrated instruments.

Between the overload and three-fourth load tests, the boilers were tested for leakage. To determine this, all valves were closed after the boilers had been filled to marks on the gauge glasses, and the boilers were kept under a steam pressure of 150 pounds per square inch for four hours. A measured quantity of water was then put into the boilers to bring the water level back to the original marks.

Results of Tests—	Underload.	Overload.
Average load, kilowatts	385.8	570.8
Per cent of rated load.....	77.5	114
Duration of test, hours.....	4	4
Steam pressure at turbine throttle, gauge.....	142.4	143.3
Steam pressure at turbine inlet, gauge.....	87.0	123.02
Vacuum turbine exhaust, inches.....	27.57	26.77
Barometer, inches	29.45	29.5
Vacuum at turbine referred to 30-inch barometer, inches	25.08	27.22
Revolutions per minute.....	3,600	3,600
Total water used, corrected for temperature, degrees F.	34,552.0	78.8
Drips from steam header, pounds.....	397.0	485.44
Drips from separator, pounds.....	91.5	318.75
Temperature of feed water, degrees F.....	83.16	68.25
Boiler leakage, pounds	1,927	1,927
Moisture in steam by calorimeter, per cent....	4.48	5.12
Actual weight of water chargeable to turbine, pounds	30,612.01	43,878.23
Actual consumption dry steam per kilowatt per hour, pounds	19.83	19.21

At the annual meeting of the National Association of Cotton Manufacturers, held on April 24 at the Massachusetts Institute of Technology, the association medal was presented to Mr. Charles B. Burleigh in acknowledgement of the merits of a paper read before the association at its fall meeting on September 13, 1906, entitled "The Curtis Vertical Steam Turbine."



Turbo-Alternator Tested at Aurora.

cent. The turbine and generator operate at 3,600 revolutions per minute, the generator being of the 2-pole, 2-phase turbo type, generating 60-cycle current at 2,200 volts. The normal current per phase is 114 amperes. The turbine is served by a standard Allis-Chalmers turbo jet condenser.

Conditions of the Test.

The time during which the turbine could be spared for test was limited from midnight Saturday to midnight Sunday; it was therefore decided to run only two tests, viz., one at 10 to 15 per cent overload, and one at three-fourths full load. As the turbine is provided with a jet condenser, the steam consumption had to be determined by weighing the feedwater, and to correct this it was necessary to make a boiler leakage test during the time available for test purposes.

To determine the amount of feedwater used, two barrels were placed on a platform and connected with each other by a short horizontal pipe introduced into the sides of the barrels near their tops. A water supply pipe with valves was brought over these barrels for the purpose of filling them alternately. Each barrel was provided with a large plug cock in its bottom. The barrels were carefully calibrated, and when filled so that the water would just enter the connecting pipe above mentioned, they were found to contain 413 pounds and 391.25 pounds of water respectively at 58 degrees F. As the feedwater during the test was at a higher temperature, a correction was made for the difference. Under the platform two receiving barrels were placed; into these the upper barrels emptied through the plug cocks men-

RECOMMENDATIONS OF WISCONSIN RAILROAD COMMISSION.

The first biennial report of the railroad commission of Wisconsin, reviewing its operations from the organization of the commission to June 30, 1906, and opinions to December 1, 1906, has been issued. The commission recommends a number of changes in the laws. In the list of recommendations is the following:

The jurisdiction of the commission over street railways should be either increased or diminished. Under the construction placed upon the law by the attorney-general and by the commission, it confers jurisdiction upon the commission to regulate any street railway company whose lines pass beyond the limits of the city in which it is operating. This right of regulation extends to the urban business of the company as well as to the business of the company outside of the limits of the city. As a result the commission appears to have a right to regulate the entire business of a street railway company where any of its lines extend beyond the city limits, but it has no right to regulate the business of a street railway company whose lines are entirely within the limits of the city in which it is operating. It would appear to the commission that it should either have power to regulate the urban business of all street railway companies operating in the state or that such power should not extend to any of them.

The commission also recommends that every corporation doing business in the state should be required to furnish a verified list of its stockholders upon demand from the commission.

The report gives figures of operations of the street and interurban railways in Wisconsin for the calendar years 1904 and 1905. In the year 1905 the total gross receipts from the railway business of 20 companies reporting were \$4,321,876, as compared with \$4,144,267 in the previous year. The total amount applied for "depreciation or reserve" was \$409,133 in 1905 and \$373,932 in 1904. Other items of expense in the two years were as follows:

	1905.	1904.
Conducting transportation	\$1,272,132	\$1,273,783
Maintenance of way and structures.....	172,054	192,073
Maintenance of rolling stock.....	207,889	206,989

THE CLEVELAND SITUATION.

Both the Cleveland Electric Railway and the low-fare interests are making preparations for extensive publicity campaigns to secure the favor of the citizens for their respective sides of the controversy. In the meantime the Cleveland Electric Railway has nearly completed the work of removing its property on the Central-Quincy lines and has so far been successful in preventing operation over those lines by its rivals.

Judge Chapman of the common pleas court on May 4 granted two temporary injunctions applied for by the Cleveland Electric Railway, one restraining the Forest City Railway and the Municipal Traction Company from interfering with the property of the Cleveland Electric in Central avenue and Quincy street, and the other enjoining further progress in those streets under the grant of the Forest City Railway, on the ground that the mayor's alleged financial interest in the company has invalidated the franchise.

At the council meeting on Monday night Councilman Felton attempted to have some action taken on his ordinance granting to the Cleveland Electric Railway a 6-year franchise on Central avenue and Quincy street on the basis of seven tickets for a quarter, but the ordinance was tabled. The Cleveland Electric filed with the city clerk several hundred revocations of consents to the Forest City Railway for the Central-Quincy lines, which are intended to operate against the pending ordinances to the Low Fare Railway. Three ordinances were passed giving the Low Fare Railway franchises on all of the lines now occupied by the Cleveland Electric Railway, whose franchises expire in February next, according to the city's claim. Fifteen ordinances were also introduced giving the Low Fare company franchise extension

rights over 15 cross streets between Central avenue and Quincy street. The manifest object is to keep the Cleveland Electric guessing as to which street the company intends to use so that it cannot block the work by preventing the securing of consents. A resolution was also passed directing the Cleveland Electric to repair its St. Clair avenue tracks by June 15 under penalty of forfeiture of its franchise. The company has refused to lay new groove rails and to pave between the tracks on its Detroit avenue line, where the city is repaving the street, because of the city's claim that the franchise on that street expires next February. A resolution was introduced requiring the company to proceed with the work at once, under the same penalty as provided in the previous resolution. It was referred to the committee on street railways.

The suit of the Cleveland Electric Railway to enjoin the Low Fare company from laying track or operating on the Central-Quincy lines, on account of the lack of a sufficient number of consents, has been given several hearings before Judge Phillips and is expected to be decided the latter part of this week. In the meantime the Low Fare company is temporarily restrained from doing any work under its permit from the board of public service.

Municipal Ownership Commission Preparing Report.

At a meeting of the Municipal Ownership Commission of the National Civic Federation, held in New York City on May 6, a number of subcommittee reports were received and a special committee consisting of Walton Clark, Edward E. Bemis, Milo R. Maltbie and J. W. Sullivan, was appointed to undertake the work of assembling and compiling the mass of material and of incorporating therewith the special contributions of an economic character made by recognized authorities. This committee will prepare two reports for publication, one being a synopsis of the more important matter for use by the press and the other a pretentious volume containing all of the statistics, records and contributions which have resulted from the committee's extensive investigation of municipal ownership at home and abroad. It is expected that the former report will be ready for distribution about June 10.

Rules and Regulations of the Operating Department of the Denver City Tramway Company.

The 1907 edition of the rules of the Denver City Tramway Company, revised to March 15, 1907, has just been received. The rules are remarkably complete and show the attitude of the company, not only to its employes but to its patrons as well, to be that of co-operation and a desire to do all within its power to give its passengers the best service possible and a foresight for the welfare of its employes. Throughout the little book useful hints are given to the motorman and conductor, and city ordinances, relating to the operation of electric cars and conduct of employes of electric railway companies, are inserted to aid the conductors and motormen to understand the rules and to improve the service.

London Underground Railways.

It is stated on good authority that the greater part of the tube railways, the construction of which has been undertaken by the Underground Electric Railways Company of London—about 22 miles in all—will be open for operation before July 1, 1907. The construction of these lines has been delayed much beyond the expectation of the promoters, so that at the present time there are only about 12 miles open for traffic, namely, about 3¾ miles of the Baker Street & Waterloo Railway, opened in March, 1906, and about 8 miles of the Great Northern Piccadilly & Brompton Railway, opened in December, 1906. The earnings of the uncompleted system scarcely enable the formation of a final opinion as to the possibilities, but the Wall Street Journal is informed that the portions which have been opened are showing weekly increases at the present time. The American expert and practical street railway man, who recently visited the city to look over the whole London situation and the properties of the Underground Electric Railways, is stated to have expressed the belief that the enterprise will in due time work out with good results.—Wall Street Journal.

PIPING AND POWER STATION SYSTEMS—XXXIX.

BY W. L. MORRIS, M. E.

Condensation Main and Branches—Class (J6-7-8 and 9).

This class of service pertains to surface condensers only. The condensation alone or with the air contained in it may be delivered to an open heater by the pump running continuously at a fixed speed, or the pump may be regulated by a float if the pump handles the condensation only. If the condensation pump is governed by a float it cannot handle air mixed with condensation. In this case the water of condensation may be delivered directly to the boilers, as shown in Figure (G1-2), through a closed heater, the condensation pump in this case being that employed for feeding the boiler. With this arrangement, though extremely simple, it is necessary that the pump be located at a sufficient distance below the condenser discharge, so that the weight of the column of water in the pump suction pipe will be sufficient to raise the valves of the pump and completely fill the pump cylinder without the necessity of maintaining a greater vacuum in the pump cylinder than in the condenser.

The details shown in Figure 276 would not be suitable for high pressure such as would be required in boiler feeding, though as a matter of fact this detail could not be employed, as the diameter of the pump necessary for boiler feeding would be far less than is necessary for the type of valve construction there shown. For high pressures the outside packed plunger pump is better suited, as it is at all times possible to ascertain exactly what the leakage is and the condition of the packing. In Figure 277 (J2-7) is shown an

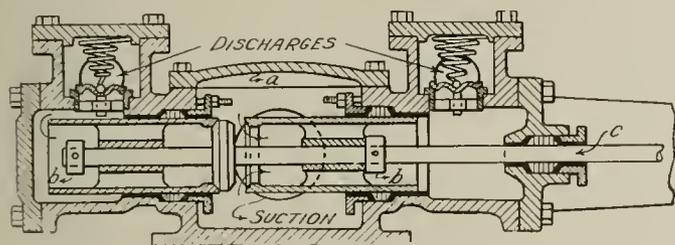


Figure 277—(J2-7).

outside packed plunger pump, which is packed by removing the cover plate over the suction chamber, a. The suction valves in this pump, as will be seen from an examination of the drawing, are mechanically operated by the movement of the plunger rod, upon which the valves are mounted. The discharge valves are of the usual heavy type employed for boiler feed pumps. The two brass plungers, which are free to slip on the rod within the limit set by the collars, bb, have valve seats turned on them at their outside ends. In operation the motion of the pump rod is transmitted to the plunger through the suction valve, which causes the valve to be firmly seated and kept tight by the pressure against the end of the hollow rams, and being mechanically opened, give free access for the water through the suction end. A feature which will be evident from an examination of the drawing is the large suction valve area presented by this type of construction. This type of pump is especially suited for direct steam drive with the steam cylinder at the other end of the piston rod. From its construction it will be easily seen that this pump is well adapted to handle air and water, together, but is not suitable for use as a dry vacuum pump on account of the large clearances.

To insure a high efficiency the design of a dry vacuum pump should be of the crank and flywheel type, so that the clearances may be reduced to the least possible amount, as shown in Figures (J2-5 and 6). This type of pump shown in Figure (J2-7) would be more efficient for handling air and water combined if the valves on the piston rod closed against the other end of the ram, closing against the ram from the

same side as shown, the valves being located inside of the ram. The air pump shown in Figure (J2-5-6 or 7) cannot be used if located a considerable distance below the condenser, as shown in Figure (G1-2). For these types of pump the suction lines should be carried from the bottom of the condenser to the suction chamber of the pump along practically a level line, giving the air a free path to the air pump over the surface of the water in the suction line. If it is necessary to place a wet vacuum pump a considerable distance below the condenser, owing to the use of spring loaded suction valves, it is then necessary to keep all the water pumped out of the suction pipe in order to permit the air to flow freely to the pump cylinder. This necessitates the pump being run at a higher speed, and by keeping the water out of the pump its capacity for handling air is decreased as the water is not present to fill the clearance spaces. The greatest capacity for handling air is obtained when the water taken at each stroke is just sufficient to fill the clearance spaces.

The condensation pump is oftentimes located in an out of the way place owing to the position of the condenser, and, in fact, it is sometimes necessary to set other pumps in positions where it is impossible to provide ready means for observing their operation. The most necessary operating condition to be observed is the speed at which the pump is running. This can be easily ascertained by arranging an indicator at a point readily observed by the operator.

A simple detail for such an indicator and one which permits the indicator to be placed in almost any location is shown in Figure 278 (J2-8). The indicator piping is attached to one end of the steam cylinder or water cylinder and the change of pressure is noted by the rise and fall of the water in the gauge glass, there being one movement for each stroke. The upper valve, a, is kept closed while in operation, the lower one being open. The quantity of air in the glass can be increased by manipulating the different valves, closing c, opening b, closing b, opening a, and drawing of the water through e. To raise the water line have c open, draw air at d and close b, open a and discharge contents of glass as much as required through e. The operation of this device is due to the air confined in the upper part of the gauge glass, the volume changing as the pressure on it changes. Not only can the speed be observed with this gauge, but also the regularity of motion. The liquid in the glass may be colored, but for continuous service it is better to use clear water, as nearly all colored liquids mark the glass where the liquid and air come in contact. It will be better to use galvanized iron or brass pipe and fittings, as they would reduce the danger of the glass becoming soiled and therefore make it possible to observe the motion of the water more easily.

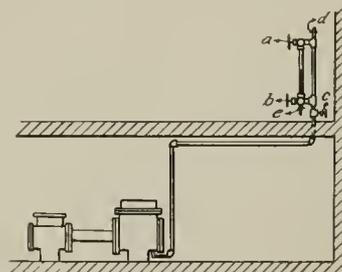


Figure 278—(J2-8).

City Water Main—Class K 1.

Plants that are provided with their own water supply soon become very careful in the distribution and use of city water. It is only a plant in which no other than city water is obtainable in which the employes of the plant become wasteful in its use. The operator becomes so accustomed to seeing large quantities of water used in regular work that what he wastes appears quite immeasurable.

In laying out the piping system of the plant which is to be operated entirely with city water many different methods can be introduced which will reduce or avoid the use of water. For example, instead of using hydraulic turbine tube cleaners, power cleaners should be employed, as they are successful in any plant and especially so in plants which use only city water. Instead of using furnaces having water

cooled parts some other type should be used to save the continuous loss of water. Instead of the bearings being water cooled they should be made sufficiently large to run cool without water. Instead of ashes being dropped into metal hoppers or other receptacles which necessitates their being wetted they should discharge into a masonry hopper, allowing air to the grate to carry off the heat.

If the water contains a considerable quantity of scale-forming salts it should be treated chemically in a purifier in order to reduce to a minimum the quantity of water wasted in blowing off. Little has been accomplished in the design of an exhaust condenser, a device which would save practically all the water fed to the boilers by condensing. Such a condenser would in all probability be constructed on the same general principles as an ejector, the ejector, however, having the greatest amount of work to perform, as it takes water from a state of rest and at a lower pressure.

An exhaust ejector would take air at practically the same pressure as the air it would discharge against. One cubic foot of air requires 0.0686 heat units to increase its temperature 1 degree F., or, if air is taken at 65 degrees and delivered at 205 degrees, the increase in temperature would be 140 degrees, which would require 9.6 heat units per cubic foot. Exhaust steam would have 965.7 latent heat units per pound, and as the volume at atmospheric pressure is 26.36 cubic feet per pound the exhaust steam would contain 36.6 latent heat units per cubic foot. To condense 1 cubic foot of steam therefore would require 3.8 cubic feet of air.

(To Be Continued.)

BRIDGE-DECKING RECORD USED ON WINONA INTER-URBAN RAILWAY.

In the Electric Railway Review for March 30, 1907, page 434, there was reproduced a record blank which was used

<u>BRIDGE DECKING RECORD.</u>				
WINONA INTERURBAN RAILWAY Co.		DIVISION.		
BRIDGE No	AT	DATE		
TOTAL No PANELS		TOTAL No BENTS		
			TOTAL LENGTH	
<u>CAPS</u>				
No.	Size.	Timber.	Feet, BM.	Remarks.
<u>STRINGERS</u>				
<u>TIES</u>				
<u>GUARD TIMBERS</u>				
<u>PACKING BLOCKS</u>				
<u>SWAY BRACING</u>				
<u>BULKHEAD TIMBERS</u>				
<u>MISCELLANEOUS</u>				
Total Feet BM.				
				<u>Inspector.</u>

Bridge Decking Record, Winona Interurban Railway.

by the Winona Interurban Railway, Winona Lake, Ind., in recording the progress of pile driving on the Peru division. Accompanying this record is a bridge-decking record blank which has been compiled by R. M. Murray, chief engineer. It is shown herewith. This blank is intended to serve as a permanent record of the material used in the construction of the deck of the bridge.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL.B., OF THE CHICAGO BAR.

May Require Taking Out Permit to Do Work.

An ordinance of a city which requires street railway companies and other corporations holding franchises to use the streets of the city to file an application for a permit before entering upon and obstructing the streets, and which requires the applicant to file specifications of the manner in which the work is to be constructed and to fix the location thereof, and requires it to give bond to hold the city harmless for damages caused by the proposed work, and which gives the city council power to grant or refuse such permit, the supreme court of Nebraska holds, State, on the relation of the Lincoln Traction Company, v. Frost, 110 Northwestern Reporter, 986, is not invalid, as interfering with or violating the franchise rights of the company in the streets. The court will not presume that under such an ordinance the city authorities will act arbitrarily or abuse their discretion, but will presume that the ordinance will be construed according to its legal effect, and that if the proper conditions are met the permit will not be refused.

Duty Created by "Run Slow" Sign.

In an action against a street railway company for injuries received by a foot passenger struck by a car of the defendant while crossing a public street, it was established that when and where the accident occurred there was a sign, placed over the tracks by the defendant corporation, requiring cars to "run slow." The court of errors and appeals of New Jersey holds, Hayward v. North Jersey Street Railway Company, 65 Atlantic Reporter, 737, that this requirement, adopted by the defendant corporation previous to the accident, for the guidance of its servants in matters relating to the safety of the public, and made public, created a duty as to such persons as would be likely to be injured by a failure to observe the precautions prescribed. Proof of a violation of such requirement by the motorman, directly resulting in injury to the plaintiff, is evidence, although not conclusive, from which the jury would be warranted in finding the motorman negligent and the defendant therefore liable.

Company Entitled to Have Bill of Particulars.

In the case of Ferris v. Brooklyn Heights Railroad Company, 102 New York Supplement, 463, an action for an alleged assault by the defendant's servants upon the plaintiff when a passenger on one of its cars, the second appellate division of the supreme court of New York approves of an order for a bill of particulars. It says that it thinks a bill of particulars proper in this case to reach justice and to afford the defendant fair opportunity for preparation to meet the issue. The defendant is a corporation which works many cars and employs a large number of men. An allegation that on or about a certain day, when the plaintiff was a passenger on a car on a specified line on a specified street, he was assaulted by the defendant, its conductor, agents, servants and employes in charge of said car, is indefinite to the extent that it leaves the defendant in the dark as to the day, the time of day, the car, or the servants, and requires a minute, searching and laborious investigation by the defendant before it can throw any light upon the alleged occurrence.

There is nothing unreasonable, the court says, in requiring the plaintiff to name "the place and exact time of day that the accident (sic) happened, and also the direction the car was going." The information not only serves to locate and specify the occurrence, but also the car, and consequently those in charge of it, as it is common knowledge that the defendant keeps a record of its cars, their trips, and the particular servants in charge of each of them.

With regard to the bill requiring the number of the car, line and badge number of the motorman and conductor, the

court says that this was but to specify the car among the many worked by the defendant, and to identify the servants out of the many employed by it. If the plaintiff knew the names of the servants he could be required to give them. Of course, it was not essential to complaint or recovery that the plaintiff should give the numbers of the servants, or their names; but that was not the question. If he knew the numbers there was no good reason why he should not furnish the information.

The requirements of a setting forth of the length of time the plaintiff was confined to bed and house, the amounts paid for doctor's bills and medicines, the nature of his business, average earnings, and the time of his detention from work, were proper. But the court thinks that the plaintiff should not be required to give the "exact statement of injuries claimed to have been sustained" by him, or "the nature, extent and effects of same"; there being no allegation of permanent injuries.

Valid Ordinance as to Railroad Crossing by Cars.

A city ordinance intended to regulate the manner of crossing steam railroads by street cars in the city, provided that it should be unlawful for any conductor, in charge of any street car using the streets of said city for the purpose of carrying passengers or freight, to permit such cars to cross or enter upon the track or tracks of any steam railroad in said city until such conductor should have first fully crossed on foot to the opposite side of the farthest track of said steam railroad from his car, and it should be unlawful for any motorman, gripman or engineer, in charge of such car, to run into or upon the track or tracks of any such steam railroad until the conductor in charge of such car had first crossed on foot to the opposite side of the farthest track of said steam railroad from said car, and from said point had signaled such motorman, gripman or engineer to proceed with his car. The appellate court of Indiana, division No. 2, while not basing its decision upon the validity of the ordinance, states, *Indianapolis Traction & Terminal Company v. Romans*, 79 *Northeastern Reporter*, 1068, that it deems the ordinance valid. The court says that it was not necessary to pass upon the question of the validity of the ordinance, because the uncontradicted evidence, without reference to the ordinance, showed the company's negligence, the evidence showing that the car in question was run upon the track of a steam railroad, directly in front of an approaching train, without any effort to stop the car, and without any attempt by the conductor to ascertain whether the way was clear.

Right to Transfer from Short to Long Service Car.

A passenger on a car bearing in a conspicuous place the sign, "Fourth street only," was ordered off when the car reached that street, the conductor stating that the car did not go any farther. The passenger demanded a transfer entitling him to a continuation of his trip to his place of destination, which was refused.

It appeared that the company, in regulating its traffic, provided, over the route this passenger desired to travel, two classes of cars upon the same tracks, viz., long and short service cars. What he demanded was a transfer from a short-service car to a long-service car upon the same line.

The appellate term of the supreme court of New York holds, *Baron v. New York City Railway Company*, 102 *New York Supplement*, 746, that the refusal of a transfer was a violation by the company of section 104 of the New York railroad law, which provides that upon the refusal of a street car company to issue a transfer to a passenger, entitling the passenger to a continuous trip from the point of embarkation to another point on the railroad operated by such company, the company shall forfeit \$50 to the aggrieved party.

The court does not agree with the contention that the plaintiff failed to establish a cause of action on the ground that there was no proof that the transfer demanded by him was to a leased line. It says that the legislature never

intended that the obligation imposed by said section should be limited to leased roads.

Nor does the court consider that it was an excuse for a refusal of a transfer to the plaintiff to say that the giving of a transfer would confer upon him the privilege of stopping over. This argument could be urged against all transfers.

The court says that it may properly take notice of the fact that the region of the city through which the car under consideration passed was largely a congested business section, where the traffic was much heavier than in the extreme northerly or southerly parts of the city. The running of short-service cars between the long-service cars through crowded avenues is a reasonable regulation, well within the powers of the company in the management of its railroads, when, as in this case, reasonable notice is given of the conditions of operation. However, the company cannot lawfully refuse a transfer to a passenger whose continuous trip carries him beyond the terminal point of the short line. The court concedes to the company the right to establish lines of short-service cars, but it can find no authority that permits the company, no matter how conspicuous and complete the notice, to arbitrarily require passengers desiring to make a continuous trip beyond the place of destination of the short-service car to board only a long-service car. If the company possessed such authority it might avoid the giving of many transfers by establishing numerous short routes in various parts of the city and by operating thereon mainly short-service cars.

Right to Transfers Not Limited to One Direction.

A passenger boarded a southbound car, paid his fare, and asked for and received a transfer. He then left the car and boarded a westbound one on an intersecting street. On a car going northerly from this latter street he was refused a transfer, and was obliged to pay another fare to enable him to reach his destination. The appellate term of the supreme court of New York holds, *Kelly v. New York City Railway Company*, 102 *New York Supplement*, 742, that he was entitled to recover the statutory penalty for refusal of transfer.

Section 104 of the New York railroad law provides that "every such corporation entering into such contract," referring to one of lease, shall carry "between any two points," and "shall upon demand, and without extra charge, give to each passenger paying one single fare a transfer entitling such passenger to one continuous trip to any point or portion of any railroad embraced in such contract." The court says that when the passenger pays for the right to ride it is upon an agreement between the parties that he shall have a continuous ride for the one fare to his point of destination. Such a ride under the circumstances disclosed in this case was guaranteed to the plaintiff by the statute.

The court is unable to find legal support for the defendant's claim that it has the right to impose a limitation upon the giving of transfers by refusing them to passengers desiring to continue their journey upon lines not running in the same longitudinal direction. It was the contention of the defendant that "when a trip becomes southerly it shall not thereafter become northerly, and vice versa, without the payment of an additional fare."

The court thinks such a rule is a violation of the statute. It is not an excuse to show that such a rule is necessary to prevent a fraudulent use and abuse of the defendant's transfer system. The question of the reasonableness of such a rule and its effect upon the defendant's earnings affords no support for said contention. The reasonableness of the rule is not involved here. The statute gives to the public specifically and in unmistakable language the right to "one continuous trip to any point or portion" of the roads. The application of ordinary intelligence to the consideration of this question indicates at once to an impartial mind an unobscured and definite meaning in the words of the statute. The court has no right, under the claim of construction, to add to or take from that meaning. It can see no relief for the defendant except in additional legislation.

News of the Week

Legislation Affecting Electric Railways.

Florida.—The senate has passed a bill requiring both steam and electric railways to provide separate accommodations for the white and negro races.

Missouri.—The senate on May 3 concurred in a house amendment to Senator Cooper's bill enabling cities to regulate the charges of public utility companies by ordinance, and the bill has gone to the governor, who is expected to sign it without delay, as it is along lines recommended by him. The bill contains a court review provision and cities are empowered to provide for commissions to ascertain facts in regard to public utilities.

Pennsylvania.—The Fabey bill, requiring electric railway companies to secure local franchises before applying for state charters, was passed by the house on May 1, by a vote of 129 to 52.—The Homsher eminent domain bill was reported favorably by the house committee on city passenger railways on May 1.—The house has defeated a bill permitting railroads with less than 40 miles of track to charge 5 cents a mile passenger fare.

New York.—President E. W. Winters and Vice-President T. S. Williams of the Brooklyn Rapid Transit Company appeared before the senate railroad committee on May 7 and asked that before the committee acts upon the Wagner 5-cent fare bill a subcommittee be appointed to investigate the conditions. The bill, which was recently passed by the house, provides that no more than 5 cents shall be charged for a continuous ride within the limits of a municipality over the lines operated or controlled by one company, and would compel the Brooklyn Rapid Transit Company to reduce its fare to Coney Island, which is now 10 cents. The officials declare that the passage of the law would work a serious injustice.

Commission Report on Woodlawn Wreck.

The New York state board of railroad commissioners on May 6 made public its findings in regard to the New York Central wreck near Woodlawn on February 16, in which 24 persons were killed and 143 injured. The commission eliminated from the list of probable causes obstruction on the track, broken parts of equipment and defects inherent in the locomotives, limiting the probable causes to two—character of track and high speed. The commission finds:

"That the accident was caused by a condition of weak track, which was discovered and reported by the engineer of train 5, which left the Grand Central station on the morning of February 16 at 9:03 a. m. Also that this bad spot became worse by reason of the pounding it received from numerous passing engines, holding, however, until subjected to the unusual and abnormal pressure exerted by the impact of the two powerful electric locomotives running at a very high rate of speed striking it in quick succession, shearing the spikes and causing the rail to spread. The accident, therefore, was the result of a track condition, plus speed, plus again the neglect to locate and remedy conditions that had been reported on the morning of the accident.

"The board is further of the opinion that on the day of the accident in question no trains should have been allowed to run over the Harlem division on track 3, even at the schedule rate, until the track supervisor on that division had reported affirmatively to the superintendent or the general manager even that the track in question was right in every respect. The testimony adduced by the board fails to show that any such affirmative report was made, and the officials of the railroad when given an opportunity to offer evidence on this subject likewise failed to produce any testimony to that effect."

The commission also recommends extra strong tie plates and double-spiking on curves, close inspection of track and train equipment and a change in the rules of the company to enable a more ready location of responsibility.

Rapid Transit Affairs in New York.

The rapid transit commission at its meeting on May 2, after a hearing on the application of the Interborough-Metropolitan Company for permission to build a third track on the Second and Third avenue elevated lines for express trains, adopted a resolution introduced by John H. Starin to the effect that the board would negotiate with the company for the granting of a franchise for the additional elevated trackage, provided that company will enter into a contract with the city to construct and operate those portions of the Seventh and Eighth avenue and Lexington avenue roads, referred to in Mr. Shonts' letter to the board on April 25, using entirely its own capital in construction and equipment, and provided, further, that it will also agree to arrange for a system of universal transfers between subways, elevated structures and surface lines on all its lines in the boroughs of Manhattan and the Bronx. President Shonts, after reading the resolution, stated that it would be impossible under present conditions for the company to construct the subways with its own money, and that it would not at present consider any system of universal transfers.

George L. Rives, counsel to the commission, submitted a report, dealing with the objections made by Mr. Shonts to the form of contract drawn for the new subways. The substance of Mr. Rives' report was that the stipulations complained of by Mr. Shonts were not due to any arbitrary action by the commission, but to the obligations placed on the commission by the changes in the rapid transit act in 1905, and by the Elsborg bill, which was passed last year.

The commission gave a hearing on the application of F. B. Behr for a franchise to build a monorail line from the foot of Atlantic avenue to Coney Island. Mr. Behr stated that the plan of construction contemplates a double-track road on elevated pillars

16 feet above the street surface. The speed will be 80 miles an hour, exclusive of stops.

It is probable that the commission will take no further action until the fate of the public utilities bill is decided. It has been suggested that the city might build the subways in sections, as its borrowing powers will not permit of its building them outright.

American Railway Insurance Company.

The inspection and survey bureau of the American Railway Insurance Company of Cleveland, O., which was organized on January 10 at Cleveland, as noted in the Electric Railway Review of January 12, page 57, by 27 leading traction and power companies, for the purpose of carrying their own fire insurance, has sent out a book of 55 pages describing the work the company proposes to do and offering many helpful suggestions for the adequate protection of electric railway properties against fire.

The object of the company, as previously stated in the Review, is to carry the companies' insurance at actual cost. The plan was worked out principally by Henry N. Staats of Cleveland, who is manager of the company, and was outlined in the report of the "Insurance" committee of the American Street and Interurban Railway Association at Columbus last fall. The company is now ready to carry a part at least of the insurance of the companies represented, and is the first of a series of companies to be organized, including the Traction Mutual Insurance Company, the Electric Railway Insurance Company and the Associated Railways Insurance Company, which will carry both sprinkled and un-sprinkled risks. The idea of the formation of the several companies is to scatter the risks, the aim being to bring the various companies eventually to a position where they can carry all of the insurance of any electric railway company. Horace E. Andrews, president of the Cleveland Electric Railway, who was largely instrumental in the formation of the American Railway Insurance Company, is its president.

The book just issued, besides outlining the plan to obtain insurance at actual cost, contains the report of the "Insurance" committee, submitted at the Columbus convention and the discussion on and approval of that report, which were published in the Daily Electric Railway Review of October 18, 1906, and two chapters devoted to automatic sprinkling of electric railway properties. It also contains a large number of halftone illustrations of the buildings of the Cleveland Electric Railway, which are equipped with automatic sprinklers, and of several tests of sprinklers.

Chicago-New York Air Line Called to Account.

The Chicago-New York Electric Air Line Railroad, the much advertised company which proposes to build an electric railroad from Chicago to New York, and promises to carry passengers over its 750-mile air line in 10 hours for \$10, will probably be called into court to account for its expenditure of the amounts derived from its large sales of stock. Theodore Nemoyer, a former employe of the company, has filed a suit in the circuit court of Cook county, Illinois, asking for an injunction restraining the company from doing business in Illinois, for a thorough accounting and for the appointment of a receiver in case in the progress of the hearing it should be demonstrated that the company can be more economically administered by officers of the court.

After giving a history of the development of the concern and the acts of its officers the plaintiff asks the court to enter an order nullifying a number of contracts. President Alexander C. Miller and other officers of the company are charged with mismanagement and with wasting securities of the company, with misrepresenting facts concerning the company's assets and hazarding its treasury through depositing funds in weak depositories. The petitioner further avers that the charter is liable to forfeiture because the capital stock of the Air Line was increased without authority of the stockholders and that the officials are giving away two shares of stock to every one they sell. He charges the officials, headed by the president, with voting themselves excessive salaries. He states that the entire proceeds from the sale of the capital stock is turned over to the Co-operative Construction Company of Chicago, of which Jonathan D. Price is president, and that both Miller and Price receive \$25,000 a year salary in addition to large blocks of stock. He also states that the officers have no knowledge of the cost of constructing the line, as no surveys have been made east of the eastern part of Ohio and no profiles have been made between there and Tolleston, Ind.

President Miller has issued a statement denying the claims of Nemoyer, who, he says, is a disgruntled employe, and stating that contracts have been let and deliveries of materials partly made for the first 20 miles of the line from Laporte, Ind., toward Chicago. Work is now in progress at Laporte and a 3-mile spur track has been built from Laporte to the construction camp.

Wage Increases.

The Twin City Rapid Transit Company of Minneapolis, Minn., operating in Minneapolis, St. Paul, Stillwater and vicinity, has announced that the wages of all its trainmen will be increased on June 1. This is a voluntary action on the part of the company and comes as a complete surprise to the men. At present the men receive 22 cents an hour after the first six months of service; under the new scale they will receive 21, 22 and 23 cents an hour for the first, second and third years, respectively, 24 cents for the fourth and fifth years, and 25 cents thereafter. All trainmen appointed during the past year will receive the 22-cent rate during the second six months of service. This means that a large percentage of the company's employes will immediately receive the maximum rate of 25 cents an hour.

The Omaha & Council Bluffs Street Railway of Omaha, Neb., on May 1 put into effect a new scale of wages, as follows: For the first year of service, 21 cents an hour; for each succeeding year, including the fifth, an increase of 1 cent an hour; fifth to ninth

years, 25 cents an hour, and after the ninth year, 26 cents. This is an increase of 1 and 2 cents for the 800 employes affected.

The Tacoma Railway & Power Company, Tacoma, Wash., has announced a new scale, effective at once, which amounts to an increase of 2 and 3 cents an hour. The new rates for conductors and motormen are: First six months, 23 cents; second six months, 24 cents; second, third and fourth years, 25 cents; fifth, sixth and seventh years, 26 cents; eighth, ninth and tenth years, 27 cents; eleventh and twelfth years, 28 cents; thirteenth, fourteenth and fifteenth years, 29 cents, and after fifteenth year, 30 cents. Gripmen will receive 1 cent an hour above this scale.

The Duluth Street Railway, Duluth, Minn., has announced a new scale, effective on June 1, of 21 cents an hour for the first year, with an increase of 1 cent an hour for each year, including the fifth.

The St. Thomas (Ont.) Street Railway, owned and operated by the city, has announced a new schedule of wages for its trainmen as follows: For the first six months, 15 cents an hour, for the next 2½ years, 17 cents an hour, and thereafter 18 cents an hour.

Congress of Manufacturers.—The twelfth annual congress of the National Association of Manufacturers of the United States will be held at the Waldorf-Astoria, New York, on May 20, 21 and 22.

Extension of Time in Which to Comply with Safety Appliance Law.—The Indiana railroad commission has granted the Angola Railway & Power Company, Angola, Ind., which operates a three-mile electric line from Angola to Angola lake, an extension of time until May 1, 1908, to equip its line according to the provisions of the safety appliance law.

Express Deal Completed.—It is reported that the deal has finally been completed whereby the Pacific Express Company has arranged to take over the express business between Toledo and Dayton, O., now handled by the Toledo Urban & Interurban Railway, the Western Ohio Railway and the Dayton & Troy Electric Railway. It is expected that the new service will go into effect about June 1.

Hospital Annex for Railway Employes.—The Georgia Railway & Electric Company of Atlanta, Ga., and the Southern Railway have proposed to build and equip an annex to the Grady Hospital in Atlanta for the accommodation of employes of the company. The facilities of the hospital are often overtaxed and the companies desire a separate ward for their patients, where they may receive immediate attention, under the control of the companies' physicians.

Ft. Wayne & Wabash Valley Adopts Merit System.—The Ft. Wayne & Wabash Valley Traction Company, Ft. Wayne, Ind., has announced that it has adopted the merit system of disciplining employes, beginning on May 1. Under this system an employe will receive a certain number of demerit marks for each violation of the rules and merit marks for efficient service. Efficient service for a certain period will cancel the demerits. Cash prizes are to be given all employes who have a clean record up to July 1. The operation of the system will be in charge of J. B. Crawford, superintendent of transportation.

Joliet Strike Averted.—A strike of the 119 conductors and motormen employed by the Chicago & Joliet Electric Railway, Joliet, Ill., which was threatened last week, was averted on May 3, when an agreement was reached between the men and the company on the basis of an increase of two cents an hour, extra pay for overtime, recognition of the union and a plan for arbitration of future differences. The men held a meeting on April 30 and voted to strike if their demands were not granted. The men employed on the Joliet city lines have been paid 20 and 21 cents an hour, while those on the Joliet-Chicago run were paid 24 cents. They demanded 25 and 27 cents for the city lines and 30 cents for the Chicago run.

Convention of the Southwestern Electrical and Gas Association.—President H. S. Cooper of Galveston, Tex., announces that the third annual convention of the Southwestern Electrical and Gas Association will be held at San Antonio, Tex., on May 14, 15 and 16. It is earnestly desired to make this the banner convention of the association, and every effort is being made by the officers and executive committee to make it such. An excellent list of practical papers on live subjects for every branch of the association will be presented, and an interesting question box has been prepared. San Antonio is an interesting and hospitable city and ample accommodations, both for guests and for exhibits, have been arranged. Special entertainments will be given by the San Antonio Traction Company and the San Antonio Gas and Electric Company.

New England Street Railway Guide.—Robert H. Derrah of Boston, Mass., formerly general passenger agent of the Boston & Northern and Old Colony Street Railway companies, has issued the 1907 edition of Derrah's Official Street Railway Guide to New England. This, the eleventh edition of this well-known guide, contains 128 pages of useful and interesting information about the electric railway systems of New England, in a suitable size for the pocket, 5 by 7 inches. This year a new arrangement has been adopted and all towns reached by electric railways are placed in three classifications, giving in alphabetical order all towns reached from Boston, Providence and Worcester. The mileage, fare, running time, route and points of change are given for each town. The book contains several good maps and descriptions of trips to the many points of interest which are reached by the New England lines. Besides being exceedingly useful to the traveler this guide is of special interest to any one interested in electric railways as illustrating the remarkable development of the electric railways in Massachusetts, Rhode Island, Connecticut and New Hampshire.

Construction News

FRANCHISES.

Baker City, Ore.—A 30-year franchise has been granted to William Pollman and associates of Baker City to build and operate an electric line in this city. It is stated that rails and cars have been ordered and that work will be started as soon as the materials arrive. The promoters promise to have 1½ miles of line in operation by the end of the year and later to extend it to points outside of the city.

Bennettsville, S. C.—J. J. Matheson, Warren Moore and Vann Livingston, Bennettsville, S. C., have applied for a franchise to build and operate a street car system in Bennettsville, which will connect with interurban lines to be built in Marlboro county. One of these will run from Bennettsville to Blenheim and another from McColl to Gibson and Laurinsburg, S. C. It is stated that arrangements for financing the project are about completed.

Champaign, Ill.—The Corn Belt Traction Company has been granted a franchise to build its interurban line over Walnut street from the north city limits to Main street. Cars are to be in operation within one year from the granting of the franchise.

Dubuque, Ia.—The Eastern Iowa Traction Company has applied for a franchise to enter Dubuque with its interurban road.

Gary, Ind.—A petition, signed by 150 of the 5,000 residents of Gary, has been filed with the board of that village, asking that it pass franchise ordinances, granting to subsidiary companies of the United States Steel Corporation the exclusive right to supply light, water, heat, power, telephone and traction service inside the corporate limits.

Hanover, Pa.—The Hanover & York Street Railway Company has applied for a franchise to enter Hanover with its 18-mile double-track line between Hanover and York. In exchange for the franchise the company agrees to pay the borough 3 per cent of the gross receipts, based on the pro rata length of the line, and to pave between the rails and keep same in repair.

Silver Creek, N. Y.—The Buffalo & Lake Erie Traction Company has been granted a franchise to enter Silver Creek with its interurban line. The road will enter from the east over private right of way and leave at the southwestern limits by way of Main street. The road is to be completed within 18 months from the date of the franchise.

Westfield, N. Y.—A 99-year franchise has been granted to the Buffalo & Lake Erie Traction Company to build a double-track line through Westfield from the eastern limits to Portage and Main streets and on Main street. The franchise also provides for the construction of a viaduct over the creek at the western end of the village of sufficient width to accommodate a roadway and sidewalk in addition to the trolley tracks. The cost is estimated to be between \$90,000 and \$100,000, of which the village will pay \$35,000. A special election will be held to ratify this portion of the franchise. It is stated that the line will be in operation within 18 months from the date of the franchise.

RECENT INCORPORATIONS.

Bahia Tramway Light & Power Company.—This company has been incorporated in Maine with \$3,500,000 capital stock to build a system of electric railways in Bahia, Brazil, South America. The company has an authorized issue of \$7,500,000 50-year 5 per cent bonds, of which \$3,500,000 have been offered in London and Brussels at 90½. Some of the financing, it is said, will be undertaken in New York, and among the New Yorkers mentioned as interested in the enterprise is W. L. Bull, who has already large interests in South America.

Columbus Kenton & Lima Railway.—It is reported that this company will soon file incorporation papers as a consolidation of the Columbus Urbana & Western Electric Railway of Columbus, O., the Lima Kenton & Marion Traction Company and the Delaware Magnetic Springs & Northern Traction Company, which are controlled by J. A. Vandegrift of New York and W. H. Ogan of Columbus.

Kansas City & Olathe Electric Railroad.—Incorporated in Kansas to build an electric railroad 20 miles long from Rosedale southwest to Olathe, through Wyandotte and Johnson counties, in Kansas. Capital stock, \$175,000. Incorporators: D. E. Johnson, R. O. Larsen, George Holsinger, J. A. Stewart, F. P. Dickson and R. W. Hoken.

Lake View Traction Company.—Incorporated in Mississippi to build and operate an electric railway between Memphis, Tenn., and Clarksdale, Miss. Principal office, Clarksdale; capital stock, \$500,000. Incorporators: G. W. Agee, R. F. Tate, Anthony Walsh, W. A. Percy, H. E. Craft and others.

Syracuse & Chittenango Railway.—Incorporated in New York to build an electric line from Syracuse to Chittenango, Madison county, about 10 miles. Capital stock, \$500,000. Incorporators: W. H. Dowe, G. S. Terry, New York City; C. G. Everson, Syracuse, N. Y.

Twin City & Lake Superior Railway, Minneapolis, Minn.—Incorporated in Maine to build a double-track high-speed line for freight and passenger service from Minneapolis and St. Paul to Duluth and Superior, Minn., 129 miles. It is proposed to operate

the line by steam at first, but later to use the Farnham inverted protected third-rail system. Seventy-pound rails are to be laid. Two surveying crews are at work at present locating the line and it is expected to begin construction in a short time from both ends. Capital stock, \$7,000,000. Officers: President, E. W. Farnham, Chicago; vice-president, W. H. Crossland, Minneapolis; treasurer, F. B. Kidder, Minneapolis; secretary, S. A. Carlisle, Wyoming, Minn.

Wagner Lake Shore & Armour Railway.—Incorporated in South Dakota to build an electric line from Wagner to Mitchell, S. D., 65 miles, with a branch to the shore of Lake Andes. The road will conduct a general freight and passenger business and also will furnish electric power for commercial purposes along its route. Capital stock, \$1,000,000. Incorporators: A. H. Pease, John Steransky and John Absher, Wagner; Albert Amundson, Lake Andes; E. P. Wanzer, Armour.

West Point (Va.) Traction Company.—Incorporated in Virginia to build an electric line in West Point. Capital stock, \$10,000. Incorporators: J. W. Marshall, president; J. W. Owens, secretary and treasurer, and W. C. Dunham, all of West Point, Va.

TRACK AND ROADWAY.

Albany, N. Y.—The New York railroad commission has authorized the construction of the following electric railways: Canandaigua Southern Railway, running from Canandaigua, Ontario county, to Atlanta, Steuben county, a distance of 33 1-3 miles; Utica Southern Railway, from Clinton through Deansboro, Waterville, Oriskany Falls and Madison to Hamilton, in the counties of Oneida and Madison, a distance of 26 miles; One Hundred and Forty-fifth Street Railway, starting at the corner of One Hundred and Forty-fifth street and Lenox avenue, and running along One Hundred and Forty-fifth street to Broadway, in New York City; Queens Borough Street Railway, from the junction of Franklin and Van Alst avenues, along Van Alst avenue to Winthrop avenue, in the first ward of the borough of Queens.

Atlantic Shore Line Railway, Kennebunkport, Me.—Work was started last week on the connection between York Beach and Kennebunkport, Me., 15 miles, which is expected to be opened some time in June, and which will connect the eastern and western divisions of the company's system. Rails and other materials are on hand for the construction of the first three miles and the remainder is being delivered. W. G. Meloon, general manager, Portsmouth, Me.

Bay City, Mich.—It is reported that E. W. Mills of Detroit is the promoter of a new company that proposes to connect Bay City and Port Huron, Mich., through Caro, Vassar, Memphis, Richmond, Sanilac and Capac. Mayor Johnson of Cleveland is reported as interested in the project.

Bay Counties Electric Railroad.—It is reported that this company will in a few weeks break ground for a new line from Belvidere to Lakeport, Cal., via Corte Madera, Greenbrae, Point San Pedro and Novato. Representatives of an eastern syndicate have gone over the route of the proposed line and are said to have reported favorably on a proposition to underwrite the bonds. Richard Hotelling is president.

Broadway, Va.—The United States Leather Company of Philadelphia, which owns several tanneries in this region, is making surveys for an electric line from Broadway to Lost City, Va., 30 miles.

Chillicothe, Mo.—A. W. Carpenter of Columbus, O., J. T. Carpenter of Toledo, O., and J. W. Andrews of Fairfield, Ia., are promoting an electric railway from Chillicothe, Mo., to Newton and Marshalltown, Ia., and are seeking to raise subscriptions for the preliminary work.

Corinth & Shiloh Electric Railway, Corinth, Miss.—It is reported that this company will soon let contracts for its line from Corinth to Shiloh, Miss., 22 miles. Right of way has been secured and a survey has been made. Abe Rubel is president.

Gallatin, Mo.—It is reported that C. F. Alt of Warren, Pa., is interested in a project to build an electric railway from Gallatin to Excelsior Springs, Mo., about 40 miles.

Grand Junction, Colo.—Surveys are being made for an electric railway to connect several towns in the fruit belt, including Fruita, Grand Junction, Palisades and Plateau City.

Grand Rapids (Mich.) Electric Railway.—President J. W. Boynton is sending out a prospectus and personal letters in the interest of the company's extensive plans for construction of new lines radiating from Grand Rapids. The company has planned about 500 miles of new railways, including six different lines, as follows: 1. From Grand Rapids to or near Rockford, thence to Greenville, Langston, Edmore, Clare, Gladwin, West Branch, Rose City, and thence to Alpena on Luke Huron. 2. From Grand Rapids to Belding, thence to Palo, Hubbardston, Maple Rapids, and other towns to Saginaw. 3. From Grand Rapids to Battle Creek, Coldwater, Coldwater Lake, California, Montgomery and Camden in Michigan, thence to southern state line, thence to Pioneer and Montpelier, thence to Napoleon, Weston, Bowling Green and other cities to Fostoria, O. 4. From Grand Rapids to Freeport, Grand Ledge, and thence to Lansing. 5. From Grand Rapids to Kalamazoo. 6. From Grand Rapids to Grand Haven harbor on Lake Michigan. All of these routes have been fully surveyed and located except the line from Belding to Saginaw, and the engineers are surveying that. Of these different lines 40 miles of right of way 100 feet wide through private lands has been conveyed by deed or contract to the company. Two hundred miles is graded and ready for cross ties and rails.

Illinois Traction Company, Champaign, Ill.—General Manager L. E. Fischer of Danville, Ill., announced recently to a delegation of Fairmount citizens that the company would build an extension of the line out of Danville, from Catlin to Fairmount. Preparations are being made for double-tracking the line from East St. Louis to Staunton.

Kansas City & Olathe Electric Railroad.—This company has begun construction at South Park, Kan., on its proposed line to Shawnee, Kan. Tracklaying was completed several years ago between Rosedale and South Park, three miles.

Knoxville (Tenn.) Railway & Light Company.—This company is now building a 3,000-foot extension of the Lonsdale line.

Kokomo, Ind.—It is reported that a company is being organized to build an electric line from Terre Haute to Kokomo, Ind., through Crawfordsville and Frankfort.

Lake Erie & Youngstown Railroad.—An official report from J. H. Ruhlman, president, Youngstown, O., states that this company is now making surveys for its proposed electric line from Conneaut to Youngstown, O., 60 miles. Contracts are to be let July 15 and grading is to begin this summer. George Tod, Jr., chief engineer.

Lewiston Augusta & Waterville Street Railway, Lewiston, Me.—Fred S. Gore writes that the Fred S. & A. D. Gore Corporation of Boston, Mass., has the contract for building this company's proposed lines from Auburn to Mechanic Falls, Me., nine miles; from Sabattus to Gardiner, 20 miles, and from Augusta to Waterville, 21 miles. Construction is to begin at once. The overhead work will be of the bracket type. There will be three 125-foot steel bridges on the line with concrete abutments. John R. Graham, Bangor, Me., is president; E. D. Reed, Lewiston, Me., general manager.

Lima & Toledo Traction Company, Lima, O.—A contract has been awarded to the National Bridge Company of Indianapolis, Ind., for the construction of a 1,400-foot reinforced concrete bridge over the Maumee river at Roche de Boeuf, O., on its line from Leipsic to Toledo.

Little Rock & Hot Springs Electric Railway, Little Rock, Ark.—The Electrical Installation Company of Chicago has the contract for building this line from Little Rock to Hot Springs, Ark., 56 miles, including several bridges. Surveys have been made and most of the right of way secured. C. J. Kramer, president; J. R. Van Franks, chief engineer.

Madison & Interurban Traction Company, Madison, Wis.—President F. W. Montgomery of New York, N. Y., states that surveys have been made for an extension from Madison to Janesville, Wis., but that it has not yet been decided whether the line will be built this year, on account of the high price of materials.

Marion, O.—F. M. Ohl of Toledo and associates, who are interested in a project for an electric line from Marion to Tiffin, O., via Wyandot, Nevada and Sycamore, recently went over the route of the proposed line, securing data. They stated that financial arrangements have been made for building the line this summer.

Maryland Electric Railways, Baltimore, Md.—J. G. White & Co. of New York are now engaged in the work of converting the Baltimore & Annapolis Short Line, which has been absorbed by the Maryland Electric Railways Company, for electrical operation between Baltimore and Annapolis. The wire for the overhead work has been ordered and is expected within a few weeks. Power will be obtained from the Westport power house of the Consolidated Gas Electric Light & Power Company. Between Cliffords and Camden the Baltimore & Ohio tracks are used. Negotiations are pending for a lease of one of the tracks for the exclusive use of the electric road, and the line is being straightened so as to reduce the distance between Cliffords and Camden from 6 to 4 miles, thus reducing the distance between Baltimore and Annapolis from 28 to 26 miles. J. W. Brown, president.

Nazareth, Pa.—It is reported that a company has been organized to build an electric road between Nazareth and Bath, Pa., for the accommodation of employes of the cement companies, and that seven-eighths of the right of way has been secured. Conrad Miller of Nazareth is president.

New Castle & New Wilmington Street Railway, New Castle, Pa.—G. B. Zahniser, chief engineer, states that surveys have been made and a private right of way acquired for this company's proposed line from New Castle to New Wilmington, Pa., 10 miles, and that contracts for construction will probably be let this summer.

Newell (W. Va.) Street Railway.—This company is said to be contemplating the extension of its lines to New Cumberland, W. Va. Frederick Lawrence, general manager.

Northern Electric Railway, Chico, Cal.—H. A. Butters, president, San Francisco, is quoted as saying that the line from Marysville to Sacramento, Cal., will be completed by August 1. Cars are now running regularly between Chico and Yuba City and Marysville.

Northern Ohio Traction & Light Company, Akron, O.—It is announced that this company will build an extension from West Brookfield to East Greenfield, O., this summer. Charles Currie, general manager.

Ogden (Utah) Rapid Transit Company.—The double-tracking of the line from Washington avenue to Glenwood Park, in Ogden, has been completed.

Ohio & Southern Railroad, Columbus, O.—Rapid progress is now

being made on this line from South Columbus, O., south to the Hartman stock farm, 7 miles. It is reported that the line will be extended farther south to Washington Court House.

Omaha & Nebraska Central Railroad.—It is announced that the contract for grading this line between Omaha and Hastings, Neb., has been let to C. D. Conover of Omaha and that actual construction work will be started within a few days. Contracts for grading the remainder of the line are now in hand and will be let within the next few weeks. W. H. Fuller, chief engineer. J. C. Knisler of Omaha is interested.

Peninsula Railway, Barstow, Fla.—E. C. Stuart, president, writes that contracts are to be let this week for the grading of this line from Barstow to Tampa, Fla., 50 miles, via Mulberry, Nichols, Plant City, Collinstown and Thonotosassa, and that construction is to begin on June 1. The Evers Engineering Company of Cleveland, O., has charge of the engineering work. Sixty-pound rails will be laid.

Peoples Street Railway, Nanticoke, Pa.—It is reported that this company will extend its line to Benton, Columbia county, Pennsylvania, via Shickshinny and Huntington Mills. K. M. Smith, president, Alden, Pa.

Philadelphia & Garrettford Street Railway, Philadelphia.—A contract has been let for the extension of this line from Alden to Collingdale, Pa. The road is controlled by the Philadelphia & Westchester Traction Company and passengers will have access over the latter's lines to Philadelphia, connecting with the Philadelphia Rapid Transit Company's elevated line at Sixty-third and Market streets. W. A. Hall, chief engineer, Llanerch, Pa.

Philadelphia Rapid Transit Company.—This company has opened a new extension in Philadelphia from Sixty-fifth street and Kingessing avenue to Fortieth and Market streets, connecting at the latter point with the new Market street elevated line.

Portland, Ore.—The United Railways Company, which has built about two miles of track on Front street, under the franchise of the Oregon Traction Company, is applying for an extension of time in which to complete the work. It states that the Front street belt line will be completed in 30 days, and that the line will be extended to Hillsboro. The company has been delayed by the non-arrival of construction material. The application is contested by the Oregon Electric Railway, which claims a prior right to the Front street franchise, and which is building a line to Salem.

Rochester Corning & Elmira Traction Company, Rochester, N. Y.—This company, which is seeking a certificate of necessity for its line from Rochester to Corning and Elmira, N. Y., will be given a hearing on May 20 on its application for permission to issue \$8,000,000 of bonds. The commission was enjoined last week from granting the permission, at the instance of the Erie Railroad. The application of the company for a certificate of necessity was opposed before the board of railroad commissioners by the Lehigh Valley Railroad, Delaware Lackawanna & Western Railroad, Erie Railroad, Elmira Corning & Waverly Railway, Elmira City Railway and Corning & Painted Post Street Railway. The board of railroad commissioners refused to grant the certificate, it being shown among other things that the road would be unprofitable, and that there was not sufficient business for the lines now existing. The appellate division reversed the decision, and directed the board to grant the certificate of necessity. An appeal was taken to the court of appeals, and an undertaking filed, which had the effect of staying proceedings on the part of the board and on the part of the applicant. The board, however, through a misunderstanding, issued the certificate of necessity, and the railroads which appeared in opposition obtained a writ of certiorari to review the action of the board in so doing, and obtained an order from the court staying the proceedings of the applicant railroad company. Until the matter is finally disposed of by the court of appeals the proceedings of the company are stayed.

Rumford Falls & Bethel Street Railway, Rumford Falls, Me.—The Maine railroad commission has given this company its approval of location of its line connecting Mexico, Rumford, Hanover, Newry and Bethel, Me., 30 miles. Elliott W. Howe, O. J. Gonya, E. K. Day, William H. Rae and Dennis J. McCoy of Rumford Falls are the directors.

St. Joseph Valley Traction Company, Elkhart, Ind.—The first car was operated over this company's new line from Lagrange as far as Orland, Ind., on April 29. H. E. Bucklen, Chicago, president.

San Diego (Cal.) Electric Railway.—It is stated that this company will this year place contracts for several extensions as follows: Adams avenue line, about three miles; University line, two miles; Third street line, three miles, and Ocean Beach lines, about 35 miles. Charles McLagan, chief engineer, Coronado, Cal.

Snohomish Valley Railroad.—The Snohomish Construction Company has been incorporated for the purpose of building the first 15-mile section of this road, projected to extend from Snohomish to Seattle and Tacoma, Wash. Work is to begin in a few weeks on the construction of the first section, which extends from Snohomish to a point in Cherry valley, seven miles beyond Monroe. The officers of the company are: President, Edward Wright; vice-president, Charles H. Lamprey; secretary and treasurer, J. F. Taylor, all of Snohomish.

Sioux Falls (S. D.) Traction System.—F. M. Mills, formerly treasurer of the Benton Harbor-St. Joe Railway & Light Company, Benton Harbor, Mich., has issued a circular stating that he has been granted a franchise for a street railway system for Sioux Falls, S. D., and that he proposes to organize a company to build lines in the streets of that city, to be extended as fast as the patronage will justify. The franchise requires that five miles of

track shall be constructed by July 1, 1908, and includes a provision for the use of the line by interurban railways. Mr. Mills states that he expects to begin construction in the spring of 1908 and that he will be pleased to receive estimates on all material necessary for electric railway, light and power purposes.

Southwest Missouri Railroad, Webb City, Mo.—Surveyors are now locating an extension of this line from Webb City to Columbus, Kan., where connection will be made with the line of the Pittsburg Railway & Light Company. E. J. Pratt, engineer.

Springfield (Ill.) Consolidated Railway.—This company is planning to begin work at an early date on the construction of an extension of the North Eighth street line to the Zoo park, north of the city, at a cost of about \$20,000.

Titusville (Pa.) Electric Traction Company.—The directors have decided to extend the company's lines to Cambridge Springs and Oil City via Cherrytree. E. J. Robertson, chief engineer.

Washington Frederick & Gettysburg Electric Railway, Frederick, Md.—This company has filed a trust deed to the Baltimore Trust & Guarantee Company to secure an issue of \$400,000 of bonds for the construction and equipment of its line from Frederick to Emmitsburg, Md., via Thurmont, about 25 miles. The section between Frederick and Thurmont, 17 miles, is now under construction, with six miles graded. It is expected to have the line between Frederick and Lewistown in operation by August 1.

Washington, N. C.—The Washington Investment Company of this city has engaged the James D. Lalor Company of Washington, D. C., to build an electric railway system in Washington, N. C., and to Washington Heights, a suburb. Surveyors are now at work.

Waterloo Cedar Falls & Northern Railway, Waterloo, Ia.—Chief Engineer M. L. Newton is preparing plans and specifications for an extension of the Commercial street line to the site of the proposed driving park, about two miles.

POWER HOUSES AND SUBSTATIONS.

Atlantic Shore Line Railway, Kennebunkport, Me.—This company has awarded a contract for the erection of a new rotary substations at Ogunquit, Me. The contract was awarded to the firm of Jones & Clark of Kennebunk.

Chicago Lake Shore & South Bend Railway, South Bend, Ind.—This company has just closed a \$2,500,000 contract for electrical equipment with the Westinghouse Electric & Manufacturing Company of East Pittsburg, Pa., for the equipment of its power house, substations and line. The Westinghouse single-phase alternating current system will be installed. The power house at Michigan City, Ind., will contain three 3,000-horsepower Westinghouse steam turbines and generators and a switchboard of similar capacity. Thirty-one cars will each be equipped with four 100-horsepower single-phase motors. The Chicago terminus of the road will be at Kensington, where connections for downtown parts of the city will be made with the trains of the Illinois Central Railroad. J. B. Hanna, South Bend, president.

Georgia Railway & Light Company, Atlanta, Ga.—This company has just completed the erection of a new substation at East Point, Ga., which, with the property on which it stands, costs about \$25,000. The new station will be used to furnish current for the district from East Point to College Park and to furnish the power for the trolley line to Hapeville. The building, which is externally designed similar to the Carnegie Library at Atlanta, Ga., faces a small park, and from external appearances it is impossible to tell that it is a substation. It is a 2-story building and is equipped with the most modern electrical machinery.

Northern Texas Traction Company, Ft. Worth, Tex.—It has been announced that this company is introducing a novel method of preventing delays caused by breakdowns in its substations. A small substation has been mounted on wheels and left at a siding between Arlington and Grand Prairie, and is connected by telephone to the other substations, so that, in case of a breakdown or accident to the machinery, it can be rushed to any of the substations. When not needed for emergency service it is not left idle, however, but is connected to the line and helps to take the load from the regular stations.

Tacoma (Wash.) Railway & Power Company.—This company has announced that it will build a new substation at the northern end of the city of Tacoma, near the terminus of the Point Defiance line. This additional substation was necessitated by plans which have been made for giving a one-minute service on this line.

Tri-City Railway & Light Company, Davenport, Ia.—It is stated that the tests made of the Cheatham electric switch, which has been installed at Second and Grady streets, has given perfect satisfaction, and if further trial proves equally satisfactory it will be adopted over the entire railway systems of the three cities. The working parts of the switch consist of an overhead contact on the trolley wire, which is connected to a solenoid magnet, the plunger of which operates the switch. The switch is set for straight ahead or to take the siding, according as the motorman does or does not leave the power turned on while passing under the overhead contact.

West Jersey & Seashore Railroad.—Owing to the great increase in traffic this company has found it necessary to install a 6,600-volt Curtis steam turbo-generator and increase the boiler capacity of its plant at Westville, N. J. A small horizontal Curtis turbo-generator of 76-kilowatt capacity has also been ordered. Six 1,000-kilowatt rotary converters and 13 air-blast transformers will be installed in the substations at South Camden, Glassboro, Newfield, Mizpah, Atlantic City and Westville.

Personal Mention

Mr. J. H. White, general manager of the Winona (Minn.) Railway & Light Company, has resigned, effective on July 1.

Mr. D. D. Price of Frostburg, Md., has been appointed master mechanic of the Cumberland & Westernport Electric Railway, Cumberland, Md., succeeding Mr. C. K. Definbaugh, resigned.

Mr. Alva Reynolds, heretofore roadmaster of the Hoosac Valley Street Railway, North Adams, Mass., has accepted a similar position with the Pittsfield Electric Street Railway, Pittsfield, Mass.

Mr. Frank M. Welch has been promoted from assistant claim agent to claim agent of the electric railway lines controlled by the New York New Haven & Hartford Railway, with office at New Haven, Conn.

Mr. C. F. Bryant has resigned as auditor of the Connecticut Railway & Lighting Company, Bridgeport, Conn., on account of the consolidation of that company with the Consolidated Railway of New Haven, Conn.

Mr. V. R. Hughes, recently chief engineer of the Pueblo & Suburban Traction & Lighting Company, Pueblo, Colo., has resigned to take a similar position with the Northern Colorado Power Company at Lafayette, Colo.

Mr. A. R. Whaley, heretofore division superintendent of the New York New Haven & Hartford at New York, has been appointed manager of the Grand Central station and general superintendent

of the electric zone of the New York Central railroad, effective on May 1. Mr. Whaley was born in 1861 at Coventry, R. I., and received his early education in the common schools. He entered railway service in 1877 as a freight brakeman on the Providence & Worcester Railroad. On this road he performed almost every duty, from freight and passenger brakeman to conductor, baggageman, station master and general yard master; in 1891 he was appointed assistant trainmaster. On the consolidation of the New York Providence & Boston with the New Haven and the leasing of the Old Colony system, thus bringing together five roads, Mr. Whaley was given charge of all crews on three divisions, with headquarters at Providence.

In 1898 he was made general agent of terminals at Providence and in 1899, upon the death of the superintendent of the Worcester division, that division was added to his territory and he received the title of superintendent. About the same time all docks and coal piers of the New England Navigation Company were placed in his charge and in 1900 the central division was abolished and added to his territory. It was due largely to the efforts of Mr. Whaley that the Providence Warren & Bristol, which was formerly a steam road, became an efficiently operated high-speed electric line. In December, 1904, Mr. Whaley was appointed superintendent of the New York division of the New York New Haven & Hartford, with headquarters at New York City, and he has been the responsible official in charge of this division during the electrification of this line between Woodlawn and Stamford and has had charge of all of the operating difficulties which would naturally arise in handling a heavy traffic during the progress of the electrification and erection of the catenary construction by the Westinghouse company, as well as the added difficulties involved in maintaining schedules while the New York Central electrification was in progress at the Grand Central station. Mr. Whaley is recognized as a good disciplinarian, who takes pleasure in solving difficult operating problems. His experience with electric operation and electrification work makes him especially fitted to fill the position to which has now been appointed.

Mr. W. W. Griest has resigned as president of the Lancaster County Railway & Light Company, Lancaster, Pa. Mr. Griest has been president of this company since it was first organized to take over all of the electric lines and lighting systems of the county, comprising about 200 miles of railway and several electric and gas plants. Mr. Griest will be succeeded by Mr. George Bullock, president of the United Gas & Electric Company, New York. Another change in the personnel of the company, due to its recent purchase by the Bertron Storrs & Griscom banking firm of New York, is the election of Mr. R. E. Griscom of Philadelphia as vice-president, to succeed Mr. Charles B. Keller, who also has resigned the vice-presidency of the subsidiary companies. Mr. M. E. Dodge of New York has been chosen treasurer. Mr. Edgar C. Titzel, formerly

superintendent of the Conestoga Traction Company, a subsidiary of the Lancaster County Traction & Light Company, has been chosen general manager of all of the electric lines and lighting systems. Mr. Griest will retain the presidency of this company; Mr. George Bullock has been elected vice-president, and Mr. John S. Graybill, Jr., has been re-elected secretary and treasurer.

Mr. William A. House, whose formal election as president of the United Railways & Electric Company, Baltimore, Md., was announced in an earlier issue of the Electric Railway Review, has been associated with the company in various capacities for about 28 years.

In 1879 he entered the accounting department of the old People's Passenger Railway Company, serving in this and other departments until 1883, when the road was reorganized with Mr. T. E. Hambleton as president and Mr. House as secretary and general superintendent. In 1889 this company was taken over by the Baltimore Traction Company and Mr. House became general manager of the combined properties. Under his management the lines of the company in 1892 were converted for electrical operation and other noticeable improvements made. In 1895 he was elected vice-president in addition to his duties as general manager, and one year later succeeded ex-Governor Frank Brown as president. In 1897, when a second consolidation of the properties was effected, including the merging of the City & Suburban and the Baltimore Traction companies into the Baltimore Consolidated Railway Company, Mr. House again became vice-president and general manager, with Mr. Nelson Perin as president. Two years later there occurred the merging of all the traction properties in Baltimore into the United Railways & Electric Company, with Gen. J. M. Hood as president and Mr. House as second vice-president and general manager. Upon the death of Mr. Hood Mr. House became acting president, and in April last, as earlier announced, was formally elected president of the company.

Mr. Charles H. Clark, for the past four years engineer of maintenance of way with the Cleveland Electric Railway at Cleveland, O., has resigned to accept a similar position with the International Railway Company at Buffalo, N. Y., effective on June 1. He was born in Rochester, N. Y., in 1869, and received his education in the public schools of Canastota, where he graduated in 1887. His appointment as time-keeper for T. William Harris in 1888, at that time engaged in street railway construction work in Syracuse, N. Y., marks the beginning of his extensive experience in this branch of street railway work. He later entered Cornell University, where he graduated as civil engineer in the class of 1892. After leaving college he entered the draughting department of William Wharton, Jr., & Co. of Philadelphia, where he remained until it was decided to change the old Gray's Ferry road from

horse power to electricity, when he was appointed superintendent of construction of this undertaking. At the completion of this work he again became associated with T. William Harris in the building and reconstruction of street railways in Syracuse, Oswego, Troy and Oneonta, N. Y.; Norristown and Scranton, Pa., and Washington, D. C., later being given charge of the construction of a 60-foot dam, which was built at Trenton Falls, N. Y. From 1901 to 1903, as chief engineer of the Utica & Mohawk Valley Railway, which is controlled by the Andrews-Stanley interests, Mr. Clark had entire charge of its various improvements and extensions in and around Utica. In 1903 he was transferred to the Cleveland property of this syndicate, with the position of engineer of maintenance of way, where he has remained until his present appointment.

Mr. R. E. Danforth, who was recently appointed general manager of the street railway department of the Public Service Corporation of New Jersey, at Newark, N. J., succeeding Mr. A. H.



William A. House.



A. R. Whaley.



Charles H. Clark.

Stanley, assumed his new duties on May 1. Mr. Danforth will divide his time between Rochester and Newark for the present, until his successor has been appointed as general manager of the Rochester Railway.

Mr. Burton B. Pierce has resigned as superintendent and chief engineer of the Mansfield Railway Light & Power Company, Mansfield, O., to become chief engineer of the Washington Portland Cement Company, Concrete, Wash.

Mr. Clarence P. Hayden, superintendent of the eastern division of the New Hampshire Electric Railways, Haverhill, Mass., has been appointed superintendent of the Haverhill and Salem divisions, succeeding Mr. Robert Dunbar, resigned.

Mr. John G. Phillips, heretofore purchasing agent and superintendent of rolling stock of the Hudson Valley Railway, Glens Falls, N. Y., has been appointed assistant general manager, effective on May 1. He succeeds Mr. John H. Cain, who has been appointed superintendent in place of Mr. F. W. Kinnonth, resigned.

Mr. William Gettys, for several years master car builder of the Tacoma (Wash.) Railway & Power Company, has resigned his position and the car building department will hereafter be in charge of Mr. W. G. Denny, who was recently appointed master mechanic of the company in place of Mr. William Glenn, resigned.

Mr. Walter A. Draper has been elected secretary of the Cincinnati Traction Company, succeeding Mr. S. C. Cooper, resigned on account of ill health. Mr. Cooper has held his present position for about six years and had previously been connected with various Schoepf properties in Washington and Baltimore for about 15 years.

Mr. C. M. Bange, whose photograph is presented herewith, was recently appointed superintendent of motive power of the Northern Ohio Traction & Light Company, with headquarters at Canton, O., succeeding Mr. William E. Ralston, resigned, as previously reported in the Electric Railway Review.

To accept his present position Mr. Bange resigned as master mechanic of the Detroit Jackson & Chicago Railway, formerly the Detroit Ypsilanti Ann Arbor & Jackson Railway of Detroit, Mich., which was recently absorbed by the Detroit United Railway. Mr. Bange, who is 39 years of age, was born in Pontiac, Mich., and has been engaged in electrical work for the past 22 years. For 12 years he was employed in the telephone field and later in electric light construction. He has been connected with electric railway work for about 10 years, first as master mechanic of the old Detroit Rochester Rome & Lake Orion Railway, which is now a part of the Detroit United Railway system, and later in a similar position with the Detroit Ypsilanti Ann Arbor & Jackson Railway.



C. M. Bange.

Mr. F. W. McAssey, heretofore auditor of the Rockford & Interurban Railway, Rockford, Ill., has been appointed general superintendent. Mr. C. C. Lines, heretofore superintendent of track and lines, has been appointed superintendent of construction of the Beloit (Wis.) Traction Company, controlled by the officers of the Rockford & Interurban. Mr. E. Main has been appointed to succeed Mr. Lines at Rockford.

Mr. C. M. Clark, chairman of the executive committee of the Portland (Ore.) Railway Light & Power Company, which is a consolidation of the Portland Railway, the Portland General Electric and the Oregon Water Power & Railway companies, has been elected president, to succeed the late Henry W. Goode, formerly of Portland, Ore. It is stated that according to present plans Mr. Clark will administer his new duties from the Philadelphia office of the company.

Reduced Rate for G. A. R. Encampment.—Official announcement is made by Frank D. Norvick, general passenger agent of the Terre Haute Indianapolis & Eastern Traction Company, comprising the merged lines in Indiana, that a round-trip rate of \$3.00 has been granted from Indianapolis to Ft. Wayne because of the state G. A. R. encampment, to be held in Ft. Wayne on May 21, 22 and 23. Tickets bought on any day of the encampment will be accepted on any local or limited car without the payment of excess fare and will be good returning up to and including May 25. The tickets will be routed by way of the Indiana Union Traction Company from Indianapolis to Peru and by way of the Ft. Wayne & Wabash Valley from Peru to Ft. Wayne, with no change of cars throughout the trip. When the steam roads of Indiana refused, in retaliation for the 2-cent law, to grant their usual 1-cent-a-mile rate for the state encampment, the G. A. R. sought to obtain a 1-cent rate from the tractions. This was refused, but the \$3.00 rate from Indianapolis to Ft. Wayne was conceded. As the distance is 136 miles, the \$3.00 fare is practically one cent a mile, plus 25 cents.

Financial News

Boston Elevated Railway Company.—The following particulars regarding the company's probable cash requirements, as stated during the hearing before the Massachusetts railroad commission on April 18, when approval was requested for the issue of \$3,000,000 additional stock and \$3,800,000 bonds, are published by the Boston News Bureau:

Probable cost of East Cambridge extension and subway, \$12,900,000, as follows:

Elevated railway, Union station to Lechmere square.....	\$4,450,000
Cambridge subway	6,000,000
Connection in Boston.....	450,000
Cars for Cambridge subway.....	1,000,000
Power and fenders.....	1,000,000

Expenditures from organization to February 1, 1907, and requirements for construction and equipment:

Construction and Equipment Expenditures—	Expended to February 1, 1907.	Estimated balance needed.	Total.
Deposited with state.....	\$ 500,000	.....	\$ 500,000
Engineers and general expenses...	832,008	\$ 858,300	1,690,308
Structures	4,822,268	778,350	5,600,618
Construction and equipment of power houses	1,616,444	1,852,000	3,468,444
Terminals and other stations, exclusive of land	1,496,795	1,070,000	2,566,795
Equipment of subway.....	165,463	.....	165,463
Real estate	8,885,835	2,698,700	11,584,535
Rolling stock	1,810,904	1,822,000	3,632,904
Machinery and tools	114,465	50,000	164,465
Equipment of tunnel	243,712	170,000	413,712
Totals	\$20,487,894	\$9,299,350	\$29,787,244

An additional statement shows that \$6,895,344 cash would be required for the above outlay, even if the \$2,091,900 premium received from the sale of stocks and bonds and held on deposit were applied thereto. This estimate is made on the assumption that the elevated structure does not go beyond Forest Hills square. If it does, \$1,500,000 would have to be added to the above, making a total of \$8,395,344 new cash required, plus the use of all premium funds on deposit.

California Midland Electric Railroad, San Francisco.—The stockholders of this company have authorized the issue of \$3,000,000 of 5 per cent 40-year bonds.

Coney Island & Brooklyn Railroad Company.—This company has passed the dividend due on May 1. In 1903 and 1904 the company paid 16 per cent in dividends, in 1905 it paid 10 per cent, and in 1906 the dividends aggregated 8 per cent. The earnings will be applied to improvements if the \$1,500,000 of new stock which has been authorized and is to be offered to stockholders at par does not provide enough money to meet the cost of the improvements which are considered necessary.

Consolidated Railway Company, New Haven, Conn.—The report for the eight months ended February 28, 1907, makes the following showing:

Total gross earnings from operation	\$4,027,135
Less operating expenses	2,516,371

Net earnings	\$1,510,764
Add income from other sources.....	682,828

Total income	\$2,193,592
Charges, taxes, etc.	1,966,534

Net income

Against this net income there was charged \$200,000 for the six months' dividend, paid on December 31, 1906, and \$66,666 for the accrued dividend for January and February, 1907.

Electric Properties Company.—Directors of the Electric Properties Company have declared a dividend of 2 per cent on the common stock for the year ending April 30, payable on June 10. They also declared a dividend on the preferred stock at the rate of 6 per cent per annum to April 30, 1907, from the date of the last dividend on January 31, and from the date subsequent payments were received, payable on May 10 to preferred stockholders and subscription receipt holders of record on May 4. The company, which was organized in May, 1906, for the purpose of acquiring, financing and developing properties, especially those in which electricity plays the principal part, and which also acquired the ownership of Westinghouse, Church, Kerr & Co., through which it conducts a general engineering and construction business, completed its first fiscal year on April 30, 1907. The company has paid dividends for the first fiscal year on the preferred stock at the rate of 6 per cent per annum.

Gainesville (Tex.) Electric Railway & Light Company.—This corporation has changed its name to the Gainesville Traction Company.

Hammond (Ind.) Whiting & East Chicago Electric Railway Company.—At the annual meeting of stockholders on May 7 H. C. Saitonstall was elected a director to succeed V. Shaw Kennedy. The other directors were re-elected. The following officers were re-elected: President, D. F. Cameron; vice-president, D. M. Cummings; secretary and treasurer, O. S. Gaither.

Havana Central Railroad Company.—Speyer & Co. of New York announce that they will receive deposits of the common stock and the first mortgage 5 per cent bonds of this company in accordance with the plan announced by J. Henry Schroder & Co. of London for the sale of the property to the United Railways of the Havana and Regla Warehouses, Ltd.

Interstate Railways Company, Philadelphia.—Charles W. Welsh, of Robert Glendinning & Co. of Philadelphia, has been elected a director to succeed Joseph L. Caven.

Maryland Electric Railways Company, Baltimore.—This company has sold \$750,000 Baltimore & Annapolis Short Line 5 per cent bonds to New York bankers. Prior to the absorption of the Baltimore & Annapolis Short Line's property by the Maryland Electric Railways the Short Line had authorized the issue of \$1,000,000 bonds to meet the cost of electrifying the road.

New Orleans Railway & Light Company.—Earnings for the three months ended March 31, 1907, with a comparison, were as follows:

Quarter ended March 31—	1907.	1906.
Gross earnings, all sources.....	\$1,595,713.39	\$1,491,331.60
Operating expenses	767,294.79	765,759.14
Net earnings	\$ 828,418.60	\$ 725,572.46
Fixed charges	489,717.92	447,348.30
Net income	\$ 338,700.68	\$ 278,224.16
Other deductions	9,723.74	8,809.01
Surplus	\$ 328,976.94	\$ 269,415.15

New York City Interborough Railway Company.—Theodore P. Shonts, president of the Interborough-Metropolitan Company, has been elected a director, to succeed Arthur Turnbull.

Rochester (N. Y.) Railway Company.—Earnings for the quarter ended March 31, with comparisons, were as follows:

Quarter ended March 31—	1907.	1906.	1905.
Gross earnings	\$561,758	\$487,281	\$416,198
Expenses	358,486	289,573	250,101
Net earnings	\$203,272	\$197,708	\$166,097
Other income	\$,640	3,229	1,325
Total income	\$211,912	\$200,937	\$167,422
Charges	106,003	93,746	89,541
Surplus	\$105,909	\$107,191	\$ 77,881

South Chicago City Railway Company, Chicago.—H. C. Saltonstall was elected a director at the annual meeting of stockholders on May 7 to succeed V. Shaw Kennedy. The other directors were re-elected. The following officers were re-elected: President, D. F. Cameron; vice-president, D. M. Cummings; secretary and treasurer, O. S. Gaither.

Terre Haute Indianapolis & Eastern Traction Company, Indianapolis.—The board of public works of Indianapolis has approved the lease by this company of the Indianapolis & Northwestern Traction Company and the Indianapolis & Martinsville Rapid Transit Company and its purchase of the Indianapolis & Eastern Railway and the Indianapolis & Western Railway. The consent was necessary in order that the new company might operate in Indianapolis.

Western Massachusetts Street Railway Company, Westfield, Mass.—The Massachusetts railroad commission has approved the purchase by this company of the property of the Woronoco Street Railway Company, and has authorized for that purpose the issue of \$250,000 additional capital stock in exchange at par for the stock of the Woronoco company. The Western Massachusetts company operates 12 miles of track from Westfield to Huntington. The Woronoco company operates 17 miles of track from Westfield to Holyoke and West Springfield. The entire capital stock of the Western Massachusetts company is owned by the New England Investment & Security Company.

Western Railways & Light Company.—It is reported that a company has been formed with the above title to consolidate the Illinois Traction Company of Champaign, Ill., which is controlled by W. B. McKinley of Champaign, and interests associated with the Sun Life Insurance Company of Montreal, Can., with the Galesburg Railway & Light Company of Galesburg, Ill., the Illinois Valley Railway of La Salle, Ill., and the Quincy Horse Railway & Carrying Company of Quincy, Ill., which are controlled by Mr. McKinley and Portland, Me., capitalists, represented by G. F. Duncan. Mr. McKinley is to be at the head of the new company.

Dividends Declared.

Rochester Railway Company, common, quarterly, 1 per cent.

Accident on the Toledo Urban & Interurban Railway.—A serious accident on the Toledo Urban & Interurban Railway occurred on the night of May 5, when the southbound Dayton-Toledo limited car met in a head-on collision with the northbound local car from Findlay, about a mile south of Bowling Green, O. Both cars were late and were running at a high speed. It is stated that from 30 to 50 persons were injured, three of them fatally. The cars were telescoped and were totally wrecked. The accident seems to have been caused by a misunderstanding of orders. The company has appointed a committee of superintendents of other lines to make an investigation.

Manufactures and Supplies

ROLLING STOCK.

New York & Queens County Railway, Long Island City, N. Y., has placed an order with the American Car & Foundry Company for 40 all-steel cars.

Interborough Rapid Transit Company, New York, has ordered 40 motor trucks, class 84-30, and 60 trailer trucks, class 66-30 T, from the Baldwin Locomotive Works.

Chicago Union Traction Company, Chicago, has secured an option from the St. Louis Car Company on 600 new cars. These will be equipped with four General Electric Company motors each.

United Railways Company of St. Louis, St. Louis, Mo., is reported to have ordered the building of 100 new cars at its own shops. These will be equipped with four 50-horsepower motors each and will be built at the rate of three cars a week.

Texas Traction Company, Dallas, Tex., has placed an order for 15 interurban cars, 58 feet in length, with passenger and smoking compartments and a seating capacity of 60 passengers. The cars are for delivery on December 1. We understand the order was placed with The J. G. Brill Company.

Pennsylvania Railroad has ordered for the West Jersey & Seashore Electric Line 10 motor coaches from the American Car & Foundry Company and 7 motor coaches, 2 combination passenger and baggage cars and 2 baggage cars from the Wason Manufacturing Company. The coaches will have a seating capacity of 58 passengers and the combination cars a seating capacity of 38 passengers, with a baggage compartment 15 feet 7 3/4 inches in length. All of the cars are 55 1/2 feet in length and are for delivery on June 1.

Baton Rouge Electric & Gas Company, Baton Rouge, La., as reported in the Electric Railway Review of May 4, has purchased nine semi-convertible cars from the St. Louis Car Company for delivery about May 13. The specifications call for the following details:

Seating capacity...32 passengers	Wheel base.....7 ft. 6 in.
Length of body.....21 ft.	Width, over all.....8 ft. 8 in.
Over all.....31 ft.	Body and underframe....Wood

Special Equipment.

Brakeshoes	Diamond	Interior finish	Mahogany
Couplers	Journal bearings	Motors	2 GE-80
.....St. Louis radial draw bars	.....Monitor full length	Roofs	Sanders
Curtain fixtures	Pantasote	Seats	Rattan—cross, type L-3
Curtain material.....	12-inch steel	Trucks.....	Dupont No. 46
Gongs	Kranshaar		
Headlights			

SHOPS AND BUILDINGS.

Atlantic Shore Line Railway, Kennebunkport, Me.—This company has let a contract to Jones & Clark of Kennebunk for the construction of a car barn at Ogunquit, Me.

Illinois Traction Company.—It has been decided to build a passenger station, containing business offices, ticket rooms and dispatcher's office at Granite City, Ill., on the corner of Twenty-second and Niedringhaus avenues.

Ft. Dodge Des Moines & Southern Electric Railway, Boone, Ia.—This company and the Newton & Northwestern Railroad have let a contract to S. J. Webster of Boone for the erection of an \$18,000 joint passenger station and office building at Boone.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—This company has acquired title to a tract of ground between Tenth and Eleventh streets, south of Arbor street, Omaha, and proposes to build a large new car house for the Farnam, Dodge and Harney lines.

Willamette Valley Traction Company, Portland, Ore.—This company is reported to have purchased land at Springfield, Ore., for car houses, repair shops, yards and a passenger station.

TRADE NOTES.

Borne Scrymser Company has removed its New York offices from 135 Front street to 80 South street.

Rossiter, MacGovern & Co. have removed their New York offices from 17 Battery place to 90 West street.

Niles-Bemont-Pond Company has declared its regular quarterly dividend of 1 1/2 per cent on the preferred stock, payable on May 15.

Pratt & Whitney Company has declared its regular quarterly dividend of 1 1/2 per cent on the preferred stock, payable on May 15.

Electric Service Supplies Company, Philadelphia, announces the removal of its New York office from 85 Liberty street to the United States Express building, 2 Rector street.

Buell & Mitchell, New York, contractors and experts in steel for building and bridge construction and for manufacturing purposes, announce the opening of a branch office at 70 Kilby street, Boston, in charge of Henry W. Nutt as manager. The company

has appointed as its New England representative the Rogers Shear Company of Warren, Pa., for the exclusive sale of its output of high elastic limit round, square and twisted concrete steel bars.

McClintic-Marshall Construction Company, Pittsburg, has opened an office in Room 923, Columbus Savings and Trust building, Columbus, O., in charge of F. C. Lewis.

Gould Storage Battery Company announces that on June 1 it will remove its New York offices from 1 West Thirty-fourth street to 341-347 Fifth avenue, corner of Thirty-fourth street.

B. F. Sturtevant Company, Boston, has removed its New York offices from 131 Liberty street to the Engineering building, 114 Liberty street, where larger quarters have been secured.

Northern Engineering Works, Detroit, has received an order from the International railway at Buffalo, N. Y., for four 3-motor electric northern traveling cranes of 10 tons capacity; also one overhead electric track and trolley.

Barrett Manufacturing Company, 17 Battery place, New York, is having plans prepared by Ballinger & Perrot, engineers, for a new plant to be erected at Thirty-sixth and Wharton streets, New York. The building will be 78 by 124 feet, two stories in height and of reinforced concrete construction.

F. I. Cordo has been appointed purchasing agent of the Griffin Wheel Company, Chicago, to fill the vacancy caused by the death of P. J. Geraghty. S. L. Prest, formerly comptroller of the company, has been elected treasurer and G. F. Griffin, manager of the review department, has been made secretary.

Joseph W. Lowry, purchasing agent of the Westinghouse Air Brake Company, died on Monday, May 6, at his residence in Pittsburg of heart failure, following an illness of five months. He was born in Pittsburg in 1866. He was also president of the Duquesne Manufacturing Company, of which he was one of the organizers.

Lupfer & Remick is the name of a recently formed co-partnership to do a general engineering business. Edward P. Lupfer, a member of the American Society of Mechanical Engineers, has resigned as constructing engineer between Wellsville and Buffalo on the Buffalo & Susquehanna Railway, to devote his time to this business. Frederick N. Remick was also formerly connected with the Buffalo & Susquehanna Railway. The offices of the company are located at 590 Ellicott square, Buffalo, N. Y.

Under-Feed Stoker Company of America, Marquette building, Chicago, has recently received a fourth order from the Georgia Railway & Electric Company of Atlanta, Ga., for Jones stokers. The first order received from this railway was for four stokers in July, 1904, which has been added to at intervals until the fourth order now in hand makes a total of 36 Jones stokers in its Butler street station, and providing for the equipment of 7,200 horsepower of Babcock & Wilcox boilers. The installation of 18 stokers under the third order given in May, 1906, necessitated the removal of another type of stoker heretofore installed in that plant.

F. V. L. Smith has been appointed representative in the south of the Sprague Electric Company, New York, with headquarters at New Orleans, La. Mr. Smith has had a wide experience in the electrical field, having been electrical inspector of the Pan-American exposition in 1901 and afterward electrical inspector for the National Board of Fire Underwriters in New York City until December, 1904, when he became chief electrical inspector for the Louisiana fire prevention bureau, with headquarters in New Orleans. Owing to his extensive knowledge of electrical work and his acquaintance in the south, Mr. Smith is well fitted to represent the Sprague Electric Company in that section.

Allis-Chalmers Company, Milwaukee, has received an order from the Bristol Tramways & Carriage Company, Limited, of London, Eng., for an Allis-Chalmers vertical cross-compound Reynolds Corliss engine, with cylinders 26 and 56 by 48 inches. This unit will be installed in the central power station at Bristol to drive a 1,000-kilowatt direct-coupled, direct-current generator. The engine, operating under 140 pounds steam pressure, will develop approximately 1,700 indicated horsepower. The Bristol station now contains four Allis-Chalmers vertical cross-compound engines, which are somewhat smaller than the new unit just purchased. They have cylinders 22 and 44 by 42 inches and are used to drive 550-kilowatt generators. The engines now in this station have been in continuous operation for eight years. It was doubtless due largely to their good record that the purchase of the new American-built unit was made.

General Fireproofing Company announces, coincident with establishing a branch office at 82 Second street, San Francisco, the appointment of W. W. Thurston as district manager in that territory. The company is well and favorably known on the coast through large sales in the past of herringbone expanded steel lath and expanded metal. Mr. Thurston will devote especial attention to exploiting pin-connected girder frames and cold twisted lug bars, two advanced types of reinforcement in which engineers recognize unique points of merit. Another recent acquisition by the General Fireproofing Company is W. E. Ramsey, engineer, a graduate of the University of Illinois, and formerly with the Expanded Metal Fireproofing Company at Chicago. Mr. Ramsey is at present with the home office at Youngstown. Jesse Briegel has been engaged by the Chicago office as salesman. Through his previous connections as adjuster with liability insurance companies, most recently with the accident liability department of the Aetna Life Insurance Company of Hartford, Conn., Mr. Briegel has formed an extensive acquaintance among contractors, factory owners and employers, which should be of advantage in introducing the General Fireproof-

ing Company's system of reinforced concrete. The main offices of the company are at Youngstown, O.

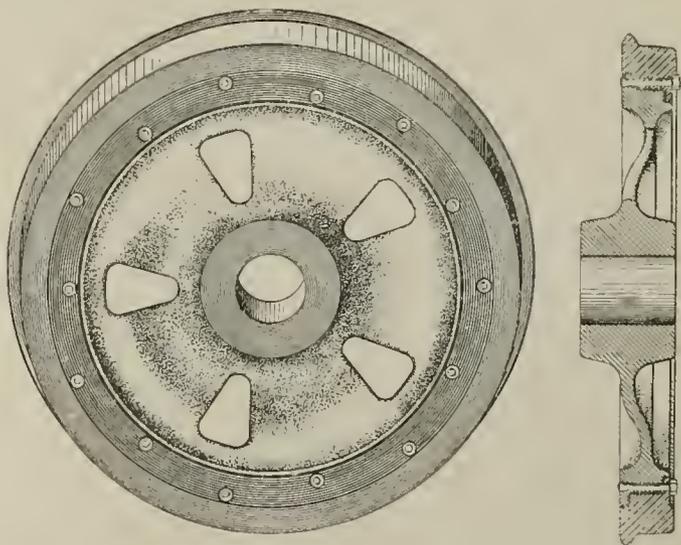
ADVERTISING LITERATURE.

John Ruscoe & Co., Limited, Albion Works, Hyde, Manchester, Eng.—This company is circulating a pamphlet in the interests of its one-horse drum carriage, designed for the handling and laying of electric cables.

Western Electric Company, Hawthorne, Ill.—This company is about to issue its 1907 supply catalogue. The publication will be a large volume of 700 pages, listing a very complete line of electrical supplies. The previous catalogues which have been issued by this company in recent years have been in great demand by dealers and those interested in electrical supplies because in addition to furnishing a complete list of all material handled by the Western Electric Company, they have embodied many features of general interest to the electrical trade. The edition for this year, which is now in the press, we are advised, will be more complete and instructive than anything issued heretofore by this company. The advertising department of the Western Electric Company, as previously mentioned in these columns, has been reorganized and placed under the charge of Howard M. Post, who at one time successfully handled the advertising for the Kellogg Switchboard & Supply Company, manufacturers of telephone apparatus, and the Quincy-Manchester-Sargent Company, manufacturers of railway supplies. Mr. Post was also associated with the Lord & Thomas Company for a period.

Noiseless Car Wheels.

One of the continuous annoyances which confront the management of electric railways operating in cities or through residential districts is the constant list of complaints which are charged against the companies because of the noise made by cars operated



Noiseless Car Wheel.

at high speed. Further, a source of loss which is experienced by railway companies is that caused by the great cost of renewing and turning down car wheels which have developed flats, and renewing wheels with broken flanges. With standard solid cast wheels or those fitted with rolled steel tires, considerable delay is caused in the shops because it is necessary to remove wheels and axles in order to turn down the wheels or to replace steel tires. This consequently increases the number of cars which are out of service because of repairs being made, thus adding greatly to the cost of operating cars. A further element in the cost of replacing worn or damaged wheels is that with the solid wheel or those fitted with steel tires it is necessary to put them in a press and force the tires on the wheel centers or the wheels on to the axles. Hence there is a chance that the gauge of the wheels may not be correct and undue strain and excessive wear are the inevitable results.

In order to obviate these difficulties, the "Noiseless" wheel, shown in the accompanying engraving, was designed. Though it is called a noiseless wheel, the name is not intended by the manufacturers to convey the idea that it absolutely prevents all noise, as that is an impossibility, but it is claimed that its construction reduces the amount of noise very materially, especially in rounding curves.

As will be seen from the illustration the wheel consists of a cast-iron center, on which a chilled cast-iron or rolled-steel tire is forced, the latter, however, being separated from the cast-iron center by heavy cloth cardboard packing. The tire is securely held in position on the cast-iron center by numerous countersunk bolts. It is claimed that the cardboard packing reduces the shock on the wheel and by dampening the vibration reduces the noise.

An advantage of the sectional wheel is that, the cast-iron center not having to be chilled, the metal is of more uniform structure, and, the different parts of the casting being more nearly of equal thickness, they can be cast entirely free from strain, which distorts and locally weakens the metal in solid cast-iron wheels. By making the wheels in this manner it is possible to easily replace a rim without taking the wheels and axles from the car, thus

greatly reducing the time that a car is out of commission for the turning down of wheels or replacements.

As it is unnecessary to disturb the center and unnecessary to use a wheel press the tires can be put in place while the wheel is on the car and gauging is unnecessary, as the tires are held in a definite position by the flanges on the cast-iron centers. It is stated that the cloth cardboard packing can be used continuously without having to be replaced.

The cost of the cast-iron centers and cast-iron tires of the noiseless wheel is about three times that of an ordinary cast-iron wheel and the cost of those fitted with rolled steel tires is a trifle less than built-up wheels with steel tires. The results of actual tests which have been made on these wheels have shown the mileage to be approximately 200,000 to 250,000 for the cast-iron tires and 250,000 to 300,000 for the rolled steel tires, whereas the mileage of the ordinary cast-iron wheel will not greatly exceed 25,000. It follows, therefore, that since the cost is three times as great, and the mileage seven or eight times as great as that of the cast-iron wheels, they actually cost but half as much when the mileage is considered.

The wheel is manufactured and sold by the Noiseless Car Wheel Company, whose incorporation with a capital of \$1,000,000 was recently noticed in these columns. The headquarters of the company are now located in Detroit, but it is intended to establish the general sales office in Chicago. The company is now represented at the latter point by George H. Bryant, president, 1055 Old Colony building. The other officers are: Vice-president, August Ziesing, president of the American Bridge Company; treasurer, Bethune Duffield, Detroit, and secretary, W. F. McCorkle, Detroit. The directors are: George H. Bryant, western representative of Thomas Prosser & Son, August Ziesing, Bethune Duffield, J. L. Carleton and Fred M. Delano.

The Acheson Effect.

BY ORRIN E. DUNLAP.

E. G. Acheson of Niagara Falls, N. Y., has invented a process for suspending graphite in water or oil, where it remains permanently suspended, thus adding largely to the possibilities of graphite as a lubricant, and, strange to say, when so suspended in water the graphite possesses the remarkable power of preventing rust or corrosion of iron or steel. This latest process will be known to the scientific world as the "Acheson Effect," and when suspended the product is called deflocculated graphite. In the deflocculated condition produced by Mr. Acheson graphite has a condition of fineness far beyond that attainable by mechanical means. In fact its condition resembles, if not wholly approaches, the molecular state. The "effect," for such it must be termed, is produced with water and a comparatively small quantity of gallotannic acid, and when thus treated the graphite remains suspended in the water, showing not the slightest disposition to settle. The black liquid passes with ease through the finest filter paper. Severe tests have demonstrated that it is an admirable lubricant, and there is every reason to believe that deflocculated graphite with and without oil will succeed oil as a popular agent for all classes of lubrication.

Graphite has been known for years to be an excellent lubricating body, not especially in a dry state, but when associated with a liquid, oil, fats or water. Strenuous efforts, extending over a long period, have been made to suspend graphite in a liquid to be used as a lubricant but all these efforts have been unsuccessful. It is well recognized that plain water has many advantages as a lubricant if it had sufficient body to withstand the pressures brought to bear and to which lubricants are subjected. Its very high specific heat would be of great advantage to keep down the temperatures of bearings, while its low viscosity would reduce friction, but unfortunately it has not sufficient body to withstand the pressure of an ordinary bearing. It also has the fatal quality of rusting and corroding metals. The "Acheson Effect" makes it possible not only to reduce graphite to practically the molecular state and to cause it to remain suspended in water for an indefinite period of time, but it, as stated, prevents rust or corrosion while associated with water, thus enabling the taking advantage of water as to its high specific heat and low viscosity, making of the new product a lubricant seemingly quite superior to any heretofore used.

About six years ago Mr. Acheson engaged in a series of experiments having as their object the production of crucibles from artificial graphite. This led him to a study of clay, and he learned that American manufacturers of graphite crucibles import from Germany the clay used by them as a binder of the graphite entering into the crucibles; also that the German clays are more plastic and have a greater tensile strength than American clays of very similar chemical constitution, while residual clays—those found at or near the point at which the parent felds pathic rock was decomposed—are not in any sense as plastic or as strong as the same clays when found as sedimentary clays at a distance from their place of origin. Chemical analysis failed to account for these decided differences.

It was under these conditions that Mr. Acheson reasoned that the greater plasticity and tensile strength were developed during the period of transportation from the place of their formation to their final bed, thinking possibly it might be due to the presence of extracts from vegetation being in the waters which carried them. He made several experiments on clay with vegetable extracts, tannin being one of them, and found a moderately plastic, weak clay, when treated with a dilute solution of gallotannic acid or extract of straw, was increased in plasticity. Being acquainted

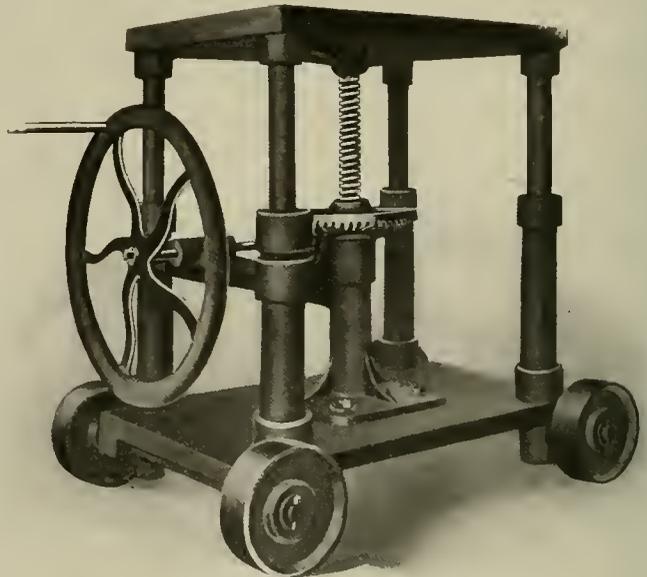
with the record of how the Egyptians had the children of Israel use straw in the making of bricks, and believing it was used not for any benefits derivable from the weak fibers, but for the extract, he calls clay so treated Egyptianized clay.

Last year Mr. Acheson discovered a process for producing a fine, pure, unctuous graphite, and undertook to work out the details of its application as a lubricant. In the dry form, or mixed with grease or oil, it was easy to handle, but he wished it to enter the entire field of lubrication as occupied by oil. In his early efforts to suspend it in oil, he met the same troubles encountered by his predecessors in this line of work. It would quickly settle out of the oil. His unctuous graphite was just plain, simple graphite, and obeyed the same laws governing the natural product. Such was the condition of things in the latter part of 1906, when the thought occurred to Mr. Acheson that tannin might have the same effect on graphite that it did on clay. He tried it with satisfactory results. The writer has seen most interesting and successful experiments made with unctuous graphite of Mr. Acheson's manufacture, which might properly be termed disintegrated unctuous graphite. It may be added that Mr. Acheson has obtained his "effect" with amorphous bodies generally, alumina, lampblack, clay, graphite and siloxicon, the only exception being magnesia, which needs further tests.

Mr. Acheson's success in deflocculating graphite and causing it to remain suspended in water was most gratifying. However, he realized that the people of the world had been educated to the use of oil as a lubricant, and that it might be difficult to re-educate them to the use of water and graphite for a similar purpose until they better understood what he has accomplished. It was with such convictions that he undertook to solve the problem of replacing the water used as a conveyor of the deflocculated graphite with petroleum. His first experiment, and probably the simplest and most rational, was to diminish the quantity of water by evaporation, leaving the graphite in a dry state, to be rubbed up later in oil. While this method produced what seemed to be an ideal result, it was soon discovered that in a comparatively short time the graphite had settled out of the oil, having lost its deflocculated condition and returned to its original flocculated state. Consequently it was not in condition to remain suspended in oil, nor indeed was it possible to again suspend it in water. Notwithstanding this apparent failure, the desired result eventually was accomplished, and it may be accepted as fact that the "Acheson Effect" permits the suspension of graphite in water or oil at will, there to remain permanently suspended.

Patten Motor Lift.

Considerable time and money can often be saved by providing proper means for handling heavy weights in the repair pit. Owing to the cramped space in which men are compelled to work much



The Patten Motor Lift.

time is lost if proper facilities for handling motors, armatures, etc., are not provided. Realizing the convenience and the demand for an efficient motor lift which can easily be operated by hand, Mr. Paul B. Patten, 78 Lafayette street, Salem, Mass., has designed and placed upon the market a compact, well-made motor lift.

As will be seen by examining the accompanying illustration the lift comprises a solid cast-iron base, mounted on wheels. Supported upon this base are four telescoping legs, which act as guides to a platform, 3 feet 5½ inches by 24 inches. The platform is moved up and down by a 2½-inch square-threaded steel screw of ½-inch pitch. The nut, which is circular and has a bevel gear cut upon it, is turned upon seventy-two ½-inch steel balls by a hand wheel and gear. The gear ratio is 3½ to 1. It will thus be seen that the heaviest load can easily be handled by one man with the aid of this lift. The height of the machine when closed is 32½ inches and when open it is 56 inches high. The weight of the complete machine is about 1,000 pounds.

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The statement which was made public on May 9 by E. H. Harriman, president of the Southern Pacific Company, shows that of the floating debt of that corporation, for which provision is to be made through the issue of stock, \$16,234,336 was incurred in the purchase of electric railways, principally around Los Angeles, Cal., and Salt Lake City, Utah. This figure illustrates the extent of the recent investments of this company in electric railways. In the last year steam railroad companies have been large purchasers of electric roads, both urban and interurban, and by these investments have acquired valuable feeders and protected their own properties. That these investments will increase steadily seems to be an undoubted tendency of the times.

There are many good reasons for housing high-potential transformers in individual compartments. It is also desirable that provision be made for handling them easily when repairs are necessary. In the large substation of the Portland Railway Light & Power Company, described in this issue, the transformers are single-phase water-cooled units, each of 850 kilowatts capacity, lowering the potential from that of the transmission line, 33,000 volts, to 11,000 volts, the distribution pressure for this and other substations in the city. There are six such transformers, each placed in a fireproof room having no connection with the main part of the station. There is only one entrance to each transformer room and that is normally closed by a steel door. Under operating conditions the units are positively independent of each other, except through the electrical connections, and each is in a compartment of such construction that it would hardly seem possible for fire or any electrical disturbance in one compartment to be transferred to its neighbors. To facilitate repairs the transformer cases are mounted on small trucks which permit of the units being rolled through the doors on to a large concrete platform built at the same

elevation as the floors in the transformer compartments. This type of construction should fully meet the requirements, both mechanical and electrical, for plants operating at high potential and for service demanding continuity of operation.

The subject for discussion at the coming meeting of the Central Electric Railway Association is "Modern Methods of Train Dispatching." This is a fertile topic and

The Telephone and Train Dispatching.

one that should be productive of interesting arguments. While the conditions on electric railways vary so greatly that it hardly would be wise to adopt, at the present time, a standard method for dispatching trains, nevertheless there are essential requirements for a good train-dispatching system that can wisely be considered for general adoption. With the rapid growth of interurban lines and the consequent shortening of the headway, it becomes more and more desirable to use a dispatching system which includes, as one of its essential factors, some method for permanently recording all train orders delivered to crews. Some roads have, for this and commercial reasons, entered into contracts with telegraph companies, employing operators as station agents and requiring them to handle the train dispatching by telegraph. It will not be questioned that the telegraphic order offers a high degree of accuracy; but, differing from the conditions on steam roads, electric trains run on such short headway that the element of the delay in running time required to ask for and receive orders by telegraph would seem to be a disadvantage that should be considered. Other high-speed lines have adopted a method which provides the security of the telegraph and yet saves a considerable amount of time in transmitting orders. This system includes a copying device which mechanically deposits in a locked receptacle an exact carbon copy of the order which is issued and received. There also is the commendable feature that this duplicate cannot be seen by the crew. This system also assures that there shall be available, for the use of the superintendent alone, carbon copies of every order issued by the dispatcher and received

by the crew, together with the proper marks to identify the man who transmitted the order over the telephone. The telephone is unquestionably the most satisfactory medium now available for transmitting train orders, but its use requires more than ordinary carefulness. For this reason all efforts are to be welcomed that tend toward the elimination of mistakes due to carelessness in giving or receiving train orders.

Improved operating conditions in the power plant have become so important within the last few years in the minds of street railway managers that in some quarters the attention given to this topic has been criticized as excessive. Doubtless it is true that on many roads the actual money cost of delays in the car service, of protracted rolling stock repairs, and of low standards of efficiency in platform work have not been properly appreciated, but in view of the sums expended on modern systems simply to keep the cars in motion it is clear that the power question was never a more lively issue than it is today. During the last year, for example, the street railways of Massachusetts expended nearly \$20,000,000 in operating expenses. Of this the cost of rolling stock repairs aggregated \$2,300,000; transportation wages came to \$7,500,000, and the cost of power was \$3,000,000. The magnitude of these figures proves their importance. Taken with repairs to roadbed and track, \$1,750,000, and damages for injuries, \$1,400,000, these five items comprise about 75 per cent of the cost of operation, and to decry the need of saving every possible dollar in each item is to talk without wisdom.

Although experience has demonstrated the practicability of using concrete for shop floors, there appears to be a doubt as to the advisability of using this material in the wheel room, where the wheel presses, boring mill and wheel lathes are installed. The handling of wheels over the concrete floor soon chips the surface of the concrete, with the result that the floor not only becomes uneven and thus unsatisfactory for handling the work, but presents a very bad appearance. The question of the thickness of the concrete or of reinforcement does not enter into the problem or present any means of overcoming the difficulty. In the case of the new Camden shops of the Public Service Corporation it has been decided to use creosoted wood blocks placed on a concrete bed and the experience of this company at its main plant, the new Plank Road shops, has been such that it has even been decided to replace the concrete floor of the wheel room there with the creosote blocks. The cost of blocks on a concrete bed is about 45 cents a square foot, as compared with about 15 cents a foot for plain concrete, but the space to be paved in any wheel room is so small in comparison with the general floor area that the question of cost does not present itself for serious consideration.

Many technical students receive their first experience in handling tools and machinery in the engineering college laboratories. It is thought that one of the most important factors in the education of an engineer is practical experience with the handling of apparatus similar to that which he will be called upon to take in charge after his graduation. Believing this, strong efforts are now being made by the faculties of our prominent engineering schools to enlarge the capacities of their mechanical departments so that students may become better acquainted with the handling of machinery and the details of its manufacture. An experiment which was performed in the laboratory of the University of Illinois on a recent visit of the Western Society of Engineers serves to illustrate the method pursued by the technical instructors with a view to familiarizing young engineers with operating machinery. This experiment was performed to show a method of synchronizing two

alternators without regard to their phase relation. It is accomplished by inserting in the circuit of the incoming machine a coil of wire without an iron core. The coil used experimentally in synchronizing a 45-kilowatt 2-phase generator with a 125-kilowatt unit, consisted of 30 pounds of No. 8 wire wound on a cylinder two feet in diameter. The cost of such a coil is about \$12, or, roughly, 1 per cent of the cost of the machine to be synchronized. The effect of the coil is like that of a spring, preventing any serious jar. It is connected in but one phase and is cut out of circuit when both phases are thrown together. The machines may be synchronized without waiting for them to be adjusted in step, and it is stated that the results are no more severe than with the best possible manipulation without the coil. While such experiments as these may or may not have an actual commercial value they do, however, afford a means for training a student so that he becomes well acquainted with the design, use and possibilities of machinery, and therefore can make better use of the excellent store of fundamental knowledge given him by his alma mater.

HANDLING CARS IN THE PAINT SHOP.

Improved methods of handling cars in the paint shop are desirable on many electric roads. The use of stub tracks in shops is largely responsible for the lack of flexibility in car movement within doors which at present hampers repair and storage work in so many instances. Local conditions often impose the necessity of a track layout which is far from satisfactory, but when a shop is built on cheap land unrestricted by adjoining buildings or streets, it is a mistake not to consider the possibilities in the way of through tracks and cross-overs, a transfer table, traveling crane or even a roundhouse design. The new shops of the Elgin & Belvidere Electric Railway at Marengo, Ill., which were described in an article in the Electric Railway Review of March 9, 1907, illustrate in an interesting way the flexibility of a through track arrangement in the repair and storage sections; not only can cars be moved in and out of the building with a minimum of obstruction to one another, but the enlargement of the shops in the future can be effected along symmetrical lines, which will permit the present ease of transfer to be enjoyed on a larger scale. The value of cross-overs in the paint shop was thoroughly appreciated in the construction of the new repair plant of the Union Street Railway Company of New Bedford, Mass.

A plain stub track layout in the paint shop opens the door to no little confusion and extra expense in handling the cars if the road is not large enough to be relatively independent in the time required for repairs. In the work of painting, the first car entering any one of the tracks would be the first one to leave the shop ready for service; and, in order to accomplish this, the cars in front of it, in case the track is fully occupied, would have to be moved out into the yard and hauled out of the way. Otherwise the first car in must be held idle after it is ready for service, causing a loss in earnings, which is liable to amount to a good many hundred dollars a year.

It often happens that one or more cars will be wet with varnish or paint at the time, and will be in no condition to be hauled into the dust and blowing dirt of the yard or street. In case the paint shop doors lead directly into the open, the cars which are being painted on parallel tracks are liable to be exposed to dusty drafts every time a car is moved, and actual instances have occurred where the wet varnish was ruined by these conditions. Additional time and expense are also entailed when car bodies are jacked up without trucks if these have to be moved out of the way before work upon them is completed.

Liberal shop areas with cross-overs will be found very helpful in reducing the amount of idle movement. The provision of through tracks and doors at each end of the shop

enables the work to be passed through progressively, and the cost of the necessary extra special track work is a small matter in relation to the convenience afforded. At the Marengo shops the first car in becomes the first car out. The shop in such a case is a way station instead of a terminal. On account of the relatively infrequent movements of cars in paint shops it seldom pays to install elaborate hoisting facilities. When the land is limited in area by surrounding buildings the roundhouse scheme of tracks can sometimes be used effectively. The transfer table also has its place in large shops, but in general the use of either cross-overs or through tracks is the least expensive method, all points considered, of facilitating the movement of rolling stock in the paint shop. Incidentally the location of this department with reference to the carpenter and machine shops is worth studying carefully. The woodworking and painting departments are in such close relation that their separation is a great disadvantage because of time and labor lost.

PERMANENT TROLLEY POLES.

The increasing scarcity of timber and the necessity for frequent replacement of wooden poles have encouraged experimental work on the construction of poles of a permanent character. A type of reinforced concrete pole which promises long life is used for supporting the overhead construction along one mile of track of the Lafayette & Logansport Traction Company. The constructional details of these concrete poles were illustrated and described by R. M. Feustel, assistant engineer of the Ft. Wayne & Wabash Valley Traction Company, in the *Electric Railway Review* of May 4, 1907, page 589. The new poles are 32 and 42 feet long, each length being set 8 feet in the ground. The shorter pole is 10 inches square in section at a point 8 feet from the bottom, and tapers to a section at the top 6 inches square. It is reinforced by eight $\frac{3}{8}$ -inch twisted square bars, 32 feet long, placed close to the surface. The 42-foot pole is 12 inches square in section at a point 8 feet from the base and is reinforced with $\frac{1}{2}$ -inch bars. The shorter poles carry the trolley bracket and a single cross-arm for supporting telephone and direct-current feed wires. The 42-foot poles are similarly fitted and in addition carry a 7-foot cross-arm and the pole-top pin, thus affording supports for the three wires of a high-tension line. Wrought-iron steps are embedded in the longer poles at a height affording a lineman a convenient footing when it is necessary for him to work on the high-tension wires at the top of the pole. The concrete mixture used comprised one part cement, three parts sand and three parts gravel or fine crushed stone. The materials were mixed wet. All poles have a facing of one part cement to three parts sand. The approximate weight of the 32-foot pole, which has a volume of 22.5 cubic feet and contains 122 pounds of steel, is 3,286 pounds. The 42-foot pole has a volume of 29 cubic feet and contains 242 pounds of reinforcing steel and 21 pounds of wrought iron in the steps, giving a total weight of 4,323 pounds. The design of the longer pole is considered sufficiently safe to support the high-tension wires in spans of 200 feet. For this reason an economy in first cost was obtained by alternating a short and a long pole with a spacing between adjacent poles of 100 feet. Thus the trolley wire is supported, as usual, on flexible brackets 100 feet apart, and the high-tension wires hang in spans of 200 feet.

Experimenting with a more permanent type of pole probably is brought about not so much by the growing scarcity of wooden poles as the desire to obtain a type of overhead structure which will require less expense for maintenance in good operating condition. With untreated or even treated wooden poles replacement becomes necessary after a very few years of service; and, other than the cost for new poles, these replacements result in delays to traffic, which undoubtedly appear in the net financial results of operation. It is

stated that the cost of the concrete poles is not excessive, and, if actual service shows that they are not mechanically weak, the total cost when considered for a number of years should demonstrate their economy.

POOLING MOTORS ON CITY SYSTEMS.

The practice of pooling locomotives on steam railroads has shown such satisfactory results under modern specialized operating organizations that it is important for electric railways operating a large number of cars in city service to consider how far it may be profitable to pursue the same policy in the use of motors. Closely allied with this problem is that of interchanging cars for service on different divisions, but here the practice of companies with regard to painting rolling stock settles the question without much delay. If all the cars of a system are painted the same color, with detachable signs, there need be little difficulty in satisfactorily pooling them, provided the attempt is not made to force small single-truck cars to do the work of large ones, and vice versa. When the policy of the management and the demands of the public require the use of separate colors as an aid to route classification, the question of pooling at large drops out of sight in the cost of repainting, including, of course, time lost in earning nothing while each car is in the shops.

On roads operating but a few cars each it is a simple matter to interchange motors or to draw upon reserves as the occasion dictates. Many small roads are today using several types and makes of motors, but there is little real necessity for the use of more than two sizes. It is safe to say that in the majority of cases a single type of motor can be found which will be capable of handling all the business on a small road, and if 4-motor equipments of this type are used on double-truck cars for the faster and heavier runs, the results ought to be thoroughly satisfactory on the score of flexibility, economy of operation and reduced investment in spare parts.

As the size of the system increases, however, the requirements of motive power become more complex. In proportion to the track mileage, the street railways operate many more routes than is the case in steam railroad practice, and only in cities exceptionally favored geographically are these routes to any great extent alike in physical characteristics. The traffic conditions vary on almost all routes, and with these the number and duration of stops, which are such vital factors in motor performance. Different sizes of motors become necessary for different classes of service, the smaller motors going to the easier runs with the smaller cars.

In such systems it is possible to set aside a certain number of motors for use in each division, holding a few in reserve at each car house where a division superintendent has headquarters. Special hoisting facilities are then required in order to rapidly substitute for a burned out motor one in good condition; storage space must be charged off; one or more mechanics maintained at the car house, and probably several thousands of dollars' worth of motors held against time of need. It may often pay to do this, especially in car houses located far from the shops, but the full advantages of pooling all the motors at a common center and drawing upon that stock as occasion arises ought to be realized before the other policy is settled upon. The whole problem is rather one of fitting motors to given routes rather than of assorting them by divisions, on most large systems. It is usually the case that a car traverses several divisions in part as it covers its route, and it is as probable that a breakdown will occur near a centralized shop as in close proximity to the division car house where the car is stored in times of light traffic. Motors cannot be transferred from route to route in a large city without discrimination, and the maintenance of the reserves at the central shops insures a minimum extra investment. When a division includes several complete routes of distinguished physical and traffic characteristics in compari-

son with the balance of the system it may well pay to hold a few motors in reserve at the central car house of that division, but in general the pooling of motors at a central shop with special regard to routes and service is the better plan. Motors can be ordered as needed, by telephone, installed at the division car house, or, if the management prefers, the car can be run to the central shops for the change-over. Local conditions will determine the best place for changing motors, but most car house foremen should be capable of overseeing such work. Free interchange of motors, trucks and cars is desirable on similar route conditions, but it is certain to lead to inefficient operating results if practiced on a large system in the way which is usually feasible on a small one.

ANNUAL REPORTS OF RAILWAYS.

Ohio River Electric Railway & Power Company.

In the annual report for 1906 of Percy M. Chandler, president of the Ohio River Electric Railway & Power Company, Pomeroy, O., many details of the operation of the property are discussed. The results for the year, with comparisons, were as follows:

	1906.	1905.	1904.
Gross earnings	\$58,981.10	\$53,196.61	\$45,591.67
Operating expenses	36,224.77	30,125.57	29,362.10
Net earnings	\$22,756.33	\$23,071.04	\$17,229.57
Fixed charges and taxes.....	17,808.97	17,790.18	16,377.43
Net income	\$ 4,947.36	\$ 5,280.86	\$ 852.14
Operating expenses—percentage			
of gross earnings	61.4	56.6	64.4
Motor car-miles	290,557	285,633	277,743
Freight car-miles	12,702	12,956	9,447

An abstract of the statement of John Blair MacAfee, the vice-president and general manager, contained in the report, follows:

The company continues to have more coal freights offered than can be accommodated by reason of the impossibility of obtaining sufficient car equipment from the Hocking Valley Railway.

Owing to the increased cost of operation, cost per car-mile has increased as well as the operating ratio. Your company's track and roadway has reached an age at which considerable renewal is required.

During the year 1905 the sum charged to this item was...\$1,481.43
Whereas during the year just past there has been charged... 4,584.07

Being an increase of\$3,102.64

In the item of maintenance of equipment an increase is shown of \$1,100.96. Under the headings of operation of power plant, operation of cars and general expenses, a total increase is shown of \$1,895.60.

During the past year we have abandoned the contract for carrying United States mail. An arbitrary ruling of the government imposed conditions which made the contract unprofitable. The government paid us \$200 per year for seven deliveries per day. Under a new arrangement, recently made by the government with an individual carrier, certain of these deliveries have been abandoned and the department pays \$240 per year to the individual.

We are still able to report no unsettled accident claims against your company. The total amount of damages paid on account of accidents for the past year was \$139.05.

Certain paving has been done in the different towns along the line of your road during the year 1906. The total charge against your company incident to this paving is \$3,852.82. By arrangement, however, with the civic authorities, your company will pay for that paving in the following manner: There will be paid \$994.25 during the year 1907, and the balance will be liquidated by semi-annual payments, the final payment being due on June 20, 1916.

During the year two new Brill semi-convertible cars have been purchased and delivered to the company. These cars are equipped with General Electric motors and air brakes, the total cost of the cars being \$8,818.95. Of this sum there has been paid \$4,974.51. The balance is being liquidated in deferred payments.

I. L. Oppenheimer, the superintendent, furnishes further details in the report. Of the gross receipts \$46,516 was received from passenger business, while freight receipts were \$6,012.57, divided as follows: Sale of parcel tags, \$1,202.95; delivery local freight Hocking Valley Railway, \$463.92; car-

load freight to and from Hocking Valley Railway, \$4,345.70. An abstract of Mr. Oppenheimer's statement follows:

In my last year's report I ventured the statement that this year would be the largest the company ever had. While the increase has been substantial it would have been still larger except for a diphtheria epidemic, which caused the closing of schools, churches and all places of public gathering in Pomeroy and Middleport. During September, when we expected to reap unusually large returns by reason of a varied number of amusements planned, the epidemic was at its worst, a portion of the amusements were suppressed, and those that were allowed to take place were failures, causing a loss in our passenger receipts of fully \$1,000. In the freight department we have suffered a loss in the carload business by reason of the car famine, which was considerably worse this year than last. With ample car supply this business should have shown a splendid gain, as our local way freight and parcel tag receipts will partially testify by showing a gain of 24.7 per cent. With the increase of our receipts has come an unusually heavy operating expense and maintenance cost, due to the increased price of all the materials and the heavy repairs necessary to the roadbed, which, I regret to say, is not in as good condition as I would like to report, and considerable money will have to be spent in maintaining this part of the property, and if the cost is within reason a better ballast should be used than has been employed heretofore. Four thousand three hundred and eighty-eight new ties were used, being 2,600 less than my recommendation of last year. The rapid advance in the price of ties has made this work expensive.

The overhead line is in good condition, and has involved no expensive maintenance cost; 78 pole renewals were made, all of first-class Michigan white cedar.

Rolling stock is all in the best condition. The cars have been kept well painted, seven repainted and two retouched in the past year; their electrical equipment has been carefully and well maintained, and with the acquisition of the two splendid new cars we are well prepared to meet all traffic requirements.

TRACTION MERGERS AND FEDERAL CONTROL.

Fourteen of the larger cities of Indiana connected by interurban traction lines are involved in an extensive merger project. The controlling interests have been concentrated in the hands of five syndicates which own all but two interurban lines of the state. Their holdings are such as to admit of almost immediate consolidation.

The completion of the merger thus proposed would connect the extreme southern towns of Indiana with those on Lake Michigan in Indiana and Illinois, and also with some of the towns of Ohio. Holders of interurban lines in Ohio seem to be working with those in Indiana, so that consolidation in the eastward direction is likely. It is also not improbable that developments in the direction of St. Louis may soon be made. In fact, the whole territory north of the Ohio, east of the Mississippi and south of the lakes, seems to be destined sooner or later, from present indications, to pass under one gigantic system of traction control.

Traction unification in the central states has already passed far beyond state limits, and must in due time receive attention as interstate commerce. The federal commission has in a few cases reminded western traction companies that they are subject to its jurisdiction. Within the scope of this territory there are probably 70,000 miles of steam railways. The adjustment of traction with steam business is a widening problem. As traction business develops it must add enormously to the amount of work which will fall to the federal commission to take care of, and must render the rate problem still more complex.

The first decision of the interstate commerce commission on express company rates has just been handed down, requiring a considerable reduction in charges on powers to New York City. This opens still another field of rate regulation over which federal control has hitherto had no authority.—Wall Street Journal.

It is estimated that about 200,000 people visited Coney Island last Sunday, May 12, most of them traveling over the lines of the Brooklyn Rapid Transit Company. Luna Park opened Saturday night and Dreamland, the other big park, was expected to be opened the latter part of this week.

NEW SUBSTATION OF THE PORTLAND RAILWAY LIGHT & POWER COMPANY.

The power supply for the Portland Railway Light & Power Company of Portland, Ore., is obtained from three steam-driven plants and three water power plants. The most recently built hydro-electric plant, known as the Cazadero station, was described and illustrated in the Electric Railway Review of May 11, page 608. This station is about 40 miles from the city of Portland. The power is transmitted over two 33,000-volt transmission lines, which have as their terminus the large modern substation described in this article. The machine equipment of this station includes two 1,000-kilowatt railway rotary converters, one 1,000-kilowatt phase-changing set, and eleven 44-kilowatt magnetic arc rectifier sets, together with transformers and auxiliary apparatus of the most recent design.

Building.

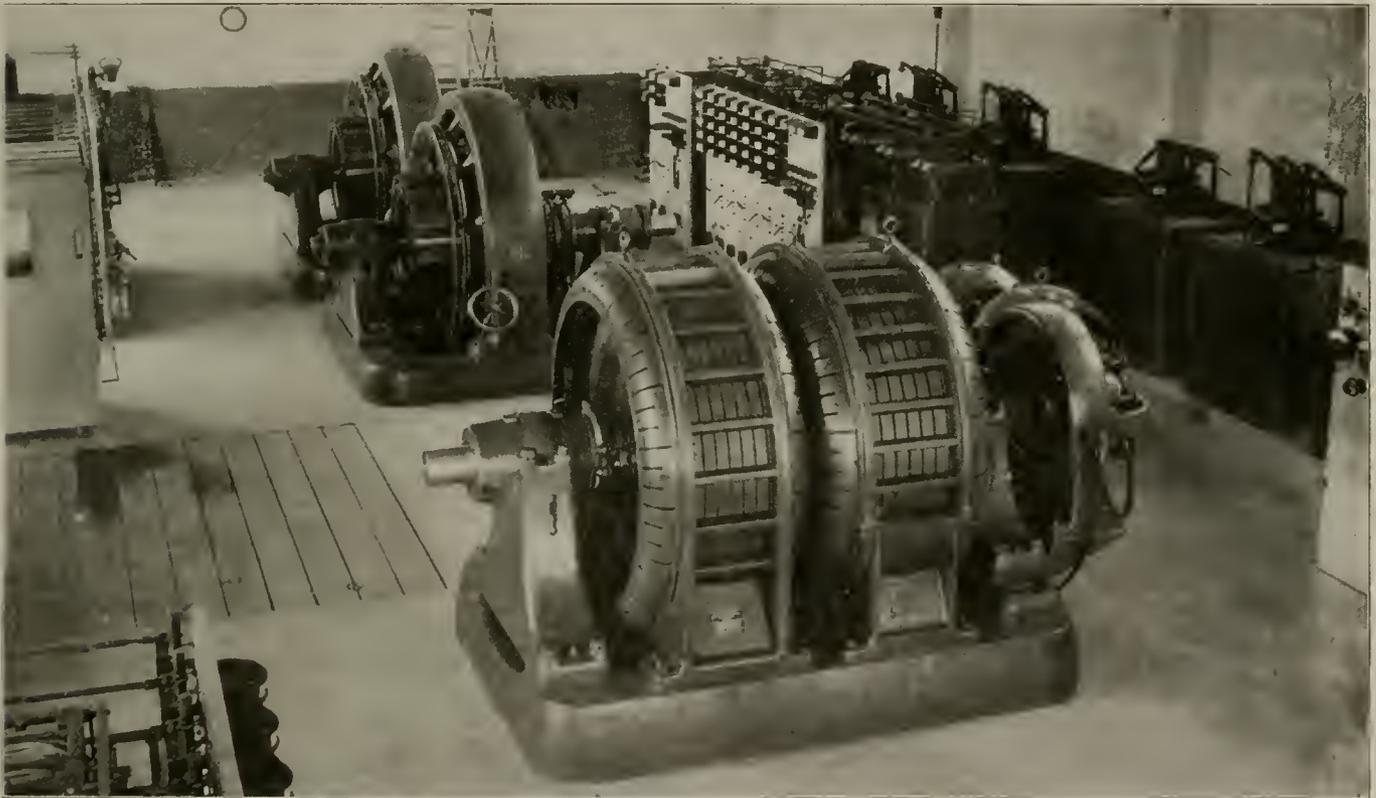
The substation building of brick with stone trimmings is located near the load-center of the city and forms a structure of pleasing design. The floor area of the building is 41 by 136 feet in dimensions. All the foundations, floors and interior divisions are of concrete. The roof is supported by structural steel girders and interior pilasters support runways for a 20-ton Pawling & Harnischfeger motor-operated crane. Accompanying engravings illustrate the interior arrangement of the building and disposition of the apparatus. It will be noted that at the end of the machine room is an independent portion of the building 16 feet wide. This part of the struc-

ture is three stories high and houses the high-tension transformers and all 33,000-volt switches and buses. The lead from the other switch passes through and under the floor of the third story to connect with a current transformer supported in a saddle below this floor. From the transformer the line passes to the terminal of a type F 60,000-volt remote-control oil switch of General Electric manufacture. From the opposite terminal of this switch which stands over a hole in the third floor, the 33,000-volt current is taken through a disconnecting switch to connect with four 33,000-volt bus wires



Portland Railway—Substation. Showing Outside Entrance to Transformer Compartment.

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Portland Railway—Interior of New Substation, Showing 1,000-Kilowatt Rotaries and Phase-Changing Set.

ture is three stories high and houses the high-tension transformers and all 33,000-volt switches and buses.

High-Tension Tower.

The two incoming 33,000-volt 3-phase transmission lines enter the third story of the wire tower through 24-inch vitrified tiles. The bare wire of each phase takes the following course through the tower to the main bus: The incoming wire is dead-ended on a line insulator, whose pin is embedded

directly below it and in the second story of the tower. The lead from the other switch passes through and under the floor of the third story to connect with a current transformer supported in a saddle below this floor. From the transformer the line passes to the terminal of a type F 60,000-volt remote-control oil switch of General Electric manufacture. From the opposite terminal of this switch which stands over a hole in the third floor, the 33,000-volt current is taken through a disconnecting switch to connect with four 33,000-volt bus wires

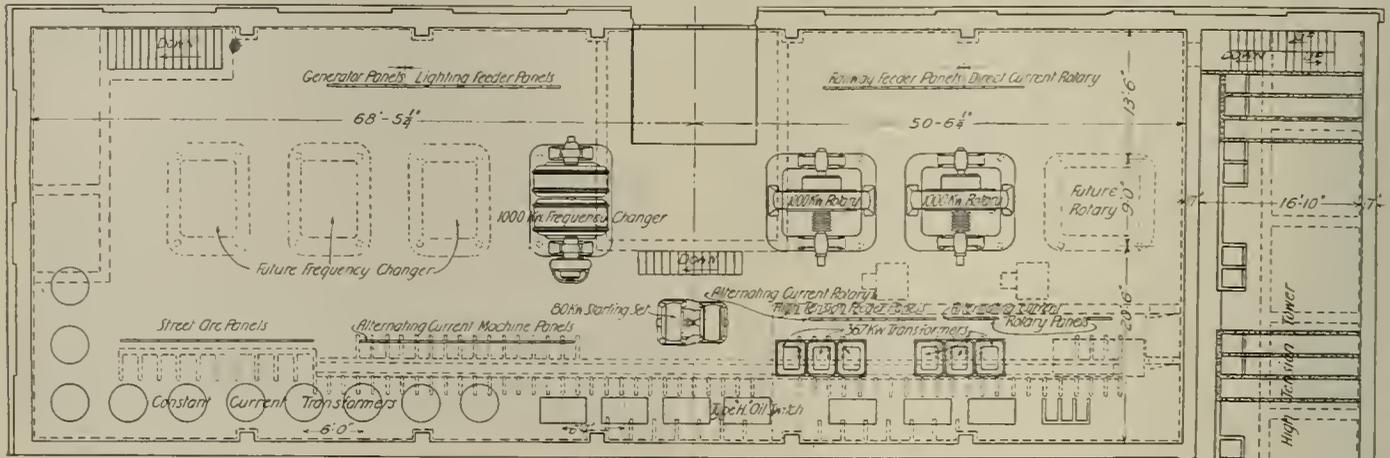
mounted horizontally in concrete septums opposite the second story of the wire tower. The lower bus is neutral.

The common bus wires afford a means for interconnecting in various ways the incoming transmission lines with the transformer equipment. The leads from the buses to the trans-

formers are also bare wire, mounted on line insulators and protected by concrete barriers. From each phase in the bus compartments connections are made through hand-operated disconnecting switches with 850-kilowatt single-phase transformers, which lower the potential from 33,000 volts to 11,000 volts.

The center and leads are taken from both ends and carried through the basement of the substation to feed the phase changing set and the rotary converters.

The 11,000-volt distribution buses are supported on line insulators in concrete septums and the circuit is so looped



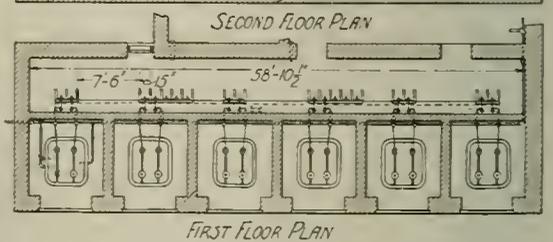
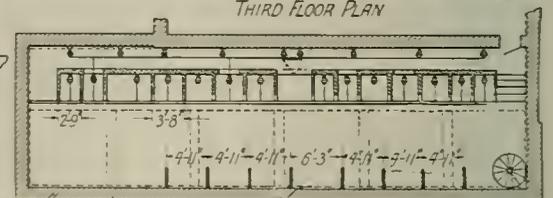
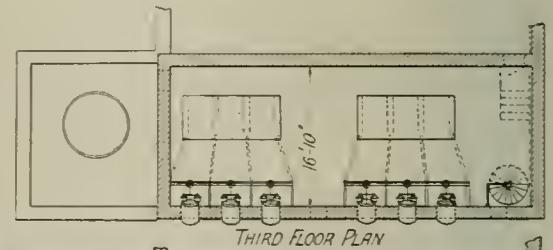
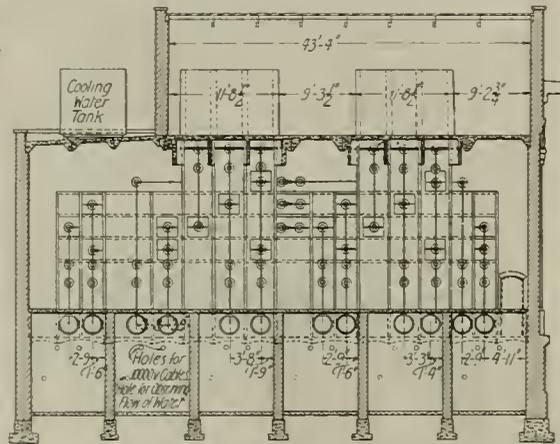
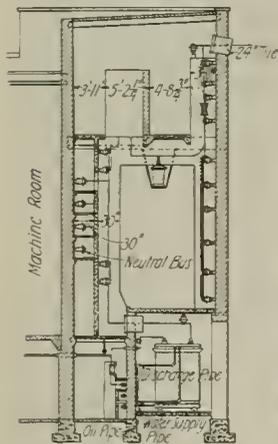
Portland Railway—General Machine Floor Plan, Showing Disposition of Units.

formers are also bare wire, mounted on line insulators and protected by concrete barriers. From each phase in the bus compartments connections are made through hand-operated disconnecting switches with 850-kilowatt single-phase transformers, which lower the potential from 33,000 volts to 11,000 volts.

Transformer Arrangements.

By reference to the sectional views of the wire tower the special arrangement of the transformers may be noted. Each

with disconnecting switches that either half may be dead and the transformers and phase-changing set still have their current supply uninterrupted. As the switchboards stand on



Portland Railway—Sections and Plans of High-Tension Tower, Showing Transformer Sections and Connections.

transformer unit is housed in a brick and concrete compartment which can only be entered through steel fire doors opening on to a concrete platform at the rear of the substation, as shown in the exterior view of the building. The six step-down transformers are of the oil-insulated water-cooled type, mounted on trucks so that they may easily be drawn on to the platform outside the building for repairs.

From the secondary side of the step-down transformers current is taken by wires leading through a partition wall and connecting through knife switches with an 11,000-volt, 3-phase set of buses extending parallel with the row of transformers. These buses are provided with knife switches at

the machine floor directly above the bus lines the wiring connections are comparatively simple for such a large station.

Switchboard and Machines.

The switch equipment includes seven Form H 300-ampere General Electric switches, six of which control the input to six air-cooled step-down transformers of 367 kilowatts capacity each. These transformers lower the potential from 1,000 volts to 430 volts for the operation of two 1,000-kilowatt capacity, 33-cycle, 600-volt General Electric rotary converters. The rotaries have starting motors

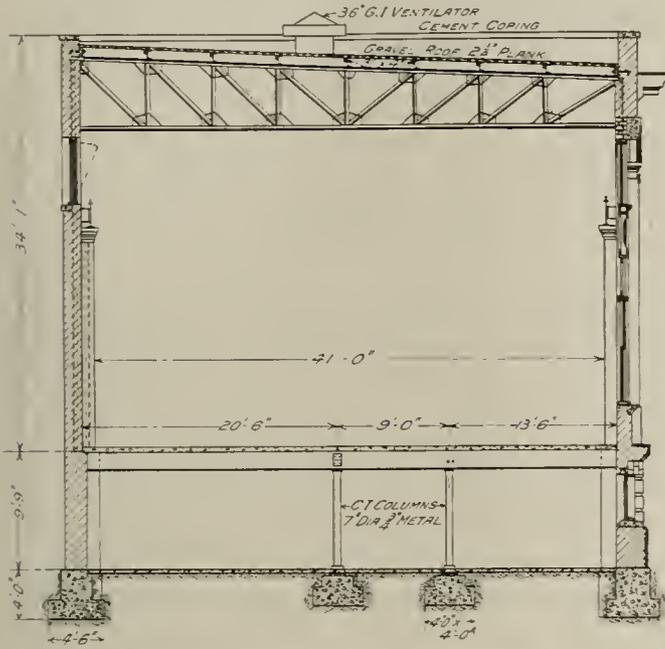
mounted on the common shaft. Current for starting is furnished by a starting set comprising a 125-volt, 640-ampere generator, driven by a 100-horsepower, 220-volt, 33-cycle induction motor.

Through the seventh of the oil switches, earlier men-

There are five switchboards for controlling the various classes of apparatus, including the lighting transformers and mercury arc rectifiers. This well-designed substation is of ample dimensions to accommodate three additional phase-changing sets and one additional rotary converter of the capacities now used.

NEW CAMDEN SHOPS OF THE PUBLIC SERVICE CORPORATION.

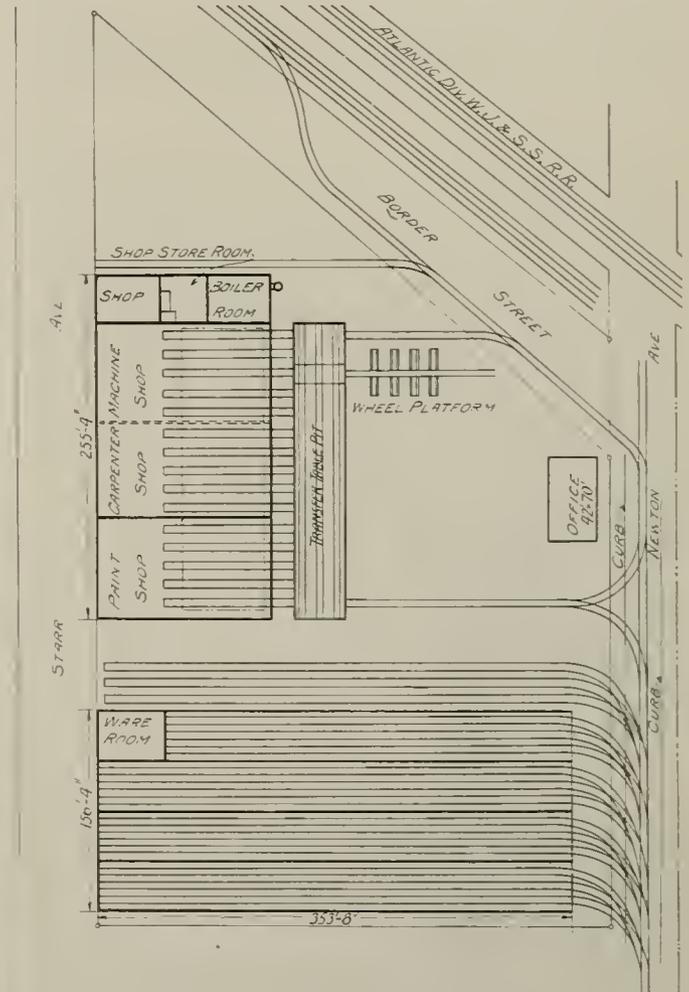
A new shop plant for the South Jersey division of the Public Service Corporation is now under construction at Camden, N. J. The shop site is at the corner of Border street and Newton avenue, and is of the shape indicated in the accompanying engraving showing the layout of the buildings. The main building, which is now completed, so far as



Portland Railway—Cross Section of Machine Room and Basement.



Portland Railway—Transformer Compartment with Entrance from Outside of Building.



Camden Shops, Public Service Corporation—Layout of Buildings and Tracks.

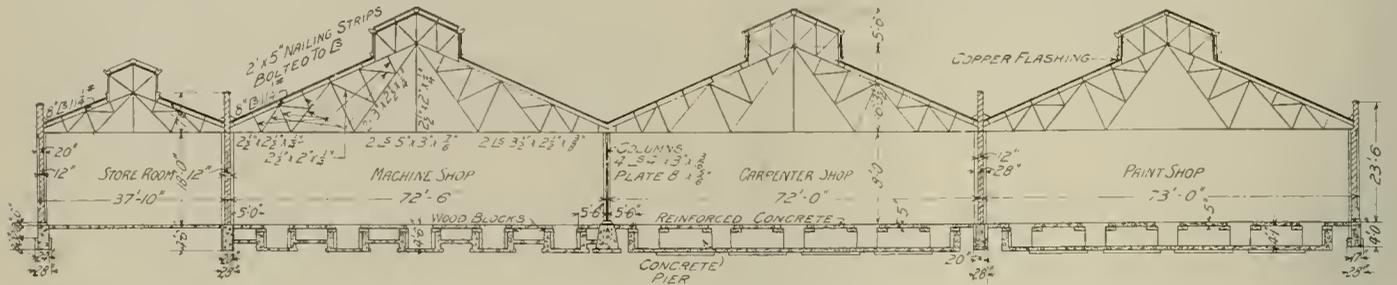
the external structure is concerned, is arranged, as shown, for a machine shop, carpenter shop and paint shop, with the boiler room and shop storeroom at one end. The building is 255 feet 4 inches long and 130 feet 8 inches wide, and the space devoted to the machine shop, carpenter shop and paint shop respectively is 72 feet in each case. There are five pit tracks allotted to each section, all tracks being served by the transfer table. The length of each pit is about 74 feet, or long enough to accommodate a car body and provide space for running out two pairs of trucks.

The paint shop is separated from the carpenter shop by a fire wall having one 5-foot opening on the side opposite the pits. A similar fire wall divides the machine shop from the boiler room shop, storeroom and wheelroom, each with openings into the machine shop. Between the machine shop and carpenter shop are placed steel columns on concrete founda-

tioned, 11,000-volt current is fed direct to a 1,400-horsepower synchronous motor, driving a 2,300-volt, 60-cycle generator, these two units forming the phase-changing set.

tions, spaced 16 feet apart on centers. These serve instead of a wall to support two sections of the steel truss roof. The roof stresses are calculated independently for each section of the building, thus constituting three main bays. The roof has a pitch of one in five. The building is of brick, the walls 12 inches thick with pilasters placed 16 feet apart on centers. All foundations, including the pits, are of concrete. Fully 40 per cent of the exterior wall space is devoted to windows, affording excellent lighting in the shops. The window allot-

23, 1907, page 380. There will be five jib cranes and one wall crane with air hoists, similar to those illustrated and described in the Electric Railway Review of March 23. The air pressure used on the shop tools will be supplied by a compressor plant, consisting of a Westinghouse twin electrically driven set. The five pits in the machine shop will be fitted with car hoists, similar to those in the Plank Road shops, each set made up of four jack screws, driven by a motor in the forward end of the pit. One pit will be fitted



Camden Shops, Public Service Corporation—Section Across Shops.

ment is shown clearly in the accompanying engraving from a photograph of the exterior of a building. The entire interior of the building will be finished above the window sills in white, in order to give the best possible reflection of light. The roof on each of the four bays is capped with a louvre of galvanized iron and glass running the entire length of the bay.

The complement of tools in the machine bay is very complete, including jib cranes in front of the machine pits. The small shoproom in the corner of the building at the end of the small section or bay devoted to the boiler room will

up with the wheel grinder designed by the company and previously described. The toolroom will be located in the carpenter shop bay near the compressor plant. The toolroom will be of structural steel frame, covered with wire netting of 2-inch mesh, and the office will be located above it. The latter will have a concrete floor between beams finished with $\frac{3}{8}$ -inch yellow pine. The ceiling of the office will be on a level with the bottom cord of the roof truss, and will be built of iron, supporting adamant block.

It will be noted that the tracks in the paint shop are of sufficient length to hold two cars on each track, thus giving



Camden Shops, Public Service Corporation—General View of Buildings.

be equipped with a wheel press, boring mill and wheel lathe. This room is separated from the machine shop by a fire wall with a 5-foot passageway and has a 9-foot exit to the outside, where a wheel platform is to be built. The equipment of the machine shop consists of two Buffalo down-draft forges, one small babbitting forge, Bradley power hammer, bolt cutter, three drills, shaper, milling machine and two lathes. The machinery will be driven from line shafting.

In the armature section will be installed two winding machines and an armature bander. These will be similar to the machines designed by the company for the Plank Road shops, described in the Electric Railway Review of March

the shop a capacity of 10 cars. This bay will be arranged with a washstand, so that the cars may be washed for painting. It is the ultimate purpose, if the growth of the system demands it, to build a new plant shop on the opposite side of the transfer table, in which event more space could be devoted in the present building to the machine shop. The boiler house will be served by a steam road track to enable the company to deliver coal cars so that coal can readily be unloaded. The power house chimney is a circular brick structure on an octagonal base, and is 85 feet in height and 48 inches in diameter.

The boiler room equipment will consist of two return

tubular boilers of 250 horsepower capacity. The general storeroom and offices will be heated from the boiler room, the pressure from the boiler being reduced by valves in the feed line near the heaters, so as to give about five pounds of pressure to the coils and radiators. Condensation will be cared for by the vacuum system. The shop building, except where painting is done, will be heated by the fan system, and air will be distributed through galvanized iron pipes hung from roof trusses. The paint shop is to be heated to 80 degrees F in zero weather by direct radiation, placed on the floor near the windows.

The operating barns shown in the general layout plan will be built in four bays, each separated by a fire wall with space in one bay for a ware room. The building is 156 feet 4 inches wide and 353 feet 8 inches long. Each bay has three tracks and in addition there are three storage tracks outside the building. The building will have concrete foundations and brick walls and will have a roof of heavy mill construction. Each track, for a distance of 100 feet in the forward part of the building, will have inspection pits of open construction, consisting of piers placed 8 feet apart on centers and supporting 7-inch Trilby rails. Angle-bar cover braces will be riveted between the tracks every four feet to support a cast-iron walk 36 inches wide and $\frac{3}{8}$ inch thick. The building will be painted white on the inside and will be ventilated with 36-inch ventilators placed 50 feet apart in the skylights.

On Newton avenue a 2-story brick office building 70 feet by 42 feet will be erected. The first floor will be devoted to the office of the general superintendent, chief dispatcher, superintendent of tracks, starters and receivers, men's room, storeroom and locker and toilet accommodations. The second floor will be left as a hall and will be utilized as a club room, library and entertainment center for employes of the South Jersey division. It is intended to build a general storeroom building, line stable and an oil house as a part of the general layout.

As was noted in the description of the Plank Road shops, the Public Service Corporation fully appreciates the necessity of providing an adequate fire protection, and the Camden shops will be provided with a dry pipe automatic sprinkling system with a steel tank and tower to supply water reserve and an electric motor-driven centrifugal pump to supply the proper pressure, similar to the system installed at the Plank Road shops. The Camden shops will also have an auxiliary fire alarm system and will be equipped with chemical fire extinguishers and other paraphernalia for fighting fire in an effectual manner. The work on the new plant began under the direction of A. H. Stanley, then general manager of the street railway department of the Public Service Corporation, and the designs are in charge of Martin Schreiber, engineer maintenance of way. The contract for the shop building was let to J. S. Rogers Company of Stanwick, N. J.

A NEW TYPE OF TRACKLAYING MACHINE.

The machine illustrated herewith is being used for laying the track of the Pacific Traction Company between Tacoma and American Lake, Wash. This new line will be 12 miles long and a considerable portion of the track is being laid on an abandoned steam railroad embankment. The tracklayer was recently designed and patented by C. O. Wescott, Puyallup, Wash. The equipment necessary for laying track comprises a light locomotive, which pushes four flat cars.

On the forward car is a structural steel bridge which extends in front of the car for a distance of about 18 feet, or enough to allow a rail supported by tongs in the center to be lowered from the end of the bridge. On the framework of the bridge, as shown in the illustration, are four air cylinders, the pistons of which operate steel cables, which in turn control the handling of the steel rails. A conveyor by which ties are brought from the rear car to the front end of the bridge extends along the floor of all the cars. The conveyor

is operated by a donkey engine carried on the floor of the car next to the locomotive. This car also carries a supply of miscellaneous tools and extra equipment, such as may be needed in the progress of the work. The second car in front of the engine carries 500 standard ties and the angle plates necessary to lay 1,000 feet of track. The car immediately in the rear of the tracklayer is loaded with a sufficient number of 33-foot rails to lay 1,000 feet of track. These rails are carried on skids elevated above the car floor so that they can be dropped on to a conveyor, which will carry them along the middle of the cars and directly over the tie conveyor, from where they are slid to opposite sides of the car.

While the rails for one rail length of track are being placed, the tie conveyor is operated by the donkey engine in the rear, and ties are brought forward to be placed ahead of the tracklayer. Meanwhile two rails from the rail storage car are slid to a point under the bridge of the tracklayer and directly over the car wheels below. The rails are then lifted by tongs connected through cables with the air cylinders and carried ahead to the extremity of the bridge, as shown in the illustration. Then by the releasing of the air



Wescott Track-Layer in Operation.

in the operating cylinders, which movements are controlled by a man standing on the elevated bridge, the two rails are lowered directly in front of those already spiked in place. Temporary clamps are next placed to hold the rails to gauge so that the entire tracklaying equipment may move forward and the spiking be postponed until after the engine has passed the rails already laid. In this way the process is continuous, the ties being brought ahead and placed, the rails being lowered directly in line and gauge and the spiking gang following the locomotive, which pushes the train from the rear. When the several incomplete details in the preliminary design of the tracklayer have been perfected, it is anticipated that the work of placing the ties and rails can be carried on with a crew of seven men other than the necessary spikers which will follow the train.

According to the figures compiled by the forest service of the United States Department of Agriculture in Circular 97, which has just been issued, this country as a whole consumes every year between three and four times more wood than all the forests of the United States grow in the meantime. The average acre of forest lays up a store of only 10 cubic feet annually, whereas it ought to be laying up at least 30 cubic feet in order to furnish the products taken out of it. Since 1880 more than 700,000,000,000 feet of timber have been cut for lumber alone.

STANDARD M. C. B. COUPLERS FOR INTERURBAN CARS.

It is very desirable that a large interurban system handling freight in foreign cars as well as operating its passenger equipment in trains, have all its rolling stock provided with a coupler designed according to the master car builders' standard contour lines and capable of intercoupling with all

burn Steel Castings & Coupler Company, Minneapolis, and delivered to the St. Louis Car Company for the new equipment. The coupler as now perfected and adopted for the extensive system of the Pacific Electric Railway Company has a standard M. C. B. contour for the head which will intercouple with any similar equipment as used on the Pacific Electric or the foreign freight cars handled over its line.



M. C. B. Couplers—Train of 18 Cars En Route from St. Louis to Los Angeles.



M. C. B. Couplers—Train Moving Around 50-Foot Radius Yard Curve.

rolling stock of that or any other system. These conditions so impressed the management of the Pacific Electric Railway, Los Angeles, Cal., that some time ago steps were taken to provide a type of coupler that would fulfill the desired requirements.

The type of coupler shown under various conditions in the accompanying illustrations is the result of a considerable amount of careful designing and experimental work carried on by the Pacific Electric Railway and Edwin C. Washburn. The couplers were manufactured by the Wash-

burn Steel Castings & Coupler Company, Minneapolis, and delivered to the St. Louis Car Company for the new equipment. The coupler as now perfected and adopted for the extensive system of the Pacific Electric Railway Company has a standard M. C. B. contour for the head which will intercouple with any similar equipment as used on the Pacific Electric or the foreign freight cars handled over its line.

It will be noted from the illustrations that the coupler and draft rigging are mounted so that they can swing radially about a pin connecting them to a standard radial drawbar anchor bolted to the center sills of the car by $\frac{3}{4}$ -inch bolts. The drawbar is provided with a spring yoke draft box and a spring sufficient for handling five or six large interurban cars. To prepare the bumpers of the cars for the accommodation of the radial couplers it was necessary to bolt on the timber extension as shown in the line drawings. Other than increasing the rigidity of the framing of the car this extension pro-

FREIGHT HANDLING AT BIRMINGHAM.

In the development of a freight service between Birmingham, Ala., and the suburban districts of that city, the Birmingham Railway Light & Power Company has adopted some interesting billing and other forms necessary to facilitate the handling of shipments.

During the past five years this company has given much attention to the building up of its freight traffic, which now produces receipts of practically \$5,500 gross per month. The operating expense of this department is about 60 per cent of the receipts.

In the Street Railway Review of April, 1904, and of May, 1905, were published data on the freight handling methods of this company. Since these articles appeared the service has been extended to better accommodate the suburban towns and a very thorough system of records has been adopted.

Two regular daily freight trains leave the First avenue station at Birmingham en route for the suburbs. The first two trains in the morning, known as the "Meat Specials," are

FORM 88
BIRMINGHAM RAILWAY, LIGHT & POWER CO.
 FREIGHT TRAFFIC DEPARTMENT
DRAY TICKET
 B.R. L&P.C.
 Birmingham, Ala., Station ----- 190-----
 Received from -----
 the property described below in apparent good order, except as noted, to be forwarded to-----
 Marks:-----
 This is only a receipt for the property hereon described. It is not a Bill of Lading or contract to transport such property. This receipt can be exchanged for a regular Bill of Lading at the freight office of the Company of the station where this receipt was given.

NO. OF PACKAGES	DESCRIPTION	WEIGHT

 ----- Agent:

Freight Handling at Birmingham—Dray Ticket, Substitute for Bill of Lading.

usually laden with meats, fruits and other perishable goods. One of these trains departs for Bessemer at 6:15 a. m. and the other leaves at 6:30 a. m. for Ensley, Pratt City, Thomas and way stations. So well do these trains serve the rural districts that cold storage houses have been abandoned and the residents now depend on the electric road for their day's supply of meats and provisions. The other regular freight trains leave Birmingham for Bessemer at 10:30 a. m. and 2:30 p. m.; for Ensley at 10:00 a. m. and 3:30 p. m.; for points on the North Birmingham, Gates City and East Lake divisions at 8:30 and 11 a. m. and at 3 p. m., and for Boyles, North Birmingham, at 2 p. m. Each freight train is composed of from one to six 35-foot box cars hauled by one of the company's standard express motor cars.

The motor car is utilized in carrying freight to be distributed at way stations. The box cars, so far as possible, are loaded with carload shipments for one of the 13 established agency stations. In the latter case the car is locked and set in on a siding and left to be unloaded at pleasure. The freight traffic has been so uniformly developed that it is seldom necessary to haul empty cars in any direction.

The company's freight equipment consists of, besides the motor cars, 18 box and 7 flat cars. Other equipment is now being built at the company's shops.

Track connections are made at Bessemer with the Louisville & Nashville, Alabama Great Southern, Southern, Frisco, Birmingham Southern, and with the Seaboard Air Line; at East Birmingham with the Union Track and Birmingham Belt; at Pratt City with the Birmingham Southern; and at Woodlawn with the Louisville & Nashville. Cars carrying freight to be delivered at points on the electric lines are picked up at the connecting points and set out on the siding nearest the delivery point. The company has also an inter-

BIRMINGHAM RAILWAY, LIGHT & POWER CO.
 TRAFFIC DEPARTMENT.
CONDUCTOR'S DAILY REPORT OF CAR MOVEMENTS.
 Motor Car No. -----
 Time Out ----- M. Time In ----- M. DATE ----- 190-----

Car Initial	Car No.	Comms	Way Bill or Sling Ticket No.	FROM	TO	Time Picked up	Time Set out

 INSTRUCTIONS:
 Conductors of local express trains will forward this report daily to the Auditor. Conductor.
 Conductors of switch trains will forward this report to Freight Traffic Manager with way bills and flag tickets daily. Motorman.
 Brakeman.

Freight Handling at Birmingham—Conductor's Daily Report Blank.

change agreement with the Southern Express Company whereby express is carried between Birmingham and the suburban points where express offices are not maintained.

As a usual thing all freight and express shipments are delivered to the consignee at the station. At Woodlawn, a town located three miles distant from Birmingham, however, a free city delivery is maintained. This free delivery was found advisable on account of the wagon competition by means of which goods hauled from Birmingham were delivered at the doors of the consignees. The free delivery of goods costs the company an average of about 2 cents per 100

BIRMINGHAM RAILWAY, LIGHT AND POWER COMPANY
 TRAFFIC DEPARTMENT.
Conductor's Train Book.
 Date ----- 190-----
 Motor Car No. ----- Time out ----- M. Time in ----- M.

Car Initial	Car Number	Comms	Way Bill or Sling Ticket No.	FROM	TO AND CONSIGNEE	Time Picked up	Time Set out

 REMARKS:----- TRAIN CREW:----- Conductor, Motorman, Brakeman.

Freight Handling at Birmingham—Conductor's Train Book.

pounds, but as the practice attracts a large amount of extra business, it produces satisfactory results.

The freight rates as established by this company are based on the Southern classification and with but few exceptions the tariffs adopted by the steam railways for the Birmingham district are used. A minimum charge of 10 cents is made for packages weighing 50 pounds or less and 15 cents for packages from 50 to 150 pounds. Special rates are made on commodities essential for household purposes.

The forms used in billing, checking and forwarding freight have been perfected with a view to simplifying the office work necessary for properly recording the business done. When goods are received for shipment, three carbon copies are made of the freight bill. The original goes to

the consignee, the duplicate is signed by the consignee and kept as an office receipt, the triplicate is sent to the auditor and the fourth copy is kept in the billing station as an office file. This system relieves the agent at destination of the arduous duty of making his freight bills from the waybills

take is made in billing the shipment. In order that such mistakes may be rectified at once a waybill correction notice blank is provided for furnishing notice of such discrepancy to the freight traffic manager. When the error is traced to its source the agent is advised that the correction is approved.

FORM 154-12-19-06-5M.

Birmingham Railway, Light & Power Co.

AGENTS' RECAPITULATION AND SETTLEMENT.

This report must be made on the 7th, 14th, 21st and last day of each month to include business done 1st to 7th inclusive, 8th to 14th inclusive, 15th to 21st inclusive, 22nd to last day of month inclusive.

Bring forward to this report the totals of each daily report, Forms 66 and 67, and each day's remittance. Forward to Auditor Promptly. Take impression copy.

STATEMENTS—FORM 67				ABSTRACTS—FORM 66				REMITTANCES	
DATE	ADVANCES	FREIGHT		DATE	ADVANCES	FREIGHT		DATE	AMOUNT
		COLLECT	PREPAID			COLLECT	PREPAID		

Freight Handling at Birmingham—Recapitulation and Statement Sheet.

after a car is set to his station and within about ten minutes after the train arrives the agent is ready to make deliveries.

On account of the large number of small shipments, it has been found inadvisable, because of the large expense of printing, to furnish bills of lading indiscriminately to shippers. Instead of the regular bill of lading, however, a dray-ticket is provided. This ticket is really a receipt to the ship-

If goods are "over," "short," damaged in transit or are "unclaimed" another form is used for conveying such information to the freight traffic manager. Failure to submit these forms, properly made out, immediately makes the local agent personally responsible for the goods.

Mileage made by the local freight trains is reported daily to the auditor and the work done by the switch trains is re-

FORM 67.

Birmingham Railway, Light & Power Co.

Statement of Way Bills Received and Proceeds.

Sheet No.

Settlement No.

At the top of column show billing station and under that head list all of the Way Bills received from that station in numerical order. Foot the columns and where necessary carry forward the footings. Carry the totals of this statement to form 153 on the settlement dates as per instruction on that form.

..... Station. Date..... 190... Agent.

Way Bill No.	Date	Advances	Freight		Leave blank	Way Bill No.	Date	Advances	Freight		Leave blank
			Collect	Prepaid					Collect	Prepaid	

Freight Handling at Birmingham—Statement of Proceeds and of Way Bills Received.

per, which, if desired, may be exchanged for a regular bill of lading. The freight traffic officials, however, consider the dray-ticket equally as binding as the regularly printed form. The ticket is 5½ by 8½ inches in size and is printed at a nominal expense.

Freight received at any station up to 15 minutes before the arrival of any train is dispatched on the first train. In hastening the departure of freight it is often that some mis-

ported to the manager of the freight traffic. The concise form used in making these reports contains headings for the car number, the time out, time in, cars transferred and contents of the same, waybill number, origin and destination of car, time it is picked up and time set out. These reports are made by the conductors from the train-books with which each is supplied.

The method adopted for keeping station records of busi-

ness done at the several agencies has been carefully developed. The agents make daily statements to the freight traffic manager of all waybills and money received and forward an abstract of the same to the auditor of the company. On the 7th, 14th, 21st and last day of each month a recapitulation and settlement sheet, which is a verification of the daily reports and a general statement of the condition of the agencies, is forwarded to the auditor. Records of all freight and moneys received are kept in station books from which the reports are compiled.

The tonnage moved daily by this department is upwards of 275,000 pounds and at closing time at night no freight is

REHABILITATION OF THE BROOKLYN RAPID TRANSIT COMPANY.

In 1902, when Mr. Winter undertook the rehabilitation of the Brooklyn Rapid Transit Company, he faced a trying and complex situation. The citizens were hostile, the municipal government was antagonistic, and the property was a wreck. The first undertaking was to provide money for the extensive improvements which were absolutely and immediately necessary. This was done through a new refunding mortgage for \$150,000,000, the proceeds to be used in retiring the securities of some of the constituent companies, and the remainder as required for improvements. The next work was to effect a complete reorganization and consolidation of the personnel and duties of the subordinate officers. Having the money and the men to carry out his plans, Mr. Winter began the far-reaching reconstruction whose progress thus far is outlined in these two articles.

Depending on results rather than on promises and smooth words, Mr. Winter has been content for the most part to let the people form their own conclusions as to whether or not the company was making a conscientious effort to remedy the evils so long suffered by the community and to provide a modern and efficient transit system. Shortly after he was made president a contract was made with the city for disposing of ashes in Brooklyn, and over \$600,000 was invested in plant and equipment for removing the refuse. At that time the company was openly accused in some quarters of using unfair means in obtaining the contract. There have since been complaints that the collecting stations and incinerator plants constituted a public nuisance, and that the ash cars caused delays to cars carrying passengers. The contract is soon to expire, and, more because it has aroused public hostility than because it has not been profitable, the company has notified the city that it will not again bid on the job. It will give up the business and write off on its books the investment of \$692,000. There is some question as to when the contract expires. The company claims that it expires in 1907, but in spite of all the clamor about its having obtained the contract on unduly favorable terms, the company has been threatened with mandamus proceedings if it does not continue the collection of refuse until November, 1908.

Results of the improvement policy were not apparent at first, and the new administration came in for quite as much condemnation as the old, but the attitude of the public has been gradually changing. The innumerable civic organizations in Brooklyn no longer hold frequent meetings to denounce the company; only occasionally is an attempt made to make political capital out of it; the newspapers are ready and willing to give praise where praise is due. From a financial and operating standpoint the results of the improvements have been even more clearly marked. For the year ended June 30, 1902, the gross earnings were \$12,510,622, net earnings \$4,301,225, and net income after fixed charges \$103,321. For the year ended June 30, 1906, gross earnings were \$18,473,328, net earnings \$8,031,951, and net income \$2,742,952. With an increase of 48 per cent in gross earnings, net earnings increased 86 per cent and net income 2,450 per cent. The 1902 surplus, after deducting \$84,428 for improvements, was only \$18,893. In 1906, after deducting \$1,652,113 for betterments and special appropriations, the surplus was \$2,075,563. The operating ratio in 1902 was 65.5 per cent, and in 1906 had been reduced to 56.5 per cent.

The value of these improvements to the company is perhaps more strikingly illustrated in other ways, less important in the aggregate, but more vital as really typifying the changes which have been wrought. Five years ago the insurance rate on the property of the Brooklyn Rapid Transit Company, including shops, stations, car barns, power houses and rolling stock, averaged \$1.65 per \$1,000. Today it is \$0.85, and this in spite of the fact that three years ago an arbitrary advance of 20 per cent was made in the basis rate on all Brooklyn risks. The saving in yearly premiums, large as it is, is nowhere nearly so important as the reduction in the risk of destruction by fire of some important element of the transportation machine, which it indicates.

In the year ended June 30, 1901, 8.28 per cent of the gross earnings was paid out in settlement of such claims. This percentage has been steadily lowered until for the year ended June 30, 1906, it was 3.71 per cent; this notwithstanding the big increase in number of passengers carried. In 1906 the damages paid were over \$300,000 less than in 1901, and less than in any year in the history of the Brooklyn Rapid Transit Company since it took over the lines which it now operates.—The Railroad Gazette.

Form R 27

B.R. L&P.C. BIRMINGHAM RAILWAY, LIGHT & POWER CO.

FREIGHT TRAFFIC DEPARTMENT

REPORT OF GOODS OVER—SHORT—DAMAGED—UNCLAIMED

At Station No.
Date 190 Train No. Condr.
Car No.

WAY BILL REFERENCE

From No. Date 190 Shipper Article Consignee Weight Agent

HERE SHOW NATURE OF REPORT AND DISPOSITION OF GOODS

NOTE—This report must be forwarded by first mail to Freight Traffic Manager. Agents will be held responsible for failure to promptly make this report.

Freight Handling at Birmingham—Way Bill Correction Notice.

on hand at stations to be forwarded except that which has been received after the last train has departed.

The character of the freight movement is aptly expressed in the advertising motto used in all advertisements of this department: "Express service at freight rates."

The traffic managers of steam and interurban railroads in Indiana have declined to grant reduced rates to the public for public occasions during the present summer. The steam line men say that in view of the recent adverse legislation and the 2-cent law, concessions of this kind are to be withheld. On the other hand, the traction men say it is unnecessary for them to reduce rates because their equipment is inadequate to handle the large crowds that desire to be carried on these various special occasions. They argue that it is inadvisable to offer additional inducements for travel when they know they must leave large crowds at the stations along the lines on such occasions because of the lack of cars to carry them.

BOOK TABLE.

Roadmasters and Maintenance of Way Association of America.—Proceedings of the Twenty-fourth Annual Convention. Published by the association, Walter E. Emory, Chicago & Northwestern Railway, Chicago, Ill., secretary. Paper, 136 pages, 5¾ by 8½ inches.

This volume comprises the verbatim report of the annual convention held at Chicago on November 13-15, 1906.

American Street and Interurban Railway Claim Agents' Association.—Proceedings of the third annual convention. Published by the association, B. B. Davis, secretary, Columbus, O. Paper, 253 pages, 6 by 9 inches.

This book contains a complete report of the proceedings of the convention held at Columbus, O., on October 15, 16 and 17, 1906.

American Society for Testing Materials. Proceedings of the ninth annual meeting. Published by the society. Philadelphia, 1906. Cloth, 712 pages, 6 by 9 inches.

This volume contains the report of the annual meeting of the society, which was held at Atlantic City on June 21 to 23, 1906, and in addition to the committee reports and discussions there are included in this volume memoirs of a number of deceased American investigators who have contributed largely to the advance of the testing of materials. These memoirs were prepared by Gautano Lanza.

Locomotives: Simple, Compound and Electric. By H. C. Reagan, New York, 1907. John Wiley & Sons. Cloth, 494 pages, 5¾ by 8 inches. Price, \$3.50.

The fifth edition of this popular treatise on locomotives is revised, enlarged and brought up to date, by including an account of the recent developments of the compound locomotive, the electric locomotive and the motor car. The number of pages is increased from 617 to 946. The book is almost entirely descriptive and has little to do with principles or design. It is dedicated to locomotive engineers and firemen and should prove to be a satisfactory volume for their entertainment and instruction.

The Peabody Atlas of Coal Mines and Coal Railways. By A. Bement, C. E. Published by the Peabody Coal Company, Chicago, 1906. Cloth, 149 pp., 16¾x18 in. Price, \$5.00.

This publication contains colored maps showing the location of the coal fields of Illinois, Indiana, Ohio, Michigan, western Kentucky, Iowa and Missouri. The text gives much technical information in regard to coal, including a brief description of the geology of each coal field; names and number of the various coal seams, with their relative importance, and chemical analyses, showing the relative composition of fuel from the different states. Information is given in regard to the economical use of coal, with hints as to the manipulation and management of fires so as to render the combustion of bituminous coal smokeless, and there are various illustrations of the latest types of smokeless boiler furnaces.

Hamlin's Index-Digest of the Interstate Commerce Acts.—By Charles S. Hamlin. Boston, 1907. Little, Brown & Co. Buckram, 480 pages, 6¼ by 9½ inches. Price, \$3.50 net.

Mr. Hamlin, who is corporation counsel of the Boston chamber of commerce, and a member of the law committee of the National Board of Trade, has given to the public in this book a work of much importance. The volume contains the text of the important laws of the United States relating to railways, shippers, etc., as officially printed by the interstate commerce commission, including the original interstate commerce act, approved on February 4, 1887, and amendments; the Hepburn act, approved on June 29, 1906; the acts in relation to testimony before the commission; the acts concerning the immunity of witnesses; the act to expedite hearings; the so-called Elkins act; the act approved on August 7, 1888, as to government-aided railroad and telegraph lines; the safety appliance laws; the resolutions providing for the investigation of block signal systems and of railway discriminations and alleged monopolies of the coal and oil businesses; the act approved on June 1, 1898, providing for arbitration

between carriers and their employees; the Sherman anti-trust act; the un repealed provisions of the Wilson tariff act, relating to trusts in import trade, and the act approved on June 3, 1906, relating to the liability of railways to their employees. To these are added an index of the principal words and phrases used in these laws, a concise digest of the laws and citations of all uses of the same words and phrases in the different acts. Changes in the earlier laws are indicated on the margin of the text. The work will be of special value to lawyers, shippers, railway officials and students of railway subjects.

Boiler-Waters—Scale, Corrosion, Foaming. By William Wallace Christy. New York, 1906, D. Van Nostrand Company, 23 Murray street. Cloth, 235 pages, 6 by 9 inches. Price, \$3.00.

This is a good general treatise on boiler waters, although the portion relating to water softening occupies only one chapter of 40 pages. The book contains little that is new or original, but is a good collection of recent articles from technical papers, contains a great deal relating to quality and purification of feed waters for locomotives and is probably one of the best books of the kind for the use of the railway master mechanic. The practice of publishing an almost complete catalogue of scientific books at the end of a volume of this kind is a reprehensible one and should be avoided by publishers who have any regard for space in office libraries.

Encyclopedia of Engineering. Treatise on boilers, steam engines, locomotives, electricity, automobile motors, refrigeration, etc. Published by Calvin F. Swingle with the co-operation of mechanical and electrical engineers. New York and Chicago, 1907. Cree Publishing Company. Seven volumes, cloth, 3,500 pages, 5½ by 8¾ inches. Price, \$24.

This Encyclopedia consists of seven large volumes each 2½ inches thick. It has been compiled from the papers of the International School of Engineering and is intended to furnish practical instruction for those who are not in position to take up the correspondence course or to attend a school of engineering. A number of practical examples are given in each volume, which help to bring out the fundamental principles involved and also to fix the essential points in the reader's mind. This Encyclopedia will be of special benefit to those who are not in a position to obtain a regular technical education at a school or university.

The Engineering Index, Volume IV—Five Years, 1901-1905. Edited by Henry Harrison Supplee and J. H. Cuntz in co-operation with Charles Buxton Going. New York, 1906, The Engineering Magazine. Cloth, 1,234 pages, 6¼ by 9¼ inches. Price, \$7.50.

The fourth volume of The Engineering Index is a continuation of the work originally begun by the late Professor J. B. Johnson in the Journal of the Association of Engineering Societies in 1884 and turned over by that association to The Engineering Magazine at the close of 1895. The previous volumes published respectively in 1892, 1896 and 1901 cover very thoroughly the field of technical periodical literature, and in the present volume care has been taken to maintain and advance the high standard already adopted. The classification used is the same as that introduced in Volume III. It includes all branches of engineering and contains more than 50,000 entries as compared with 40,000 in the previous volume. The list of periodicals indexed includes 250 technical engineering journals in six different languages, about one-fourth of these being in languages other than English. In every case a brief extract is given showing the scope and purpose of the article sufficient for the investigation without further reference. It can be used as a convenient guide to the vast mass of information buried in the files of engineering publications in reference libraries, and the index thus becomes the master key by which this information is made available. The volume is especially valuable at the present time as it can be used by the engineer in the new Engineering building in New York City, where the invaluable technical libraries of the mining, mechanical and electrical engineers' societies are now collected. Catch

words and cross references as here used are probably the result of a long experience, but in glancing over the volume it would seem that there is a too frequent use of large capitals in the text for cross references which tend rather to confuse than to assist in the rapid use of the book. This is simply a suggestion and it may be there is good reason for the practice indicated.

Handbook of Timber Preservation. By Samuel W. Rowe. Chicago, 1906. Pettibone, Sawtell & Co. Leather, 202 pages, 3¾ by 6 inches.

The handbook on "Timber Preservation," by Mr. Rowe, was first issued in 1900, and the increased demand for information on the practical side of this subject has justified another edition, which has been revised and somewhat extended in its scope. The primary purpose of the book is to furnish information as to the practical workings of timber preserving plants, so as to enable the operator to fully understand the philosophy and principles involved and to serve as a guide during the construction of the works and their operation. In a general way the book is an epitome of the experience and observation of the author and gives the results of much labor and study. It contains an account of the various methods of treating timber and the results obtained and is quite fully illustrated with drawings of the apparatus used in timber treating plants, much of it in detail. This hand book will be found of great convenience and much interest to all those connected with the operation of timber treating plants, and it will also be found a convenient reference book by the railroad superintendent and other officers who have charge of such plants.

Graphical Handbook for Reinforced Concrete Design. By John Hawkesworth. New York, 1906, D. Van Nostrand. Cloth, 64 pages, 8¾ by 11 inches. Price, \$2.50.

This book is intended for the use of architects and engineers whose work in reinforced concrete design does not warrant the steady employment of a concrete engineer. The use of such a graphical handbook should render it unnecessary to call in expert assistance to solve most of the problems ordinarily presented in the design of reinforced concrete structures. The book contains a series of plates, showing graphically by means of plotted curves the required design for slabs, beams and columns, under various conditions of external loading, together with practical examples explaining the methods of using each plate. The design of most of the common forms of concrete construction may be ascertained directly from these plates, without performing any of the computations ordinarily required. While an inspection of the plates is all that is needed to select the design for the given conditions, nothing is sacrificed in the way of flexibility by the graphical method, but a wide range of choice is afforded to the relative proportions of steel and concrete to be used. The plates are drawn to a large scale and have plain figures, so that they can be easily read for comparatively small values, and although the page is large, where necessary the plates occupy a full double sheet. They are printed on heavy paper. The unit stresses described by the building code of New York city have been adopted throughout as a standard, and the methods are those sanctioned by the best practice at the present time.

Combustion and Smokeless Furnaces. By Joseph W. Hays. New York, 1906, Hill Publishing Company. Cloth, 104 pages, 5¼ by 9½ inches; price, \$1.50.

This volume has special reference to the smoke nuisance, and as such it is a welcome addition to the literature of combustion and smokeless furnaces. The subject is treated in a popular manner and is intended largely for the owners of boilers in cities and the engineers in charge of them, with a view of giving them intelligent advice as to the best methods of arranging boilers in order to prevent smoke and to comply with the smoke ordinances of large cities. The author has obtained much information from the standard authorities, and it will be of use in presenting sound advice to the general

reader on a subject which is thoroughly understood only by the skilled engineers. One of the most valuable parts of the volume is that relating to steam jets, where it is shown that this is the favorite method of attempting to prevent smoke and 75 per cent of the patents issued in the last 17 years on smoke consuming appliances have been founded on modifications of the steam jet. The author states that it is not possible to give any views favorable to the use of the steam jet and quotes a number of authorities who are in agreement with respect to its undesirability. The steam jet has probably done more than anything else to prevent the radical changes in boiler settings which are necessary for the proper suppression of smoke, and this explosion of the fallacy and uselessness of the steam jet we regard as the most important protest against its further use to be found in technical literature. In the conclusion the author points out some other undesirable features which are continually being presented under the guise of smokeless furnaces and shows that by the use of the most of them damage will result to the boiler and no improvement made in the matter of smoke.

Concrete Factories. Compiled by Rob't W. Wesley. Published for the Cement Age Company, by Bruce & Banning, No. 1 Madison avenue. New York. Boards. 152 pages, 6¾ by 10 inches. Price, \$1.00.

This contribution to the literature of cement comprises a series of papers descriptive of the use of cement and concrete is applied to construction at industrial plants. It offers in condensed form what is believed to be the most complete review of the principles underlying reinforced concrete construction. The method of the treatment was intended to present the matter in such form that it would be understood by the layman as well as the engineer. The book contains the report of the United States advisory board on "Fuels and Structural Materials," the report of the sub-committee on "Tests," the only translation of the French rules on reinforced concrete, which have just been issued by the ministry of public works in France, and a number of profusely illustrated articles showing the methods of reinforced concrete construction including all the well known reinforcing systems. "Reinforced Concrete Construction," a chapter by Walter Mueller, is a concise description of the many concrete reinforcing systems now in the market, and "Concrete in Factory Construction," by E. A. Trego, reviews the work that has been done with concrete in the construction of industrial plants during the past few years. This book also contains "A Surface Finish for Concrete," by Henry H. Quimby, and a symposium of articles on the use of concrete in constructional work by eminent authorities on this subject.

Street Railroad Accident Law. By Andrew J. Nellis. Albany, N. Y., 1904. Matthew Bender. 350 pp., 6 by 9 inches. Price, law sheep, \$6.00.

In this publication the author has given a complete treatise on the principles and rules of law by the courts of the states and territories of the United States and Canada in determining the liability of street railroads for injuries to the person and property by accidents to passengers, employes and travelers on the public streets and highways, and on the pleading and practice in the various jurisdictions in street railroad accident litigation.

Street railway law itself has been recognized as a subject for separate text-book treatment but a comparatively short time. That a single branch of it, namely, street railroad accident law, should now be so treated indicates the sudden prodigious development of the latter through the enormous amount of litigation relative to it, and it is to be borne in mind that the cases which reach the courts of last resort are but a small fraction of those occurring, for it is the boast of the claim departments that they settle out of court most of the accident cases arising; yet 102 pages are here required for the table of cases alone.

The author does not venture far into the domain of

theory, but confines himself almost altogether to succinctly stating and orderly arranging the principles he has found laid down in the cases cited. Comparatively little space specifically is given to matters purely electrical or designated as being peculiar to electric railways, but the rules developed are for the most part as applicable to electric railways as if that term had been used instead of "street railroads," with which, in most cases, it may be said to be practically interchangeable.

The book is clearly written and thoroughly practical and unquestionably is one that will prove valuable to street railway attorneys and claim agents alike, while many points of value to the financial and other departments of a street railway are discussed in its pages.

SELECTING AND LOCATING TROLLEY FROGS.

In the selection of trolley frogs proper importance is seldom given to the divergence angles. It is not generally recognized that divergence angles and other details, when particularly suited to the operating conditions, will not only increase the reliability of overhead construction but will add greatly to its life. For this reason the General Electric Company has issued a pamphlet which contains instructions for the proper choice of trolley frogs.

For ordinary city service, with turnout radii not exceeding about 50 feet, the 20-degree frogs are suitable, but with the longer radii introduced by suburban and interurban work smaller divergence angles are necessary. The introduction of higher speeds has necessitated the use of longer pans to overcome the inertia of the trolley wheel in passing between the inner ends of tongues.

The following table gives the range of distance from track switch point to track frog with which each set of trolley frogs may be most satisfactorily used:

Track Frog Distance	Divergence Angle of Trolley Frog
Up to 22 feet	20 degrees
From 20 to 30 feet	15 degrees
Above 28 feet	8 degrees

The minimum frog distance given in the table with which the 15-degree frogs may be used to best advantage corre-

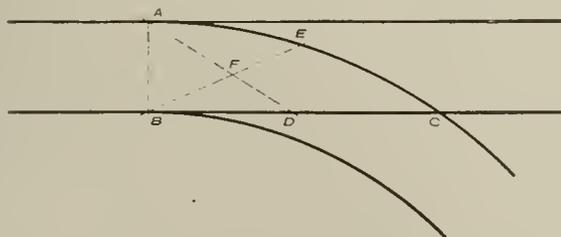


Diagram to Assist in Locating Trolley Frogs.

sponds to a turnout radius of 40 feet, but when suburban cars using high-speed trolley wheels run over city tracks it is advisable to use 15-degree rather than 20-degree frogs throughout the city construction, even where the minimum frog distance is less than 20 feet. The 20-degree frogs are especially designed for use with No. 0 and 00 wire, but will admit the use of No. 000 round or grooved wire.

The 15-degree and 8-degree frogs are designed for wire up to and including No. 0000 round or grooved.

The accompanying diagram shows an excellent method of properly placing the frogs on the line, and while certain variables, such as superelevation of the outer rail on the curve, length of wheel base and projection of trolley pole rearward from center of car may necessitate slight variation of setting, this location will be found so nearly correct that a very small alteration, which must be determined by experiment, will compensate for the variable conditions. The diagram may be used as follows:

From switch point A draw a line to center point, D, of track frog distance, BC. From switch point B draw a line to center point, E, of arc AEC. The intersection of these two lines at F will be the proper location of the frog.

THE CLEVELAND SITUATION.

The principal interest in the Cleveland controversy during the past week has centered in the suit of Edward L. Isom, a property holder, backed by the Cleveland Electric Railway, to enjoin the Low Fare Railway from proceeding with construction work on the Central-Quincy route, which is being heard before Judge Phillips of the common pleas court. The matters at issue are the legality of property owners' consents to the low-fare lines, later revoked by agreements with the Cleveland Electric, the legality of the revocations and the validity of the unrevoked consents as applying to the particular construction contemplated by the Low Fare Railway. The original consents were obtained by the Forest City company, under an ordinance which the Cleveland Electric attorneys declare grants only the right to construct an extension of an existing line. The greater part of last week was taken up by the attorneys of both sides in the effort to agree on a statement of facts, and the real hearing began on Friday morning, May 10. It was continued on Monday and Tuesday of this week and no decision is expected before the end of next week.

President W. B. Colver of the Low Fare Railway has begun negotiations with the Cleveland Electric Railway for the use of the latter's tracks, power, etc., in the streets in which the former holds franchises, as provided in the ordinances. As the Cleveland Electric has practically removed its property in Central avenue and Quincy street, the only street by the Cleveland Electric Railway, and to operate cars East Fifty-fifth street. President H. E. Andrews of the Cleveland Electric Railway left for the east on Saturday afternoon, promising to give the Low Fare company an answer on his return.

At the meeting of the council on Monday night, May 13, the Low Fare Railway presented a communication in which it offered to restore immediately at its own cost all tracks, poles and wires removed from Central avenue and Quincy street by the Cleveland Electric Railway, and to operate cars on those lines, paying to the city the balance after deducting from gross receipts operating expenses and 6 per cent on the investment. Or, the company offered to restore the tracks, etc., and to permit the use of the restored tracks by the Cleveland Electric Railway free of charge, with no stipulation as to rate of fare, until a final settlement shall be had in the courts, and to accept transfers of the Cleveland Electric Railway whether that company accepts transfers from the Low Fare company or not.

An ordinance granting a franchise to the Cleveland Electric Railway for the Central-Quincy route was introduced.

The Cleveland Electric Railway has begun a campaign for popular approval of its offer of seven tickets for a quarter in return for a franchise, by circulating throughout the city an endless chain letter signed by President Andrews. The letter requests the recipient to write or call upon the councilman from his ward and the editor of his newspaper, urging an immediate acceptance of the company's proposition, and also to write to ten of his friends and acquaintances, asking them to do likewise.

THE LAFAYETTE & LOGANSFORT RAILWAY.

In the article on the construction of the Lafayette & Logansport railway in the Electric Railway Review of May 4, 1907, page 588, it was stated that the Lafayette & Logansport Traction Company was organized for the purpose of constructing a road between Lafayette and Logansport. The general counsel of the company, Messrs. Barrett and Morris, desire to have it stated that the Lafayette & Logansport Traction Company is a corporation organized under the laws of the state of Indiana for the purpose of owning, constructing, operating and maintaining an electric interurban railway between the terminal cities of Lafayette and Logansport; the railway to be operated in conjunction with the Ft. Wayne & Wabash Valley company's line from Ft. Wayne to Logansport.

ELECTRICAL EQUIPMENT OF THE DETROIT RIVER TUNNEL.

A tunnel is being built under the Detroit river for the transference of both the freight and passenger trains of the Michigan Central Railroad. The tunnel will replace the present ferry service between Detroit on the American shore and Windsor on the Canadian side of the river. Two tracks will be laid in separate iron tubes 65 feet beneath the surface of the river. These iron tubes will rest on beds of concrete and will be flanked by concrete walls. The electrified zone will be 4.6 miles in length and will comprise with the yards some 15 miles of single track.

Electric locomotives for operating through the tunnel were decided upon because they would not only permit of greater celerity in handling traffic but also afford a complete solution of the ventilation problem. Six 100-ton direct-current locomotives of the swivel truck type, with geared motors, will comprise the initial equipment for hauling both freight and passenger trains. Each locomotive will be capable of hauling a 900-ton train up a 2 per cent grade at a speed of 10 miles per hour. Four 280-horsepower motors will be mounted on each locomotive, two motors being placed on each of the two swivel trucks. The Sprague-General Electric multiple unit control system will be furnished, enabling the locomotives to be operated singly or in train. Current for operating the motors will be taken from a third rail by means of contact shoes. Automatic, high-speed air brakes will form a necessary part of the equipment. The electrical equipment for the locomotives as well as for the tunnel in general will be furnished by the General Electric Company.

Current for operating the system will be purchased from the Detroit Edison Company and will be delivered to a substation at Detroit at a potential of 4,400 volts, and at a frequency of 60 cycles. At the substation two 1,000-kilowatt synchronous motor-generator sets will be installed for supplying direct current to the third rail at 650 volts. A 15-kilowatt, 125-volt exciter for the synchronous motor will be mounted on a shaft extension of each of the motor-generator sets.

A very complete electric lighting and electric pumping equipment forms a part of the project. The yards and approaches to the tunnel will be lighted by arc lamps, while the tunnel itself will be illuminated by incandescent lamps arranged on duplicate circuits. Alternating current from the main power supply, at a frequency of 60 cycles, will be used on the lighting circuits. To insure an uninterrupted lighting service the lighting circuits in the tunnels are so arranged that half the lamps in both tunnels will burn if, by chance, either of the lighting circuits in the tunnels should be broken. A single 3-phase distributing circuit will run through each tunnel and from these circuits suitable connections will be made to step-down transformers. The secondaries of the step-down transformers will be interconnected with duplicate circuits for half the lamps in each of the tunnels.

For keeping the tunnel dry five sumps will be provided, each sump drained by induction motor centrifugal pumps arranged in duplicate. The motors on the pumps will operate directly at 4,400 volts and the controlling circuits with compensators will be centralized in the substation. For indicating the amount of water in each sump, a float system will be provided having both visible and audible indicating devices in the substation.

At the substation a regulating storage battery will be provided to carry the fluctuations of the load. If the main power supply from the Detroit Edison mains should be interrupted this storage battery will have sufficient capacity to operate the entire system for half an hour. In such an emergency the lighting and pumping alternating current equipment will be energized by 60 cycle, alternating current from a 50-kilowatt motor-generator set, the driving motor being supplied with current from the storage battery. Flexible switching arrangements will be installed to enable this interchange of power supply to be easily and quickly made.

NEW STYLE OF TRANSFER FOR MONTREAL.

The Montreal Street Railway Company has adopted a new style of transfer, as shown in the accompanying illustration,

Montreal Street R'y

→

CONDITIONS

This Transfer is NOT A STOP-OVER, and is NOT TRANSFERABLE, and only good if passenger takes first car leaving junction where transfer is made. Passengers must see that transfer bears proper date and that the TIME and DIRECTION are correctly punched, otherwise it is void. In case of dispute passengers are requested to pay fare and refer to Superintendent.

W. G. ROSS,
Man. Dir.

P.M.

AMHERST

WED. 17

APR. 17

N	BEARER STARTED FROM					S
1	10	20	30	40	50	
2	10	20	30	40	50	
3	10	20	30	40	50	
4	10	20	30	40	50	
5	10	20	30	40	50	
6	10	20	30	40	50	
7	10	20	30	40	50	
8	10	20	30	40	50	
9	10	20	30	40	50	
10	10	20	30	40	50	
11	10	20	30	40	50	
12	10	20	30	40	50	

E LE PORTEUR VIENT DE W

9802

New Transfer Used in Montreal—Obverse and Reverse. (Original 1 3/8 by 4 inches.)

4 inches in size and are printed in various colors on standard transfer paper.

which is much less complicated than the old form and is expected to simplify considerably the work of the conductor as well as to avoid possible inconvenience to passengers. The transfer is punched with the direction from which the passenger started and with the time at which he is due at the transfer point. Passengers are required to ask for transfers at the time of paying their fare and to see that they are properly punched.

The transfer slips are 1 3/8 by

CONSTRUCTION OF THE MILWAUKEE NORTHERN RAILWAY.

Such excellent progress has been made during the fall and winter months on the construction work of the Milwaukee Northern Railway, which will open up communication between the eastern Wisconsin towns of Sheboygan, Port Washington, Fond du Lac, West Bend and numerous others in this populous district and Milwaukee, that it will probably be ready for operation on at least one division by early summer.

Except for short distances in the centers of some of the larger towns, the Milwaukee Northern roadbed is located on its own right of way, and in almost a straight line. The entire absence of grade crossings is a feature which will permit of a high speed schedule. Where the road crosses twice both the Northwestern and St. Paul tracks, subways of steel bridging and masonry abutments or viaducts are used. At Grafton the line passes over a steel viaduct 765 feet long over the St. Paul tracks and again over a viaduct of similar construction 454 feet long at Mequon.

The complete power equipment was purchased from and built by the Allis-Chalmers Company of Milwaukee. Three-phase alternating current will be generated at 405 volts by three direct-connected alternators, each of 1,000 kilowatts normal capacity, driven at 107 revolutions per minute by Allis-Chalmers twin tandem gas engines, each with a rated capacity of 1,500 horsepower. It is stated that this equipment when in operation will enjoy the distinction of being the largest installation in America of gas engine driven electric generating units used exclusively for traction purposes.

The main power house is located at Port Washington, and eight sites for substations have been provided.

W. A. Comstock, Alpena, Mich., is president of the company, and F. W. Walker of Port Washington is vice-president and chief engineer.

PIPING AND POWER STATION SYSTEMS—XL.

BY W. L. MORRIS, M. E.

A system for condensing the exhaust steam by means of atmospheric air is shown in Figure 279 (K 1-1). The exhaust pipe is shown in the center of the air flue, the object being to increase the temperature of the air to create a draught. The air would, however, be drawn through the flue by the flow of steam through the ejector flights. The upper section is shown as a water and air separator.

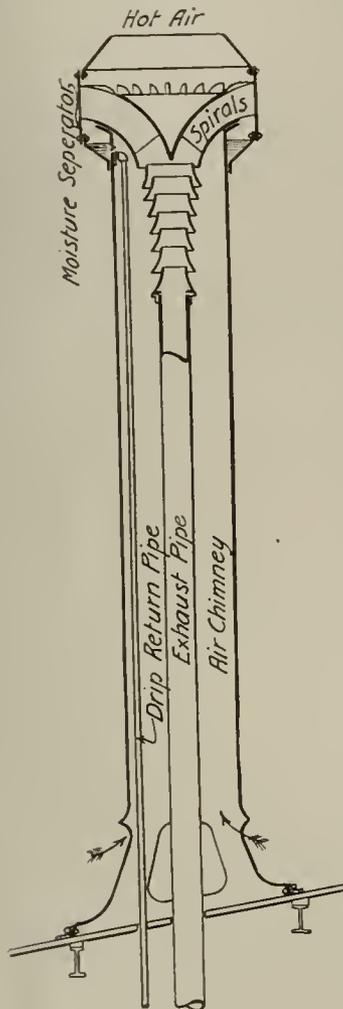


Figure 279 (K1-1).

ful if the saving in water expense would justify or equal the interest depreciation and operating cost of such an arrangement. A plant equipped with an exhaust condenser would not require an exhaust heater, as it is possible to feed the cold make-up water into the exhaust condensing chamber, thereby aiding the process of condensation and heating the water. To use more water for the purpose of condensing would be just so much water wasted, as there would be no use for it and it would therefore be discharged into the sewer. The amount of water added to take the place of that lost in the form of vapor would be close to 10 per cent of that fed into the boilers. To prevent an excess of air passing through the chimney, shown in Figure 279, it is possible to provide a thermostat in the return drip pipe, which could operate a damper or series of dampers, controlling the quantity of air passing through the chimney. This would be necessary to maintain the condensation at a high temperature for boiler feeding.

One objection to such a condenser is the increase of difficulties arising from cylinder oil, as all the oil is returned to the boiler feeding system, but it has the advantage of materially decreasing the amount of scale-forming salts ad-

In the arrangement of a condenser of this character, it must be noted that the exhaust travels at a high velocity, possibly 5,000 feet per minute, and the air at 1,000 per minute, which is quite rapid, about that obtainable by a high stack. To what extent the air would be accelerated by the exhaust ejector is quite problematical and to secure the greatest difference in weight of air in the chimney, and that without, it may be advisable to place the condenser at the base of the chimney, causing the entire column of air to be at the highest possible temperature. If the capacity of the chimney is less than the exhaust blower or ejector, then the increased length of stack would simply offer resistance to the flow of air, as is the case of a high smokestack placed over the fan of an induced draught plant. It is quite probable that the air chimney would have to be fully twenty times the area of the exhaust, or about four and one-half times the diameter of the exhaust pipe. The air can be supplied from a blower, but it is very doubt-

mitted to the boiler. A saving of fuel and water in electrical plants using city water can easily be obtained by using motor driven auxiliaries instead of steam driven auxiliaries. The greatest difficulty experienced with motors for this service has been that only one speed was obtainable, but there are now a large number of different types of variable speed motors on the market, which have a wide range of speed with nearly a constant efficiency. These motors are principally used to drive machine tools, some of them having a range of 5 to 1, that is, the speed is variable from full speed to one-fifth the full speed.

Plants which have their own water supply and are within reach of city waterworks should have a connection to the city main of sufficient size to supply the boilers. Invariably the city connection is so made that it is a source of loss to the waterworks. The most common method is to connect the city water to fire hydrants and install a meter at the point where the city water enters the building, as shown in Figure 280 (K 1-2). The system as shown is primarily laid out for

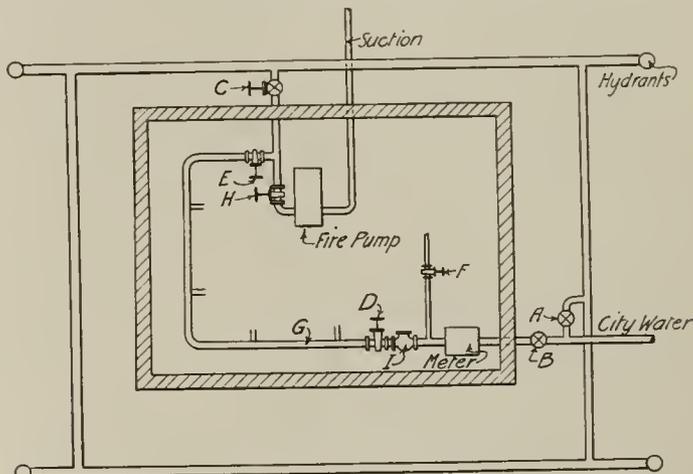


Figure 280 (K1-2).

station convenience and reliability. The fire hydrants are taken from a fire system located on the outside of the building, fitted with a valve a, which admits the city water to it. There is no meter placed between the city mains and the hydrants, partly on account of the liability of the meter becoming damaged under severe working speeds and thus shutting off the flow of water. As the hydrants are a protection against fire the city is expected to furnish water for this service. The valves b and c close all connections into the building to prevent loss of pressure in case of fire and damage to the inside piping. In regular operation it is assumed that the valve a is closed, b open, c open, d closed and h and f open. This places the outside fire lines and inside boiler and miscellaneous service line g on the station water system and its fire pump shown in the illustration, the only city water being that taken for drinking purposes and wash basins through the valve f. The assumption is that the city water would be used for fire service only, in case the fire pump is thrown out of service, or, if the water supply of the power plant fails, city water could be run into the lines through the valve d. The plan looks honest, and if used as stated it would be. The chief engineer of the plant knows how much water has been used, and if at any time it becomes necessary to stop the fire pump and use city water, the assistant is liable to be reprimanded and consequently to obviate this he would open valve a and cut off the pump at h, thus allowing the city water to flow around through the fire mains back to the general main to supply the boilers without registering on the meter. From the operator's standpoint there can be no objection to this plan except that it makes possible the presentation of an excessive water bill in case the waterworks inspector should find the valve a open. If the station operator is perfectly honest and

does not want to place a means of obtaining city water without passing through the meter in the hands of his employes, he can employ the following system: The valve a should be sealed to prevent its being moved without breaking the seal. The valve b should be open and valve d closed under ordinary conditions. The check valve i prevents station pressure from backing into the city lines. In this case it would be necessary to make arrangements with the waterworks regarding the valve a, some predetermined damage being agreed upon which can be collected in case the valve a is found open at any other time than immediately after a fire, the seal being the property of the waterworks. The valves a, b and c should be located sufficiently distant from the building to permit operating them in case of a fire, and if against a wall they should be a considerable distance from windows or door openings to permit access to them. An excellent arrangement for placing valves a and b would be to have a hose at the fire department house about 50 feet from the building with the valve posts inside, or along the side of the building. Fire service is seldom or never needed and to familiarize the employes with its location and operation it is generally a good plan to have the parts of the fire system exposed so that they are constantly in sight of the employes.

Ordinarily but one meter is placed in a station, one that is large enough for the ultimate emergency requirement, as shown in Figure 280. If the city waterworks is satisfied with this arrangement it should be satisfactory to the station operator. The small line f is oftentimes but $\frac{1}{2}$ or $\frac{3}{4}$ inch piping and the meter a 3 or a 4 inch, with nothing flowing through it except the water passing through the small line. The leakage past a large meter is sufficient to supply all or a large part of that used from the small line, and to get the correct reading a smaller meter should be installed for ordinary use and the large one for emergency service.

(To be continued.)

PROJECTED ELECTRIC LINE FROM MILAN TO GENOA.

United States Consul J. E. Dunning reports that an electric railroad 85 miles in length and to cost \$47,000,000 is to be built between Genoa and Milan, Italy.

The electrical current will be generated by water power by three engines of 24,000 horsepower. To complete the line 19 tunnels will have to be built, the most important being 12 miles long, which will require six years in its construction. The cost of the road will be about \$500,000 per mile, according to the estimate. The line will have a double track, the trains being hauled by electric locomotives. The latter will be combined with baggage cars, with two sets of trucks, having four motor axles, each axle of 300 horsepower, and will weigh 45 tons. With this force of 1,200 horsepower per locomotive they will be able to operate at a speed of about 54 miles an hour for parts of the line having a grade of 8 feet per thousand and at a speed of 80 miles an hour on the level. The trains will be run in three cars, each car carrying 50 persons—the whole train weighing 160 tons. These figures are for the express and local trains. The plan is to have them running from 4 o'clock in the morning till midnight. The express trains will run every two hours. The locals will run much oftener, and will collect passengers from the smaller towns and take them to the express station farther along the line, where passengers can transfer. All locals will, after leaving Milan, take all passengers collected from the smaller stations to the station of Tortona—the only express station—as well as those locals starting from Genoa. The express trains will take passengers from Milan to Genoa, or vice versa, in one and one-half hours, while the locals will require two and one-half hours. In this way there will be 20 trains per day, carrying an average of 6,000 persons.

The 70 to 100 freight trains to run each 24 hours will have combination locomotive and baggage cars of the same size and power as those of the passenger trains, and will pull 30 freight cars, each car weighing 22 tons, which includes 12 tons of goods on each car, so that the train will pull in all 700 tons. These trains will run at the speed of 20 miles an hour on the inclines, and about 35 miles an hour on the level.

To prevent accidents, there will be no grade crossings along the line, and 372 bridges must be built. The principal tunnel will be perforated from both ends at once, and at the same time in eight places along the lines, boring holes from above. In all, this tunnel will be constructed from 10 borings at the same time. By the time this tunnel is ready the whole line will be finished.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B., OF THE CHICAGO BAR.

Motorman Must Know Whether Headlight is Burning.

It was urged in Indianapolis Street Railway Company v. Taylor, 80 Northeastern Reporter, 436, the appellate court of Indiana says, that there was no evidence to show that the motorman knew that his headlight was not burning. But the evidence was that he stood in the front vestibule of the car, where he could see in front of the car, and it followed from natural laws that, if there was no headlight on his car, he knew it.

Need Not Change \$10 Bills—Rule Upheld.

A man and his wife boarded a car, and, upon being approached by the conductor of the car for fare, tendered to him a \$10 bill, all the money the man had, for change and payment of their fare, which was five cents each. The conductor declined to accept the bill, upon the ground that he was unable to make the change, and required the two to leave the car; no other offer of payment being made. This action of the conductor was charged to have been unlawful, oppressive, and in violation of the right of the parties to be transported by the company upon its car to their destination. The company, in defense, relied upon a rule, theretofore made by it, requiring all conductors of cars to be provided with currency or fractional coins, or both, to the amount of \$5.00, and to change bills or coins of that denomination or less when tendered in payment of car fare, and, upon failure of passengers to tender bills or coins of that sum or less, to put them off the car. There was no publication of this rule, nor did it appear that these parties had actual notice of it.

The supreme court of Tennessee holds, Knoxville Traction Company v. Wilkerson, 99 Southwestern Reporter, 992, that the rule of the company invoked in this case was reasonable, one which it had a right to enforce, and that its conductor had the right to refuse to change the bill tendered him by the parties, and, upon his failure to otherwise pay the fare, to require them to leave the car. It also holds that it was immaterial that this rule was unknown to the parties. It was so reasonable in its terms and so necessary to the convenience of the company in the collection of fares that the public was charged with notice of it. Where the fare to be paid, as in this case, is so small, and the number of passengers so numerous, any one proposing to take passage upon one of the cars of the company is bound to know the necessity of providing himself with change reasonably near the amount of fare to be paid, and of the inconvenience and probable impossibility of the conductor furnishing change in large amounts.

The court does not think the company has the right to require the exact fare charged to be tendered, but it certainly may fix a limit upon the amount of change it will undertake to furnish its patrons.

Lack of Cars and Shortening Run on Public Occasions.

Where a franchise is sought and granted to operate a street railway, upon the condition that enough cars will be run to serve the public convenience, the court of appeals of Kentucky says, Frankfort & Versailles Traction Company v. Marshall, 98 Southwestern Reporter, 1035, an action brought by the latter party, that it may be doubted whether the grantee of the franchise can excuse its failure to comply with the condition upon the fact that it had not supplied itself with cars enough to meet the requirements of travel on public and festival occasions. The court is not prepared to say that they are not usual, customary, and reasonably to be expected, although at irregular intervals, though it does not mean to decide the question here, because unnecessary to do so.

In this case the traction company—which owned only four trolley cars and one trailer, and the regular schedule of

which was to run all of them, except the trailer, through the city of Frankfort, across the bridge, and through South Frankfort, as that part of the city south of the Kentucky river is called, and back again to the points of starting—on the occasion of a circus outside the city limits changed its schedule temporarily, because of the extraordinary demand made upon it by the great crowd at the circus grounds, and ran only one car to South Frankfort, stopping all the others after they had got well into the city, where there were pavements and street lights, where the passengers were disembarked, and the cars returned to the circus grounds for another load. The plaintiff, with his wife and brother-in-law were at the circus, and took passage on one of the cars, intending to go to their home in South Frankfort, which was on or near the company's line. The fares were paid. When the car reached the corner in North Frankfort where the company had been discharging its passengers, it was announced that all passengers should get off, as that car was going back to the circus grounds. It was then near 11 o'clock at night. The conductor in charge of the car told the plaintiff to get off, and declined to carry him and his party farther, informing him that he would have to walk home, or to wait for another car and pay his fare again. Thereupon the plaintiff refused to get off the car, when the conductor seized him, and jerked him from the car.

The court, in affirming a judgment for the plaintiff, says that, if he was a passenger the carrier was bound to fulfill its contract with him by carrying him to his destination, either upon that or some other car, and its failure and refusal to transfer him to another car, entitled him to complete his journey upon that one. That the carrier wanted to use the car in going back after other people, who had not yet become passengers was no excuse for not complying with its contract obligations to its passengers.

Company Liable as Partner in Amusement Enterprise.

A street railway company entered into a contract with parties who had leased a tract of land, reciting that it was the intention of said lessees to conduct upon said ground various amusements, in the conduct of which business it was presumed that certain benefits would accrue to the street railway, that, in order to procure funds for the establishment and conduct of said business, it was necessary that aid and assistance be extended said lessees by said company, and that it was agreed, among other things, that said amusements should be carried on under the name of "Electric Park," that when patrons walked to the park and paid 10 cents admission, said amount should accrue wholly to said lessees, but when patrons rode to the park and paid 15 cents for transportation and admission, 7 cents per passenger should go to said lessees and 8 cents to the company.

This contract was read by the contractor who constructed the park, under a contract with one of said lessees, and who thereafter sought to hold the company liable therefor as a partner. The appellate court of Indiana holds, *Breinig v. Sparrow*, 80 Northeastern Reporter, 37, that, under all of the circumstances of the case, it was so liable.

The court says that it holds without hesitation that one who causes a contract to be so prepared as that a person of ordinary understanding reading it is thereby induced to believe that a partnership exists, and whose conduct, extrinsic to the writing, accords with such conclusion, cannot subsequently, after a third party has parted with value upon the strength of the belief thus induced, be permitted to deny liability. The practical interpretation placed upon this contract by its officers justified the contractor in relying upon it as evidencing the responsibility of the railway company. During the entire transaction its president was treated by the corporation so as to indicate that such contract was subject to the interpretation which he might place upon it. Its board of directors, its officers, and the majority of its stock-

holders, participated in both the enterprise and interpretation of the contract. Having thus induced the contractor to incur the expense incident to the construction of the building in accordance with the contract which he was also thus caused to make, it was bound to him therefor.

Liability in Putting Child Off Car for Want of Fare.

A young woman put a small child six years of age, her cousin, on an electric car, in charge of the conductor, one cold January afternoon, telling the conductor to put the child on a connecting car in another city. It seemed that the young woman thought the child had a 5-cent piece, the amount which would be due as her fare; but, in point of fact, she did not have it.

On proceeding to the outskirts of the city in which this took place, where houses were few and none was occupied for the distance of a block or more, the conductor put the child off the car and left her by the side of the track. He said that after he started on he looked back and saw the child following after the car, instead of going back in the direction of where she was put aboard. He went on to a passing point, not a very great distance, for cars going in opposite directions, and there told the conductor of the car going back that if he saw her he had better pick her up and take her back. That car met her, and took her aboard. She seemed very cold and much frightened, and two woman passengers took her in charge.

The Kansas City court of appeals affirms a judgment for damages, *Harless v. Southwest Missouri Electric Railway Company*. It says that the instructions for the plaintiff permitted a recovery for fright, mental suffering and anguish. The defendant assailed the propriety of such instructions on the ground that, where there is no bodily hurt, mental anguish and fright are not elements of damage. That is the law in cases of mere negligence. But in cases where the wrongful act is accompanied by offensive, insulting and humiliating conduct, or where the act itself is wilful and inhuman, such elements enter into the damages which may be recovered.

The court holds that the conduct of the conductor must be considered inhuman in the circumstances developed by the evidence. It says that the first of these circumstances was that the plaintiff was not a passenger, and therefore was not entitled to consideration from the standpoint of a passenger.

But, being on the car wrongfully, and though, notwithstanding her tender years, the court charged her with responsibility for that wrong, yet, on considerations which arise outside the relations of carrier and passenger, she was entitled to humane treatment.

There are certain acts where circumstances must determine their character.

It would not have been inhuman, nor even improper to have put off a person of mature years at the place where the plaintiff was left, who was aboard the car wrongfully; but the plaintiff was not of an age to care for herself. She was tender in body as well as mind, and consequently easily made to suffer with cold, and to be distressed, confused and terrorized. To a little girl of that age, an unfamiliar house, even though no more than 300 or 400 feet away, was a long distance off; and who is it, with capacity sufficient to be a conductor, who should not have known that the strange place, the cold wind and bleak day would frighten and perhaps freeze so small a child? The court cannot, and does not, suppose that he affirmatively wanted to injure the plaintiff; but it must judge of the character of his act by the act itself, and, so judged, it showed him to have been so wholly indifferent to the result of his conduct as to characterize it as wilful and malicious as those terms are known to the law.

The court therefore holds that, notwithstanding no bodily harm was inflicted in putting the plaintiff off of the car, yet she was entitled to have her fright, mental suffering and anguish considered as elements of damage.

News of the Week

Central Electric Railway Association.

A regular meeting of the Central Electric Railway Association will be held at the Claypool hotel, Indianapolis, on Thursday, May 23. Several papers will be presented on the subject of "Modern Train Dispatching." As this topic is an important one it should induce the presence of a large attendance and an especially interesting discussion. At this meeting the Standardization committee and the Express committee will report on these subjects of much interest. H. A. Nicholl, president, and W. F. Milholland, secretary-treasurer, announce the following programme for the one day's session:

10:30 a. m.—Order of business.

11:30 a. m.—"Modern Train Dispatching," by J. K. Gray, trainmaster Western Ohio Railway, Lima, O.; M. C. Stern, General Systems Company, Dayton, O.; J. B. Crawford, superintendent of transportation, Ft. Wayne & Wabash Valley Traction Company, Ft. Wayne, Ind.

Demonstration, Chauncey P. Button, general manager Telegraph Signal Company, Rochester, N. Y.

12:30 p. m.—Adjourn for lunch.

2:00 p. m.—"Issuing of Supplies—How to Prevent Leaks," by S. R. Dunbar, purchasing agent Indiana Union Traction Company, Anderson, Ind.

3:00 p. m.—Report of committee on "Standardization"; report of committee on "Express Contracts."

Henry Clews on Municipal Ownership.

Henry Clews, in an address on "Individualism versus Socialism," in the Columbia theater, Brooklyn, on May 12 said:

"Let us take a lesson from England in this respect, where public ownership has been tried on a larger scale and under more favorable conditions than elsewhere. In a few instances the running of street railways or city lighting plants has been successful, but exceptions do not always prove the rule, and the conditions under which these enterprises have been operated there must be taken into consideration.

"Many of these enterprises in English cities have proved unprofitable. The accounts have been juggled, and expenses that should be charged against the plant were often transferred to city accounts. Not a few of the English cities have so run into debt as to injure their credit and impair the sale of their securities. Already the British taxpayer is beginning to complain about the costliness of these municipal ownership schemes, and a decided reaction against them is setting in. The London county council has launched heavily into these ventures, many of which have proved losing ventures, and some prominent experts have gone so far as to predict that London will be bankrupt before long, unless present tendencies are reversed. If municipal ownership has failed under the highly favorable conditions which exist in England, how can it succeed here?

"American railroads under private ownership perform the best and cheapest service in the world."

Purchase of Supplies Authorized in Chicago.

The Chicago City Railway has been granted permission by the board of supervising engineers to place contracts for Portland cement to be used in the work of reconstructing the company's lines. Options will be asked on 30,000 barrels of cement and at least 20,000 barrels will be ordered. The Chicago City Railway has also been authorized to purchase 2,400 new car wheels. For experimental purposes 400 of these wheels will be of solid steel and the remaining 2,000 will be cast-iron spoke wheels. A small quantity of new machinery to facilitate the handling of material in the storage yards of the company will also be purchased.

The board of supervising engineers, in charge of traction rehabilitation in Chicago, will have about 100 employees. Chairman Arnold has been authorized to appoint and to fix the salaries of all the employees except the six assistant engineers, who will have charge of separate divisions of the work and will be chosen by the board as a whole.

Track reconstruction by the Chicago City Railway Company will be begun at once at three points in the city. The board of supervising engineers decided that the reconstruction work should be begun at Wallace street, on the Root street line; at Grand Crossing, on the South Chicago avenue line, and at Indiana avenue and Fifty-first street.

A petition for the rehearing of the Mueller case has been filed with the supreme court of Illinois by the attorneys of the city of Chicago. The petition alleges that the issue of certificates would not constitute an indebtedness of the city, since the statute states that "under no circumstances shall the certificates become an obligation or liability of the city."

In the supreme court of the United States at Washington there has been docketed a petition for a writ of certiorari to bring before that tribunal the record of the case of the North and the West Chicago Street Railroad companies against the Chicago Union Traction Company, in which the petitioners seek the setting aside of the merger of the lines. The prayer was refused by the trial court, and the United States circuit court of appeals.

It is stated that the plan of reorganization of the Union Traction company has been about completed. The time limit for deposits of stock of the underlying companies has been extended until May 22.

W. W. Gurley, general counsel for the Union Traction company, said that 93,000 of the total 120,000 shares of Union Traction preferred stock had been deposited with the New York committee.

Only 50,000 were necessary. Of the 200,000 shares of common, 139,000 had been deposited, or 5,666 more than required. It is stated that with the stock which has been deposited and with the additional stock which has been pledged the interests controlling the underlying companies will have more than a majority when the negotiations with the Union Traction representatives are opened.

The San Francisco Strike.

The strike of the conductors and motormen of the United Railroads of San Francisco, which was declared on May 5, as reported in the Electric Railway Review of May 11, 1907, page 612, has continued throughout the past week without any immediate prospects of a settlement. Neither side shows any disposition to recede from its position and the company has issued statements that it would no longer recognize the union. The company has imported several hundred non-union men, who are quartered in the various car houses, where every preparation has been made both for caring for the men and for protection from attack. On May 11 the company operated cars for passenger traffic for the first time since the opening of the strike. Twenty-five cars were run on the Sutter and Eddy street lines late in the afternoon, carrying about 1,000 passengers, and on the following day 50 cars were operated, carrying about 20,000 passengers. The cars were protected by about 500 policemen and there was little disorder. On Tuesday the protection of the police was somewhat relaxed and there was considerable rioting throughout the day.

On Thursday of this week about 130 cars were operated on eight lines of the system. No important developments have taken place this week and the officers of the United Railroads have expressed themselves as entirely satisfied with the present situation.

The men are striking for a flat scale of \$3.00 per day for eight hours' work, in place of the present scale, which the company has offered to continue for a year, of \$3.10, \$3.20 and \$3.30 for the first, second, third and following years of service.

Legislation Affecting Electric Railways.

Illinois.—The legislature has passed a bill requiring elevated railroad companies to erect guard railings for the protection of passengers along the edges of the station platforms, with gates to correspond with the platform gates of the cars.

Massachusetts.—The house has passed a bill requiring fenders on street cars. The legislature last year appropriated money for an investigation of various fenders by the railroad commission, which has been in progress since January 17, and the companies have been directed to submit types of fenders for approval by May 15.

New York.—The assembly on May 15 passed the Page-Merritt public utilities bill, which has been advocated by Governor Hughes. An abstract of the provisions of the bill was given in the Electric Railway Review of April 6, 1907. The bill contemplates the abolition of the present state railroad commission and the rapid transit commission of the city of New York and the substitution therefor of two commissions, one for the city alone and one for the state outside of the city, to have jurisdiction over public utility corporations.—Assemblyman Hackett has introduced a bill prohibiting electric railways from putting strike-breakers on their cars.

Pennsylvania.—The senate on May 13 passed the Homsher bill, giving to electric railway companies the right of eminent domain. The bill now goes to the house for concurrence in the senate amendments. One of these provides that companies, before taking property for proposed lines, must file two separate bonds as surety for damages.—The senate on May 14 passed the bill requiring electric railway companies to file with the secretary of state the consents of the cities or towns through which a proposed line or extension is to run, at the time of application for a charter.—The Dunsmore commission bill was finally passed on May 15 and sent to the governor. The bill provides for the appointment by the governor of a commission of three members with complete power to investigate railroads, street railways and other public utilities, in such matters as rates, management, distribution of cars, crossings of one railroad by another, bond issues and facilities for transportation, but with no power to enforce their recommendations. If its recommendations are not carried out it may petition the secretary of internal affairs and the attorney-general to proceed against the corporation. The commission is empowered to examine the books of any railroad.—The senate on May 15 passed the Kennedy bill fixing five cents as the maximum street car fare within the limits of cities of the second class.

Texas.—The senate has passed the "gross receipts" bill, which imposes a tax of three-fourths of 1 per cent of the gross receipts of street and interurban railways operating in or connecting towns of over 20,000 population.

Rapid Transit Affairs in New York.

At the meeting of the rapid transit commission on May 9 Chief Engineer George S. Rice submitted a report recommending the construction by the city of a part at least of the so-called triborough subway route, in view of the fact that the Interborough-Metropolitan Company has refused to bid for the new subways. The report contained a full outline of the proposed route, beginning at Pelham Bay park, running through Westchester avenue, Southern boulevard and under the Harlem river, thence down Third avenue and the Bowery, across the new Manhattan bridge and then proceeding through the Flatbush avenue extension, Ashland place and Fourth avenue to Fortieth street, South Brooklyn, but recommended the present construction of only such portions as could be built for \$40,000,000, conceded to be available by the city for use in the extension of rapid facilities. The entire route would cost \$60,000,000. Mr. Rice estimated that

the essential portions of the subway could be built in three or four years. The line would be operated as an independent route and would provide a very complete transit system between the boroughs of the Bronx and Brooklyn, with connections to Manhattan. The matter was referred to the committee on plans and contracts.

At the same meeting the report of the plans and contracts committee on the application of F. B. Behr for permission to build a monorail system between Brooklyn and Coney Island was considered. A resolution was adopted that before the board should lay out a route and advertise for bids Mr. Behr should be required to give assurance that he would bid for the construction of the road and to deposit \$25,000 to guarantee the expenses of surveys, etc. It is said that Mr. Behr already has consents of three-fourths of the property owners along the proposed route.

On May 11 President Shonts of the Interborough-Metropolitan Company sent to the commission a communication in reply to the proposition of John H. Starin that the company be given franchises for third tracks on its elevated lines, provided it would build the Lexington and Seventh and Eighth avenue subways with its own money, as reported in the Electric Railway Review of May 11, page 628. Mr. Shonts said that it would be impossible for the company to build the subways under the conditions of the proposed contract, and repeated the offer contained in his letter of April 24, to complete the rapid transit system provided the terms of the contract are such as to cover interest, sinking fund and depreciation. As the company regards the Starin proposition as tantamount to a refusal of this offer it is evident that the transit situation is deadlocked until the fate of the public utilities bill is decided, unless some action is taken on Mr. Rice's triborough plan.

On May 13 Mr. Shonts addressed a communication to the Retail Dry Goods Association, which has interested itself in the subway question, inviting a thorough inspection of the company's books and accounts for the purpose of determining the cost of the present subway and of making an analysis of the company's estimates of the cost of the new subways.

Bids were received on May 14 for the construction of the second section of the bridge subway loop. The Cranford Company of Brooklyn bid \$2,150,000 for the subway and \$60,000 additional for the pipe galleries. The Degnon Contracting Company, which has the contract for the first section, bid \$2,800,000 and \$75,000 additional for the pipe galleries. Chief Engineer Rice said, after seeing the bids, that the system would cost \$8,000,000 or \$9,000,000, instead of \$6,500,000 as estimated.

Western Society of Engineers.—On May 11 about 100 members and guests of the Western Society of Engineers of Chicago visited the University of Illinois at Champaign. The day was spent in inspecting the university buildings and experimental laboratories.

Philadelphia Traction Situation.—The special committee of the Trades League of Philadelphia, which has been opposing the plan of the Retail Merchants' Association for settlement of the traction question, has been dissolved. Directors of the league were convinced that the opposition to the plan did not have the approval of the members of the league.

Chicago City Railway Refuses Wage Demand.—Representatives of the union of the motormen and conductors employed by the Chicago City Railway Company met with President Mitten on May 11 and presented their demand for 25 cents an hour for the first six months' service and 33-1-3 cents thereafter, with a 9-hour day, in place of the company's offer of 23 cents for the first three months, 25 cents for the ensuing nine months, and 27 cents thereafter, which was recently refused by the men. Later in the day President Mitten sent a letter to the officers of the union, stating that the company could not comply with the demands and repeating the former offer. A committee has been appointed to see Mr. Mitten again in the effort to secure a compromise.

Indiana Interurbans Not Affected by 2-Cent Fare Law.—Attorney-General James Bingham of Indiana, at the request of the state railroad commission, has rendered an opinion that the 2-cent fare law, passed at the last session of the legislature, does not apply to interurban railroads. The commission has received many inquiries on this point. The attorney-general states that steam and interurban railroads are regarded as two separate classes of transportation facilities; that the rates on the interurban roads were below 2 cents a mile at the time the law was passed, and that the history of the legislation shows that while the bill was before the legislature amendments were introduced seeking to extend the law to interurban roads, indicating that the law in its present form was not intended to apply to such roads.

Atlantic City Conventions.—George Keegan, secretary of the American Street and Interurban Railway Association, has issued a circular in regard to the October conventions. As announced in the circular issued on April 9, 1907, by the secretary of the American Street and Interurban Railway Association, the special committee consisting of members of the American association and the Manufacturers' association, appointed to decide on the location for the 1907 convention, has decided on Atlantic City, where the next convention will be held on October 14, 15, 16, 17 and 18, 1907. The many good features about Atlantic City for a convention city are too well known by all manufacturers to dwell upon. Contract has just been closed for the use of the steel pier for the exhibits, and, with the most excellent hotel facilities which Atlantic City provides, this convention is sure to be admirably taken care of. After the next meeting of the executive committee, which will take place on May 20, 1907, another circular containing more detailed information will be issued.

Construction News

FRANCHISES.

Adel, Ga.—A franchise has been granted to William Scandrett, J. Z. Jackson, J. J. Parish, Jr., and others, to build a street railway system in Adel. It is stated that preliminary work is well under way and that the company will soon be incorporated.

Astoria, Ore.—A franchise has been granted to E. B. McFarland and S. D. Adair for a street railway from the corner of Eleventh and Commercial streets to Young's Bay Bridge, to be part of an interurban line from this city to New Astoria. One thousand dollars will be forfeited by the company in case the road is not in operation within one year.

Aurora, Ind.—The Indiana Southern Railway, recently incorporated with a capital stock of \$10,000, is seeking a franchise to operate a freight and passenger line in Aurora. This is the revival of a project agitated several years ago for the building of an electric line between this city and Rising Sun, Ind., by a company organized and known as the Southern Indiana Railway. This project was abandoned when the Big Four was built through this section and it is now revived by Garry Hermann, J. R. Wymond, W. V. Webber, C. W. McMullen and E. W. Swarthout.

Bennettsville, S. C.—Application for a street railway franchise has been made to the town council by J. J. Matheson, Warren Moore and Vann Livingston.

Brazil, Ind.—The Terre Haute Indianapolis & Eastern Traction Company has secured a 50-year franchise from the board of county commissioners to operate its interurban line in Clay county and in Liberty street, Harmony, Ind., for a distance of 1,000 feet.

Canton, O.—The Canton-Akron Consolidated Railway Company has secured a franchise from the Stark county commissioners for an electric railway, to be known as the Dalton & Wooster line, through the western portion of the county from Mansfield to East Greenville, O. The line must be completed not later than December 1.

Detroit, Mich.—The Highland Park council has renewed the franchise of the Detroit United Railway on Woodward avenue for 21 years, making it coexistent with the life of the present franchise of the company. The grant includes the building of a loop on its 20-acre tract of land opposite the Ford Motor Company's new site; a "Y" at the power storage station at Woodward and Courtland avenues, and four sidetracks into the loop tract and to a freight shed. The company will extend the Oakland avenue line to a point near the Ford Motor Company's site and across to Woodward avenue. Also, it is provided that should the city fares in Detroit be readjusted the same schedule is to apply to the Highland Park territory when it is annexed to Detroit. It is stated that work on the Oakland avenue extension will be started as soon as the material can be assembled and that when completed the congestion of traffic on the Woodward avenue line during the state fair in the fall will be considerably relieved. The connecting point for the Oakland and Woodward avenue lines will be at the new car barn site.

Gary, Ind.—The United States Steel Corporation, which is building the town of Gary, has now secured 50-year franchises for all its public utilities, including a street railway system, gas, water and electric plants. The street railway franchise was granted to the Gary Electric Railway.

Goldfield, Nev.—The board of county commissioners has received a number of applications for franchises to build an electric street railway system in and to points outside of Goldfield. Offers of payment for these privileges range in price from \$2,000 to \$25,000. It is stated, however, that no action will be taken pending negotiations with the chamber of commerce which insists that the franchise shall be granted only to the company agreeing to give a portion of its earnings to the city and which will concede, among other demands, the right of the municipality to take over the system at the expiration of the franchise.

Oakland, Cal.—The Oakland Traction Company has applied for a franchise to operate its line in Lake Shore, Lake Park and Pleasant Valley avenues. This will be an extension of its present line now ending at Grand avenue.

Pana, Ill.—A franchise has been granted to the Springfield & Southeastern Traction Company, which is to build a line from Springfield to Pana by way of Assumption and Taylorville. Work must be begun within six months and completed within two years from the date of the franchise. J. J. Finn, Decatur, Ill., president.

Riverside, Cal.—The Crescent City Railroad has applied for a franchise to build an electric railway which will connect Riverside with the new cement plant now being built by the Southern California Cement Company at West Riverside.

Toledo, O.—The Lima & Toledo Traction Company, Lima, O., which is building an extension to Toledo, has applied for a franchise to enter the city at the southern limits, near the Miami & Erie canal, following the canal and crossing several of the streets at grade. The franchise provides for a terminal near the corner of Belmont and Michigan avenues, but it is stated that the company later will ask for permission to enter the business district of the city and erect an interurban station.

Waycross, Ga.—A franchise has been granted to Burdette

Loomis of Hartford, Conn., George W. Dean of Waycross, Ga., and F. H. Elmore of Jacksonville, Fla., to build and operate a street railway system in this city. The petitioners agree to commence work within six months and to have the line completed within three years from the date of acceptance.

Wichita, Kan.—An ordinance granting to the Wichita Railroad & Light Company the right to build and operate a single-track street railway in Waco avenue, from Ninth street north to the city limits, has been passed by the council. The ordinance calls for passenger service only and the line must be in operation from Ninth to Seventeenth streets within 15 months from date of acceptance of the franchise.

York, Pa.—The city council and the Hanover & York Street Railway Company have finally reached an agreement on the terms of a franchise for the use of the streets in York for the company's proposed line to Hanover, and after several ordinances had been introduced the council on May 12 granted the company a franchise, under which the company is to build a line on Market street, the main thoroughfare of the city.

RECENT INCORPORATIONS.

Chenango Valley Electric Railway.—Incorporated to build and operate electric railways in New Jersey. Capital stock, \$100,000. Incorporators: H. O. Coughlan, L. H. Gunther and John R. Turner.

Deodate & Hershey Street Railway.—Incorporated in Pennsylvania to construct an electric railway in the southern portion of Dauphin county. Capital stock, \$30,000. M. S. Hershey, Lancaster, Pa., president.

Duff & Eastern Railway, Duff, Tex.—Incorporated in Texas to construct an electric line in Duff. Capital stock, \$25,000. Incorporators: George W. Curry, Charles C. Curry, P. D. Hammett and William P. Mollette.

Eugene & Eastern Railway.—Incorporated in Oregon to build an electric railway from Eugene to Springfield and from the McKenzie river valley to Prineville, Ore. Frank W. Waters of Salem, Ore., vice-president of the company, is quoted as saying that surveys for both routes have been made and right of way acquired over the greater portion of the distance. The lines will develop rich timber and mineral districts in the east central part of the state and provide an outlet to the market for these products. It is the intention to complete the lines during the summer, provided rails and other materials can be procured. Capital stock, \$1,000,000. Incorporators: A. Welch, president, Portland; Frank W. Waters, vice-president, Salem; E. W. Hall, secretary-treasurer, Portland; James R. Thompson, constructing engineer, Portland; Charles A. Hardy, attorney, Eugene, Ore.

Fremont Street Railway.—Incorporated in Ohio to take over the present street railway system in Fremont and to extend and improve the property for interurban traffic. The present line, about two miles long, is owned by the Kerlin interests of Toledo. Incorporators: Hon. A. H. Jackson, Hon. James Hunt, J. M. Sherman, J. J. Anderson, Fremont; and R. G. Kerlin, Toledo, O.

Fremont Tiffin Marion & Southern Railroad.—Incorporated in Ohio to build an electric railway from Fremont through Sandusky to Tiffin and Marion, O., with such branches as may be needed. Capital stock, \$10,000. Incorporators: Donald McKenzie, William H. Kildon, Alexander Kiskadden, James D. Watson and W. W. Weller.

Garrettford & Delaware County Railway.—Incorporated in Pennsylvania to build an electric road from the Garrettford station of the Philadelphia & Westchester Traction Company to the crossing of the Philadelphia Wilmington & Baltimore Railroad on the public highway between Chester Heights and Llewellyn, about 10 miles. Capital stock, \$100,000. Incorporators: George K. Powell, Wilkesbarre, president; John M. Garman, A. H. Bloom, B. C. Allen, E. J. Doyle, Thomas W. Haines and L. E. Waller.

Inland Electric Railway.—Incorporated in Oregon to build an electric line from Klamath Falls to Bomaza, Yonna and Merrill, Ore. Capital stock, \$25,000. Incorporators: E. J. Murray and H. L. Colgate.

Jefferson City (Tenn.) Electric Railway Light & Power Company.—Incorporated in Tennessee with \$15,000 capital stock. Incorporators: W. T. Russell, J. B. Huff, A. A. Galbraith, J. T. Watkins and Frank Galbraith.

Mankato Electric Traction Company.—Incorporated in Minnesota to build an electric street railway in Mankato. Principal office, Mankato. Capital stock, \$200,000, of which \$2,003 is paid in. Incorporators: A. J. Whipple, Glenoe, Ill.; C. C. H. Fynee, A. M. Hewes, E. D. Adcock, M. J. Porter, Chicago.

Oklahoma City Electric Railway Terminal Association.—Incorporated in Oklahoma to build two electric lines in Oklahoma City. One of the lines will extend from the south side of Capital Hill north through the city; the other will start from the junction of the Chicago Rock Island & Pacific and the St. Louis & San Francisco railways, cross the city and terminate at a point near Main street and the North Canadian river. Capital stock, \$1,000,000. Incorporators: Guy V. McClure, Warren F. Moore, C. Combs, Fred S. Combs and J. J. Johnson, all of Oklahoma City.

Panhandle Electric Railway & Power Company.—Incorporated in Washington to build and operate an electric line with headquarters at Spokane, Wash. Capital stock, \$1,000,000. Incorporators: Amasa J. Smith, Harry W. Wallace, Spokane; John R. Jones, Hillyard, Wash.; W. Payne and Andrew Coolin.

Pittsburg, Pa.—It is announced that the promoters of two new electric lines to be built in Allegheny county, Pennsylvania, will, on May 28, apply for charters for this purpose. One will be known as the Crucible Street Railway and will operate in a number of streets and highways of West Elizabeth borough, beginning at State street and running to the Allegheny county boundary line, returning by the same route. The other is the Bellebridge Street Railway and will be built in Elizabeth borough, beginning at the Monongahela river road and ending at Short street, returning by the same route.

Rockford Oregon & Southern Railway.—Incorporated in Illinois to construct a line from Rockford through Winnebago, Ogle and Lee counties to Dixon, Ill. Principal office, Oregon, Ill. Capital stock, \$10,000. Incorporators: Frederick C. Jones, Charles D. Etnyre, Arthur F. Herbert, Oregon, Ill.; Louis C. Wachsmuth and Fred H. Wachsmuth, Chicago.

Terre Haute & Merom Traction Company.—Incorporated in Indiana to build an interurban line from Terre Haute to Merom, about 30 miles. It is stated that surveys have been completed and practically all the right of way has been secured. Work will be started in about two months. Capital stock, \$750,000. Incorporators: Lafayette Brown, H. L. Bartlett, J. F. Oldbuck, J. T. Barrett, Frank S. Lewis, A. E. Hays and Virgil Pounds. Headquarters, Indianapolis, Ind.

TRACK AND ROADWAY.

Amityville, L. I.—The village board has granted a 2-year extension to the franchise of the South Shore Traction Company.

Baltimore Frederick & Hagerstown Railway.—Westinghouse, Church, Kerr & Co. of New York have recently completed surveys for this proposed line from Baltimore to Frederick and Hagerstown, Md., 78 miles, and it is announced that construction will begin shortly. It is expected to enter Baltimore from the southwestern side, over the tracks of the United Railways & Electric Company. The company was chartered several years ago and has an authorized capital stock of \$15,000,000. James E. Ingram of Baltimore is president.

Boston & Eastern Railway, Boston, Mass.—This company, which is seeking the approval of the Massachusetts railroad commission for its line from Boston to Lowell, Mass., has filed a new set of plans through Chelsea, whereby the tracks will pass under the streets. The hearing before the commission has been postponed until June 3. John H. Bickford, chief engineer.

Buffalo & Lake Erie Traction Company, Buffalo, N. Y.—This company, which is building from Dunkirk, N. Y., west along the shore of Lake Erie, is making rapid progress with the work and expects to have cars running as far as Westfield by the middle of the summer. The Dunkirk & Fredonia Railway, which has been acquired, has been rebuilt, and about a mile of track has been laid from Dunkirk east. J. C. Calisch, Buffalo, general manager.

Chattanooga (Tenn.) Railways Company.—It is reported that the directors have recently considered plans for building an electric line from Chattanooga to the summit of Lookout Mountain and have decided to build the line if the property owners will grant the right of way.

Columbia & Manor Electric Railway, Columbia, Pa.—This company, which proposes to build an electric railway from Millersville to Columbia, Pa., with several short branches, about 12 miles in all, has elected officers as follows: President, Henry Wertz, Washingtonboro, Pa.; vice-president, H. M. Herr, Lancaster, Pa.; secretary and treasurer, E. K. Hirshey, Creswell, Pa.

Columbia & Walla Walla Traction Company.—J. H. Morrow, general manager, Waitsburg, Wash., states that this company will in the near future begin surveys for an extension up the Snake river to Clarkston, Wash.

Columbus & Lake Michigan Railway, Lima, O.—Rapid progress is being made by the engineers in the employ of the Schoepf syndicate on the work preliminary to extending the line to Defiance for electrical operation between Lima and Defiance. Work is being pushed on several of the 13 concrete arches and bridges; 70,000 ties have been purchased and delivery is to begin this week; poles for the Defiance end of the line are to be delivered soon and rails have been ordered.

Columbus Marion & Bucyrus Railway, Delaware, O.—It is announced that grading on this extension of the Columbus Delaware & Marion Railway from Marion to Bucyrus, O., which was stopped last fall, will be resumed this week. George Whysall, general manager.

Consolidated Railway, New Haven, Conn.—This company has applied to the street board of Hartford, Conn., for permission to double-track its Trinity street line, from Pearl street to Capitol avenue.

Cortland & Auburn Railroad.—This company has been granted a certificate of necessity by the New York railroad commission for a line from Cortland to Auburn, N. Y. Surveys are in progress and contracts are to be let shortly. W. L. Webb of Philadelphia, chief engineer.

Dayton & Troy Electric Railway, Dayton, O.—This company has agreed to elevate its double track at Dayton between the corporation line and the old channel of the Miami river, at the request of the county commissioners.

Ft. Wayne & Toledo Traction Company.—Surveys have been started for this proposed road from Toledo, O., to Ft. Wayne, Ind.

The Eldenbell Construction Company of New York are the engineers and Francis B. Morgan of Cleveland and C. M. Pierce of New York are interested.

Ft. Wayne & Wabash Valley Traction Company, Ft. Wayne, Ind.—It is now announced that the Lafayette & Logansport extension, which was described in the Electric Railway Review of May 4, 1907, page 588, will be opened for traffic on June 1.

Galt (Ont.) Preston & Hespeler Street Railway.—It is announced that plans are practically completed for about \$100,000 worth of improvements to this company's system. These will include new car barns, the installation of a 750-horsepower engine, orders for new rolling stock and the double-tracking of the line. Martin N. Todd, Galt, Ont., is president and general manager.

Hummelstown & Campbelltown Street Railway, Hershey, Pa.—Thomas J. Humphreys, who has the contract for grading the remaining 2½ miles of this company's extension west of Campbelltown, now has a large force of men employed on the work. The present terminus of the line is at Palmyra. There still remain 1½ miles to be graded between Derry Church and Hershey, for which a separate contract will be let.

Illinois Traction Company, Champaign, Ill.—This company last week succeeded in laying the crossing over the tracks of the St. Louis Merchants' Bridge Terminal Railway at Venice, Ill., and laid the 150 feet of track necessary to complete the line to the Mississippi river at the site of the proposed bridge to St. Louis. The crossing was placed at night in spite of the opposition of the Terminal Railway men and an injunction was secured to prevent interfering with the work after it was finished.—Tuttle Brothers, who have the contract for grading the Lincoln-Mackinaw line, are making preparations for beginning work at once, and a large number of men will be put to work in the endeavor to complete the 28 miles by August 1. The Helm Contracting Company of Pontiac has been awarded a contract for six miles of the grading.—Tuttle Brothers have also announced that if the weather is favorable the Decatur-Champaign line will be completed this month.

Indianapolis & Louisville Traction Company, Louisville, Ky.—Master Mechanic W. H. Palmer has announced that with the exception of a small section of overhead work this line is now completed from Sellersburg to Scottsburg, Ind., and that this section will be put in operation as soon as the new cars arrive.

Indianapolis Columbus & Southern Traction Company, Columbus, Ind.—It is reported that as soon as the extension from Columbus to Seymour is completed the line from Indianapolis to Greenwood, Ind., will be double-tracked. Right of way is now being secured.

Indianapolis Newcastle & Toledo Electric Railway, Newcastle, Ind.—This company has completed surveys during the past week for a branch line from Newcastle to Greenfield, Ind., and the right of way is now being secured.

International Railway, Buffalo, N. Y.—President Henry J. Pierce announces that he has placed an order for \$75,000 worth of steel rails to be laid in Chippewa, Pearl and Franklin streets.

Jefferson City, Tenn.—A company has been organized to build an electric railway from Jefferson City to Dandridge, for both freight and passenger service. James H. Bundren of Jefferson City is interested.

Kansas Traction Company, Coffeyville, Kan.—This company, recently incorporated to build an electric railway from Coffeyville to Lawrence, Topeka and Kansas City, Kan., is now securing stock subscriptions in the towns along the route for the preliminary work. A site for a power house has been donated at Coffeyville. F. B. Shirley, Coffeyville, president.

Lima, O.—It is reported that the Lucas Construction Company of Toledo, O., is reviving the old Bartholomew project to build an electric line between Lima and Bellefontaine, O., via Westminster, Roundhead and other villages. Bartholomew graded seven miles of the line before abandoning the plan about a year ago.

Little Rock & Hot Springs Electric Railway.—We are advised by the Electrical Installation Company of Chicago that the statement published in the Electric Railway Review of May 11 that that company has the contract for building the line from Little Rock to Hot Springs, Ark., is incorrect, as that company has no contract with the Little Rock & Hot Springs Electric Railway.

Marengo & Midland Railway, Marengo, Ia.—Surveys have been started for the line from Marengo to Midland, Ia., which is to be a branch of the proposed system of the Iowa & Missouri Traction & Power Company, which will extend from Fairfield to Cedar Rapids, Ia., 96 miles. H. H. Erimmer of Marengo, president; J. W. Andrews of Fairfield, chief engineer.

Minneapolis Kansas City & Gulf Electric Railway, Minneapolis, Minn.—This company has been organized by Minneapolis men and has issued a prospectus for an electric line from Minneapolis south through Albert Lea, Minn., to Des Moines, Ia., as the first section.

Mississippi Valley Electric Railway, Nauvoo, Ill.—W. A. Calhoun, consulting engineer, states that 80-pound steel rails have been ordered from the Lackawanna Steel Company for building the proposed lines from Nauvoo to Niota, Carthage and Hamilton, Ill., and that they are to be delivered in August and September. Contracts for grading are to be let about June 15. Franchises have been secured in Nauvoo and Carthage.

New York, N. Y.—It is reported that A. H. Stanley, who recently resigned as general manager of the Public Service Corpo-

ration of New Jersey to become general manager of the London Underground Electric Railways Company, is president of a company organized to build an electric railway from a point on the Hudson river, opposite Grant's tomb, in New York, to Nyack, N. Y., a distance of 28 miles. Detroit capitalists are said to be associated with him.

Northwestern Elevated Railroad, Chicago, Ill.—The Ravenswood elevated extension, from Clark street junction, in Lake View, to Ravenswood, 3½ miles, is to be opened for traffic on Sunday, May 19.

Okanogan Electric Railway, Spokane, Wash.—An official report from this company states that work is expected to begin about June 1 on the proposed electric line from a junction with the Victoria Vancouver & Eastern Railway near Nighthawk to Brewster, Wash., about 60 miles, via Loomis, Conconully, Okanogan and several mines. Surveys have been completed as far as Okanogan. Contracts have not been let. President, A. M. Dewey, Spokane; chief engineer, G. H. Wheeler, Conconully.

Owensboro (Ky.) City Railway.—It is reported that this company will expend \$50,000 this summer on improvements.

Parkersburg (W. Va.) Marietta & Interurban Railway.—J. F. Carr of Marietta, O., has been awarded the contract for the construction of the Muskingum extension to this company's line, and work is now under way. Five miles yet remain to be completed between Marietta and Lowell, O. C. H. Shattuck, Parkersburg, W. Va., is general manager.

Rochester Corning & Elmira Traction Company, Rochester, N. Y.—The most serious obstacle to the construction of this road from Rochester to Corning and Elmira, N. Y., has been withdrawn. General Manager George A. Engert of the Rochester & Southern Construction Company, which is to build the road, has received notice from the Erie Railroad that it has withdrawn its appeal to the court of appeals to stay proceedings under the certificate of necessity granted by the state railroad commission by direction of the appellate division.

Russell Fork Railway, Ashland, Ky.—This company has been organized for the purpose of constructing an interurban electric line in Dickinson and Buchanan counties, Kentucky, to the Kentucky state line. The road will tap valuable timber lands and mineral deposits of that section.

St. Louis St. Charles & Western Railroad, St. Louis, Mo.—It is stated that the work of laying new steel rails on this company's line between St. Charles and St. Louis, Mo., is now in progress. Robert McCulloch, general manager, St. Louis.

Seattle, Wash.—Jacob Furth, president of the Seattle Electric Company, owned by Stone & Webster of Boston, Mass., is quoted as saying that the surveys now being made for electric lines radiating from Bellingham, Wash., through Whatcom and Skagit counties, will be the nucleus of a line to be built by Stone & Webster from Bellingham to Seattle, via Sedro-Woolley, Mt. Vernon, Burlington, La Conner, Snohomish and Everett, about 100 miles. An extension north to Vancouver, B. C., is also said to be a possibility.

Seattle, Wash.—P. P. Carroll of Seattle represents a syndicate which, he says, proposes to expend \$40,000,000 in the construction of electric railways and power development in Washington. The electric railway projects include the Puyallup Valley Northern Transit Company of Puyallup, Wash., for which the Continental Engineering-Construction Company of New York has the contract to build from Seattle to Tacoma; the Snohomish Valley Railroad, which proposes to build from Snohomish to Cherry Valley and later to Seattle and Tacoma; and the Seattle-Chelan-Spokane Railway, which intends to build from Puget Sound to Renton and Spokane. The men who are backing these enterprises have decided they can build and profitably operate the lines in connection with numerous power plants to be operated by water power. The plants will be located at towns along the lines of railway, and will furnish power for commercial and municipal uses as well as for the operation of the railways.

South Dakota Gas Electric Company, Huron, S. D.—J. A. Cleaver, president, writes that contracts for grading are to be let soon for this proposed line from Huron to Spink county, South Dakota, 49 miles. Surveys have been completed to Irving and Carpenter, 40 miles. The road is to be for freight and passenger service. Sixty-pound rails will be used.

Spokane & Big Bend Railway, Spokane, Wash.—W. H. Plummer of Spokane has been re-elected president of this company, which proposes to build a line from Spokane to Crystal City, Wash., 70 miles. Work has recently been started at the Spokane end of the line. Entrance to the city will be had over the tracks of the Spokane & Inland Railway.

Spokane Pend d'Oreille Rapid Transit Company, Spokane, Wash.—A court decision has confirmed the claim of the Prairie Development Company, which consists of the backers of the railway project, to the ownership of 1,500 acres of land on the shores of Lake Pend d'Oreille, Idaho. J. Grier Long, who, together with M. F. Mendenhall, D. K. McDonald and R. A. Hutchinson, is interested in both companies, states that this decision paves the way for immediate construction of the proposed line from Spokane to the lake, 46 miles.

Springfield Wilmington & Cincinnati Traction Company, Springfield, O.—This company, which proposes to build from Springfield to Cincinnati, O., 72 miles, has filed a mortgage for \$4,000,000 with the county recorder. The Eldenbell Construction Company of New York has the contract and work is to begin at once.

Tampa & Sulphur Springs Traction Company, Tampa, Fla.—This company's new line from Lafayette street and Florida avenue, Tampa, to Sulphur Springs, about five miles northeast of Tampa, has been completed and an experimental trip was made on May 9. The power house and car sheds are located on the Hillsboro river. H. H. Kirkpatrick, general manager.

Texas Traction Company, Dallas, Tex.—It is now reported that approximately 30 miles of grading has been completed on the Sherman-Dallas interurban line, which will be 64 miles long. Seven grading camps are now located at different points along the route and another is soon to be established. The 80-pound rails will be delivered in monthly instalments, beginning in July. F. A. Jones, chief engineer.

Toledo Urban & Interurban Railway, Toledo, O.—This company has notified the city council of Toledo that it is ready to co-operate with the municipality in building a new bridge over the canal at South street, in place of the present wooden truss structure, which has been condemned. It is estimated that the bridge would cost \$22,500.

Twin City & Lake Superior Railway.—W. H. Crossland, vice-president, Minneapolis, writes that this company, whose incorporation was noted last week, will build a double-track third-rail electric line from Minneapolis and St. Paul, Minn., to Duluth, Minn., and Superior, Wis., 130 miles, of which 91 are in Minnesota and 39 in Wisconsin. The road will be practically an air line and will intersect no present towns or villages. Surveys have been made and grading is to begin on June 1. No general contracts are to be let. The road is to handle both freight and passengers. Maximum grade, 0.5 per cent; maximum curvature, 1½ degrees; weight of rail, 70 pounds. About 4,500 feet of steel will be required for the five principal bridges, although the company is not at present in the market for equipment. E. W. Farnham of Chicago, president; J. H. Thomas, Minneapolis, chief engineer. Headquarters, 345 Railway building, Minneapolis.

United Traction Company, Albany, N. Y.—The appellate division of the supreme court of New York has given a decision confirming the favorable report of a commission to determine the necessity of an extension of the Western avenue line from Madison avenue and Allen street to a point about 1,500 feet west and General Manager E. S. Fassett has announced that the work will begin at once. The material for the extension of the Broadway line is expected about June 1.

Wagner Lake Shore & Armour Railway, Wagner, S. D.—A. H. Pease writes that this company, recently incorporated, is now making surveys for its proposed line from Wagner to Mitchell, S. D., 75 miles, by way of the east shore of Lake Andes, Armour and Hillside. Contracts for grading are to be let and grading is to begin in 60 days. The company will operate electric lighting plants at the terminals and at several intermediate points. A tract of 106 acres of ground has been secured for a summer resort at Lake Andes. Fifty-six-pound rails will be used. The powerhouse will be located at Wagner and substations at Armour and Mitchell. The Minneapolis Steel & Machinery Company will furnish the power equipment. John Absher of Wagner is president.

West Jersey & Seashore Railroad, Philadelphia, Pa.—This company is now lowering its tracks on Atlantic avenue, Atlantic City, N. J., to the new paving grade. The work, which, it is estimated, will cost \$360,000, is expected to be completed by June 1. The company has paid to the city treasurer \$150,000 for the cost of paving on Atlantic avenue, under the terms of its perpetual franchise. This sum, together with \$5,000 per annum which the company is to pay for the next 10 years, will completely relieve the company thereafter from responsibility for the maintenance of the street.

Whatcom County Railway & Light Company, Bellingham, Wash.—Manager L. H. Bean has announced that construction work on the Bellingham-Skagit county line will begin in about a week. Materials have been ordered.

Winona Interurban Railway, Winona, Lake, Ind.—At elections held last week in five townships along the route of the proposed Warsaw-Ft. Wayne line subsidies were voted to the company in Columbia, Richland and Union amounting to \$50,370, and subsidies amounting to \$21,500 were defeated in Lake and Washington.

POWER HOUSES AND SUBSTATIONS

Georgia Railway & Electric Company, Atlanta, Ga.—It has been announced that a large gas engine is being installed in the Davis street plant of this company and will be ready for service as soon as the generator winding is finished. It will serve as an emergency power supply in case of a shutdown of the Bull Sluice powerhouse.

Long Acre Electric Light & Power Company.—It is announced that this company has purchased a plot of ground on which to build a power plant capable of developing 100,000 horsepower. It is stated that about \$500,000 was paid for the plot of land, which is located at One Hundred and Twentieth street and East river, New York City.

Mount Hood, Ore., Railway & Power Company.—It is stated that work on the 15,000-horsepower generating station of this company has been started. During the past week bids have been received by the company from electrical manufacturing companies for supplying and installing the electrical apparatus in the station. It has not been announced to whom the contract has been awarded. It is said that the present contract on which bids have been received will amount to about \$280,000.

Personal Mention

Mr. J. B. Livingstone, heretofore auditor of the Oregon Water Power & Railway Company at Portland, Ore., has resigned to become associated with the Jersey Central Traction Company at Keyport, N. J.

Mr. A. C. Murray, heretofore assistant to General Manager L. E. Fischer of the Illinois Traction Company, has been appointed assistant general superintendent of the southern division, with headquarters at Staunton, Ill.

Mr. E. W. Poole, formerly assistant treasurer of the Connecticut Railway & Lighting Company, Bridgeport, Conn., has resigned to become associated with the United Gas Improvement Company, with headquarters at Philadelphia.

Mr. William G. Evans, president of the Denver (Colo.) City Tramway Company, has moved his headquarters from Denver to New York City, where he will represent the Denver Northwestern & Pacific Railway and other interests with which he is identified. Mr. Evans is vice-president of the latter company.

Mr. Hector W. Mackay has resigned his position as division superintendent of the Boston & Worcester Street Railway, to accept a similar position with the northern division of the New Hampshire Electric Railways, with headquarters at Hampton, N. H. He will be succeeded by Mr. Edwin C. Whitney, whose headquarters will be at Marlboro, Mass.

Mr. C. Edgar Titzel, who, as announced in the Electric Railway Review of May 11, 1907, has been appointed manager of the Lancaster County Railway & Light Company, with office at Lancaster, Pa., was born at



C. Edgar Titzel.

Irwin Station, Westmoreland county, Pennsylvania, on May 4, 1875. His parents moved to Altoona in 1880, and from there to Lancaster in 1885. He was educated in the public schools of Altoona and Lancaster; later he attended Franklin and Marshall Academy for two years and Franklin and Marshall College for one year. He entered the employ of the Edison Electric Illuminating Company of Lancaster in 1892 and was made superintendent of this company in 1896. In 1901 he was appointed superintendent of the Lancaster Gas Light & Fuel Company, and the Columbia Electric Light Heat & Power Company. In 1903 he was appointed superintendent of the Conestoga Traction Company of Lancaster,

succeeding Mr. Frank S. Given. Since that time he has been superintendent of all the above companies, which are owned by the Lancaster County Railway & Light Company. On March 1, 1907, the controlling interest of the Lancaster County Railway & Light Company was sold to Bertron, Storrs & Griscom of 40 Wall street, New York City, and on May 1, 1907, Mr. Titzel was appointed manager of the above companies, being locally in charge of all the properties owned by the Lancaster County Railway & Light Company.

Mr. Frank Steinhart, United States consul-general at Havana, Cuba, and a director in the Havana Electric Railway, which was recently reorganized, as announced in the Electric Railway Review of March 16, 1907, has been appointed general manager of this company. His resignation as consul-general, which was tendered about three months ago, will be effective on June 1, at which time he will assume his new duties.

Mr. Edward Raver, heretofore superintendent of the Logansport division of the Ft. Wayne & Wabash Valley Traction Company, has been appointed superintendent of the local street railway lines in Ft. Wayne, Ind. Mr. Raver entered the service of the company in 1891 as motorman. Former Assistant Superintendent Rider of the Ft. Wayne local lines will be transferred to Logansport to succeed Mr. Raver as superintendent.

Mr. Walter A. Draper, who, as announced in last week's issue of the Electric Railway Review, has been elected secretary of the Cincinnati Traction Company, succeeding Mr. S. C. Cooper, resigned, was born at Portsmouth, O., and graduated from the Ohio Wesleyan University in 1883. For about five years he has been secretary and treasurer of the Cincinnati Zoological Garden Company, which is controlled by the Cincinnati Traction Company and allied interests.

Mr. A. S. Richey has been appointed professor of electric railway engineering at Worcester (Mass.) Polytechnic Institute. He was formerly in charge of the mechanical and electrical departments of the Citizens' Railway, Muncie, Ind., and more recently held the same position with the Marion (Ind.) City Railway. Prior

to going to Worcester he was chief engineer of the Indiana Union Traction Company at Muncie, Ind., resigning in 1905 to become an instructor in the electric railway engineering department of Worcester Polytechnic Institute, where he has remained as assistant professor until his present appointment. He will be succeeded by Dr. George Olshausen of St. Louis, Mo.

Mr. Charles M. Crawford, secretary and treasurer of the Hartford (Conn.) Paving & Construction Company, has been appointed chief engineer of the Cincinnati Northern Traction Company, Cincinnati, O., to succeed Mr. C. A. Alderman, who resigned some time ago to become associated with J. G. White & Co. of New York. Mr. Crawford has had a long experience in steam railroad engineering and was formerly assistant engineer of the Pennsylvania Railroad.

Mr. Benjamin F. Tilton of Newburgh, N. Y., has been appointed engineer of maintenance of way for the Cleveland Electric Railway, effective on May 20, succeeding Mr. Charles H. Clark, whose resignation to take a similar position with the International Railway at Buffalo, N. Y., was announced in our issue of last week. Until his present appointment Mr. Tilton was in charge of the elimination of grades for the Cleveland & Pittsburg division of the Pennsylvania Lines.

Mr. R. F. Kelker, Jr., has resigned as engineer of the Goldschmidt Thermit Company of New York to become connected with the board of supervising engineers in charge of the reconstruction of the Chicago street railway systems. Mr. Kelker is to have charge of the track work, a position for which his previous experience in the track departments of the Brooklyn Rapid Transit Company, the International Railway Company of Buffalo and the Baltimore & Ohio Railroad renders him especially fitted.

Mr. F. W. Johnson has resigned his position as claim agent of the Connecticut Railway & Lighting Company, Bridgeport, Conn., to become assistant general claim agent of the Philadelphia Rapid Transit Company. Mr. Johnson was formerly a member of the claim department of the old Boston & Lynn Street Railway. Shortly after the consolidation of this company with the Boston & Northern Railroad he accepted the position of claim agent with the Connecticut Railway & Lighting Company, where he has been for the past five years. He is a member of the executive committee of the American Street and Interurban Railway Claim Agents' Association.

Directory of Electric Railway Associations.

American Street and Interurban Railway Association. Secretary, Bernard V. Swenson, 29 West Thirty-ninth street, New York. Annual meeting, Atlantic City, N. J., October 14-18.

American Street and Interurban Railway Accountants' Association. Secretary, Elmer M. White, assistant treasurer Birmingham Railway Light & Power Company, Birmingham, Ala.

American Street and Interurban Railway Engineering Association. Secretary, S. Walter Mower, general manager Southwestern Traction Company, London, Ont.

American Street and Interurban Railway Claim Agents' Association. Secretary, B. B. Davis, claim agent Columbus Railway & Light Company, Columbus, O.

American Street and Interurban Railway Manufacturers' Association. Secretary, George Keegan, 2321 Park Row building, New York, N. Y.

Canadian Street Railway Association. Secretary, Allan H. Royce, president Toronto Suburban Railway, Toronto, Ont.

Central Electric Railway Association. Secretary, W. F. Millholland, secretary and treasurer Indianapolis Traction & Terminal Company, Indianapolis, Ind. Next meeting, Indianapolis, Ind., May 23.

Colorado Electric Light Power & Railway Association. Secretary, John F. Dostal, Denver Gas & Electric Company, Denver, Colo.

Iowa Street and Interurban Railway Association. Secretary, L. D. Mathes, general manager Union Electric Company, Dubuque, Ia.

Massachusetts Street Railway Association. Secretary, Charles S. Clark, 70 Kilby street, Boston, Mass. Meetings held in Boston on second Wednesday of each month, except July and August.

Northwestern Electrical Association. Secretary, R. N. Kimball, Kenosha, Wis. Annual meeting, Milwaukee, Wis., January, 1908.

New England Street Railway Club. Secretary, John J. Lane, 12 Pearl street, Boston, Mass. Meetings held on fourth Thursday of every month.

Oklahoma Electric Light, Railway and Gas Association. Secretary, Galen C. Crow, general manager Guthrie Electric Light & Power Company, Guthrie, Okla.

Pennsylvania Street Railway Association. Secretary, Charles H. Smith, superintendent Lebanon Valley Street Railway, Lebanon, Pa.

Southwestern Electrical and Gas Association. Secretary, R. B. Stichter.

Street Railway Association of the State of New York. Secretary, J. H. Pardee, general manager Rochester & Eastern Rapid Railway, Canandaigua, N. Y. Next meeting, Bluff Point, N. Y., June 25 and 26.

Wisconsin Electric and Interurban Railway Association. Secretary, Clement C. Smith, president Columbia Construction Company, Milwaukee, Wis.

Financial News

Atlantic City & Suburban Traction Company, Pleasantville, N. J.—On the application of Grey & Archer, attorneys, of Camden, N. J., Vice-Chancellor Leaming of the court of chancery in Camden appointed John L. Clawson of Philadelphia receiver for this company. The application was made on behalf of C. L. Leland and Robert Wetherill. Mr. Clawson tried as chairman of a reorganization committee to secure the acceptance by creditors of preferred stock for their claims.

Bennington & North Adams Street Railway.—The New York state railroad commission has approved the issue by this company of \$450,000 first mortgage bonds.

Chicago Lake Shore & South Bend Railway Company, South Bend, Ind.—This company has increased its capital stock from \$250,000 to \$6,000,000, of which \$1,000,000 will be preferred stock and \$5,000,000 common stock.

Cleveland Southwestern & Columbus Railway, Cleveland, O.—The Commercial and Financial Chronicle contains the following statement of earnings of the roads which have been acquired by this new company:

	1906.	1905.	1904.
Gross earnings	\$645,849	\$543,226	\$475,361
Operating expenses	363,856	314,253	293,615
Net earnings	\$281,993	\$228,973	\$181,746
Interest, taxes, etc.	179,252	152,693	128,746
Net income	\$102,741	\$ 76,280	\$ 53,000

Consolidated Railway Company, New Haven, Conn.—The annual report of the United Gas Improvement Company of Philadelphia contains the following: "The property of the Connecticut Railway & Lighting Company has been leased for 999 years from August 1, 1906, and the capital stocks of the Housatonic and New Milford Water Power companies and of the Meriden Southington & Compounce Tramway Company have been sold to the Consolidated Railway Company, a corporation controlling all the important trolley properties of Connecticut. The New York New Haven & Hartford Railroad owns most of the stock of the Consolidated company and has guaranteed the fulfillment of the conditions of the lease and payment of the principal and interest of the debentures issued to buy the stocks of the water power companies and the Meriden Southington & Compounce Tramway Company. The rentals under the lease supplemented by the sum of \$10 per share on their stock paid by the owners of the common stock to the Colonial Trust Company of New York, as trustee, will be sufficient to pay interest and sinking fund charges, the cost of maintaining the corporate organization, and dividends at the rate of 4 per cent per annum on the preferred and common stock of the Connecticut Railway & Lighting Company. Simultaneously with the above transaction there were sold to the Providence Securities Company, which made payment in its 4 per cent 50-year debenture bonds, guaranteed as to principal and interest by the New York New Haven & Hartford Railroad, all of the bonds and floating debt and practically all of the capital stock of the Rhode Island Securities Company, and paid to the Providence Securities Company cash to the amount of \$10 per share of the stock so sold. By these transactions we have transferred the responsibility of managing and financing these properties to the New York New Haven & Hartford Railroad, and insured an income to the United Gas Improvement Company from its investments in Connecticut and Rhode Island of \$1,000,000 per annum, being 4 per cent on securities of the par value of \$25,000,000."

Denver City Tramway Company and Denver & Northwestern Railway.—The gross earnings of this system for the last eight years have been as follows:

1906.....	\$2,652,218.60	1903.....	\$1,977,854.78	1900.....	\$1,302,289.91
1905.....	2,412,129.30	1902.....	1,702,958.39	1899.....	1,230,161.57
1904.....	2,040,146.06	1901.....	1,507,752.17		

Delaware & Hudson.—J. Rogers Maxwell and Frank E. Smith were elected members of the board of managers, succeeding Frederic Cromwell and Alexander E. Orr, at the annual meeting of stockholders on May 14. Rufus B. Cowing criticized the purchase of electric railway properties by the company, especially that of the Hudson Valley Railway, which he said was not worth \$2,000,000, while the company had paid for it \$5,000,000. He also criticized the purchase of coal lands and said that the Delaware & Eastern, now under construction, would compete with the Delaware & Hudson. L. F. Loree, the president, answering these criticisms, said that he has recommended that \$1,500 be set aside each month for the purpose of examining coal lands south of Wilkesbarre, and that he thinks it is prudent for the company to purchase additional coal lands. Regarding the purchase of traction properties Mr. Loree spoke of the purchase of electric railways by the New York New Haven & Hartford and the New York Central & Hudson River. He believed that it remains to be seen whether the Delaware & Hudson made a mistake in buying the Hudson Valley property, and said it was his impression that the people from whom the road was purchased would take it back if such a step was found advisable. Mr. Loree said there was some doubt about the advisability of giving out detailed information about the Hudson Valley purchase until the transaction is closed. The Delaware & Hudson now holds between 80 and 90 per cent of the Hudson Valley stock. President Loree said that he had not made up his mind how much money the company will need and that another

meeting of stockholders will be necessary to approve a plan for financing. He said he believed the earnings would continue at a sufficient rate to meet present dividend payments.

Interborough Rapid Transit Company, New York.—At the annual meeting of the stockholders on May 8 the following directors were re-elected to serve for three years: Gardner M. Lane, John Peirce, George W. Young and Alfred Skitt.

Jackson Consolidated Traction Company, Jackson, Mich.—It is announced that control of this property has been purchased by the Michigan United Railways Company of Lansing. The latter company now operates local systems in Lansing, Kalamazoo and Battle Creek, and interurban roads between Lansing and St. Johns, between Jackson and Battle Creek, and between Kalamazoo and Battle Creek. The ownership of the Jackson road will add 30 miles of road to the 153 miles which had previously been operated by the Michigan company.

Marion Bluffton & Eastern Traction Company, Bluffton, Ind.—A mortgage securing an issue of \$850,000 first mortgage 5 per cent bonds has been recorded in Bluffton. Of this issue \$130,000 of the bonds will be reserved for future requirements.

Milwaukee Light Heat & Traction Company.—A trust deed to secure an issue of \$30,000,000 refunding and extension mortgage bonds has been recorded. The Metropolitan Trust Company of New York and Randolph Radman are trustees.

Norfolk & Portsmouth Traction Company, Norfolk, Va.—Earnings for March and for the three months ended March 31 compare as follows:

	1907.	1906.	Increase.
March—			
Gross earnings	\$163,135	\$123,173	\$39,962
Operating expenses	106,929	81,035	24,994
Net earnings	\$ 57,106	\$ 42,138	\$14,968
Three months—			
Gross earnings	\$447,204	\$366,966	\$80,238
Operating expenses	293,971	237,404	56,567
Net earnings	\$153,233	\$129,562	\$23,671

Scioto Valley Traction Company, Columbus, O.—At the annual meeting of the stockholders the following directors were elected: Frank A. Davis, E. R. Sharp, E. K. Stewart, W. S. Courtright and Theodore Rhoades of Columbus; George Eustis and A. B. Voorheis of Cincinnati; J. C. Hoover of Hamilton, O.; and H. B. Peters of Lancaster, O. Officers were re-elected as follows: President and manager, Frank A. Davis; vice-president, W. S. Courtright; secretary and treasurer, Edwin R. Sharp; superintendent, L. C. Bradley.

Trenton Lakewood & Atlantic Railway Company.—Peter Schlicher filed in the court of chancery, Trenton, N. J., on May 14, a petition for the appointment of a receiver for this company.

Washington Traction Company, South Charleston, O.—Stacy B. Rankin was appointed receiver of this road on May 7 by Judge A. H. Kunkle. The receiver was appointed at the request of the Guaranty Title & Trust Company of Pittsburg.

West Jersey & Seashore Railroad.—The annual report of this road for 1906 shows gross earnings of \$5,206,284, as compared with \$4,652,405 in 1905. Operating expenses were \$3,959,914 in 1906, and \$3,388,728 in 1905. The aggregate amount of construction, equipment and real estate expenditures during the year was as follows: Electrification, Camden (Haddon avenue) to Atlantic City

via Newfield and Newfield to Millville.....	\$4,460,296
Connection between Atlantic City division and Atlantic City Railroad at Winslow Junction.....	183,174
New lines, etc., in Camden, N. J.....	522,780
Double-track freight line, Westville to Haddonfield Junction.....	244,910
Miscellaneous	122,739
Electric railway and other equipment.....	559,719
Real estate	19,193

In his report the president, James McCrea, says: "You will note from the foregoing statement that the construction expenditure for the year was mainly in the electrification of your railroad from Camden to Atlantic City via Newfield Junction, and from the latter point to Millville. This required an independent terminal and various other changes and improvements in Camden. As the result of these expenditures the company has one of the most completely equipped long-distance electric lines in the country, but as the line could not be put in operation until September 18, 1906, the close of the season for heavy summer passenger traffic, and the complete service was not inaugurated until a month later, your company did not derive any material benefit from its earnings during the remaining portion of the year. Other important improvements, still under way, are the new freight line from Westville to Haddonfield Junction and the new overhead connecting line from Spruce street, on the Atlantic City division, to Van Hook street, on the Cape May division, in Camden. In connection with the electrification of the Somers' Point branch and its use under the contract by the Atlantic City & Shore Railroad Company, it was necessary to double-track that branch from Pleasantville to Somers' Point, for which we shall receive a satisfactory increase in the rental."

Dividends Declared.

Georgia Railway & Electric Company, Atlanta, common, quarterly, 1½ per cent.

Washington, D. C., Railway & Electric Company, preferred, 2½ per cent.

Manufactures and Supplies

ROLLING STOCK.

Houston Electric Company, Houston, Tex., has placed an order for 10 double-truck cars.

Puget Sound Electric Railway, Tacoma, Wash., has ordered five additional double-truck cars.

Public Service Corporation of New Jersey, Newark, N. J., has ordered 200 cars from Cincinnati Car Company.

Aurora Elgin & Chicago has ordered two interurban cars from the McGuire-Cummings Manufacturing Company.

San Diego Electric Railway, San Diego, Cal., will build during the present year 50 cars for city and interurban service.

Pittsburg & Westmoreland Railway, Pittsburg, Pa., expects to be in the market soon for four convertible double-truck cars.

Seattle Electric Company, Seattle, Wash., has ordered one sprinkler car from McGuire-Cummings Manufacturing Company.

Union Electric Company, Dubuque, Ia., has placed an order with the McGuire-Cummings Manufacturing Company for one sprinkler car.

Lacroze Tramway Company, Lacroze, Buenos Aires, S. A., has ordered 50 single-truck and 6 double-truck cars from The J. G. Brill Company.

Washington Railway & Electric Company, Washington, D. C., expects to purchase soon 25 closed cars with bodies 28 feet 3 inches in length, to be equipped with maximum traction truck and two motors of 60 horsepower each.

Virginia Passenger & Power Company, Richmond, Va., has recently purchased 20 semi-convertible cars from The J. G. Brill Company. These will have 38-foot bodies and will be equipped with Detroit type platforms, Brill trucks and General Electric motors.

Nashville Railway & Light Company, Nashville, Tenn., as reported in the Electric Railway Review of March 9, placed an order on March 4 with The J. G. Brill Company for 15 double-truck motor cars for August 10, 1907, delivery. The specifications include the following details:

Seating capacity.....	44 passengers	Height, inside.....	7 ft. 8 in.
Wheel base.....	4 ft. 6 in.	Sill to trolley base.....	8 ft. 8½ in.
Length of body.....	30 ft. 6 in.	Track to trolley base.....	.....
Over vestibule.....	40 ft. 6 in.	.....	11 ft. 4 in.
Over all.....	42 ft.	Body and underframe.....	.....
Width, inside.....	7 ft. 7 in.	.....	Wood and metal
Over all.....	8 ft. 1¼ in.		

Special Equipment.

Air brakes	National	Headlights	Arc
Bolsters, body	Steel	Interior finish	Cherry
Bolsters, truck	Brill	Journal boxes and bearings.....	.....
Brake rigging	Hand and air	.....	Brill
Control system.....	General Electric	Motors	4 GE-90
Curtain fixtures.....	.....	Paint	Sherwin-Williams
.....	Curtain Supply Co.	Roofs	Canvas
Curtain material	Pantasote	Safety tread.....	Universal
Destination signs.....	Hunter	Seats .....	.....
Door fastenings	Bronze	.....	Heywood Bros. & Wakefield
Fenders.....	Company standard	Side bearings and springs.....	Brill
Gongs	Dedenda	Trucks	Brill
Hand brakes.....	Peacock	Varnish	Murphy
Heating system.....	Consolidated	Ventilators	Monitor

SHOPS AND BUILDINGS.

Indiana Columbus & Eastern Traction Company.—It is reported that this company has taken options on a site for a large new union station at Lima, O., to cost \$150,000.

Marion Bluffton & Eastern Traction Company, Bluffton, Ind.—This company has purchased a piece of land, 20 by 66 feet, in Warren, Ind., on which will be erected a concrete passenger station.

Minneapolis Rochester & Dubuque Traction Company, Minneapolis, Minn.—M. W. Savage, president, who is connected with the International Stock Food Company, has made arrangements to convert the ground floor of the exposition building owned by that company into a terminal station for the railway company, which expects to begin construction on its proposed line from Minneapolis to Rochester, Minn., and Dubuque, Ia. The building occupies 222,400 square feet of ground space, and is expected to contain, besides car storage space, a waiting room, ticket offices, restaurant and offices. The permanent survey for the line is being made and most of the right of way has been secured, according to the statements of its officers.

Pacific Traction Company, Tacoma, Wash.—A contract has been awarded to Miller & Bischo for the erection of a brick car house, 103 by 113 feet, at South Sixty-fourth street and Union avenue, in South Tacoma. A permit for the erection of the building has been secured and work has been started.

Puget Sound Electric Railway, Tacoma, Wash.—Work has been commenced on the construction of large freight sheds, yards and

a supply depot for the use of this company and the Tacoma Railway & Power Company on Puyallup avenue, Tacoma. The freight business is increasing rapidly and the present accommodations are inadequate. The freight warehouse will be 200 by 50 feet and will have tracks through the center of the building and on either side.

Spokane & Inland Empire Railroad, Spokane, Wash.—Work has been started on a passenger and freight station at Hayden architecture and will contain a waiting room, 30 by 30 feet, an Lake, Wash. The building will be of the Swiss chalet type of office, 12 by 12 feet, and a baggage room, 14 by 20 feet. The cost is estimated at \$20,000.

Susquehanna Railway Light & Power Company, Lancaster, Pa.—This company, which has acquired the Lancaster County Railway Light & Power Company, is planning extensive improvements to the system, including an addition to the car house at Lancaster, to cost \$35,000.

Willamette Valley Traction Company, Portland, Ore.—It is stated that work on the car shops and barns for this road will be started within the next 10 days. The company recently purchased 25 lots in North Springfield, Ore., on F street, between Third and Seventh, for this purpose.

TRADE NOTES.

Wolff Truck Frame Company, Chicago, has removed its office from Room 506 to Room 529 Railway Exchange building.

H. P. Walden has been appointed purchasing agent of the Pullman Company to succeed the late W. A. Hughes.

Taylor Electric Truck Company, Troy, N. Y., has moved its Chicago office from the eleventh floor of the Great Northern building to Room 1139 First National Bank building.

D. F. Holman Railway Tracklayer Company has moved its offices from the Railway Exchange to 1103 Ellsworth building, Chicago.

Pittsburg Pneumatic Company, Canton, O., manufacturer of pneumatic riveters, drills, etc., has opened an office in the Fidelity building, Pittsburg, in charge of Charles S. Rea.

Berthold & Jennings, St. Louis, Mo., dealers in timber, poles and ties, have moved their office from the Chemical building to Suite 1302-5 in the new Lumbermen's building.

Imperial Pneumatic Tool Company, Athens, Pa., has prepared plans for an addition to its plant, 54 by 144 feet, to provide additional floor space and manufacturing facilities to meet the demands of its rapidly increasing business.

Electric Automatic Railroad Safety Signal Company, New York, has been incorporated with an authorized capital of \$1,000,000. The directors of the company are Mark Birmingham, C. A. Reed and D. W. Birmingham, all of New York.

General Electric Company, Schenectady, N. Y., at the annual meeting of its stockholders on May 14 elected Marsden J. Perry to succeed the late Gen. Eugene Griffin as first vice-president and H. L. Henderson to succeed T. W. Henderson, resigned. All the old directors were re-elected.

Atha Steel Casting Company, Newark, N. J., announces the appointment of C. W. Owston, Jr., as sales agent, with headquarters at Newark. Mr. Owston was formerly manager of the Washington, Pa., and East St. Louis plants of the Railway Steel-Spring Company and chief inspector of the American Steel Foundries at St. Louis.

Sarco Company, 906 Sixth avenue, New York, has appointed Syles R. Fralick, 269 South Canal, Chicago, its representative in that territory. Mr. Fralick, who was formerly connected with the Benjamin Electric Company, of Chicago, has an extensive acquaintance in this field and will keep on hand a full supply of the products of the company.

American Machine & Manufacturing Company, Charlotte, N. C., has been incorporated with a capital stock of \$300,000 to manufacture and sell electric, hydraulic and steam power transmission machinery. The incorporators are: D. A. Tompkins, S. B. Sargent and J. W. Conway. Mr. Tompkins, a large manufacturer in the south, will be consulting engineer of the company.

American General Engineering Company, manufacturer of specialties such as self-contained armature heading and banding machines, Perfect armature and field coil winding machines, handy armature buggy, factory armature and field coil forms, car pit jacks, power coil taping machines, quick-break fuse boxes and oil cups, has removed its offices from 132 Liberty street to 253 Broadway, New York.

Omaha Mobile Sign Company, Omaha, Neb., has been incorporated with a capital stock of \$100,000, to manufacture and sell a device by which street car advertising will travel from one end of the car to the other, instead of remaining stationary. The incorporators are: G. H. Knowles, W. E. Morris, A. A. Patzman, P. C. Wreath, J. E. Dahlman, G. A. Floersch, William William, C. H. Griffith, A. L. Kelley and Theodore Kharas, the latter being the inventor of the device.

Wells Brothers Company, Greenfield, Mass., well-known manufacturer of "Little Giant" taps, dies, screw plates, gauges, etc., has just opened a store at 54 West Washington street, Chicago, in charge of Bordwell & Barton Company. The company will carry a complete line of taps, dies and screw plates, and later on will

add other tools. The New York store, which is in charge of A. Z. Boyd, has been removed from 56 Reade street to 126 Chamber street. The other store of the company is located at 149 Queen Victoria street, London, Eng. The company does a large business in all of these branch stores, and in each carries a complete stock of its products.

General Electric Company, Schenectady, N. Y., has issued its fiftenth annual report, covering the year ending January 31, 1917. The total earnings for the company amounted to \$61,608,831.73, or \$16,924,981 more than the previous year, an increase of about 40 per cent. The earnings and expenses of the company are as follows:

Earnings.	
Royalties, dividends, interest and dis-	\$60,071,882.99
counts	532,246.19
Profits on sales of stocks and bonds.....	329,702.55
Profits of security holding companies.....	675,000.00
Total earnings	\$61,608,831.73
Expenses.	
Cost of sales and depreciation of plants..	\$53,106,594.04
Interest on debentures	74,395.01
Total expenses	\$53,180,989.05
Profits.	
Profits, less patent and miscellaneous	\$ 8,427,842.68
expenses	4,344,342.00
Paid in dividends	\$ 4,083,500.68
Written off for patents, good will ac-	999,999.00
count, etc.	\$ 3,083,501.68
Surplus	12,027,295.09
Previous surplus	\$15,110,796.77
Total surplus	\$15,110,796.77
The balance sheet of the company of January 31, 1917, is as follows:	
Assets.	
Patents, franchises and good will.....	\$ 1.00
Cash	3,910,708.85
Stocks and bonds.....	\$20,086,790.08
Real estate (other than factory plants)..	347,488.93
Notes and accounts receivable.....	22,863,788.76
Advances to affiliated companies.....	2,922,675.57
Work in progress	3,853,321.23
Merchandise inventories—	50,074,064.57
At factories	\$19,680,242.89
At general and local offices.....	2,672,152.60
Consignments	241,511.64
Discounted paper	72,667,971.70
Factory plants (including all lands,	666,607.65
buildings and machinery)	9,000,000.00
Liabilities.	\$86,245,289.20
Three and one-half per cent gold coupon	\$ 2,047,000.00
debentures	55,000.00
Five per cent gold coupon debentures...	458.34
Accrued interest on debentures.....	4,010,410.58
Accounts payable	1,465.86
Unclaimed dividends	\$ 6,114,334.78
Capital stock issued	63,572,800.00
Subscriptions on account of capital stock, an equal	750,750.00
amount being payable April, 1917.....	666,607.65
Endorsements	15,110,796.77
Surplus	\$86,245,289.20

During the past year turbo-generators of an aggregate capacity of more than 350,000 horse-power have been sold. Sales of supplies and small apparatus, such as meters, direct and alternating motors, etc., have increased 35 per cent over the previous year. Stationary motors to the number of 40,365, and aggregating 565,000 horse-power, were sold. An average of 783 supply orders were received each working day throughout the entire year, as compared with 694 the previous year. The New York Central & Hudson River Railroad and the West Jersey & Sea Shore branch of the Pennsylvania Railroad were equipped electrically in the fall of 1916 with apparatus manufactured by the General Electric Company. Expenditures aggregating \$3,834,123.80 have been made during the year for real estate, erection of new factories, extensions, additional machinery, etc. The sales billed for the first two months of the present fiscal year are more than 50 per cent greater than at a corresponding time last year. President C. A. Coffin makes the statement that should this growth in business continue, additional capital will be required.

Crocker-Wheeler Company, Ampere, N. J., has received an order from the Tennessee Coal Iron & Railroad Company for the complete electrical equipment of its new steel rail mill at Birmingham, Ala. The order includes 15 Crocker-Wheeler form W rolling mill motors, aggregating about 575 horsepower. The line of form W motors is designed for the arduous service of rolling

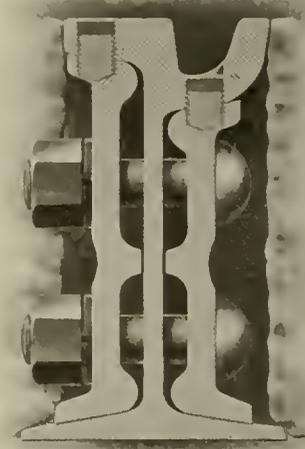
mills, and has attracted very favorable attention in the steel world for its ruggedness and simplicity of design. Among the other purchasers and users of the form W rolling mill motor are the following: Alliance Machine Company, Bethlehem Steel Company, Carnegie Steel Company, Illinois Steel Company, Lorain Steel Company, Mineral Point Zinc Company, Morgan Engineering Company,

PLASTIC RAIL BONDS.

Railway engineers now well recognize the absolute necessity of properly and amply bonding all rail joints, to reduce the current loss to a minimum. In many cases, however, rails are not properly bonded because of the expense involved in tearing up the streets



Brown Plastic Rail Bond—View Showing Method of Drilling Holes.



Brown Plastic Rail Bond—Sectional View Showing Position of Holes and Bonds.

National Tube Company, Pennsylvania Steel Company, Shelby Steel Tube Company, United Engineering & Foundry Company and Youngstown Sheet & Tube Company.

General Fireproofing Company, Youngstown, O., has about completed additions to its plant at Youngstown, which will double the capacity of the all-steel furniture factory and provide for the lug bar and girder frame departments, as complete an equipment as has been possessed for some years past by the herringbone expanded steel lath and expanded metal shops. For the manufacture of pin-connected girder frames a shop 85 by 200 feet has been erected, with a railroad spur running through the entire length of the building. Adjoining the girder frame shop is the steel yard, with stock lengths of cold-twisted lug bars and the square bars used in fabricating the girder frames. This bar yard is covered by an electric crane, having 100 feet span and 320 feet long, which has just been erected and which, because of its unusual size, creates great interest. To accommodate the steady growth of the all-steel furniture department a reinforced concrete building, 60 by 180 feet, and two stories high has been erected adjoining the old factory. The office building has been enlarged to accommodate the reinforced concrete department by the erection of a 2-story and basement addition, 36 by 36 feet. Cement plaster applied over the herringbone expanded steel lath is used for the exterior finish, and instead of woodwork in the addition, all-steel baseboards, moldings, window and door casings and doors, finished like mahogany, have been used.

ADVERTISING LITERATURE.

Concrete-Steel Retaining Wall Company, 805 Traction Building, Cincinnati, O.—The Bone system of retaining walls, bridge abutments, sea lock and area walls, in which this company is interested in the capacity of engineer, is described in a pamphlet which presents illustrations from photographs and from drawings.

Frank Ridlon Company, 200 Summer Street, Boston, Mass.—A pamphlet calls attention to the facilities of this company for handling electrical and mechanical work of all kinds, including the repair and rebuilding of dynamos and motors and the manufacture of spare parts. The pamphlet also includes a list of second-hand dynamos and motors which are on hand for sale.

Allis-Chalmers Company, Milwaukee, Wis.—Bulletins Nos. 1059 and 1060 are devoted respectively to Allis-Chalmers generators for direct-current and Allis-Chalmers belted alternators, type "AB." The direct-current generators are designed for general lighting wherever machines suitable for direct connection to steam, gas or oil engines are required. The alternators described in Bulletin 1060 are suitable for lighting and power plants in small towns, factories, public and private institutions and offices.

Falk Company, Milwaukee, Wis.—This company has just issued a new general catalogue which is a publication finely illustrated from photographs. It shows a large number of castings turned out in the company's steel department, some of which are exceedingly large, one of them reaching 84,480 pounds in weight. The castings made by the company which are particularly applicable for electric railway use, include gears and pinions. The company is also interested in special track work and cast-welded rail joints. The publication is designated as Catalogue No. 9.

to get at the web of the rail, and, for some types of bonds, removing the fish plates. Further, in many cases, no doubt, engineers have been discouraged from installing new bonds because of the rapid depreciation in their conductivity. Engineers will therefore appreciate the great advantage in favor of a bond which can be installed



Brown Plastic Rail Bond—View Showing Clamp and Lamps for Night Work.

without disturbing the pavement or rail joints, and can be installed in nearly all kinds of weather, without interrupting traffic, and which is said to be equal in conductivity to five No. 0000 copper bonds and also to have shown a conductance depreciation of only 5 per cent in nine years.

We present herewith illustrations showing the process of installing bonds which fulfill the conditions previously enumerated

and a section of the rail joint showing the position of the bonds installed. The plastic rail bond shown in these illustrations is manufactured by Harold P. Brown, electrical engineer, 120 Liberty street, New York. As will be seen from the illustrations, these bonds cannot be sheared off, and, when placed in the tram of the rail, every wagon that passes over them tends to increase the conductivity of the joint. Bonds installed in exposed T-rails are placed in a hole bored through the flange of the angle plate and into, but not through, the base of the rail.

A special magnetic clamp with shoes to fit any standard rail has been designed to facilitate the drilling of the holes required without removing the pavement. The magnet coils of the clamp are fully protected against moisture and injury, and the whole is mounted on wheels, so that it may easily be moved from one joint to another. Lamps are mounted on the clamp to permit work being carried on at night. Current for energizing the clamp magnet coils, operating the drill motor and electric lamps is taken from the trolley wire or contact rails by means of a contact arm readily removed upon the approach of a car. Special tungsten steel drills are provided for boring the required holes, which are capable of drilling 1,000 holes without the use of a lubricant and without regrinding.

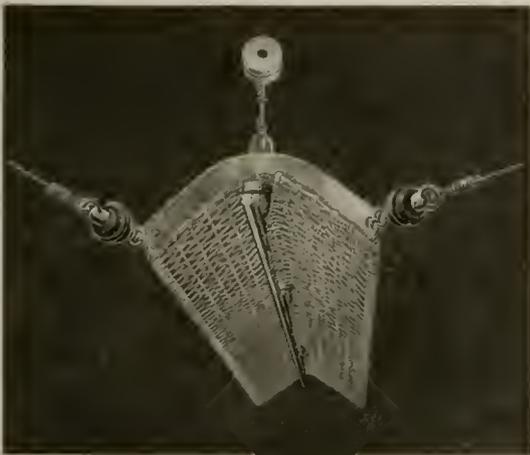
After the holes have been drilled it is only necessary to insert the amalgam composition, which comes put up in convenient, hermetically sealed packages, put the protective cap in place and the work is finished. One mechanic and two laborers can, it is stated, install from 70 to 100 of these bonds per day, which indicates the small cost of installation.

THE NATIONAL TROLLEY GUARD.

The number of accidents which have taken place at railroad crossings because of the trolley leaving the wire has caused the legislatures of several states to enact laws advising the installation of some device which will effectually prevent the loss of power when the trolley wheel leaves the wire. Many home-made devices have been installed for this purpose, but most of them have serious faults which make them useless in times of emergency. A simple guard which effectually prevents cars becoming stalled from loss of power on railroad crossings has therefore been introduced by The National Railroad Trolley Guard Company, 11 Pine street, New York.

One of the guards manufactured by this company is presented in the accompanying illustration, which shows it to consist of a wire mesh shaped in the form of an inverted V, extending over and along the trolley wire. An advantageous feature of this guard is its extreme lightness, those of aluminum weighing 13 ounces and those of copper and galvanized iron weighing but 18 ounces per running foot. On account of this low weight it is unnecessary to provide extra heavy poles and guys to support the guards. To insure perfect contact and durability the meshes are made of No. 10 galvanized and copper wire and No. 9 aluminum wire. They are fitted with substantial hangers spaced five feet apart. This protection can easily be installed without changes to the present overhead equipment.

The construction of the National guard affords ample strength



The National Trolley Guard.

and high electrical conductivity. The use of the wire net reduces the wind resistance to a minimum and effectually prevents the accumulation of ice, which otherwise might weigh down the wire and cause the poles or guys to fail. The width of the single guard for one wire is 10 inches and the depth of the trough 5 inches. Provision has been made in the design to accommodate two trolley wires. Such guards are made 15 inches wide, and space the trolley wires 6 inches between centers, the depth of the guard being 5 inches. The hangers provided with this guard are drilled and tapped to take any standard ear, thus maintaining standardization of the overhead work.

The National trolley guard, consisting simply of wire net with suitable hangers, is easily installed and shipped, a guard consisting simply of a roll of patent wire netting cut to the proper length and a set of hangers for each five feet of length. Therefore this guard can easily be installed by a regular line force.

PORTABLE AIR COMPRESSORS AND THEIR USES.

The introduction of compressed air has had a great influence in changing methods of manufacture. Some of the operations for which compressed air may be used are, for operating pneumatic riveters, hammers, chipping and calking tools, lifts, and also for the cleaning of cars, blowing out armatures, generator fields and switchboards. Besides these operations, which are mostly confined to the engine room or car shops, compressed air finds a large sphere of usefulness in mines for operating drills, hoisting engines, pumping engines, etc. Compressed air may further be advantageously used for raising water from artesian wells. For many of these uses, however, if stationary air compressors are employed, long pipe lines are required, which are costly to install and maintain in an air-tight condition, and further, the loss in transmission through long pipe lines is considerable. Therefore, for many purposes which require only a small amount of air, from 10 to 50 cubic feet of free air per minute, it is much less expensive to have a small portable compressor operated by electricity, which can easily be brought to the point where the air is required.

Small portable air compressors having these advantages are built in capacities of 11, 16, 20 and 50 cubic feet per minute, arranged as shown in the accompanying illustration. The Christensen air compressor herewith presented is manufactured by the Allis-Chalmers Company of Milwaukee, and from the general ap-



Christensen Portable Air Compressor.

pearance the reader will at once recognize the design to be identical with that of the compressors of Christensen air brake equipments, which have given such satisfactory and reliable service under the most unfavorable conditions.

The Compressor.

The compressor is of the single-acting 2-cylinder trunk piston enclosed type, with splash lubrication of all the moving parts. The cranks are set at an angle which gives the best balance of the moving parts. The connecting rods are of drop-forged steel, the wrist-pin end being solid, bushed with bronze, and the crank-pin end is of the marine type, split diagonally, thus relieving the connecting-rod bolts of the greater part of the strain, and also facilitating easy access to the nuts for adjustment and for tightening them. The nuts are prevented from backing off by split pins, which are inserted in the ends of all bolts.

The crank shaft is of forged steel, ground to the exact diameter, and carries a double helical gear attached to it by means of two feather keys set at right angles to each other and by a nut and split pin. The helical gear, which is built up of two separate wheels accurately machined, is mounted on the crank shaft by a taper fit which permits it to be easily removed. The use of two keys at right angles permits turning the gear through 90 degrees and thus causes the gear to wear evenly all around, whereas, were this provision not made, the gear would become worn at two points 180 degrees apart, corresponding to the end of the compression stroke when the pressure between the teeth of the gear and pinion is a maximum. These gears operate noiselessly and with a minimum of wear. The valves are made of solid drawn steel tubing, ground accurately to a perfect fit, and will operate continuously without the use of oil and will remain tight indefinitely. These are easily examined or replaced by removing the small screw plugs covering the valve chambers should replacement become necessary. The compressor case forms a convenient and substantial base for the motor, which is located directly above it.

The Electric Motor.

The electric motor is of the series type with form-wound armature and field coils with insulation of the highest quality ob-

tainable. The motor frame, which also forms the cover of the air compressor crank chamber, is made of low-carbon steel of high magnetic permeability. The field magnet is of the 2-coil 4-pole type, having two consequent poles, as is usual in motors for this class of service. The field coils are held firmly in position by two hook bolts, which pass through the field magnet frame. The armature is built up of varnished mild steel laminations, keyed on the shaft between two end plates. The form-wound coils are held firmly in their respective slots by means of insulating wedges driven into the slots and by three sets of band wires.

The commutator is of ample size with mica insulation. The armature winding is of the 4-pole cross-connected type, requiring only two sets of brush holders. The brush holders are provided with an adjustment for the brushes in the form of square blocks arranged so that the tension can be increased or decreased while the motor is running. The double helical gear pinion is fastened to the armature shaft with a taper fit and nut. A special tool is provided for removing the pinions from the armature shaft, thus preventing them from being damaged by the use of hammers or wedges in attempting to remove them.

The bearings for the armature shaft are of the ring oiling type, constructed in such a manner that no oil is wasted or leaks over the joints between the motor frame and the cap. Special oil guards are also fitted on the armature shaft, which prevents oil from reaching the commutator or armature. These motors are designed so that they can be started without the use of resistance, it being simply necessary to close the motor circuit.

The Automatic Pressure Governor.

The governor used in connection with the Christensen air compressor for controlling the pressure within very narrow limits consists of a Bourdon pressure gauge, the indicating needle of which is carefully insulated from the remainder of the gauge. One end of this needle is electrically connected by a flexible cord to the source of current. Two adjustable contacts connected with the solenoids which operate the motor circuit switch are mounted on the gauge dial.

Its method of operation is as follows: Should the pressure increase beyond the predetermined limit the indicating needle of the gauge comes in contact with the upper contact point; the current thus passes through one of the solenoids pulling the plunger forward and opening the motor circuit. Should the pressure decrease the indicating pointer comes in contact with the lower contact point, sending the current through the other solenoid, pulling the plunger back, thus closing the motor circuit. All of these parts are accessible for inspection and a magnetic blow-out is provided which effectually prevents the burning of the contact points.

Reservoir.

The reservoir is seamless, cold-drawn steel, made in one piece, with the bottom pressed in, and the end of the reservoir shell beaded over to form a joint, which is afterwards made solid and tight by brazing and tinning. These reservoirs are tested at 300 pounds hydraulic pressure.

USEFUL TOOLS FOR OVERHEAD CONSTRUCTION.

In the construction of an overhead line many of the seemingly simple steps in the process of stringing and fastening up the wires

saving of time that may be accomplished with these simple tools is surprising, and to the saving of time is to be added the saving in "wear and tear" on the lineman's nerves and the reduction in the number of lacerated knuckles, which tend materially to lessen the efficiency of the crew.

One of the most useful devices mentioned is the throw-in hanger wrench shown in Figure 1, for placing trolley wire hangers in position on the span or suspension wire. The hanger is first placed on the span wire, the span wire passing through the lip of one of the suspension arms and around one side of the hanger. The wrench is then placed over the hanger, as shown, two lugs on the under side pressing on opposite sides of the suspension arms. The handles of the wrench are then twisted around parallel to the span wire, bringing the other lip of the hanger near to the wire. The throw-in lever, which is shown projecting downward in the cut, is then thrown forward, bringing the span wire forward and upward into the lip. The process is simple and is accomplished in less time than is necessary to describe it. The wrench is made in various styles adapted to the different types of hangers manufactured by the Ohio Brass Company.

Figure 2 illustrates the cap and cone hanger wrench, for tightening caps on hangers of the cap and cone form when installing them on the line. The wrench consists of a pair of tongs with jaws adapted to fit over the hanger and hold it against turning while the trolley ear or clamp is being screwed into place.

The type D hanger wrench, shown in Figure 3, is of the alligator type, made of drop-forged steel. It will fit interchangeably the hexagonal nuts on the various types of insulated bolts, hanger caps, etc.

For dead-ending or anchoring trolley wires and for temporary splicing the trolley wire screw clamp, illustrated in Figure 4, will be found effective. The two halves of the clamp are brought together by two screws and it may be used interchangeably with round, figure 8 and grooved wires, from Nos. 0 to 4-0, Brown & Sharp wire gauge.

Splicing of trolley wires may be greatly facilitated by the use of the trolley wire tightener shown in Figure 5, which, like the screw clamp, may be used interchangeably with Nos. 0 to 4-0 round, figure 8 and grooved wires. The jaws of the tightener hold the two ends of the wire securely, and as the two turnbuckles on the sides are screwed up, the ends of the wires are brought together, so that the splice may be readily made.

More or less difficulty is encountered in removing ears from the trolley wire if a proper instrument is not used to pry open the lips of the ear. This operation may be quickly and easily performed by the aid of the stripping tool shown in Figure 6, which is adapted to various forms of clinch ears for round wire. The pointed end of the tool is placed between the lips of the ear and the trolley wire, after which a few blows of a hammer on the end of the tool will open the lips sufficiently to strip the ear from the wire.

A trolley terminal clamp for round or grooved wires is shown in Figure 7. It is made of bronze, in halves, which are clamped together by steel screws. The inside of the clamp and the outer edge of one end are grooved for the reception of the trolley wire.

A "come-along" clamp of more than ordinary strength and compactness is illustrated in Figure 8. This wedge clamp may be used with round, figure 8 and grooved wires. It secures a powerful grip on the wire, and the greater the stress the greater the gripping effect. A blow with a hammer releases the clamp when the wire has been fastened.

In stringing heavy feeder wires or cables, after the poles and cross arms are up, the friction of the wire may be greatly reduced



Figure 1.



Figure 2.



Figure 3.

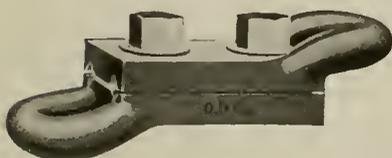


Figure 4.

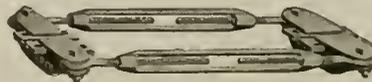


Figure 5.



Figure 6.



Figure 7.

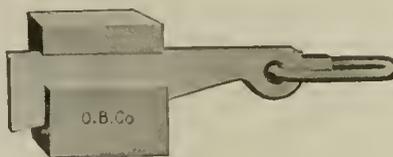


Figure 8.

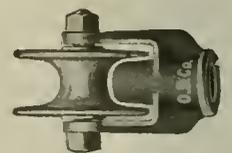


Figure 9.

become arduous tasks without the use of proper tools. A number of special devices which greatly lighten the lineman's work are being manufactured by the Ohio Brass Company of Mansfield, O. These devices were designed primarily for the installation of the company's own overhead equipment, but most of them may be used with equal success with any standard equipment. The actual

by using the Cook feeder wire sheave, shown in Figure 9. This sheave is slipped over an insulator pin and the wire passed over the pulley. By using one of these sheaves to each pole a heavy wire may be drawn over a number of cross arms at a time with ease. The groove in the pulley will take wires up to 1 1/2 inches in diameter.

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WHOLE No. 213

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With the gradual improvement of roadbed, leading to the adoption of steam road standards, it is not unnatural to find managers of interurban lines depending largely upon neighboring steam lines for trackmen, and especially for foremen. The possibilities of competing for this class of special labor have probably not been suggested in more interesting manner than in the words of the superintendent of a high-speed, rock-ballasted interurban line in the east, who was asked what particular steps he had taken to bring about the high operating efficiency of his line. He laid especial stress upon the track work, and said that the admirable track work of the line was due to the fact that the road had been able to secure its pick of the foremen from a parallel steam line by the simple plan of offering \$5.00 more each month than its steam competitor. He knew of no place where \$5.00 would go so far. He was of the opinion that many interurban lines, from short-sighted economy, merely drew the disgruntled and incompetent men from steam roads when a slight increase over the prevailing salaries paid to foremen would be productive of marked improvement in roadbed and hence in operating results.

The hearing before representatives of the interstate commerce commission in Chicago this week of the charges filed by the Chicago & Milwaukee Electric Railroad against the Illinois Central Railroad, which is reported on another page of this issue, disclosed some important facts. Charles W. Merrilies, traffic manager of the Chicago & Milwaukee Electric road, stated that satisfactory traffic arrangements are held with the Wisconsin Central Railway, under which freight is shipped in carload lots from Chicago to Minneapolis. Responding to the question why the road did not consign in its own cars the cabbage which it sought to have the Illinois Central road haul, Mr. Merrilies stated that his road, which owns three box cars, relied upon the arrangement that the railway having the long haul furnishes the cars. One of the principal points which was relied upon to strengthen

the case of the Chicago & Milwaukee Electric road was that the Illinois Central road promulgated the joint tariff, but almost immediately canceled it. Mr. Merrilies charged this cancellation to the influence of the Chicago & Northwestern Railway. There are now two cases of this character before the interstate commerce commission, in which the questions at issue are similar. The thorough manner in which the commission is proceeding in securing evidence in these cases indicates that electric railways will have every opportunity to demonstrate why they should be permitted under the law to exchange freight with steam railways.

The practice on the part of some conductors of holding or "knocking down" a part of the fares collected is a problem which practically every operating company has been called upon to face and one which has caused a great deal of trouble to the managements, as well as no small pecuniary loss to the companies. While it is believed

that most of the conductors are honest it is known that some of them are not, and, although the question of how to deal with the offenders has been given much careful thought, no method has yet been devised which has had the desired effect. Five cents is so small a sum that it is easy for a man to take a few nickels now and then, and, on account of the comparative security from detection, to let the habit grow on him before he fully realizes that he is a thief. Moreover, the general practice of simply discharging dishonest conductors when detected—which is probably due to the difficulty of securing evidence sufficient to convict—has not proved sufficiently severe to prevent others from following their example. The East St. Louis (Ill.) & Suburban Railroad has recently suffered from the dishonesty of some of its conductors and has found that the practice of discharging them when detected has not been sufficiently severe to eliminate the evil. Consequently the company resolved to adopt harsher measures for the sake of example, and, after securing evidence that a certain conductor had been holding back fares, had

him arrested and prosecuted him in the circuit court at Edwardsville, on the specific charge of embezzlement of \$1.20. The man was fined \$1.00 and costs, and given a nominal sentence of one day in the county jail. Although the penalty was a light one it is believed that the precedent thus established will have a salutary effect in preventing a recurrence of the act. Another company, the Cleveland Electric Railway, has recently announced its intention of adopting similar measures. Of course it is in most cases difficult to secure evidence sufficient to convict, but an occasional example could be made and the fear of a jail sentence should operate more strongly to keep men with dishonest tendencies in the right path than the simple prospect of losing a job.

In his annual report for 1906 Ralph Peters, president of the Long Island Railroad, says that a total of about 100 miles of single track is now operated by electric third rail. "Its workings during the year,"

**Electricity
on Long
Island Road.**

Mr. Peters says, "have been very successful, and the service has been reliable and efficient in every respect; and while it is

not yet economical, owing to the fact that your power is not fully employed, it has materially increased your passenger traffic." The company is continuing its heavy expenditures for improvements, and among the charges to capital account during the year were the following items: Electrification of lines, \$531,887, and Atlantic avenue trolley line, \$198,485. The statistics of traffic for the year show an increase of 18.8 per cent in the number of passengers carried, of 22 per cent in the passenger mileage and of 16.4 per cent in the passenger train mileage. Passenger earnings increased from \$5,076,103 in 1905 to \$5,831,453 in 1906, a gain of \$755,350. There was a slight decrease in the earnings per passenger per mile, due to a lowering of rates on commutation and excursion business; the average rate per mile was 1.522 cents, a decrease of 0.082 cent from the preceding year. The improvement which is set forth in the foregoing figures is of especial significance when it is recalled that in the previous annual report, covering the operations for 1905, it was stated that the decrease in the number of passengers carried in that year, as compared with 1904, was caused by a loss of local business due to competition from trolley lines.

The Master Car Builders' Association recommends that "axles be made of double-worked fagoted scrap, 16 per cent of new bar iron worked into the center of the axles being allowed if desired." The process of axle manufacture at the Los Angeles shops of the Pacific Electric Railway serves to illustrate how thoroughly some electric rail-

**Car Axles
from
Scrap Iron.**

ways are executing their shop work and meanwhile advantageously economizing in the purchase of raw materials by reworking scrap iron and steel. New axles are manufactured from scrap material in this company's repair shops, and a very serviceable product is obtained. When an old car is broken up the scrap wrought iron and steel are carefully sorted and turned into the company's storeroom, their value being credited to the destroyed car. The storekeeper receives this material at scrap value, and sells it on work-order requisitions to the blacksmith shop at an increase of 2 per cent in the cost for handling. Here the scrap wrought iron is cut into pieces about 16 inches long and bound into packs weighing 175 pounds each. These bundles of fagots are placed in an oil furnace and later worked under a power hammer until a homogeneous billet is formed from each. Three such billets of reworked wrought scrap are required in making a 4½-inch finished axle and seven bars for a 6-inch axle. The metal thus obtained is considered very desirable for use in axles. The large amount of working necessary to form the billets assures a very tough fiber and a high elastic limit. In this same way the scrap steel is fagoted and worked into shapes suitable for filler blocks, such as are used in building

special track work. While this economical practice is not new in steam railway shop work, its successful adoption by one large interurban road proves it at least to be worthy of thoughtful consideration by others.

The idea of using reinforced concrete arches instead of wooden or iron poles for catenary trolley suspension, as described and illustrated on another page of this issue of the Electric Railway Review, is an original one which should be productive of the best results. This system, which has been developed by E. Darrow, general manager and chief engineer of the Toledo & Indiana Railway, and which it is proposed to adopt on the company's extension from Bryan, O., to Waterloo, Ind., consists of arches 40 feet high, spaced 650 feet apart, supporting a ⅝-inch steel messenger cable, from which the trolley wire is suspended in the ordinary manner. On account of the long distance between points of suspension, the trolley wire is braced against swaying by bridle guys anchored to short concrete poles placed midway between the arches and by additional bridle guys and sway braces attached to the arches. The high-tension wires are arranged on insulators on the outside of the arch columns. Although the first cost of this form of construction is slightly higher than that of the ordinary wooden pole construction, the figures as given by Mr. Darrow being \$107 per section for the arches, ready for wires, as against \$90 for poles with brackets, the greatly increased length of life of concrete as compared with wooden poles is expected to result in a very large ultimate saving. The life of an ordinary wooden pole is only about 10 years, whereas concrete is supposed to last indefinitely. Another advantage of concrete arches is the comparative freedom from possibility of destruction by lightning.

**Concrete
Trolley
Arches.**

CARS WITHOUT MONITORS.

In the design of modern rolling stock there still remains at least one relic of stage-coach days—the monitor deck. In keeping with other advancements in car building consideration might well be given the problem of designing a car without the deck. It exists only as an unnecessary ornamental appendage, increasing the weight and decreasing the strength and cubical capacity of the car.

It is well known that the first requirement of good ventilation is a large cubical capacity per passenger, and it is equally well known that the monitors on cars furnish very little ventilation, as the air blows in one side and out the other without being properly mixed with the other air in the car. It is suggested, therefore, that the use of monitors be dispensed with, and the entire width of the car be carried up to the same height as the top of the monitors on cars now in use, thus materially increasing the volumetric capacity of the car per passenger. Besides furnishing better ventilation it would create a feeling of relief from congestion, for, though a car or hall may be actually crowded, a high ceiling has the psychological effect of eliminating the cramped feeling always present in places with low ceilings.

The most important gain from an economic standpoint is, however, the reduction in the weight of the car roof framing. This is made possible by the more advantageous disposition of the material, accompanied by an increase in the distance between the upper and lower members of the truss. Besides a slight saving in power and reduced wear on the wheels and rails in braking, there also appears a considerable saving in the cost of constructing cars in this manner. The lower cost of construction results from avoiding the expensive truss work on the monitor, and especially is this true of the all-steel construction, for, if made of steel, the fitting of so many small parts is very costly, and, if composite, the wooden parts soon rot and cause the iron work to corrode.

From the maintenance standpoint, there are a number of advantages in favor of abandoning the monitor. Among these are, that without the monitor the roofing is more easily constructed and maintained in a water-tight condition, the expense of replacing broken monitor lights is eliminated, and the trolley pole base can be more rigidly supported, thus greatly reducing the wear and tear on the roofing and the number of leaks.

An interesting example of reduction in weight is clearly presented in the trail cars of the Denver City Tramway, described and illustrated in the Electric Railway Review of May 4, 1907. The weight of these cars per unit of seating capacity is 285 pounds, compared with approximately twice this weight per unit of seating capacity of the old type trail cars of similar capacity. Another example of new construction which shows the good appearance obtained by omitting the monitor is illustrated by the gasoline motor car No. 8 of the Southern Pacific Railroad Company.

Ventilation of cars built without monitors can be easily furnished by ventilators fitted with deflectors placed in the turn of the roof at the front and the rear of the car, similar to those fitted on the cars of the Chicago City Railway.

Increasing the height of the side of the car should be of advantage in the design of semi-convertible cars, since it would permit the use of larger windows, thus making them practically as desirable as open cars. This would avoid, to a great extent at least, crowding of open cars by passengers who allow the closed cars to pass only partly filled because of the better ventilation of the open cars.

THE DOUBTFUL ADEQUACY OF URBAN FARES.

While the main encouragement for the 3-cent fare and analogous movements comes from persons of socialistic or other undesirable tendencies, it can scarcely be doubted that they have been aided in their campaigns by a showing of profits by some urban railways which are unreal and excessive because of improper accounting methods. Wide recognition of this fact is deserved, and it should lead, so far as possible, to a correction of previous error where mistakes have been made and to the adoption of clear accounting systems by managements which have not yet taken up important questions involved in issuing reports about the integrity of which, owing to plain provision for depreciation and renewals, there can be no justified criticism.

It should be borne in mind by those who have studied the situation that the public has never been taught, or had proved the fact that, except possibly in a few instances, the 5-cent fare in urban communities does not permit excessive profits if adequate provision for depreciation and amortization is continued through the life of a limited franchise. It behooves those who, after all, are really most concerned in the success or failure of these low-fare movements, which at times assume dangerous proportions in different parts of the country, to show that the true result of a radical low fare would be confiscation of the properties of the companies. Convincing evidence of the insufficiency of low fares can be produced only by conclusive figures compiled by the companies showing the true relation of operating expenses and depreciation and fixed charges to revenue.

To continue to operate without provision for depreciation or amortization is to prepare for a penalty that is as inevitable as the coming of night following day. Demonstration of the fact that after these just charges the earnings remaining for distribution to stockholders are normal, or less than normal, will constitute an argument against reduced fares which cannot seriously be denied.

The growth of the fallacy that 3-cent fares are adequate illustrates the vital need of educating the public on this important matter. Throughout the years when excessive dividends have been paid on some street railway properties there has been but slight recognition of the principle of

depreciation. Companies have assumed either that their franchise rights could not be questioned or that there would be no difficulty in procuring new ordinances.

The 5-cent fare has been the maximum rate of transportation per passenger for so long a time that custom and law now sanction it, and any advance at this late day would be difficult if not impossible to effect. Emphasis, however, should be laid on the urgent necessity for insisting that if the 5-cent fare is maintained as the maximum rate, it should be regarded also as the minimum rate.

While it is doubtful if any cure for the 3-cent fare mania would be so swift and certain as a sudden reduction to a 3-cent basis of urban street railway fares, with a corresponding decline in employes' wages, quality of equipment and appurtenances, and the inevitable resultant poor service, the bankruptcies that would follow would be so grave and serious that it is the plain duty of the companies to endeavor by all rightful means to maintain existing fares.

The low-fare injustice is generally founded on hatred of wealth, selfish political hopes or other unworthy motives. For its champions no policy is too radical, no course, even confiscation, improper. To discourage these movements, which, if successful, will strip street railway revenue to the point of despair, companies will undoubtedly be obliged to do more than explain patiently the inadequacy of 3-cent fares. It is no less sane and reasonable to advocate 7-cent fares than it is to urge 3-cent fares. In many communities there would be more merit in an argument for 6-cent fares than in the clamor for 4-cent fares. Is there not too little agitation on one side of this question as well as too much on the other?

The facts epitomizing the effect of the times on street railways may be stated as follows: Not only have labor and materials increased in cost, but taxes are continually growing larger. The length of ride for one fare is constantly increasing through the construction of extensions and through the transfer system. Because of the enlarged investments necessary in plant and equipment on account of the demands and needs of the public, fixed charges are increasing. At present, on account of the disturbance in the money markets and the difficulty of selling securities on advantageous terms, either increased interest rates or other concessions are essential in order to attract capital for improvements. Besides all these questions, there is now developing a recognition of the virtue of provision for depreciation of property and amortization of the investment.

The exactions of the public are insistent in these days. Companies must provide finer cars and must equip them with new, costly appliances designed to assure comfort, health and safety to passengers; seats are demanded for each person who chooses to board a car at any time of the day; motive power must be of modern type; cars must be kept clean and well heated and ventilated.

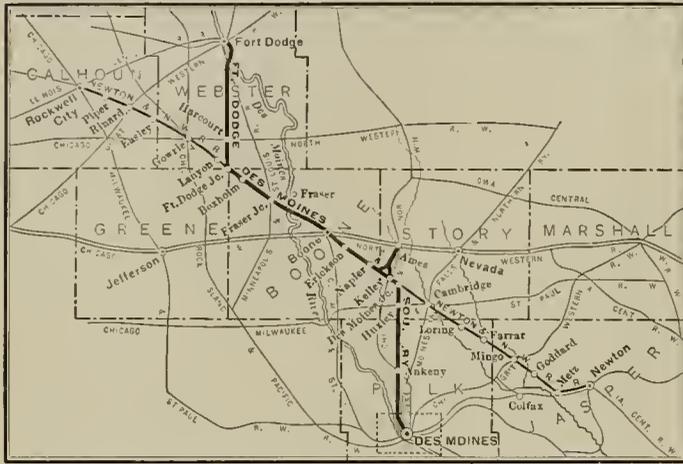
The street railway company is so completely helpless in the city in which its investment is made that periodical presentation of some of the foregoing facts should be made in those cities where the low-fare movement is rampant. The fact that every street railway can so readily be made the subject of abuse, public and political, is an additional reason why the company side of this vital fare question should be presented forcefully and ably in every large community whenever a good opportunity is offered.

If the task of providing for the transportation needs and whims of the populace of great cities is to remain thankless, there is no good reason why it should also be made unprofitable.

The Metropolitan West Side Elevated Railway on May 22 opened an extension of its Douglas Park branch from Fortieth avenue to Forty-sixth avenue and Twenty-second street. Local trains will be run every five minutes throughout the day and during the evening rush hours express trains will be run.

THE FT. DODGE DES MOINES & SOUTHERN RAILWAY.

The Newton & Northwestern Railway Company has been operating as a steam road between the terminal cities of Newton and Rockwell City, a distance of 101.7 miles, since 1903. In February, 1906, the officers decided to electrify a part of the existing line, purchase several small street railway



Ft. Dodge Des Moines & Southern Railway—Map.

systems, and construct branch lines. In accordance with this decision the Ft. Dodge Des Moines & Southern Railway Company was formed. Soon thereafter preliminary surveys for proposed lines were made, private right of way was secured and the work of electrifying the old line and constructing the new lines was begun. The first division of the electric line, from Des Moines to Ames, will be ready for

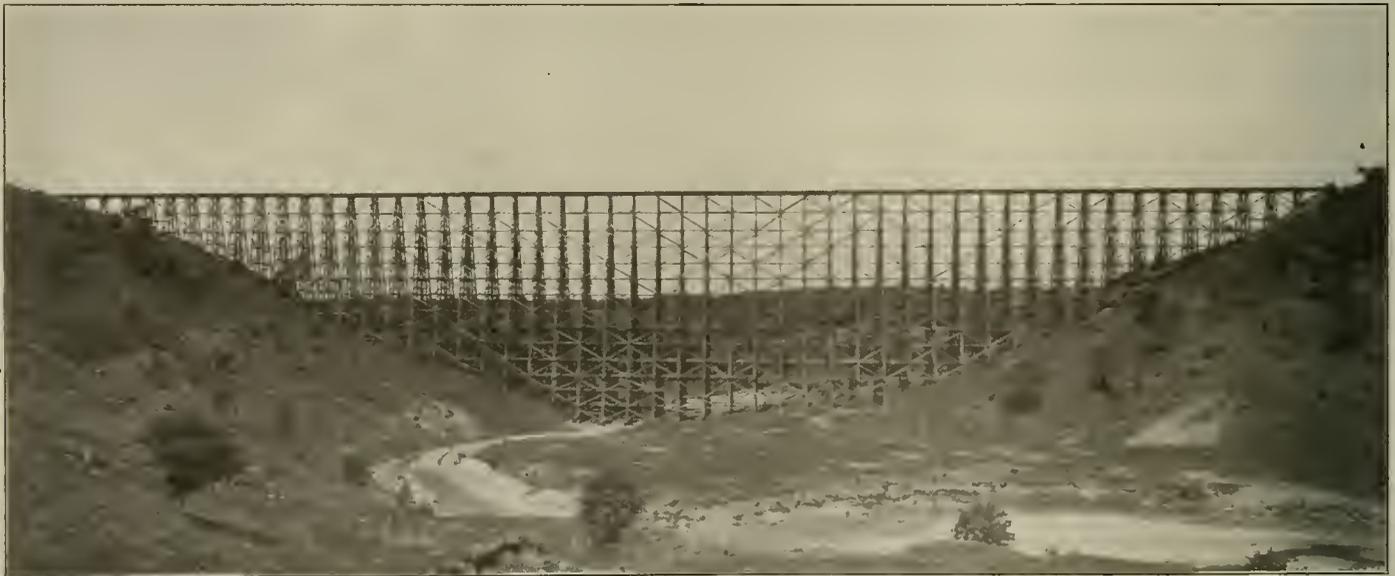
Des Moines Junction, a distance of about 25 miles, where connection is made with the main line of the Newton & Northwestern. From this junction point electric cars are to be run over the tracks of the steam railway to Ft. Dodge Junction, a distance of 37.7 miles. At Kelley, $3\frac{1}{2}$ miles west of Des Moines Junction, a branch line seven miles long has been built to Ames. The company has recently been granted a franchise to build a street railway on the principal streets of Ames and to electrify the existing steam railway that is now operating between Ames and the state college grounds near that city. From Ft. Dodge Junction, the point where the electric line leaves the right of way of the Newton & Northwestern, the tracks again run in a northerly direction to Ft. Dodge, a distance of 22.2 miles, where physical connection is made with the street railway system of that city, which is owned by the company. The distance from Des Moines to Ft. Dodge, exclusive of the Ames branch, is 85.5 miles, and from Des Moines to Ames is 35.9 miles.

Electrification of Steam Railway.

The work of electrifying the steam railway between Des Moines Junction and Ft. Dodge Junction has practically been completed. This consisted principally of bonding the rails, erecting a pole line and stringing the trolley and high-tension wires. However, in anticipation of the operation of the electric cars at high speed, it has been found advisable to ease many of the curves and to reduce the grades.

Track and Roadway.

The track, supported by an excellent roadbed, is laid with 70-pound rails. Between Des Moines and Des Moines Junction the track work is practically completed. The steel is now being laid between Kelley and Ames and between Ft. Dodge Junction and Ft. Dodge. The line from Des Moines to Kelley and from Kelley to Ames will probably be completed



Ft. Dodge Des Moines & Southern Railway—Timber Trestle 800 Feet Long and 165 Feet High.

operation by electricity on July 1, 1907, and the entire system, 85.5 miles in length, will be opened for traffic on September 1.

In the accompanying map the lines of the Newton & Northwestern and the Ft. Dodge Des Moines & Southern are shown. The electrified portion of the steam railway is between Des Moines Junction and Ft. Dodge Junction. The Ft. Dodge Des Moines & Southern has for its southern terminus Des Moines, the capital city of the state of Iowa. Entrance to this city is made over the tracks of the Des Moines City Railway Company.

From Des Moines the line extends almost due north to

before July 1 and the entire line completed before September 1. The steel on the Ft. Dodge division is now laid. On account of the proposed dual operation of steam and electric trains the trolley wire is being hung 21 feet 6 inches above the rails. Tubular iron brackets and No. 0000 trolley wire are being used.

One of the accompanying engravings, that of the deck steel truss bridge over the Des Moines river, five miles south of Ft. Dodge, illustrates the substantial character of the roadbed structures being erected. This bridge comprises two 70-foot deck spans 20 feet deep, designed for Cooper's E45 loading. The bridge abutments are of concrete con-

struction. The timber trestle approaches to the river spans have a total length of 760 feet. Another illustration shows the trestle spanning one of the canyons, west of Boone, on the electrified portion of the Newton & Northwestern. This

paratus. The generating equipment is in duplicate, either set of machines being of sufficient capacity to handle the load under normal conditions.

Coal is to be delivered to the boiler room by coal chutes



Ft. Dodge Des Moines & Southern Railway—Car Equipment.

trestle, 800 feet long, is 165 feet high over the ravine which it crosses.

Power Plant.

The generating station is situated on the bank of the Des Moines river at Fraser, which is practically the load center of the Ft. Dodge Des Moines & Southern Railway. In addition to being admirably located for obtaining feed and

from an elevated track. The coal will be hauled from the mines in bottom-dump cars and delivered to the boilers without rehandling. Along the front of the ash pits is a 12-inch spiral ash conveyor, which carries the ashes and cinders from the boiler room to a vertical bucket elevator, which loads them in cars.

The boiler equipment consists of three Aultman-Taylor



Ft. Dodge Des Moines & Southern Railway—Interior of Engine Room.

condensing water and for the economical distribution of electricity, the powerhouse is within 1,000 feet of a coal mine, from which the coal supply is received.

The building, which is of brick and steel construction throughout, is 90 feet square and 25 feet high to the roof trusses. It is divided longitudinally into two rooms, one of which is used for the boilers and auxiliaries and the other for the turbo-generators, transformers and other electrical ap-

horizontal water-tube boilers, equipped with extended furnaces, which allow them to burn slack coal, such as is mined in the vicinity of the station. Each boiler has a rated capacity of 400 horsepower and is worked under a steam pressure of 175 pounds. Space is provided for a fourth boiler. The stack is a concrete-steel structure 180 feet high and 8 feet in diameter. Boiler feedwater is supplied by two Epping-Carpenter duplex plunger pumps (7½ and 5 by 10)

which receive water by gravity from a Harrison open heater.

The generating equipment consists of two Westinghouse-Parsons 1,250-kilowatt, 3-phase, 2,300-volt, 25-cycle turbo-generators. The turbines are to be operated condensing and at a speed of 1,500 revolutions per minute. However, provision is made in the installation so that in case of accident to the condensing apparatus, which has a cooling surface of 2,000 square feet, or in case of low water, the turbines may be operated non-condensing. Circulating water for the condensers is drawn from the river through a 20-inch cast-iron pipe by Wheeler steam driven centrifugal pumps. The con-



Ft. Dodge Des Moines & Southern Railway—Timber Truss Bridge Across Des Moines River.

densation is returned from the turbines to the heater in the engine room by an Edwards steam-driven (6 by 14 inch) air pump.

Located in the engine room are two steam-driven 110-volt exciter sets, a 400-kilowatt 600-volt rotary converter, three 300-kilowatt and three 150-kilowatt water-cooled transformers and a 5-panel switchboard, which is equipped with necessary recording and measuring instruments. A general view of the interior of the powerhouse is shown in an accompanying engraving.

Substations.

It is planned to have six 400-kilowatt substations on the line, but for the present only five will be built. Other than the converter equipment at the powerhouse, similarly designed substations have been erected at Ankeny, Kelley, Ft. Dodge and Otho, and another will later be installed at Boone in connection with a general office building that is being planned.

Current is generated at the powerhouse at 2,300 volts, is stepped up to 22,000 and fed 3-phase east and west to the substations. The substations are each equipped with a Westinghouse 400-kilowatt rotary converter and three 150-kilowatt water-cooled transformers.

The car equipment which has already been received consists of ten 3-compartment single-end passenger cars. These cars are 53 feet 3 $\frac{5}{8}$ inches long over buffers and are 9 feet 4 inches wide over sill plates. Each car has 13 reversible seats upholstered in leather in the main compartment and 8 rattan-covered seats in the smoking compartment. The section at the front end of the car, set aside for baggage, is 10 feet 6 inches long and is provided with a 3 $\frac{1}{2}$ -foot sliding door on either side. The motorman's cab, 3 by 3 feet 6 inches, is located at the left-hand side of the forward end of the car.

The car body is mounted on Baldwin trucks, with 36-inch steel wheels. There are four Westinghouse No. 112 motors.

Entrance to the car is had through the sides of the rear

vestibule. In addition to the usual doors, single doors are provided at the ends for passage from one car to another when they are coupled into trains. In addition to the passenger cars an express car 47 feet 6 inches long over end sills has been received. The rolling stock was furnished by the Niles Car & Manufacturing Company.

In electrifying a section of the Newton & Northwestern Railroad care has been taken in the reconstruction work, so that the regular traffic of steam trains on this railway will not be interrupted by the electrical installation or later by the running of electric cars. It is proposed by Mr. J. L. Blake, general manager of both companies, to maintain without interruption the present schedule of passenger and freight trains over the entire length of the steam line. The steam railway passenger trains will be given the right of way over the electric cars.

Dispatching.

The running of the electric cars will be directed by telephone from the main office at Boone by a dispatcher who will also have charge of the operation of the steam trains over the track to be used jointly by the steam trains and the electric cars. The details of the operation have not yet been perfected. It is expected, however, that cars will be operated under 60-minute headway between Des Moines and Ames and under 90-minute on other parts of the system.

The general offices of the company and the car barns are



Ft. Dodge Des Moines & Southern Railway—Steel Deck Bridge.

at Boone. For the present the car equipment will be repaired in the shops of the Newton & Northwestern. A temporary building for the storage of the cars has been erected near the shops.

The organization of the Ft. Dodge Des Moines & Southern Railway is the same as that of the Newton & Northwestern. The officials are: President, Homer Loring, Boston; vice-president and treasurer, F. A. Farrar, Boston; secretary, C. A. Cushman, Boston; auditor, W. Chamberlain, Boone, Ia.; general manager, J. L. Blake, Boone, Ia.

The powerhouse construction and all electrical installations were made under the supervision of J. G. White & Co., engineers, of New York.

INDIANAPOLIS MEETING, CENTRAL ELECTRIC RAILWAY ASSOCIATION.

The last regular meeting before fall of the Central Electric Railway Association was held on Thursday of the present week at the Claypool hotel, Indianapolis, Ind., with President Nicholl in the chair. There were about 100 members present.

The president announced that the next meeting, after a summer recess, will be held at Columbus, O., on September 26. The finance committee reported a substantial balance to the credit of the association and that comparatively good progress was being made in collecting the dues from the members.

On motion of E. C. Spring the president was instructed to represent the association at the Atlantic City meeting of the American Street & Interurban Railway Association and to appoint one other member to accompany him.

J. K. Gray, trainmaster Western Ohio Railway Company, Lima, O., read a paper on "Modern Train Dispatching." (This paper appears in this issue on page 680.)

When questioned regarding the operation of work trains, Mr. Gray stated that the rules of his company require that such trains run as extras and must have orders for all movements. When they desire to run on the main line, having obtained orders, they must wait for a regular train and run as its second section. The regular is required to carry green signals for the work train as its second section, and not to remove these signals until sure that the work train is in the clear. The Western Ohio frequently operates as many as 10 or 12 extras at one time, including local freight, work and line cars.

Several members entered into discussion, regarding which one, the motorman or the conductor, should handle train orders. No definite conclusions were reached.

The matter of providing orders for operating cars if the company's telephone lines were disabled was considered. Mr. Gray stated that when there was trouble on all the railroad telephone lines, it was possible for station agents by means of properly located cut-out switches to sectionalize the telephone line and get into communication with some other agent who in all probability would be able to get the dispatcher on a long-distance telephone.

F. D. Norviel outlined the essential requirements of a train dispatching system. These comprise simple and brief rules and a well-made timetable. With these two requirements fulfilled the government of trains will be found more simple. In his estimation there is no department that needs standardization and uniform methods more than train dispatching, and there seemed to be no reason why train dispatching methods could not be standardized. In closing Mr. Norviel emphasized the great need for thorough organization in the train operating department and assurance of the execution of orders. With this last and greatest requirement fulfilled a large number of the delays and dangers sometimes incident to high-speed interurban operation disappear.

In relation to standardization, Mr. Spring stated that the books of rules adopted by the American Street and Interurban Railway Association and the Street Railway Association of the State of New York were formulated more especially by and for representatives of city railroads, and therefore are not wholly applicable to interurban operating conditions in the middle west. On motion of Mr. Spring the association instructed the chair to appoint a committee of five to report to the association recommending a set of rules for the "Operation of Trains." This is understood to mean not only rules for the conduct of employes connected with the operation of trains but also recommendations for a uniform method of train operation. The committee later appointed comprises F. D. Carpenter, general manager Western Ohio Railway Company, chairman; C. N. Wilcoxon, general manager Cleveland Southwestern & Columbus Railway Company; F. J. J. Sloat, general manager Cincinnati Northern Traction Company; C. D. Emmons, general manager Fort Wayne & Wabash

Valley Traction Company; C. A. Baldwin, superintendent of transportation Indiana Union Traction Company.

Mr. M. C. Stern, General Systems Company, Dayton, O., read a paper on "Train Dispatching by Modern Methods." (This paper appears in this issue on page 684.)

The association then adjourned for lunch and to inspect an exhibit of the Telegraph Signal Company, Rochester, N. Y. This demonstration of an entirely new method for controlling train movements and signals was in charge of Chauncy P. Button.

This very ingenious mechanism for attachment to telephone or telegraph systems, when installed at each station, automatically closes the circuit in from 15 to 20 seconds after a telegraph operator has allowed his key to remain open; it enables the dispatcher to quickly clear the wire of a "ground" at any station when an operator along the line has carelessly failed to remove the ground plug from switchboard; it enables the dispatcher to sound an alarm bell at any office or in the living apartments of any operator along the line and it also enables him to throw any semaphore signal on his district from a position of clear to danger in a period of from 25 seconds to two minutes, the operation for each station taking two seconds longer than the one preceding it. When the dispatcher has thrown the semaphore from clear to danger, there is automatically repeated to the dispatcher the number of signal that has been thus controlled.

If the dispatcher is in doubt as to whether an operator has thrown his semaphore signal to danger, he can quickly ascertain in less than two minutes by operating the device. He will receive an answer from that particular station, the same as though he had operated the semaphore signal himself. Then if the operator has failed to throw the signal the dispatcher, of course, by using the device, will throw the signal to danger.

Another marked feature is that by using this device, bridging the keys and also bridging the ground wires, it absolutely makes it impossible for an operator, who is so inclined, to interfere with the calling of an operator by an alarm bell or in placing a signal at danger, at any station, as the only method of interruption would be by cutting the wire.

This device works as successfully on telephone as telegraph lines, and when applied to a telephone circuit, permits a train dispatcher to throw any semaphore signal on his dispatching district to a stop position in a few seconds' time, the first signal operating in five seconds, the second in seven, and so on. The device was invented by S. R. Wright.

The first paper of the afternoon session was read by S. R. Dunbar, purchasing agent Indiana Union Traction Company, Anderson, Ind., and will be found in this issue on page 682.

There followed a general discussion on storekeeping with special regard to the handling of "scrap" accounts and maintaining the stores within predetermined maximum and minimum limits.

W. H. Evans, chairman of the "Standardization Committee," read his report as follows:

Report of Standardization Committee.

Your committee appointed to investigate the subject and recommend standards for adoption of this association, as they apply to traction railroads, held meetings at Indianapolis on April 25, 26 and 27, and investigated the subject of standards, principally on the line of the recommendations which were made by our association in convention assembled at Ft. Wayne on September 27, 1906, and with particular reference to the following subjects: Brakeshoes, axles, journals and journal boxes, tread and flange of wheels and rails for street and interurban railroads.

After carefully considering the various subjects, your committee would deem it advisable to make a partial report at this time, in order that this can come before the association for consideration at this meeting.

In the discussion of the advisability of standards it was evident that it would not be possible to arrive at any happy medium between the various types and classes of material now in use by the different traction companies serving the purpose for which we desire to adopt standards, but rather, it

would be necessary to arbitrarily select a standard and determine the dimensions which we consider advisable for these different parts. Any slight variation in the dimensions would necessarily interfere with the interchangeability of the parts and prevent, to a large extent, the object to be accomplished by standardization, that is, the selection of material and parts which would be of the same pattern and dimensions and common to the different roads forming this association.

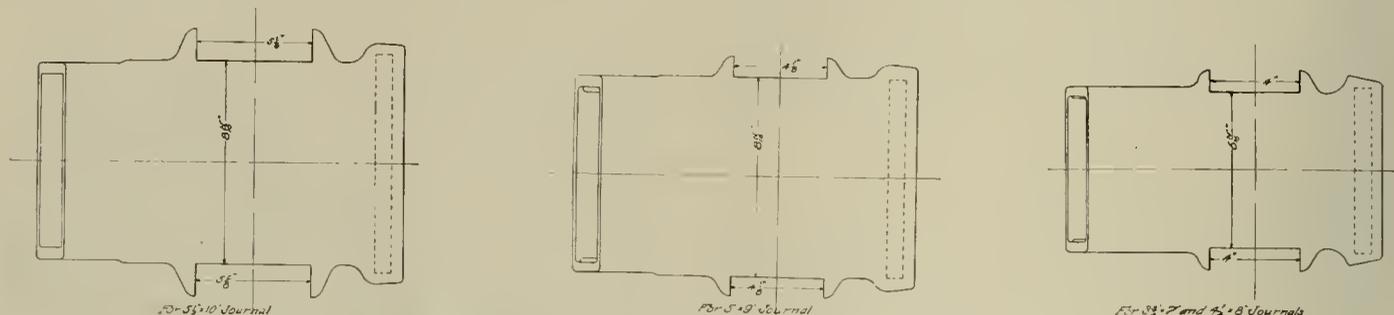
Brakeshoes.

It was decided to recommend the use of a brake head and shoe similar to the one which is now standard on the

capacity motors reducing the variety of axles to four sizes, as indicated by the axle journals, $3\frac{3}{4}$ by 7, $4\frac{1}{4}$ by 8, 5 by 9 and $5\frac{1}{2}$ by 10.

The various dimensions as given on these axles were the subject of considerable discussion by your committee, and while these dimensions very nearly approach those of axles already in service on the various types of motor trucks, it is the opinion of your committee that these dimensions can be faithfully followed to advantage in remodeling or rebuilding trucks already in service and to cover all future orders for equipment.

We would particularly recommend the advisability of re-



Standardization Committee Report—Controlling Dimensions for Pedestals and Pedestal Jaws.

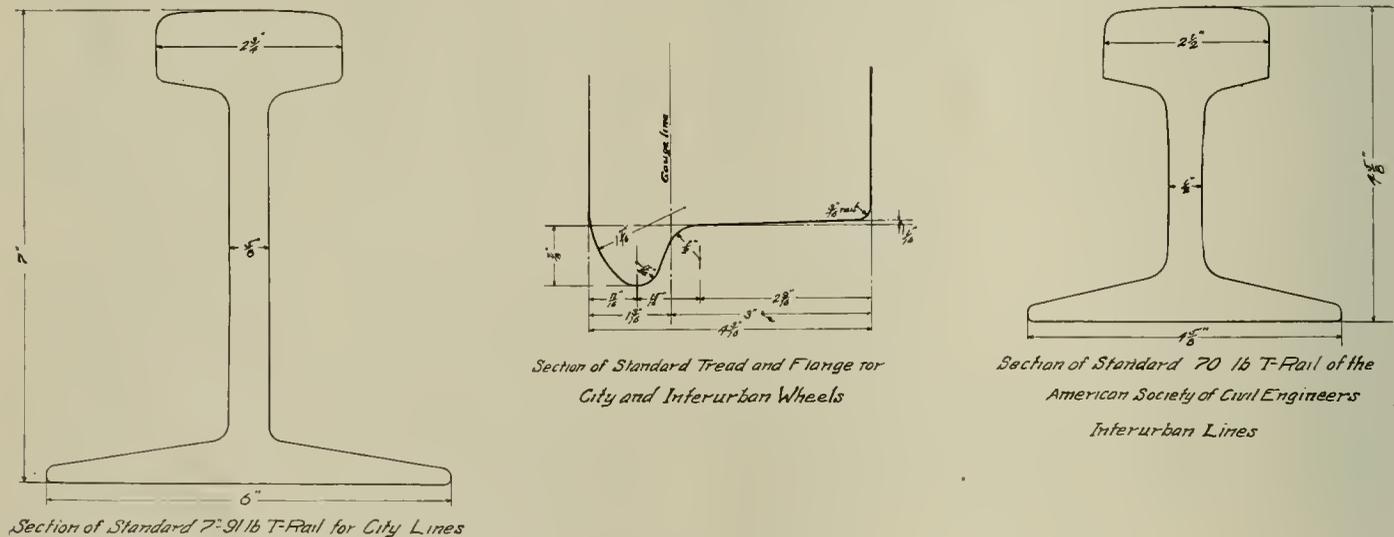
steam railroads, but adapted to a wheel tread three inches wide and consequently the shoe will be $2\frac{3}{4}$ inches wide, as shown in the attached drawings. (See illustrations.) Your committee is decidedly in favor of the shoe without the flange where it is possible to use these shoes with trucks which permit the use of brakebeams, since, in our opinion, much greater economy can be effected with the use of this type of shoe than with the flange shoe, and it is necessary to scrap a considerably smaller portion of the shoe. This shoe can also be reversed on the same wheel and requires but one pattern for all types of trucks, and can also be used, should occasion require, on wheels with the steam railroad standard width of tread.

However, we consider it advisable to include in our

recommending the journals to these standards, and also consider it very desirable to inaugurate a standard for gear fits and also for motor axle bearings, and while it may be necessary to vary from the dimensions, as recommended, for some particular style of motors or trucks, if these particular dimensions referred to above are adhered to, a decided benefit will be obtained.

Journal Boxes.

In connection with the axles already recommended we recommend the adoption of journal boxes which conform in detail to the dimensions commonly used with axles with journals of the dimensions as recommended and which have become standard on the various equipments on the steam roads.



Standardization Committee Report—Recommended Wheel Tread and Flange and Standard Rails for Street and Interurban Use.

recommendations a flange shoe which fits the same brakehead and can be used where desired in place of the shoe above recommended.

Your committee makes no recommendations as to the attachment of brakehead to the brakebeam, as this portion of the head will necessarily take the form of the various types of beams to which it is to be attached.

We would, however, recommend that with 3-inch tread wheels the center-to-center of brakeheads on the same beam shall measure $59\frac{1}{4}$ inches.

The attached drawings, covering the brakeheads and brakeshoes, are respectfully submitted. (See illustrations.)

Axles, Journals and Journal Boxes.

We would respectfully submit the attached drawings, covering axles for the various weight cars and different

The dimensions of these various parts of journal boxes, journal bearings and bearing keys are generally familiar, and your committee has not considered it advisable at this time to prepare detail drawings covering the dimensions of these parts. However, we desire to call particular attention to the dimensions of the boxes where they fit the pedestal jaws, as it is principally in this particular that the motor journal box differs from that commonly used in other trucks. We, therefore, submit the drawings attached, showing the dimensions where the journal boxes for the different axles fit the pedestal jaws. It will be noted that the dimensions of the boxes at the pedestal jaws are the same for the journal, $3\frac{3}{4}$ by 7 inches, as for the $4\frac{1}{4}$ by 8 inches, as it is found that this can very readily be accomplished, and it would, no doubt, be an advantage, as it frequently occurs that it is desirable to put in a $4\frac{1}{4}$ by 8 inch axle in place of one $3\frac{3}{4}$ by 7. These dimen-

sions for the 5 by 9 and 5½ by 10 inch journal boxes are what have usually been the practice on trucks where these axles have already been used.

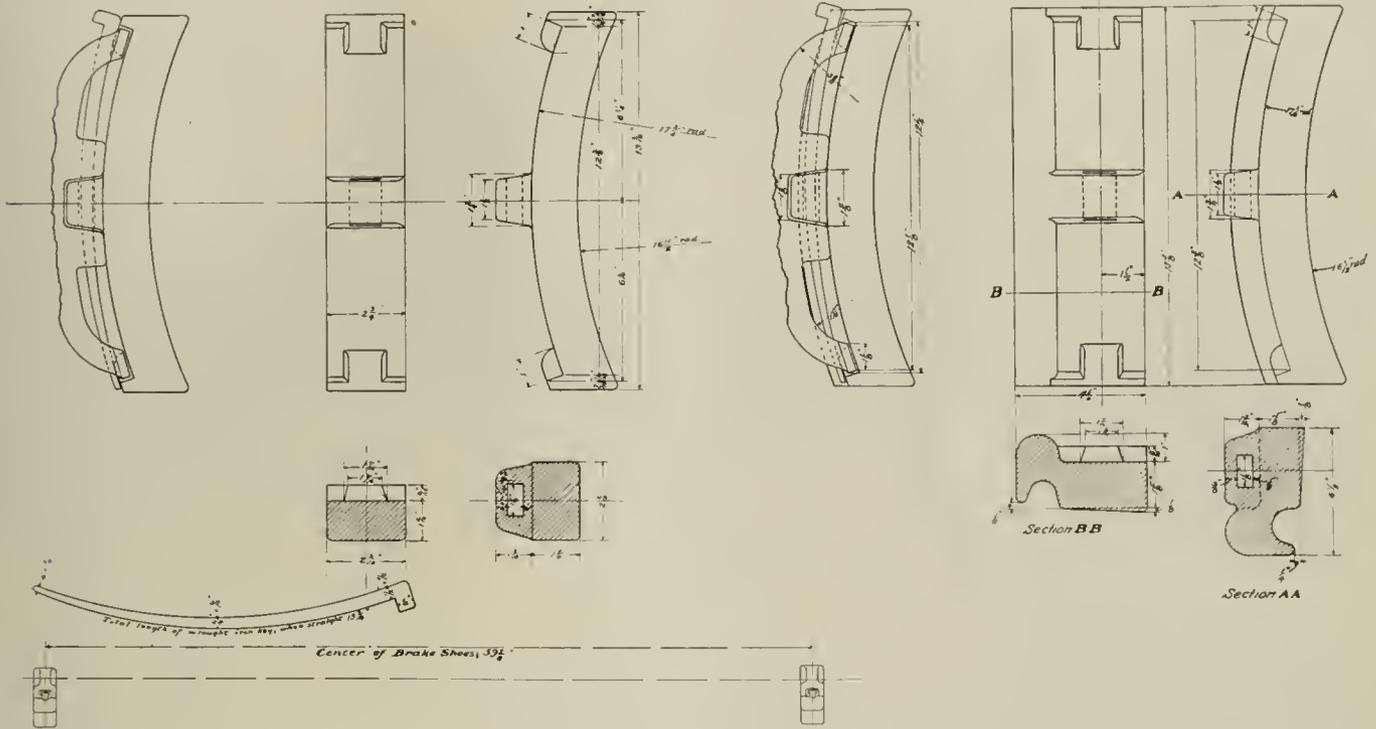
Tread and Flange of Wheels.

We would respectfully submit herewith a drawing of the tread and flange of wheels of dimensions which conform to

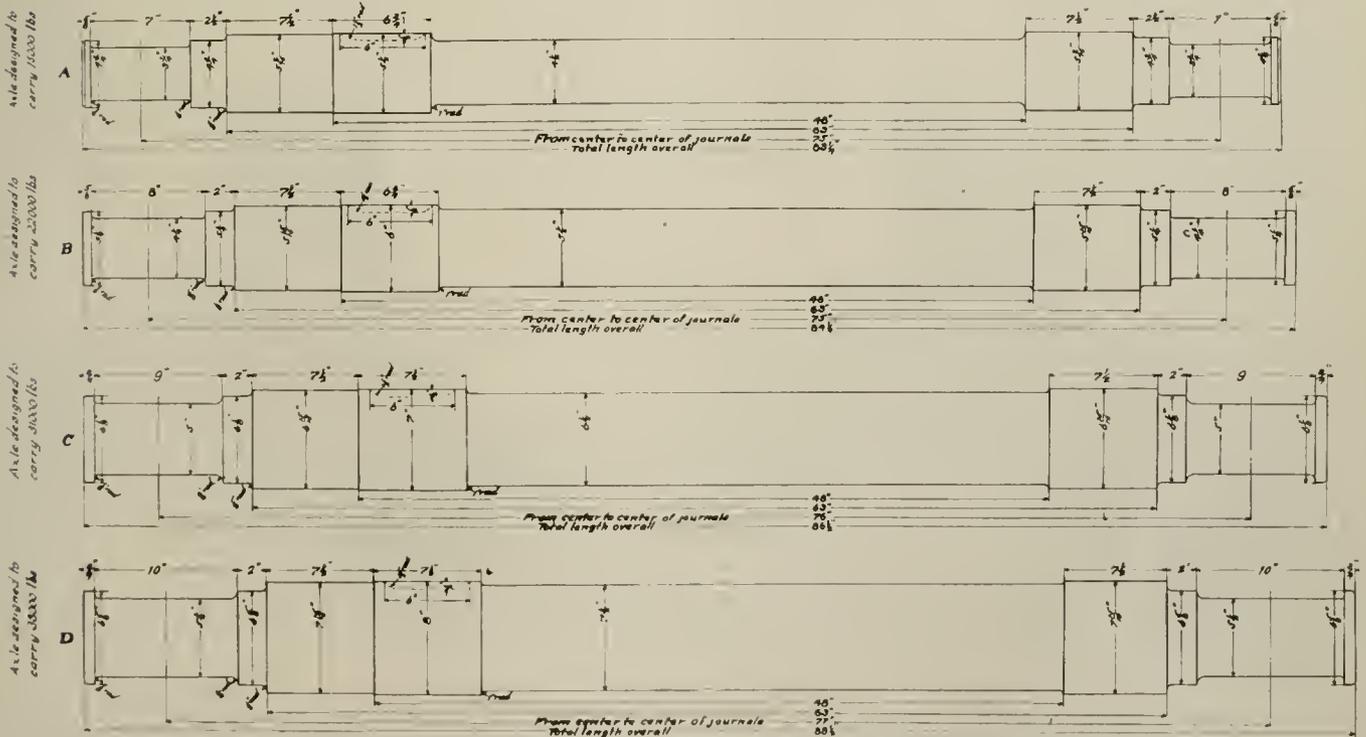
Rails for Street and Interurban Railways.

We would recommend the adoption as standard of what is known as the T-section rail for both city and interurban work.

For city tracks we would recommend what is known as the 7-inch T-rail section, 91 pounds to the yard, as shown in



Standardization Committee Report—Recommended Brakeshoes, Key and Center-to-Center Dimensions.



Standardization Committee Report—Axles Recommended for Various Loadings.

recommendations made at Ft. Wayne on September 27, 1906. In the opinion of the committee this tread and flange can be used equally well on city and interurban tracks, and was selected after a careful investigation of the types of wheels used by many of the largest traction companies in the country.

the attached drawings. This section of rail and others very similar to it have been used successfully on many of the large systems in the country, and in our opinion can well be adopted as standard.

For interurban tracks we would recommend the Ameri-

can Society of Civil Engineers' standard section, 70 pounds to the yard, as shown in the attached drawing. This rail is commonly used on interurban lines in the territory covered by our association, and so far as we have any information it has given very good satisfaction and appears to be of sufficient weight to amply take care of the interurban traction car requirements.

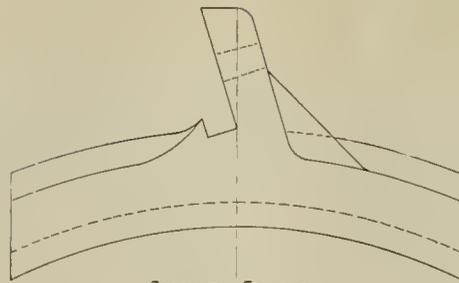
Respectfully submitted: W. H. Evans (chairman), R. C. Taylor, Fred Heckler, M. E. Baxter, W. A. Gibbs.

In introducing the report Mr. Evans explained that several subcommittees with chairmen had been appointed to handle the various phases of the work, as follows: Standardization of height of drawbar and coupler, R. C. Taylor, superintendent of motive power Indiana Union Traction Company; standardization of trolley base, wheel and parts, M. E. Baxter, electrical engineer and master mechanic Western Ohio Railway Company; standardization of classification lights and signals, W. A. Gibbs, general manager Indiana Columbus & Eastern Traction Company; standardization of foundation brake rigging and parts, Fred Heckler, superintendent of motive power and cars Lake Shore Electric Railway Company; standardization of electrical equipment, R. C. Taylor, superintendent of motive power Indiana Union Traction Company.

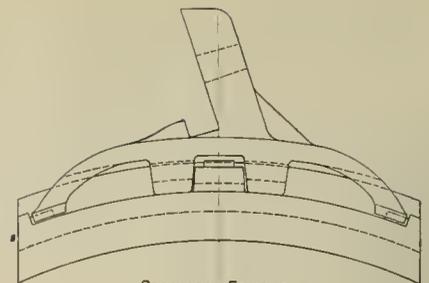
It was decided not to adopt at this meeting the report of the "Standardization Committee," but to distribute copies in printed form and thoroughly discuss the subject at the next meeting.

Messrs. McAdam and Woods of the Indiana railroad commission spoke regarding the relations between the state and the interurban railways. It was cited that whenever the freight earnings of a road become more than 33 per cent of that road's total earnings, then the board of railroad commissioners has jurisdiction over its operations. This commission has ready for immediate distribution on request a late and accurate map of the railroads and interurban lines in Indiana.

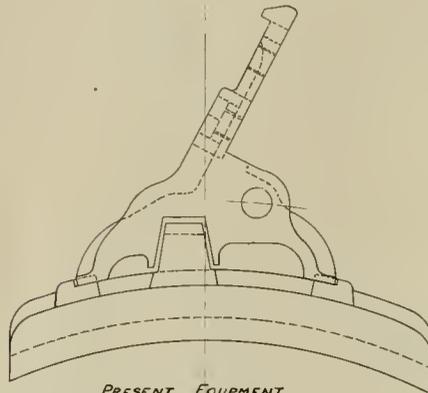
On account of the lateness of the hour it was decided to postpone hearing the report of the committee on "Express Contracts" until the next meeting of the association, after the summer recess, at Columbus in September.



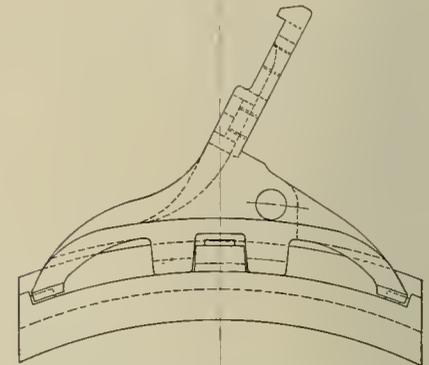
PRESENT EQUIPMENT
PECKHAM TRUCK



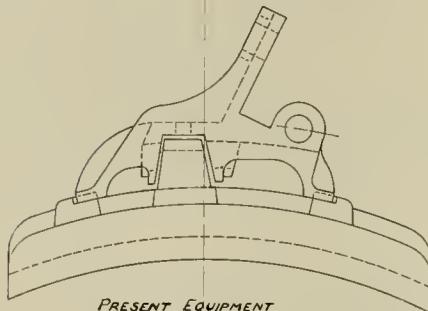
PROPOSED EQUIPMENT
PECKHAM TRUCK



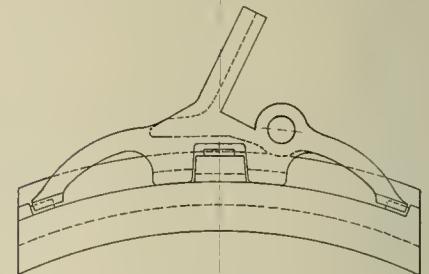
PRESENT EQUIPMENT
BRILL TRUCK



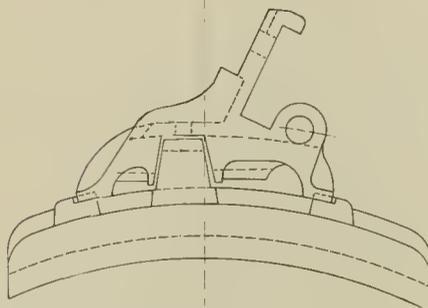
PROPOSED EQUIPMENT
BRILL TRUCK



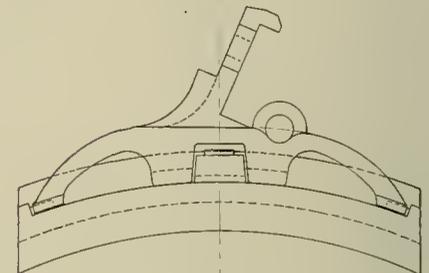
PRESENT EQUIPMENT
BRILL 27G TRUCK



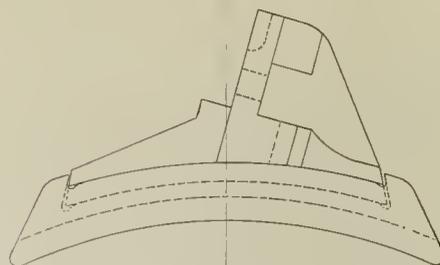
PROPOSED EQUIPMENT
BRILL 27G TRUCK



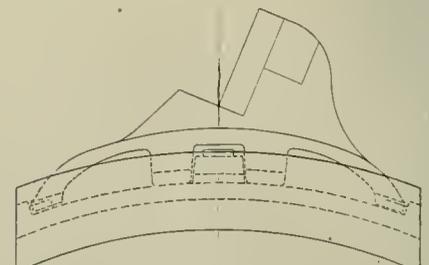
PRESENT EQUIPMENT
BRILL 27-F-1 TRUCK



PROPOSED EQUIPMENT
BRILL 27-F-1 TRUCK



PRESENT EQUIPMENT
DUPONT TRUCK

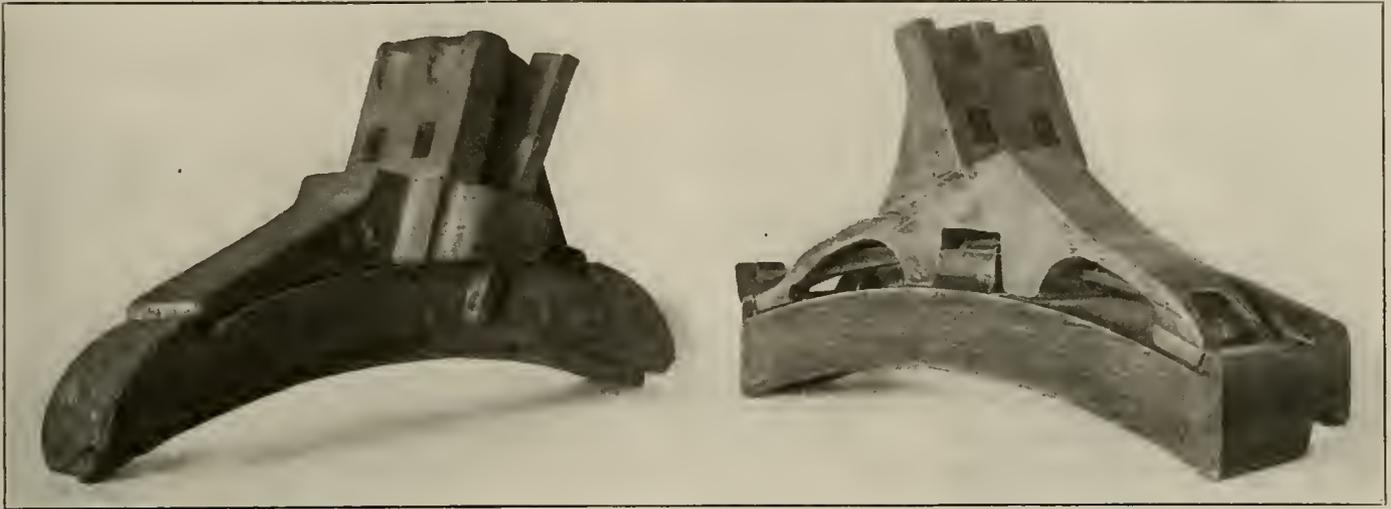


PROPOSED EQUIPMENT
DUPONT TRUCK

STANDARDIZING BRAKESHOES.

The report of the standardization committee of the Central Electric Railway Association, which was presented before the meeting at Indianapolis on May 23, recommended the adoption of a standard brake shoe for all equipments. It was

Traction & Terminal Company, has considered for the use of this company's equipment, new attachment details for the various types of shoes now used in Indianapolis. Reference to the accompanying illustrations will aid in the explanation of how it has been found feasible to adopt a standard shoe, thus dispensing with 10 different patterns for brakeheads and



Standardizing Brakeshoes—Present Shoe and Head at the Left, with Flanged Shoe and Attachment Conforming to Recommended Practice at the Right.

proposed to use a brakehead and shoe similar to those now standard for steam railroads. As the wheel tread also recommended was 3 inches wide, the shoe would be designed 2 3/4 inches wide and in detail, as shown in the illustrations accompanying the report presented elsewhere in this issue. While the committee recommended the use of a shoe without flange it also included in its report a recommended design

replacing these by one which would be designed to hold the recommended standard shoe. It also should be noted that this shoe is interchangeable with the type adopted by the Master Car Builders' Association and now universally used on steam railway equipments, the attachment features of these being the same. The illustration presented on the opposite page, and which was reproduced from a line draw-



Standardizing Brakeshoes—Present Practice Shown at the Right, with Flanged Shoe and Attachment Conforming to Recommendation at the Left.

of shoe with flange for use on trucks without brakebeams. There was no recommendation made as to the attachment of the brakehead to the brakbeam, since, necessarily, this portion of the head must take the form of the various types of beams which will support it. The committee, however, did recommend that with the 3-inch tread wheels the center-to-center distance between brakeheads on the same beam should measure 59 1/4 inches.

W. H. Evans, master mechanic of the Indianapolis

ing, shows 10 combinations of brakeshoes and heads. The five combinations on the left-hand side of the illustration are brakeheads with shoes, each of which requires both right and left handed patterns, and none of which is interchangeable with the others. It also should be noted that none of the shoes on the left-hand side of the illustration is reversible.

The five combinations shown on the right-hand side of the illustration include various brakeheads, each carrying a shoe of the recommended standard dimensions. Thus at-

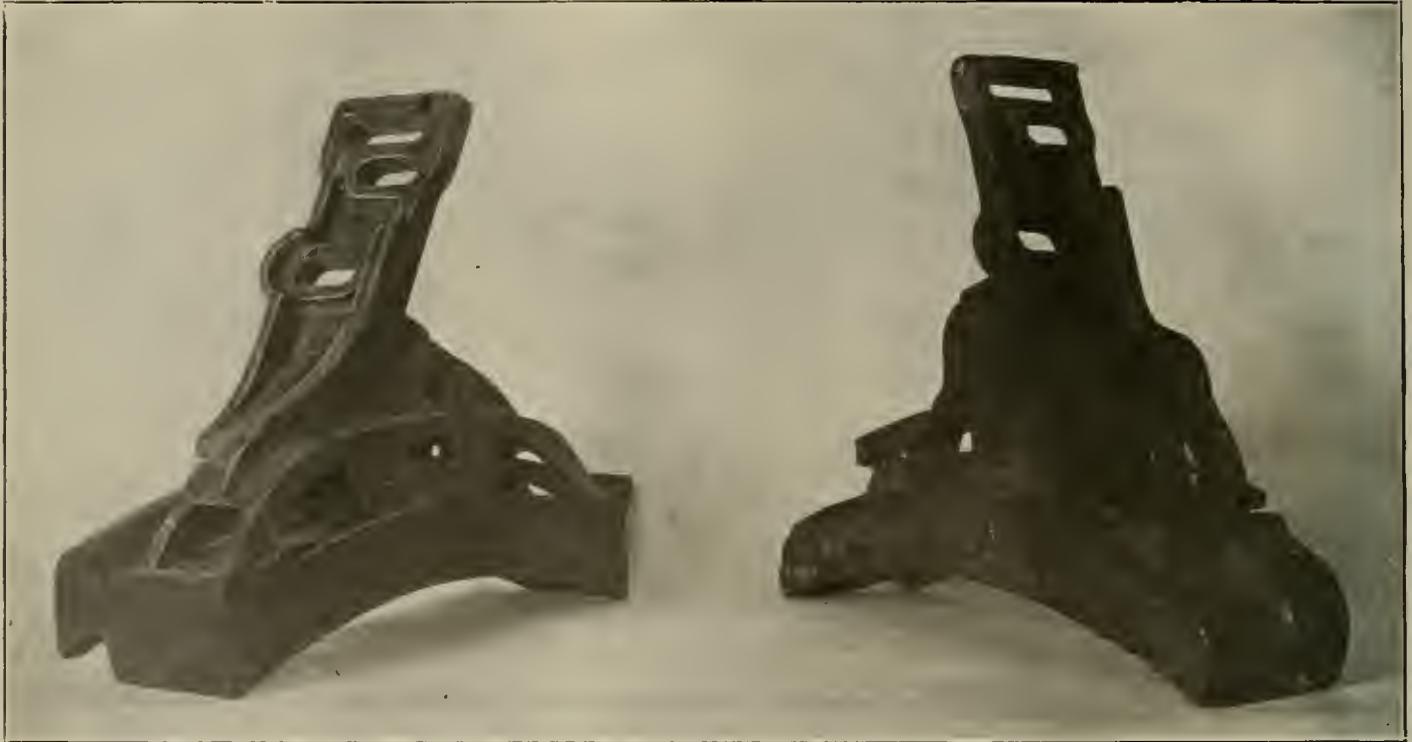
tached these brakeshoes are both reversible and interchangeable. The various heads are designed so that when attaching no changes need be made in the present beam arrangement and yet very desirable features of interchangeability and reversibility are provided.

It is well known that the present design of shoe, such as used on many interurban roads, can only be worn to about half its original weight, so that 50 per cent of the metal purchased must be sold as scrap. This undesirable feature has been well taken care of in the recommended standard shoe, since it so closely approaches the steam railroad practice

MODERN TRAIN DISPATCHING.*

BY J. K. GRAY, TRAINMASTER WESTERN OHIO RAILWAY COMPANY,
LIMA, O.

Not until recently have the managers of electric railways given very much attention to the most important part of train operation, the dispatching of trains. They have, however, lately come to realize that it is just as important to safely dispatch electric trains as steam trains. Both should be operated as nearly in the same manner as conditions will permit. There are still some electric roads that operate without a train dispatcher, but use the barn foreman or some centrally



Standardizing Brakeshoes—Present Shoe and Head Shown at the Right. Flanged Shoe at the Left Conforming to Recommended Practice.

and permits a minimum amount of scrap. Such a shoe weighing 20 pounds when new should wear to about four or five pounds for scrap.

Much credit is due to those who have taken the initiative and thus far carried on the details tending toward a standardization of electric railway rolling stock.

Steel Cars for Cement.

The United States Steel Corporation is ordering 200 all-steel box cars for its cement business in the Pittsburg and Chicago districts. The corporation made 2,076,000 barrels of its Universal portland cement in 1906, against 1,735,343 barrels in 1905. These all-steel box cars will have sides of steel plates, $\frac{1}{8}$ inch thick, which will be amply reinforced. The total weight will, it is expected, run about 3,000 pounds less than the weight of comparable wooden box cars. There is not the advantage there formerly was in owning private cars, as concessions allowed by the railroads are very small. The Steel corporation in this move is actuated chiefly by its desire to foster this new branch of the steel car business by setting a good example. It will be recalled that the Carnegie Steel Company was the first to use all-steel hopper cars, its example being followed by the regular railroads. At one time the company contemplated, so it was understood, the erection of a complete plant for the manufacture of steel cars, but desisted in connection with the famous contract for plates with the Pressed Steel Car Company, by which the latter was given plates on a sliding scale, based on the ascertained average selling price of bessemer pig iron.—Industrial World.

located, trusted employe, who does this as a kind of a side line along with his regular duties. This system seems to work very well where trains run slowly. When a train arrives at a given meeting point, in most cases the motorman calls up the barn or shops and says to the acting dispatcher, "This is Brown at Siding No. 4; Jones is not in sight"; the acting dispatcher will say, "Jones left Yorkville 15 minutes late; stay there until he comes," which they do, making a collision impossible; or if the telephone is not in working order the crew just sits down and waits for the opposing train.

The modern dispatching system is handled by a trustworthy man, preferably taken from the train service, where he has been for a period of time long enough to acquaint himself with every inch of the property, and to be thoroughly competent to hold a position where safety to both passengers and property must be assured regardless of cost and the speedy operation of trains, at the same time giving all possible dispatch with safety.

The dispatcher's office should be in a large, well ventilated room with plenty of light, and the door locked to all, for the presence of any person in the dispatcher's office is liable to distract his attention and cause him to make a mistake.

His office should be centrally located as nearly as possible so he can communicate with the trainmen distinctly, directing the movement of trains in addition to the movements provided for in the rules and timecard.

When the printed timetables, showing the meeting and passing points, and the time of all scheduled trains, and the rules directing how these trains are to proceed with relations to each other, are studied by all concerned, thoroughly understood by all, and faithfully observed, collisions will not occur.

There should be a good desk set where the telephone line is on the same poles on which the high-tension transmission line is carried, for it has happened that a live high-tension

*Read before the Central Electric Railway Association, Indianapolis, on May 23.

wire has fallen on the telephone line and had no bad effect whatever on a desk set; where the telephone line is on a separate line of poles, a cordless telephone board, equipped with 2-way cams and numbered drops, will give excellent service, but a live high-voltage wire falling on a line connected with this box will render the same unfit for service at once.

A regular train sheet must be kept, and all train movements recorded, just as soon as any train reports or is reported, and when one dispatcher relieves another all orders

THE WESTERN OHIO RAILWAY CO.—TRAIN ORDER.

Order No.

To Motorman and Conductor. Date.....190...

No..... Motor.....at Siding.....

1 Meet No.....Motor.....at Siding.....

2 Meet No.....Motor.....at Siding.....

3 Meet No.....Motor.....at Siding.....

4

5 Report at Siding.....

6 Proceed to Siding.....against No.....and report.

7 No.....of this date is annulled between.....and.....

8 No.....will run ahead of No.....to.....

9 Run as.....Section No.....from.....to.....

10 Will run Extra from.....to.....and return to.....

Complete at.....M.....Dispatcher.

Form of Train Order, Western Ohio Railway.

must be written on the prescribed form and placed in a conspicuous place so there will be no misunderstanding.

There should be three dispatchers daily, each working an 8-hour trick, to produce good results.

In order to obtain good results from trainmen they are first required to pass the examinations specified by the company, which include eye, ear and physical, stripped; if they qualify they are given a rule book and timecard with instruc-

double check. The train order is then placed in a clip fastened on the window sash directly in front of the motorman; the conductor places his copy in a clip in the rear end provided for him; thus both orders are in plain sight until fulfilled, superseded or annulled. We prefer the motorman, but permit either the motorman or conductor to receive orders from the dispatcher, for the purpose of causing the least possible delay; our telephone booths are located at the switchpoint of sidings so that when the conductor opens the switch to allow his train to take siding he is right at the telephone booth, while the motorman is on the car probably 100 feet from the booth; thus by having the conductor report and receive the train order we save a delay of possibly two or three minutes. In towns or cities the motorman invariably takes the orders, as the conductor is busy at the rear platform while at stations.

The telephone is used altogether for train dispatching on our road and excellent service is obtained; 80 miles consists of two No. 9 galvanized iron wires carried on cross-arms in the usual manner, on the same poles underneath the high-tension transmission lines and transposed every 10 poles to prevent interference from parallel power and feeder lines; 32 miles consists of two No. 12 copper lines, constructed the same as the iron line with the exception of the transposing, which is rolling every 10 poles.

On this line all the dispatching and commercial conversations are carried, keeping the line very busy at times; but if proper attention is given to the telephones and telephone line, good results will be obtained. There are 28 telephones on the line at all times and 38 telephones located in telephone booths that have cut-out switches. By connections, using just the ordinary 1-way switch, the dispatcher can communicate with Dayton, a distance of 60 miles; also with Toledo city limits, a distance of 94 miles; also with New Haven, Ind., a distance of 72 miles; also with Springfield, a distance of 70 miles.

This road is divided into three divisions, viz., Findlay-



Train Dispatching, Western Ohio Railway.—Telephone Booth at Siding.



Train Dispatching, Western Ohio Railway—Dispatcher's Office.

tions to study carefully; the student is then placed on a train with a competent man who teaches him everything possible pertaining to his division. After the new recruit has learned a division, he is called to the office and examined thoroughly, especially on train orders; after he has learned all the divisions he is again subjected to an examination. If he understands the rules and train orders thoroughly he is then permitted to operate a train with an old trainman, either motorman or conductor, as the case may be.

To obtain orders from the dispatcher, on the road I represent, the motorman or the conductor, as the case may be, steps into a telephone booth 3 by 3 by 8 feet with a window in each side 18 by 24 inches, giving one short ring, which calls the dispatcher, giving his train number and siding number to the dispatcher, who gives such orders as are necessary; the conductor or motorman, as the case may be, repeats the order as it is given and writes the same on the prescribed form, making two copies by the use of carbon paper. He then repeats the order back to the dispatcher, who checks it from the original order just given and if the same is correct the dispatcher will complete the same by giving the time and his initials. The motorman retains one order and gives the other to the conductor, who reads the order over to the motorman before the train is allowed to proceed, thus causing a

Celina division, a distance of 68 miles, operating 78 passenger trains and 8 freight trains; the Wapak-Piqua division, a distance of 32 miles, operating 50 passenger trains and 4 freight trains; and the St. Marys-Minster division, a distance of 12 miles, operating 24 passenger trains and 4 freight trains. Besides the above trains we operate a line car and work train daily except Sunday.

A novel feature in tunnel design devised by Charles M. Jacobs, the chief engineer of the Pennsylvania Railroad tunnels under the Hudson river, is found in the screw piles, which will be placed at intervals of 15 feet throughout the length of the tunnels. While the silt forming the bed of the river is sufficiently tenacious to hold the tunnels in perfect alignment during construction, it was not considered firm enough to do so when the tunnels are in use. To forestall this possible danger screw piles will be sunk to a solid foundation, and upon them the tunnel proper will rest. The piles will be 27 inches outside diameter, and the shell will be 1 1/4 inches thick. The sections will be 7 feet in length, and will be bolted together through internal flanges. The lowest section will be cast with one turn of a screw 4 feet 8 inches in diameter.—Scientific American.

THE ISSUING OF SUPPLIES—HOW TO PREVENT LEAKS.*

BY S. R. DUNBAR, PURCHASING AGENT INDIANA UNION TRACTION COMPANY, ANDERSON, IND.

A railroad, more than any other concern, it seems to me, must trust a great deal of valuable property to the hands of its employees. It places as many safeguards as possible about the handling of its cash and its cars, but is everything done which could be done to insure a proper use, as well as a proper issuing, of its material?

The cash is the heaviest problem, of course. What we do not get might pay for an accident or two, with a little material thrown in, but what fails to reach the treasury has to accomplish its disappearance before the eyes of at least a few people. When a car is put on the road with its load of humanity or freight, a great deal of property and life is entrusted to the crew and the dispatcher. They cannot disappear with it, but they can cause great loss. Unlike either of the foregoing, material can disappear and no one know where.

Preventing Leaks After Issuance.

The possibilities of loss do not stop with the issue of supplies from the storeroom, by any means, and if the title of this paper does not limit me to consideration of leaks before and at issuance I might suggest that one of the biggest problems is the care of material, tools and supplies after they leave the storeroom. The only ways to prevent leaks and waste after supplies are issued require continual vigilance on the part of the heads of departments and a policy of holding each employe strictly and individually responsible for all company property which may come into his hands.

Nowadays the concern which does not know just what its product should and does cost will not live to bother its competitors long. In order that the cost may be known, someone must know just how much material and time are necessary to accomplish the work in hand. We know that a railroad, with many of its workers away from any possibility of strict supervision, is up against difficulties which are hard—some of them impossible—to overcome, but a system of reports can be devised which will prevent excessive waste or loss.

Railroads generally supply most of the inhabitants in their territory with a complete set of tools before construction is over, but afterward I believe that absolutely no tool should be issued until the old one has been turned in, or additional tools are shown to be necessary.

As has been implied, there are, in my opinion, fewer difficulties in the way of properly issuing supplies than there are in the way of a proper use and care of them. There is an impersonality about a railroad which has its effect upon all who are employed by it; what loyalty there is more often is felt toward the head of a department, rather than toward the company itself. As the storeroom is concerned with all the departments, this "impersonality" has less effect, and, partly for that reason, the storeroom can be dealt with more strictly and exactly. The proper use and care of supplies will, I believe, always be more or less of an unsolved problem, but to my mind that is not the case with a storeroom. Leaks in the issuing of supplies can be prevented. The problem is solved by merely having a good system and sticking to that system. It is possible to do both, but, necessarily, as in all kinds of work, good tools (in this case a good system) should be in good hands. Good men are needed in the storeroom just as much as on any other part of the road. In fact, I would rather have enough good—that is, accurate and careful—men and a poor system, than cheap help and a good system.

The Storeroom.

The storeroom serves two purposes, that is, the holding of material in stock for use as needed and serving as a suspense account, so that charges are not made to the operating and other accounts until the material is actually used. Both are important, equally so as far as the storekeeper is concerned, although the auditor and the master mechanic may not agree as to which is the more important. I shall probably be unable to keep the stock and the accounting entirely separate, because what affects the one affects the other, but that there are two objects to be served should, nevertheless, be borne in mind. And as the subject is partly "How to Prevent Leaks," I shall not try to describe the leaks, but possibilities of one or more leaks will be found lurking somewhere near each suggestion that follows.

The starting points—the very foundation of our system, and without which there can be no system at all, but every-

thing left wide open for all kinds of leaks—should be a locked storeroom with big "Keep Out" signs over the inside gates, and well understood rules to the effect that nothing can be obtained from the storeroom without proper written authorization. The material and supplies in the storeroom represent cash to the company, are handled as cash in the accounting, and should be safeguarded the same as cash.

Requisitions.

To go with a locked storeroom must be rules that only someone of the storeroom force can give or take out material. The storekeeper cannot be held responsible unless he can prevent supplies from being stolen, or from being improperly issued or taken out.

The written authorization to obtain supplies should be on a specified form, generally known as a requisition, numbered if possible. As the requisition serves as the basis for the charges to the different accounts, as well as the authority on which the supplies are issued, the auditor should be at least concerned in getting up the form and in the instructions to be given in regard to its use.

The requisition is the cornerstone of any storeroom system. After the material has been issued on it, it takes the place of the material, so far as the accounts go, and must be treated as carefully as a voucher for a cash payment would be. If lost, or if misappropriated by the guardian of some source of expense because his accounts have been running high, no charge can be properly made, and the storeroom will be "short." It is important, therefore, that requisitions not only

Indiana Union Traction Company.	
PURCHASING DEPARTMENT.	
ORIGINAL.	Anderson, Ind., _____
Ship items as shown, by _____ f. o. b. _____	
upon conditions named below, to _____	
Mail invoice in duplicate for each shipment to General Office, Anderson, Ind. Render Monthly Statement of Account promptly on first of each month. Positively no allowance for Boxing or Cartage.	
NOTE: Shipment on this order will be considered as an acceptance thereof upon the conditions stated herein.	
QUANTITY	ITEMS
<p>Put these Numbers on Invoices, Shipping Memo's and Packages.</p> <p>Order A. 5350</p>	
<p>Prepay all Freight Charges.</p> <p>PLEASE ACKNOWLEDGE ORDER BY RETURN MAIL.</p> <p>If shipment cannot be made promptly notify us at once. Do not make partial shipments of above unless instructed by us. We reserve the right to cancel this order if not filled within a reasonable time.</p> <p>This order must not be filled at higher prices than last quoted or charged without advice.</p> <p>We will not accept this material if not exactly as specified.</p>	
INDIANA UNION TRACTION COMPANY.	
BY _____ PURCHASE AGENT	

Triplicate Order Blank (Original 8 by 9 Inches).

be kept in a safe place, protected from fire if possible, until charges and stock records have been made from them, but that no one outside the storekeeper and his stock or charge clerks should have access to them. One lost, mislaid or misappropriated requisition does not mean much, perhaps, but a few of them for big charges would make a large shortage at the next inventory, which would have to be charged against profit and loss.

The storekeeper must of course issue material whenever a properly signed requisition is presented. He cannot have any discretion in the matter except as between proper and improper requisitions. He should, therefore, receive definite instructions as to what and whose requisitions to honor at the same time that heads of departments are instructed as to how requisitions should be made and signed. There are many possibilities for leaks, or an improper issuing of material, if requisitions are allowed to be made without being approved, or at least being seen, by the heads of the different departments.

The requisition should contain columns in which to enter the prices of the articles named and the accounts to which charges are to be made, as well as space for date, quantity of the article on hand, quantity required, quantity delivered, description and purpose for which intended.

A good system does not stop with the locked storeroom and the requisition. The more complete the system the fewer chances there are for leaks. The requirements of the auditing department and the necessities which exist for keeping an ample stock of all supplies on hand at all times, as well as the amount of money the management is willing to allow for

*Paper read before the Central Electric Railway Association, Indianapolis, Ind., on May 23, 1907.

running the storeroom, determine the details of the system to be maintained. One of the first details to be affected by the considerations referred to is the stock record. This should be kept, preferably, on cards, arranged in the manner usual to a card index, or in loose-leaf ledgers, the sheets being large enough and arranged to accommodate several items of the same class.

On the stock record should be shown, by dates and in as much detail as desired, the quantities issued and received, as they are issued and received, and deductions and additions made from day to day, so that the amount of a given article on hand may be ascertained at a glance. I shall refer to this feature again.

Leaks from an incomplete or ill-kept stock record may not show up very big until an inventory is taken, or there is a fire, when someone is likely to inquire, "What's the matter with the storeroom?" In case of fire a complete stock record, if intact from having been properly protected, would enable the company to show clearly to the insurance adjusters just what its loss had been. That is, it could show just what had been in the storeroom when the fire occurred, and, after deducting the value of the mess that is left, the difference, or the loss, could not be questioned. It would be difficult to say what the saving might be in such a case.

An incomplete stock record, as well as incompetent men on the floor, means leaks in other directions, that is, outside of the storeroom. I refer to "low stock." One side of the leaks from low stock is the expense of express, telephones and telegrams, and the time of the purchasing agent consumed in getting material in a hurry; the other side is the expense, trouble and inconvenience of waiting for material, or of making something else do, or of running risks with the equipment. I venture to assert that if the condition of "low stock" could have been avoided on almost any road in Ohio or Indiana during say the past year, a good extra stock record clerk would have been a minor expense.

The expense of maintaining a storeroom is borne for the purpose of keeping material and supplies on hand at all times, and the end in view is, therefore, partially defeated if there are frequent or even infrequent cases of "low stock." So, I claim, a complete stock record is necessary, because it is unfair to presume that the floorman can always remember when to report that a certain item, out of perhaps several thousand, is running low. There may be several men waiting with requisitions to be filled, or there may be any one of several circumstances to distract his mind and cause his failure to notice that the supply of a certain article should be replenished. Then, again, he may think there is ample stock, whereas it may take weeks or even months to replenish.

Replenishing Stock.

The stock record clerk should have before him on each of his cards, or sheets, the minimum amount of stock it is safe to carry; that is, the point at which the supply should be replenished, which should be determined by the time it takes to get delivery and the relative importance of the material in question. Only in this way can items be ordered in ample time. No one's memory is trusted. In making his entries, the stock clerk can easily get into the habit of referring to his "minimum," and the importance of showing the amount on hand after each entry, in order that the minimum may be recognized when it is reached can readily be seen.

To prevent, so far as possible, any item so important as "low stock" being overlooked, a printed form called, say, "Memorandum of Stock Required," of an individual shape, should be used. In this way such items will not escape attention as they might if miscellaneous slips of paper were used. These forms should be used both by the stock clerk and by the man issuing the material. Two chances of catching low stock, therefore, are at hand; that is, from the records and from the stock itself, and it will frequently happen that the stock clerk and the floorman will make out slips on the same items at the same time.

Perpetual Inventory.

The complete stock record may be made to serve still another purpose, namely, that of the "perpetual inventory." The annual inventory, with its attendant expense and confusion, is a nightmare to all concerned. Errors will creep in during a year's transactions, so that besides the actual work of an inventory, which may have to be made by a force already overcrowded, a difference will probably be found to exist between the actual value of the stock on hand and the book value, which means affecting an adjustment unwelcome to someone or everyone.

The "perpetual inventory," as I understand the term, is a stock record so exact that it coincides strictly with the actual quantities of material on hand each day, and is, in fact, a complete inventory. The perpetual inventory is strongly advocated by a large number of accountants, and

an approach to it is in vogue in numbers of establishments. I would not recommend, however, the theoretically perfect perpetual inventory, as it is expensive, but a near approach to it is practicable, and a complete count will be necessary only once in several years. With this system frequent counts are made of the different items as new stock is ordered, and these counts compared with the records. Where a discrepancy is found to exist, an apportionment of the charge or credit can be made to the accounts affected, after possible causes for the error have been investigated. In order to help locate the errors, and serve as an additional check, some systems go so far as to provide a card, kept in a rack at each bin, on which the store man enters the quantity, date and requisition number each time material is removed. This really makes two stock records.

Where these frequent counts are made, more time is required from day to day, but leaks and errors are discovered and adjusted more readily, and the extra clerical expense is distributed over the entire year, instead of at the time of the annual inventory. Besides, possible thefts are more easily detected.

Price Records.

Intimately concerned with the stock record are the methods of checking-in material, entering bills, and otherwise handling the storeroom accounts so as to prevent leaks. In this era of advancing prices it is particularly important that the price record should be kept always up to date, whatever system, or lack of system, is pursued. This includes the prompt entering of bills as they are passed. Otherwise the charges may be distributed to the various accounts at improper prices, and the store's account be the loser or the gainer, as the case may be—an undesirable situation.

Checking Materials.

Material should be checked-in when it is received, and not after the bill comes in. This applies to all departments, as well as to the storeroom. If there is no record from which to approve bills, then they have to be approved from someone's memory, or by guess; either way furnishing chances for error. In order to approve bills properly the department for which the material is ordered, say the storeroom, should have knowledge in advance of the receipt of material, as to just what is to be expected, and from whom it is to come; and blanks should be provided for recording exactly what comes in. The most serviceable form for this purpose is a triplicate of the order placed by the purchasing department. It serves as a notice of the placing of the order, and can be arranged for recording the dates and quantities of material received on the order. If the record and the bills do not agree, there is a fair claim against or in favor of the shipper. A permanent record of material received at the storeroom each day is advisable for various reasons, which I shall not take the time to go into here.

Distribution.

A distinct phase of the issuing of supplies, and one which touches closely both parts of the title of this paper, is the distribution of supplies from headquarters to the various points on the road at which they are required. There are more opportunities for loss here, it seems to me, than in any other one direction. There are, of course, practically only two means of distribution, the regular freight and passenger cars, or the supply car. If there are any objections to the supply car, someone else can urge them probably better than I, so, as the subject is "How to Prevent Leaks," I say take the deadhead stuff off the regular service, so far as possible, and put it on a supply car, unless the freight business is very light and the road be altogether too short in mileage.

It might be shown by investigation that a supply car would not be so much of an expense as an actual saving. No matter how much care is taken, or how many rules there may be, it seems to be almost impossible to have deadhead material handled with as much attention as it should be. Supplies are lost and never found; there are unavoidable delays in delivery; the freights must take time out to make special side trips to the company's property; and, frequently, cars are so crowded that a choice has to be made as to whether to leave paid freight or deadhead stuff. One is as bad as the other, or a good deal worse, to readjust the Irishman's remark. Company shipments should be billed out the same as any other freight. This takes time on the part of the freight department force, and time is valuable there as well as at the storeroom, where the billing, tagging, boxing, etc., all have to be carefully attended to. The boxing, wrapping, etc., are necessary on account of transfers, rough handling and misappropriations. So much for a few of the objections to the regular service.

The supply car can be loaded at or in the storeroom, and much time be saved that department from that circum-

stance, as well as others. The regular trips of the car can be utilized by the mechanical, roadway and electrical departments for the delivery of all kinds of supplies and material belonging to each, and, many times, a special trip of some work car could be saved. Especially valuable would be the return trips of the supply car, bringing into headquarters shipments which now burden the freights or make necessary the use of a separate car. Valuable scrap, for instance, and from which there are many leaks, could be better taken care of and classified. Last, and most important, supplies would be promptly, properly and surely delivered.

Briefly, in closing, I would recommend for the issuing of supplies, properly and with as few leaks as possible, a locked storeroom, governed by strict rules as to the taking out of material; a well-considered system; enough good men to carry out the system completely; facilities for the men to handle their work without confusion, that is, an adequate storeroom, both as to size and arrangement; the distribution of supplies through the medium of a supply car; and the inculcation in the minds of everyone on the road of a wholesome respect for the storeroom and for company property.

TRAIN DISPATCHING BY MODERN METHODS.*

BY M. C. STERN, GENERAL MANAGER GENERAL SYSTEMS COMPANY,
DAYTON, O.

Train dispatching, I contend, by proper methods, is as important as the very rails over which your cars are run, and the more thorough that system may be, which must be freed from unnecessary red tape, the better the service, the greater the results. Since double-tracking is an expensive luxury, the dispatching of trains on single tracks should certainly be so well designed as to protect life and property, also to improve time schedule, for the greater number of trips a car can make daily, the greater the earning power it assumes.

The people are not unjust when they demand safe travel, and there is not a single railway official, to my mind, who aims to refuse that demand, for all books of rules contain severe and pointed instructions regarding the safety of passengers and the protection of property.

Still further, when we consider the fact that as carriers of passengers, the greatest of responsibility rests upon the officials, since all are desirous of reaching safely the point of destination, and consequently expect every precaution to be exercised, beyond the question of doubt. Man is not infallible, and methods should be adopted not only to improve conditions, but also to prevent errors, thus increasing the responsibility that rests upon the shoulders of those connected with the operation of trains, from the dispatcher to the crew.

Responsibility should be imposed upon all men, for the man so held will develop his mental powers to their proper capacity, thereby making him more reliable, hence more valuable; at the same time it improves him morally, it teaches him to abstain from drink, from excessive habits that would tend to weaken the mind and sight, and by their development physically betters him in power, strength and purpose.

Now what constitutes the fundamental basis of a perfect dispatching system? First, I would say responsibility, as explained; second, elimination of verbal messages; third, convenient and frequent means for receiving messages; fourth, proper erection, correct installation and maintenance of signals, telephones and records; and, fifth, judicious economy.

In train dispatching, wherever the verbal message method is in vogue, there exist these possible means of escaping responsibility, or shifting of blame. Verbal messages are entirely void of any security, are lacking in product of search. It is an easy matter to shift blame from one to another, when no evidence can be brought forward to substantiate either one way or the other. And written messages, singly or in duplicate only, are likewise failing in their respective completeness, since it surely would be an easy matter to destroy such orders, thereby darkening the search for the party responsible or the cause, and that course would be followed, I dare say, in 99 cases out of 100, should an accident occur, or there may be any possibility of a reprimand.

The triplicate secret method is a step forward and I suggest the issuance of three distinct copies on the autographic dispatching registers, which may be placed in booths, on cars, or wherever messages are received. These machines produce three full copies of each train order—one for the conductor, one for the motorman and the third to be retained in a private receptacle under lock and key for auditing and checking by the proper official of the road.

The dispatcher, having a machine at his desk, records in duplicate each message that he issues. One is discharged from the machine, the other retained in a locked receptacle. The conductor writes the order as he receives it, repeating it to obtain dispatcher's "complete," signs his name to the order, declaring thereby his full understanding thereof. A like course may be followed by the motorman reading and repeating the message, signing his name with like declaration of that of the conductor. Thus we have the signatures of the dispatcher, conductor and motorman, stamping indelibly upon their memories the responsibility that rests upon them. I want to impress upon you the fact that so much depends upon these orders that the utmost care must necessarily be taken so that they may be absolutely correct.

For obtaining orders at booths the conductor as a rule should call the dispatcher, who in turn will give such orders as are necessary, whereupon the conductor should write the same plainly, without any abbreviation (this is quite important), on the dispatching register, reading and repeating them, and possibly the motorman should also read and repeat. At stations the agent should call the dispatcher upon approach of car, to ascertain if any orders are to be given. If so, the conductor is signaled, or the order may be taken by the agent, read and repeated to the dispatcher for his O. K., signed in a space provided, given to conductor upon his reading, repeated and signed, both original and duplicate—one for himself and the other for the motorman—taking a signature from the motorman on his, the conductor's, copy.

If portable telephones are carried on cars, jack boxes are installed at proper points or turn-outs, switches, etc. In such cases the motorman usually calls the dispatcher, giving necessary information as to car number, time, etc.; while the dispatcher gives the order, both the motorman and himself write it as given over the register. The message is read and completed, then reread and repeated by the conductor.

The motorman's copy should be placed on a clip directly in front of him, serving thus as a notice and a most excellent reminder. The third or secret copy is beyond reach, but ready for momentary inspection. This operation does not occupy unnecessary time, it works with clock-like precision and the men readily become accustomed to its operation.

The triplicate form of train orders provides great security, and the retaining of the third copy, securely locked, where it cannot be tampered with, gives an additional element of precaution and tends to increase the factor of safety.

The dispatcher's office should be entirely separate from all other offices. The switchboard that I find very highly recommended is of the cordless type, since the desk is entirely clear for the dispatcher's sheets. As the telephone provides immediate and direct communication, it is far preferable to the telegraph. The lines may be single or duplicate, the latter preferable. The rules regarding the use of telephones should be clear, limiting it, on the dispatch lines, to strictly dispatching business.

The standard steam road train-sheets seem exceedingly well adapted for the interurban work. The train order form should be so arranged as to avoid unnecessary rewriting and so worded as to be clearly understood by all. Avoid all abbreviations.

It may be regarded as well, in the use of triplicate copies, to have a white sheet for the motorman, a yellow sheet for the conductor, while the record copy should be white to assure clear carbon work.

The question of booths is solved in the octagonal shape covered with corrugated iron, with a peaked roof. This booth should be securely anchored by lag bolts into posts driven into the earth. Furthermore, they should be well lighted.

Let your telephones be of the best type, fastened to the wall of the booth, while on a shelf place the dispatching register in a position to take orders with perfect ease. Let not the first cost of installation play any too important part, for once installed the best always produces results.

The reason that single lamps are preferable to electroliers for the dome of a car is that they distribute the light better and have not the disadvantage of electroliers of bringing into a small space wires of different potentials. This feature of electrolier wiring can hardly be avoided; often the highest potential light and the lowest will be in the same cluster and if anything goes wrong, the entire circuit is affected. The same potential enters and leaves single lamps and the wiring for the circuit is safer and better in every particular. Specifications frequently call for the lamps to be placed under the ventilator rails, or elsewhere in a vertical position. Before the use of anchored filaments in lamps the vertical position lengthened the life of the lamps, but as all car lamps now have anchored filaments no advantage is gained; in fact, lamps on lower ventilator rails should be placed horizontally to be out of the way of hand-rail straps and signal cords.—Brill's Magazine.

*Paper read before the Central Electric Railway Association, Indianapolis, Ind., on May 23, 1907.

CONVENTION OF THE SOUTHWESTERN ELECTRICAL AND GAS ASSOCIATION.

The third annual convention of the Southwestern Electrical and Gas Association was held at the Menger hotel, San Antonio, Tex., on May 14, 15 and 16. In point of attendance, work and exhibits the convention was the most successful ever held by the association. The first session was opened at 10:30 a. m. on Tuesday, May 14, by an address of welcome by Reagan Houston. This was followed by the election of new members and the address of the president, H. S. Cooper, general manager of the Galveston Electric Company.

H. M. Moore then read a paper on "Education of Legislators with Reference to Public Service Corporations." The paper pointed out the necessity for keeping the good-will of the people who elect the legislators by giving the best possible service and the advantage of having exact figures and facts ready for presentation as arguments, especially such figures as records of payments for taxes, licenses and other public expenditures. Mr. Moore suggested the appointment of a committee on "Statistics" to obtain figures and information from the various companies to be compiled at certain intervals for circulation. The "Question Box" was next taken up and various subjects relating to street railway, electric and gas plants were discussed. At the afternoon session a paper on "Labor-Saving Tools and Devices for Central Stations and Car Barns" was read by V. W. Berry. Mr. Berry discussed a number of labor-saving devices with the uses to which they may be put and advocated their installation as a matter of economy. This was followed by another "Question Box" discussion.

The Wednesday morning session was devoted to papers. David Daly, manager of the Houston Electric Company, was to have presented a paper on "The Best Car for Urban Use," but as he was suddenly called to Boston on business the paper was not written. Arthur C. Scott, professor of electrical engineering at the University of Texas, read a paper on "The Value of Scientific Tests to Public Service Corporations," pointing out the rapid advances made in the field of public utilities by the application of scientific discoveries to practical engineering knowledge, and the value of research laboratories and scientific tests. He called attention to the meagerness of the facilities for obtaining reliable tests at the disposal of American engineers as compared with those obtainable abroad and after discussing what has been done in that direction in this country advocated a greater interest in and co-operation with the technical schools on the part of public corporations. F. C. Randall read a paper on "The Getting Up and Trying Out of Forms." He discussed the requisites of a good blank form for the purpose of securing or imparting information, with suggestions as to the systematic methods of getting up such a form. The afternoon session was occupied by "Question Box" discussions. The evening was devoted to the "Rejuvenation of the Sons of Jove."

The entire Thursday morning session was given over to the supply men and was deemed such a success, both by the association and by the supply interests, that the latter have requested that it be made a permanent institution. At the afternoon session a paper on "The Application of Gas to Mechanical and Industrial Uses," by an official of the San Antonio Gas & Electric Company, was presented. This was followed by a discussion on the remaining sections of the "Question Box," reports of committees, reports of the secretary and treasurer, and the election of officers. The new officers chosen were as follows:

President—H. T. Edgar, vice-president and manager Northern Texas Traction Company, Ft. Worth.

First Vice-President—W. B. Tuttle, manager San Antonio Traction Company, San Antonio.

Second Vice-President—J. P. Crerar, president and general manager Denison-Sherman Interurban Railway, Denison.

Third Vice-President—J. F. Strickland, president Dallas Securities Company, Dallas.

The office of secretary was filled by re-electing the present incumbent, R. B. Stichter, of the Dallas Securities Company, Dallas; and the office of treasurer was filled by re-electing for the third time A. E. Judge, president and general manager of the Tyler Electric Light & Power Company, Tyler.

An especial feature of the convention was the excellence, both in matter and manner, of the "Question Box," edited by Samuel Kahn, resident engineer of the San Antonio Traction Company, which was found of the greatest interest in the convention and aroused very thorough discussions.

For the diversion of the guests the San Antonio Traction Company on Wednesday evening gave an excursion to various points of interest and an entertainment at Electric Park, which was followed by a Mexican supper tendered by the San Antonio Gas & Electric Company.

ELECTRIC TRUNK LINE OPERATION.

At a meeting of the American Institute of Electrical Engineers, held on May 21, Frank J. Sprague presented a paper entitled "Some Facts and Problems Bearing on Electric Trunk Line Operation." The paper treated the subject at great length, covering 90 printed pages, and necessarily only a brief abstract can be given here.

The author started out by a quotation of E. H. Harriman, to the effect that the development of railway systems was dependent upon the use of electricity, and said that the keynote of all prophecies for the future was the word "capacity." This he interpreted to mean economy in its highest sense, that is, saving in passenger and ton mile operation, reduced train crews, higher operating schedules, better distributed service, less dead time on sidings, less interruptions to schedule and greater freedom from accidents. He referred to the fact that 15 years ago he had expressed a fervent hope for a "single-circuit alternating-current motor," and stated that his attitude on the broad question of trunk line operation is the same now as it had been consistently since that time.

In reference to the general problem of electrification, the author believes that the financial question is ever the dominant one, and in reference to the matter of equipment he expressed his dissent with views which had been presented at a recent meeting of the New York Railroad Club, in which it was stated that the general question of the adoption of electricity should be determined by a railroad quite independently of any details, and that systems, equipment and methods of operation could then be safely determined. He did not believe that a change of motive power could safely be determined except after the presentation of a comprehensive report and a general plan of equipment and operation based upon an investigation of previous practice and an analysis of important features and details. He then summarized certain conclusions which he believed would bear the test of time, as follows:

1. Of the two broad lines on which electrification can be considered, if increased economy, that is, reduction of operative expenses by replacing the steam locomotive by an electric one, with concentration of prime power and perhaps the use of water power, be deemed the dominant reason for change of motive power, then every wheel in an electrified division should be turned electrically; and the savings effected should pay not only a fair rate of depreciation of the total equipment, but a satisfactory rate of interest on the new capital expended, in fact a better rate than if spent in some other way.

2. Increase of capacity, both in locomotive haulage, schedule speeds, motor car trains and terminal facilities, of a character impossible to steam service—all resulting in augmented traffic, and increased use and capacity of the dead part of the systems, the tracks and roadbed—will ordinarily be the more potent influence in leading to the adoption of electric operation, and will often warrant heavy capital expenditures.

3. Every large road is a problem which must be con-

sidered financially and technically on its own merits, and in most features other than those which without effort can be harmonized its decision will be of little practical concern to other roads.

4. The adoption of electricity will ordinarily begin with those divisions where traffic is comparatively dense, and once adopted the territory over which it can be extended will naturally increase.

5. Terminal properties in great cities, underground and tunnel sections, and heavy mountain sections where duplication of tracks because of extra heavy construction cost is prohibitive, offer an immediate field for the serious consideration of electrification.

6. There cannot now be safely established any final standard, or any single system selected as the only, or in all cases the best for all roads. What is the best for one might easily be less advantageous for another, and there is no valid reason why any road should adopt something fitting to a less degree its particular requirements because of the action of some foreign road.

7. Extraordinary advances have been and are being made, and new discoveries are always possible. The limits of none of the systems now in use are clearly defined, and it would seem both natural and wise that the various manufacturing, technical and inventive activities should pursue every lead to its logical conclusion—for the best will be none too good.

The author then continued with a running comment upon various phases of the problem, gave comparative facts as developed up to the present time and illustrated in some detail features characteristic of three equipments which are now attracting considerable attention. Under this head he discussed motor equipments, limitation of design, behavior of conductors, etc.

Under the head of types of motors the author considered the four types which are now being exploited, namely: Polyphase alternating-current motor without commutator single-phase alternating-current motor without commutator, single-phase alternating-current motor with commutator and direct-current motor with commutator. He believed that the single-phase motor was at a disadvantage in comparison with other types of motors because it has an intermittent and variable rate of energy input and combines two distinct functions, those of a motor and a transformer. He then discussed at some length the comparative weights of direct-current and 25-cycle single-phase alternating-current motors, and concluded that a pair of alternating-current motors could handle only about one-half the total load of the direct-current motors with all the disadvantage of higher armature speed and smaller air gaps. He said that the direct-current motor offers a most effective machine to meet the conditions of railway service because of its high average weight efficiency, simplicity of construction, ease of control, automatic response in torque and speed to varying grades of curvatures and great sustained capacity at low speed. He referred then at some length to recent improvements in direct-current motors and summarized the differences between direct-current and single-phase alternating-current motors, as follows:

1. The input of current in one is continuous; in the other intermittent.

2. One has a single frame, the electrical and mechanical parts being integral; the other has a laminated frame contained within an independent casing. Hence there is not equal rigidity, or equal use of metal.

3. One has exposed and hence freely ventilated field coils; the other has field coils embedded in the field magnets.

4. One has a large polar clearance, and consequently ample bearing wear; the other has an armature clearance of about only one-third as much, and hence limited bearing wear.

5. One is operated with a high magnetic flux and consequently high torque for given armature-conductor current; the other has a weak field, and consequent lower armature torque.

6. One has a moderate-sized armature and commutator, and runs at a moderate speed; the other, with equal capacity, has a much larger diameter of armature and commutator, and runs at a much higher speed.

7. One permits of a low gear reduction, and consequently a large gear pitch; the other requires a higher gear reduction and a weaker gear pitch.

8. The windings of one are subject to electrical strains of one character; in those of the other the strains are of rapidly variable and alternating character.

9. The mean torque of one is the corresponding maxi-

mum; the mean torque of the other is only about two-thirds of the maximum.

10. The torque of one is of continuous character; that of the other is variable and pulsating, and changes from nothing to the maximum fifty times a second.

11. One has two to four main poles only, two paths only in the armature, and two fixed sets of brushes; the other has 8 to 14 poles, as many paths in the armature, leading to unbalancing, and as many movable sets of commutator brushes.

12. One can maintain a high torque for a considerable time while standing still; the other is apt to burn out the coils, which are short-circuited under the brushes.

13. In one, all armature-coil connections are made directly to the commutator; in the other, on the larger sizes resistances are introduced between the coils and every bar of the commutator, some of which are always in circuit, and the remainder always present.

14. In one the sustained capacity per given weight is within the reasonable requirements of construction; in the other it is only about half as much.

15. Finally, the gearless type, with armature and field varying relatively to each other, is available for one, but this construction is denied to the other.

Consideration was also given in detail to the matter of electric braking. In connection with this branch of the subject he arrived at the conclusion that it seemed wise to divide the matter of braking between electric power and air. The paper then continued with a description of numerous illustrations which were presented to the audience by means of a stereopticon of various types of working conductors. In this connection he called attention to the erroneous impression that direct-current systems are essentially and necessarily dependent upon the third rail, and that the overhead trolley has been developed for alternating-current operation only. Description was given at some length of the installation of working conductors for the New York Central Electric Zone and for the electrical work of the New York New Haven & Hartford Railroad. This was followed by a general comparison of working conductors and a comparison of direct-current potentials in overhead trolley and third rail.

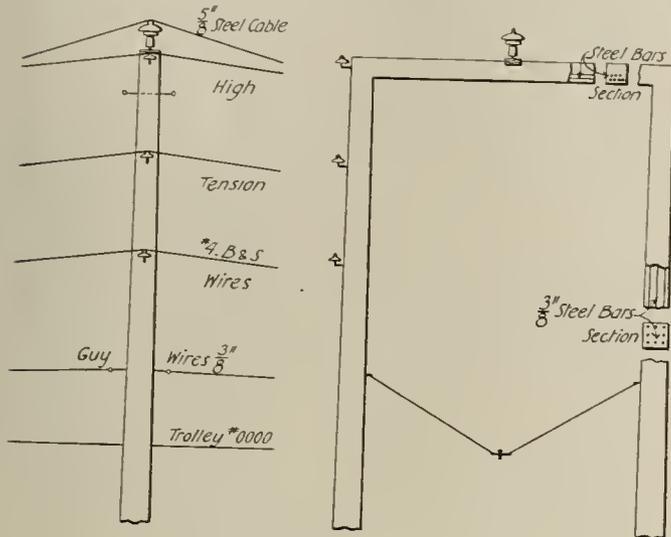
The paper then took up the matter of motor and locomotive construction and illustrated and described various types of electric locomotives designed and in use in this country and abroad. Most of this matter has been previously published. After making a general comparison of cost of direct-current and single-phase alternating-current systems, the author summed up his position in the statement that the present principal hope of usefulness of the single-phase system is on roads of considerable extent which operate an irregular and sparse traffic and where only a moderately expensive or second-class overhead construction which will keep down the ratio of line investment to that of the balance of equipment is tolerable. In departing from this condition and adopting more permanent construction in connection with the problems of denser current and higher capacities, any advantages of the single-phase system will disappear and the superiority of direct-current equipment become manifest. Any present claim for it for congested service demanding schedules of great capacity he believed not worth a moment's thought.

The paper was discussed by W. J. Wilgus, vice-president New York Central; L. B. Stillwell, consulting engineer; W. J. Potter, railway department General Electric Company; C. F. Scott and N. W. Storer, Westinghouse Electric & Manufacturing Company; G. R. Henderson, consulting engineer; and William McClellan, electrical engineer.

It is interesting to note that auxiliary poles are being used with practically every type of direct-current commutator machine on the market at the present time, including constant potential and variable-voltage generators for high speed and low speed; constant-speed and variable-speed generators for low and high voltage; constant-speed and variable-speed shunt and compound-wound motors and series-wound motors for low and high voltage. The last few months have witnessed the introduction of the auxiliary-pole motor for railway work, and many interesting developments are promised in connection with railway motors having high efficiency over a very large range of speed both for low and high voltages.—Electrical World.

REINFORCED CONCRETE TROLLEY ARCHES.

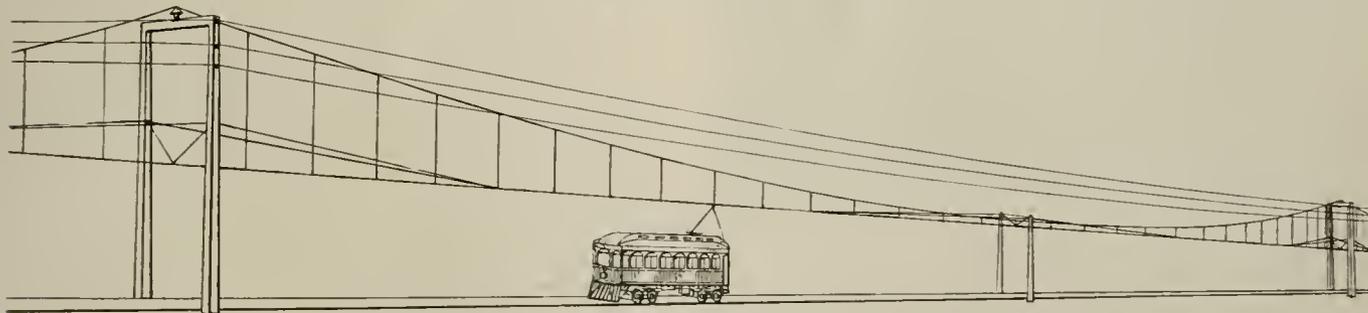
E. Darrow, general manager and chief engineer of the Toledo & Indiana Railway, Toledo, O., has developed an original idea for catenary direct-current trolley suspension, consisting of reinforced concrete arches instead of the ordinary wood or iron poles. This new construction, which is illustrated in the accompanying engravings from sketches furnished by Mr. Darrow, will be adopted on the company's extension from



Concrete Trolley Arches—Details.

Bryan, O., to Waterloo, Ind., and will probably be used to replace the present wooden pole construction on the original line from Toledo to Bryan as the pole construction requires renewal.

The arches will be set 9 feet in the ground and will extend 40 feet above the ground. They will be 12 inches square at the base and taper to 9 inches at the top. The vertical columns will be reinforced by eight and the bent by seven 3/8-inch steel bars, arranged as shown in the drawing. Midway



Concrete Trolley Arches—General Design of Catenary Suspension.

between the arches, which will be spaced 650 feet apart, will be placed two concrete poles to support the 3/8-inch bridle guys, which are anchored to steel eye-bolts in the concrete. The trolley will be also braced by bridle guys and sway braces anchored to the sides of the arches, as shown in the drawings. A 1/2-inch steel cable will be used for the messenger wire which supports the No. 0000 trolley wire. The high-tension wires, of No. 4 hard-drawn copper, are suspended on insulators on the outside of the columns, as shown, spaced 36 inches between centers at the points of suspension.

The cost of one section of the above construction, ready for wires, is \$107, as compared with about \$90 for the ordinary wood pole construction, with bracket fixtures.

The Philadelphia & Western Railroad was expected to be opened for traffic from Philadelphia to Strafford, Pa., on Friday or Saturday of this week.

HEARING OF INTERSTATE COMMERCE COMMISSION ON CHICAGO & MILWAUKEE ELECTRIC RAILROAD CASE.

Commissioners James S. Harlan and E. E. Clark of the interstate commerce commission took testimony in Chicago on May 21 in the proceeding begun by the Chicago & Milwaukee Electric Railroad to compel the Illinois Central Railroad to resume traffic relations which had been canceled. The Chicago & Milwaukee road secured from the Elgin Joliet & Eastern Railway, a belt railway at Chicago, and the Illinois Central road, a joint tariff on cabbage in car lots from Wisconsin points to Vicksburg, New Orleans, Natchez and Memphis, the tariff being filed with the interstate commerce commission on November 1, 1906. Five carloads of cabbage were shipped under this tariff. The electric road later secured a consignment of 25 carloads of cabbage for lower Mississippi points and asked the Illinois Central company to deliver cars at Rondout to transport it. Instead of complying with this request the Illinois Central road, on November 19, gave notice that the through traffic arrangement had been canceled.

The Chicago & Milwaukee Electric company was represented at the hearing by Fayette S. Munro, and the Illinois Central road by Blewett Lee, general attorney. Mr. Munro, in his opening statement, said that the Chicago & Milwaukee road was organized under the general railroad acts of Illinois and Wisconsin, and was equipped to handle a general freight business. He stated that 2,000 carloads of cabbage were shipped over the road in 1906 from Racine, Wis. Mr. Lee stated that the contention of the Illinois Central company was that the shippers in the territory through which the Chicago & Milwaukee road runs are already well served by existing steam lines and had nothing to do with the question of whether an electric line was a railroad within the meaning of the interstate commerce act.

Charles W. Merrilies, traffic manager of the Chicago & Milwaukee road, told in detail of the traffic arrangement with the steam roads. Asked why the electric line did not consign, in its own cars, the cabbage, for the transportation of which it complained that the Illinois Central had failed to furnish cars, he replied that his road had but three box

cars and that it had relied upon the usual practice of railways, according to which the line which is to get the long haul furnishes the cars.

Mr. Merrilies stated that his line had provided platforms and rooms at most of its stations for the handling of freight and express, the latter of which it handles for the United States Express Company. Mr. Merrilies stated, in response to questions by Mr. Lee, that the electric line came into competition at most points with either the Chicago & Northwestern Railway or the Chicago Milwaukee & St. Paul Railway, or both. He said that he had seen a letter from V. D. Fort, assistant general freight agent of the Illinois Central road, to the traffic manager of the Elgin Joliet & Eastern road, stating that the Chicago & Northwestern Railway had placed such pressure upon the Illinois Central road that it would have to cancel its traffic arrangement with the Chicago & Milwaukee company. Mr. Merrilies stated that

the electric line has a traffic arrangement with the Wisconsin Central Railway, under which it is handling freight in car lots from Chicago to Minneapolis, and had sought similar arrangements with the Chicago Indianapolis & Louisville Railway, the Chicago Rock Island & Pacific and the Wabash Railroad, but without success.

W. E. Keepers, general freight agent of the Illinois Central road, stated that at the time his road had refused to furnish the electric road with freight cars it was suffering severely from a shortage of equipment and was unable to allot the electric line cars, in view of the fact that this line had no cars which it could furnish in return.

The hearing was continued until some future date. In the meantime the Elgin Joliet & Eastern road will be brought into the proceeding.

COMMITTEE MEETINGS OF THE AMERICAN AND ENGINEERING ASSOCIATIONS.

A meeting of the executive committee of the American Street and Interurban Railway Association was held in New York on Monday, May 20. The members of the executive committee who were present were the following: President, John I. Beggs, president Milwaukee Electric Railway & Light Company, Milwaukee, Wis.; second vice-president, James F. Shaw, president Boston & Worcester Electric Companies, Boston, Mass.; third vice-president, Arthur W. Brady, president Indiana Union Traction Company, Anderson, Ind.; C. L. S. Tingley, second vice-president American Railways Company, Philadelphia, Pa.; H. H. Adams, superintendent of shops the United Railways & Electric Company, Baltimore, Md.; secretary and treasurer, B. V. Swenson.

It was announced that letters had been received from Messrs. Calvin G. Goodrich of Minneapolis and H. C. Bradley, acting president of the Claim Agents' Association, that they would be unable to be present at the meeting.

The past presidents of the association had been invited to attend the meeting and five of them were present. These were the following: Mr. Joel Hurt of Atlanta, Ga., president during 1894-1895; Mr. H. M. Littell of New York City, president during 1895-1896; Mr. Albion E. Lang of Toledo, president during 1897-1898; Mr. C. S. Sergeant of Boston, president during 1898-1899; Mr. Jere C. Hutchins of Detroit, president during 1902-1903.

Two of the other past presidents of the association, H. H. Vreeland, president of the New York City Railway Company, president of the association during 1901-1902, and Hon. W. Caryl Ely, president of the Ohio Valley Finance Company, and president of the association during 1903, 1904, 1905 and 1906, intended to be present, but were prevented by important business at the last moment. The secretary presented a report, in which were considered a number of matters relating to the association work. The active membership has increased from 200 companies on October 1, 1906, to 242 companies at the present day. The associate membership has increased from 113 companies on October 1, 1906, to 164 companies at the present time. A financial statement was presented which showed that the association had received more money from a larger number of active and associate members than had been received up to May 20, 1906. The secretary stated that the annual reports of the four associations containing the proceedings of the Columbus convention had been published and sent out to the various member companies and to associate members. Five hundred copies of the report of each of the four associations were bound in paper covers and each member company was supplied with one set of these paper covered reports. They are all of uniform style and octavo size.

The American Association report contains 472 pages, the Accountants' 352 pages, the Engineering 255 pages and the Claim Agents' 253 pages. In addition to the paper covered volumes, the four annual reports have been placed in two cloth bound volumes. Volume I, containing the proceedings of

the American and Engineering associations and Volume II those of the Accountants' and Claim Agents'. This arrangement of the volumes was made because associate members receive the reports of both the American and Engineering associations, whereas the reports of the Accountants' and Claim Agents' associations are reserved for member companies only.

Reprints have been made of the addresses of the presidents before the various associations, of the report of the committee on "Municipal Ownership" and of the report on "Standard Code of Rules."

The executive committee considered a number of matters relating to the association work and the plans for the 1907 convention were given particular attention. The report of the committee on subjects was presented by the chairman, Richard McCulloch of St. Louis, and accepted. This committee has provided for a number of most interesting and valuable papers relating to many of the most important problems which are now before the street and interurban railway people. It was decided to make a departure at the 1907 American association convention from the custom of recent years of having two sessions a day. It is proposed that the American association have but one session a day on Wednesday, Thursday and Friday, these sessions being from 9:30 a. m. to 1:30 p. m. It is expected by this arrangement that there will be a large attendance at all sessions and that ample opportunity will be given to all to examine the exhibits of the manufacturers during the afternoon hours of these days.

The question as to whether or not there should be a banquet was discussed at some length, and the general sentiment expressed was that a banquet should be given at the 1907 convention.

A meeting of the executive committee of the Manufacturers' association was held on the afternoon of Monday, May 20, and a dinner was given in the evening by this committee to the executive committee and past presidents of the American Street and Interurban Railway Association. The members of the committees on "Subjects" and "Standardization," which committees also met on Monday, were invited. This dinner was held in a private dining room of the Engineers' Club and proved to be a most pleasant occasion, 30 people being present.

Committee on Subjects, American Association.

The general committee on "Subjects" of the American Street and Interurban Railway Association consists of one representative from each of the affiliated associations and an equal number of representatives from the American association. This committee is in charge of the general arrangements of the programmes for the Atlantic City convention. In addition to this general committee on "Subjects," each association has its own committee which has direct charge of its specific convention programme, including the reports of the committees, the papers to be read, etc. The meeting of the general committee on "Subjects" was held at the association headquarters, Engineering Societies building, 29 West Thirtieth street, New York, on the morning of Monday, May 20.

Those present were: Richard McCulloch, St. Louis, Mo., chairman; Ernest Gonzenbach, Sheboygan, Wis., representing the American association; C. L. S. Tingley, Philadelphia, Pa., representing the Accountants' association; H. H. Adams, Baltimore, Md., representing the Engineering association; Peter C. Nickel, New York, representing the Claim Agents' Association.

Among the matters discussed were the following:

Meeting days of the different associations; committee reports and papers to be presented at the various conventions; convention halls to be used by the different associations; number of sessions to be held by the various conventions and the general arrangement of these sessions.

A bulletin will be issued in the near future.

Committee on Car House Construction, American Association.

A special committee on car house construction appointed by President Beggs of the American Street and Interurban

Railway Association for the purpose of formulating a set of rules and regulations governing the construction and equipment of modern car houses, held a meeting in New York on May 21. The committee consists of the following: H. H. Adams, superintendent of shops United Railways & Electric Company, Baltimore, Md., chairman; E. J. Cook, chief engineer Cleveland Electric Railway Company, Cleveland, O.; Charles F. Ferrin, architect Twin City Rapid Transit Company, Minneapolis, Minn.; L. H. Parker, engineering department Stone & Webster Engineering Corporation, Boston, Mass.; A. V. Porter, architect, New York City Railway Company, New York, N. Y., and Thomas Pnmfrey, civil engineer International Railway Company, Buffalo, N. Y.

A conference with the committee of the National Fire Protection Association was held first, which continued through the greater part of the forenoon. At this conference a tentative set of rules was discussed in a general way by the members of both committees.

After the first conference the committee of the American association held a separate meeting, which continued over until the middle of the afternoon. At this meeting the proposed rules for the construction of car houses was the subject under discussion. Later in the afternoon a second conference was held between the two committees and an agreement was arrived at concerning the rules which had been formulated to govern the construction of modern car houses. It was the understanding that these rules would be placed before the convention of the National Fire Protection Association on Thursday, May 23, for approval. If approved at that meeting, they will also be brought up for approval at the annual convention of the American Street and Interurban Railway Association next October.

Standardization Committee, Engineering Association.

A meeting of the "Standardization Committee" of the American Street and Interurban Railway Engineering Association was held at the office of the American Street and Interurban Railway Association on May 20 and 21.

There were present Messrs. Wallerstedt, Larned, Fairchild and Blake. Mr. Adams attended several of the meetings as president of the Engineering association. Messrs. George C. Fowler and F. W. Lane of New York were present by invitation.

The chairman of the committee announced that a number of previous meetings had been held by the New York members of the committee and that several tables of statistics had been drawn up containing the information obtained in the data sheets received from the member companies. These tables showed in complete form the data on rails, brake-shoes, wheels, etc., supplied by those answering the inquiries. The flanges and treads of wheels, brakeshoes, journals and rails were taken up. In the latter investigation the committee will receive the assistance of the "Maintenance of Way Committee."

A long communication was received from Mr. Evans of Indianapolis, a member of the committee on "Standardization," outlining the work up to date of the committee on "Standardization" of the Central Electric Railway Association.

Very valuable work was done and the chairman announced that another meeting of the committee would be called next month, the place and exact date to be announced later.

The new Ravenswood extension of the Northwestern Elevated Railroad of Chicago was opened for traffic on Saturday, May 18. The extension, which is about $3\frac{1}{2}$ miles long, leaves the main line at Clark and Roscoe streets and extends to Lincoln and Western avenues, Ravenswood. Ground was first broken for the road in November, 1905, and the first steel construction was started in September, 1906. It is planned to build a surface extension from the end of the line to Kimball and West Wilson avenues. All trains are to run as expresses, from 6 a. m. to 12 p. m., and the schedule time from Ravenswood to the Union Loop is 30 minutes. The line runs over a private right of way through a populous and rapidly growing territory.

GASOLINE-DRIVEN EMERGENCY TOWER WAGON.

About a year ago the Pacific Electric Railway purchased an Oldsmobile commercial wagon designed for trucking in city streets. Under the guidance of S. H. Anderson, chief electrician, the engines and framework of this equipment have been rebuilt and strengthened. As shown in the illustration, the automobile has been fitted with a substantial telescoping tower for trolley work. At the rear of the driver's seat is a large tool box with a second seat provided on top of it. In this box are kept all the tools necessary for the ordinary emergency work. There are also two mate-



Pacific Electric Railway—Automobile Trolley Wagon.

rial boxes along the sides of the tower. Supported from the rear is a box in which is carried a supply of rope, and ladders are placed under the tower. Since this wagon has been in use it is estimated that with one crew it has satisfactorily performed the service of two tower wagons driven by horses.

Station log books, or records in some form, of fuel and water consumption, hours of labor and times of putting machines in and out of service are kept in all well-operated power plants, but the usefulness of an engineer's diary is less generally appreciated. Many engineers may not favor such extra clerical work, but where the habit of recording important happenings day by day is not a serious burden, the operating company is likely to find it of value. The larger the plant the more important it is to keep on file the dates of various repairs, arrival of fuel and supplies, conferences with officials, accidents, shutdowns, unusual overloads, the construction of additions to the equipment and buildings, labor of contractors, visits of supply men and other similar incidents. When the company's business is carried into the courts such records may be invaluable; in the ordinary course of operation they may settle many disputed points quickly, and the keeping of a power plant diary only involves a few moments' work each day by the chief engineer.—The Iron Age.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B., OF THE CHICAGO BAR.

Freight Carrier Not a Street Railway.

Spalding v. Macomb & Western Illinois Railway Company, 80 *Northeastern Reporter*, 327.—The supreme court of Illinois says that street railroads are generally understood to be only such as are constructed and operated in the streets of a city for the purpose of conveying passengers, with ordinary hand luggage, from one point to another along the line thereof. Whether the road be a street railroad or not will depend upon the character of its traffic. It was alleged that this road was carrying not only passengers with ordinary hand luggage, but practically freight of all kinds, from one point to another on the street and from town to town along the entire line of the road. Under these allegations, admitted to be true, it could not be held to be a street railway.

No Road in Street for Private Party.

Hatfield v. Strauss, 102 *New York Supplement*, 934.—The first appellate division of the supreme court of New York holds that there is no power lodged in any local authority to grant a permit for the construction in a street of spur surface railroad tracks to be operated by the underground electric system solely for the transportation of the goods of a private firm. It says that the only ground upon which surface railroads were ever permitted to be laid in the public streets, the only authority conferred upon a corporation to occupy for the purpose of making money for itself a portion of the public streets, was that it was a legitimate street use for the benefit of all the traveling public. But the moment such a right is given for the exclusive use of a private individual there has been a taking of public property for private use which cannot and ought not to be justified.

As to Seeing Where Passenger is Before Starting Car.

Millmore v. Boston Elevated Railway Company, 80 *Northeastern Reporter*, 445.—The supreme judicial court of Massachusetts says that, on the one hand, the rule is not that the conductor of a street car, after waiting a reasonable time for a passenger to get on or off, as the case may be, may start without taking any pains to see whether the passenger is either on or off. The conductor has not performed his duty when he has simply waited a reasonable time. He must exercise reasonable care to see that the passenger is on or off the car. On the other hand, the rule is not that the conductor must absolutely see whether the passenger is on or off. In this, as in every other detail, there is resting upon him the same degree of care, namely, the highest care consistent with the proper transaction of the business; and, if he has exercised that degree of care, he has not been negligent.

What Makes a Passenger?

Alabama City Gadsden & Attalla Railway Company v. Bates, 43 *Southern Reporter*, 98.—The supreme court of Alabama says that a passenger may be defined to be one who undertakes, with the consent of the carrier, to travel in a conveyance furnished by the latter, otherwise than in the service of the carrier as such. The relation of carrier and passenger is dependent upon the existence of a contract of carriage, express or implied, between the carrier and passenger, made by themselves or their respective agents; and this relation begins when a person puts himself in the care of the carrier or directly within its control, with the bona fide intention of becoming a passenger, and is accepted as such by the carrier. There is, however, seldom any formal act of delivery of the passenger's person into the care of the carrier, or of acceptance by the carrier of one who presents himself for transportation; hence, the existence of the relation

is generally to be implied from the attendant circumstances. But it is undoubtedly the rule that these circumstances must be such as will warrant the implication that one has offered himself to be carried and the offer has been accepted by the carrier. And this, of course, necessarily involves the existence of the fact that the person must signify his intention to take passage either by words or conduct, and those in charge of the car must assent by words or conduct to his becoming a passenger.

With Fencing Law Danger to Animals Deemed Imaginary.

Indianapolis & Cincinnati Traction Company v. Larrabee, 80 *Northeastern Reporter*, 413.—The supreme court of Indiana says that in view of the statute of 1903, imposing upon interurban railroads, traction lines, etc., the duty of constructing and maintaining fences on both sides of their right of way "sufficient and suitable to turn and prevent cattle, horses, mules, sheep, hogs or other stock from getting on such road, except at crossings of public highways," etc., the danger or peril of exposure to stock kept on the premises through which it is sought to condemn a right of way will be nothing more than speculative or imaginary, and should not be considered by the jury in determining the diminution of the market value of the remainder of the lands unappropriated.

Where Runaway Horse Collides with Car.

Demonte v. Patton, 43 *Southern Reporter*, 153.—The supreme court of Louisiana holds that where a runaway horse hitched to a cart, without lights, on a dark rainy night, dashes along the track of a street railway and collides with an electric car coming from the opposite direction, with the result that the motorman is knocked off and injured, the owner will be held liable; it appearing from the evidence that the motorman could not avoid the collision. Where in such a case the motorman was running his car on schedule time, he is not chargeable with negligence for not anticipating and being prepared for the unexpected and improbable appearance on the track of a runaway horse, at large through the negligence of his driver, and in contravention of police ordinances.

Liability for Inspector Wrongfully Examining Wounds.

South Covington & Cincinnati Street Railway Company v. Cleveland, 100 *Southwestern Reporter*, 283.—The court of appeals of Kentucky says that the jury were instructed that if they believed from the evidence that the inspector in entering the room where the plaintiff (Cleveland) was, acted in the scope of his employment, and without the request or consent of the plaintiff, placed his hands upon her person and examined her wounds, they should find for her in such sum as would fairly compensate her for the mental suffering, if any, and for her sense of shame or humiliation or wounded pride, if any, resulting from such action and indignity or insult to which she was thereby subjected. The argument was pressed that if the inspector did lay his hand on the plaintiff, in so doing he was acting entirely without the scope of his employment, and the company could not be held responsible for his conduct. But it was entirely within the scope of the inspector's duty to see and converse with injured persons, to ascertain their wants, learn how the accident occurred, and inquire as to the extent of the injury inflicted; and, in the performance of this duty the inspector did go into the room where the plaintiff was lying. It is evident that in approaching the plaintiff the inspector was acting in the interest of the company, and in laying his hand upon her person he was attempting to ascertain the extent of her injuries for its benefit. The law under circumstances like these will not undertake to make any nice distinctions fixing with precision the line that separates the act of the servant from the act of the individual. When there is doubt, it will be resolved against the master, upon the ground that he set in motion the servant who committed the wrong.

News of the Week

Increases of Wages.

The International Railway of Buffalo, N. Y., has announced a new scale of wages for its conductors and motormen, effective on June 1. For the first year of service the men will receive 22½ cents an hour, with an increase of ½ cent an hour for each succeeding year, including the seventh. They now receive 21 cents an hour for the first year and 25 cents after 10 years.

The St. Joseph (Mo.) Railway Light Heat & Power Company has made a new 3-year agreement with its motormen and conductors whereby they will receive an increase of 10 per cent in wages, the average pay being 23 cents per hour.

New York Public Utilities Bill Passed.

The so-called "public utilities bill" was passed by the New York senate on May 22. It already had been passed by the house. It is now in the hands of Mayor McClellan of New York City. Mayor McClellan, it is understood, will veto the measure, and it will be passed over his head. The only amendments made to the bill by the senate provide that companies which already have secured permission for extensions and improvements may make them without the approval of the commissions which the act creates, and that the present employes of the rapid transit commission shall be retained under the new New York City commission. These amendments have been assented to by Governor Hughes.

Strike at Evansville, Ind.

A strike of the conductors and motormen employed on the Evansville, Ind., city lines of the Evansville & Southern Indiana Traction Company was declared on May 15 by the newly organized union and took effect on Thursday, May 16, when about 120 men walked out. The reason was the refusal of the company to grant the demands of the union for a flat wage scale of 20 cents per hour and a 9-hour day, with 30 cents per hour overtime, in place of the present scale of 15 to 18 cents an hour, according to length of service, and a 12-hour day. The strike had been anticipated and the company has been able to continue the operation of some of its cars every day, although service has been discontinued at night. Several riots have taken place and many people have been injured. The cars have been operated by non-union men imported from other cities.

Chicago Traction Reorganization Assured.

Announcement was made on May 22 that the necessary number of shares of the Chicago Union Traction Company, common and preferred, and of the North Chicago and the West Chicago Street Railroad companies, to insure acceptance of the Chicago Railways Company ordinance have been deposited. The amount of stock of the Chicago West Division Railway Company required, and the necessary number of shares of the North Chicago City Railway Company, except a small number, the deposit of which had been promised, were on deposit as consenting to the reorganization.

The deposit of the stocks of the Union Traction Company and the underlying companies was essential to formulation of the reorganization plan. The distribution of the stocks of the reorganized company will now be arranged. The Chicago Railways Company, the new company, will distribute its stock, pro rata, among holders of the securities of the underlying companies. According to the terms of the ordinance, the plan of distribution is to be approved by P. S. Grosscup, judge of the United States circuit court at Chicago, and Prof. John C. Gray of Harvard University.

The board of supervising engineers will co-operate with the board of local improvements in order that the work of paving streets may be confined first to localities where there is the most urgent need of improvement.

Decisions on Toronto Service.

The Ontario railway and municipal board has given judgments in three cases brought by the city of Toronto against the Toronto Railway Company in regard to improvements to the service on the company's lines. These decisions have been rendered after a series of hearings at which the city engineer and the company's representatives presented arguments. The most important decision is in the so-called "overcrowding" case. The board states that the population of the city will probably increase during the next 10 years at the rate of 15,000 a year and finds that the company has been putting on more cars in the attempt to relieve the overcrowding, but cannot agree with the city's contention that more cars operating on existing lines would solve the problem, as this would endanger the pedestrian and vehicle traffic. Consequently the company is ordered to build, with reasonable dispatch, between 10 and 15 additional miles of double track and 100 new cars, the cars to be finished in time to be distributed and put in operation on the system as soon as the new lines are built. The matter of routes is left to the company and the city. The company has already applied for franchises for additional lines and Bion J. Arnold of Chicago, acting as an expert for the city, has submitted a report recommending certain routes as required by the conditions. An abstract of Mr. Arnold's report was published in the Electric Railway Review of April 27.

The other two cases refer to regulations for passengers and to removal of snow from the company's tracks. The company is directed to close the front vestibules of its cars by doors, from November to May, making arrangements for passengers to enter by the rear platform and to leave by the front platform, and is recommended to adopt regulations to prevent the "end seat hog"

nuisance and the crowding of the rear platform by smokers. The company is required to remove and carry away the snow on its tracks when the snowfall amounts to six inches or over, and when, after successive sweepings from the tracks, the snow has accumulated on the adjoining roadway and attained a depth of six inches the company is required to carry away any further snow it may sweep from the tracks.

The Cleveland Situation.

On Wednesday of this week Judge Phillips of the common pleas court gave his long looked for decision in the Central avenue-Quincy street franchise case. The case was that of a property owner, backed by the Cleveland Electric Railway, against the Low Fare Railway Company. The court held that the latter's franchise on those streets was invalid, in that the council had lacked jurisdiction to grant the franchise, because the necessary number of consents from abutting property owners had not been secured. This decision is a great victory for the Cleveland Electric Railway, which recently ceased operating in those streets and tore up its tracks, as previously reported in the Electric Railway Review, and has since been endeavoring to block the efforts of the rival company to operate in those streets while it has tried to secure a renewal of its own franchises.

This was the only important development of the week. On May 16 the Cleveland Electric refused the Low Fare company's offer, published in last week's Review, to negotiate for the use of the former's property in Central avenue and Quincy street, and sent a communication to the council offering to resume its service in those streets if the council would grant a new franchise on the basis of seven tickets for 25 cents. On the following day the company refused an offer of the Low Fare company of \$13,500 cash for the privilege of joint operation over its tracks in Euclid avenue, from the public square to East Fourteenth street. On Saturday afternoon about 20 Low Fare cars were operated over this line, but were stopped by an agreement of the attorneys.

Mayor Johnson, several of the city officers and President du Pont of the Municipal Traction Company on May 21 addressed a large tent meeting in the interest of 3-cent fares, and Forest City stock subscription blanks were circulated.

Two-Cent Fare for Passengers Without Seats.—The Civic Union of Seattle, Wash., has passed a resolution calling upon the city council to pass an ordinance prohibiting the Seattle Electric Company from charging more than a 2-cent fare when the passenger is unable to secure a seat.

New York Loop Bill Passes.—The New York senate on May 21 passed the Dowling loop bill, which enables the New York City authorities to take the initiative toward the erection of an elevated loop through the east side streets, to connect the Manhattan tunnels of the Brooklyn and Williamsburg bridges.

Pennsylvania Strike Averted.—A threatened strike of the employes of the Eastern Pennsylvania Railways Company for an increase of wages was averted on May 20 by an agreement to submit the differences to a board of arbitration, composed of a representative of the company and one of the men. If they cannot agree they will choose a third party.

Municipal Ownership Experiment in San Francisco.—It is reported that the board of supervisors of San Francisco has decided to take over the Geary Street Park & Ocean Railroad and besides operating it, convert it from a cable to an electric road. The company's franchise has expired. The board will appropriate \$400,000 to purchase the property, in addition to the \$350,000 already set aside for the purpose.

Employees' Clubroom Planned at Ft. Worth.—The Northern Texas Traction Company of Ft. Worth, Tex., is considering plans for the construction of a clubroom for employes, to be built as a second floor of the car house on East Front street. If the plan is carried out it is stated that a local organization of the Street Railway Young Men's Christian Association will be formed and the clubroom placed under the supervision of that body.

Installing Underground Conduit in Omaha.—The Omaha & Council Bluffs Street Railway is now installing several miles of underground conduit to carry its high-tension wires through the downtown district in Omaha, Neb. The present contract calls for four miles of conduit, from Fifth and Jackson streets to Twenty-seventh and Lake streets. Another conduit will be laid from the central power station to South Omaha, where a new substation is to be located.

Decision in Favor of T-Rails at New Albany, Ind.—Judge W. C. Utz of the circuit court at New Albany, Ind., has decided a suit brought by the city against the New Albany Street Railroad to compel the use of a girder rail, in favor of the company. The company's franchise ordinance granted several years ago permitted the use of the T-rail, but a later ordinance requires the use of a girder rail. The court holds that the first ordinance is a contract that cannot be annulled without the consent of both parties.

Street Railway Strike at Birmingham, Ala.—The street railway men employed by the Birmingham (Ala.) Railway Light & Power Company, who have recently formed a local chapter of the union, declared a strike on May 20, because of the refusal of the company to recognize the union. The men were offered by the company the alternative of surrendering their union cards or returning their badges of employment and the majority of them immediately returned their cards to the barns and left the company's service. On Tuesday the men sent to Robert Jemison, president of the company, a form of agreement under which they would return to work, involving complete reinstatement of the men, recognition of the union, and arbitration of future grievances. The question

of wages does not enter. President Jemison replied to the communication, stating that he would not employ union men. About 25 cars were operated on Wednesday. The mayor has ordered all saloons closed, the police have been put on double time and special deputies have been sworn in. No attempt at violence has been made and the company has operated a few cars each day, although at long intervals.

Opinion on Louisville Franchises.—City Attorney A. E. Richards of Louisville, Ky., has submitted to a special committee of the city council, appointed to investigate the franchise rights of the Louisville Railway Company, a lengthy opinion, which completely upholds the rights of the company in the streets. The report reviews the legislation, both state and municipal, affecting the roads now merged into the Louisville Railway, and finds that the company's franchises are valid, and except for a few short lines, have been extended by the legislature for 99 years from 1890.

New York Rapid Transit Affairs.—The rapid transit commission did not award the contract for building the second section of the bridge subway loop, as expected, because the necessary six votes were not present, and, as one of the members is expected to be kept away by ill health for some time, it was evident that if any action was to be taken before the public utilities bill became a law it would be necessary to appoint a new member to succeed Lewis Cass Ledyard, who resigned several months ago. Consequently Mayor McClellan on May 17 appointed William S. Hurley to fill the vacancy.

Waterloo Strike Settled.—The strike of the trainmen of the Waterloo Cedar Falls & Northern Railway, Waterloo, Ia., which has been in progress for about two months, was settled on May 9, by agreement between the company officials and the union leaders. Cars have been operated, but trouble has been frequent and union men have refused to patronize the cars. The company agrees to recognize the union, but will hire union or non-union men, indiscriminately, and will receive a grievance committee of the union at any time. No man is to be discharged without being furnished with the reason for his dismissal.

Electrical Engineers Elect Officers.—At a meeting of the American Institute of Electrical Engineers, held in New York City on May 21, the following officers were elected: President (for one year), H. G. Stott; vice-presidents (for two years), L. A. Ferguson, J. G. White, W. C. L. Eglin; managers (for three years), B. G. Lamme, H. W. Buck, P. H. Thomas, Morgan Brooks; treasurer (for one year), George A. Hamilton; secretary (for one year), Ralph W. Pope. Certain amendments to the constitution were proposed and adopted by the institute, and the new officers will hold office in accordance with the provisions of the amended constitution.

Hearing on Philadelphia Ordinance.—It is expected that the finance and the street railways committees of Philadelphia city councils will hold a joint meeting at which arguments on the proposed new ordinance for the Philadelphia Rapid Transit Company will be heard. An ordinance has been introduced in councils by Councilman Robert M. Fry, providing that the city shall take possession of the property and franchise of the Citizens' Passenger Railway Company under authority of the ordinance of July 7, 1857, and lease it to a company which offers to provide the purchase money, give 2 per cent of the gross earnings to the city and grant 4-cent fares. A resolution has also been introduced providing for the appointment of a commission by the mayor to investigate the traction situation.

Fender Tested by Chicago City Railway.—It is announced that this company has installed a new fender on one of its cars and is testing it in regular service. The fender, which was invented by George De Clement of Kalamazoo, Mich., consists of a buffer mounted on the front of the car, and a scoop fender mounted under the car, directly in front of the wheels. This scoop is normally held 6 or 8 inches clear of the track, but is automatically released and dropped to the ground should a person be struck by the car and fall on the track. The scoop fender under the car is automatically released by a special releasing fender, which is thrown upwards when it comes in contact with any object on the track. The inventor has great confidence in the efficiency of the new fender and a company will be formed to manufacture it.

Reports of the American Street Railway Association.—Secretary B. V. Swenson of the American Street and Interurban Railway Association has issued a complete summary, index and price list of the reports of the American Street Railway Association, together with a circular offering for sale, at prices ranging from 50 cents to \$1.50, copies of the reports for all of the 24 years of the existence of the association, except five, of which two are out of print and three are reserved to make up bound sets. The entire series consists of 24 reports, covering the period from the organization meeting in 1882 to and including the reorganization meeting in 1905. These reports contain the complete proceedings of the conventions of the association, including papers, committee reports, addresses, discussions, banquet speeches and much other material of great interest and value to the street railway fraternity. More than 5,600 pages octavo are contained in these reports. Each has a frontispiece, consisting of a steel engraving of the president for the year of the report. During these 24 years the business has passed through various stages. In 1882 there were no interurban railways and the street railway business of the country was confined principally to the small horse-car roads in the larger cities. During the first eight or ten years of the association work occurred the early attempts to propel the cars mechanically or electrically, the adoption of cable systems in the larger cities and the successful application of electric power. This was followed by a wonderful development of the business, especially after the interurban railway proved to be a success. The reports of the American Street Railway Association cover the

entire period of time from the old horse-car days to the present. They are paper-covered octavo volumes, averaging about 250 pages each. Several complete sets (except the first and second reports) have been bound in six volumes to the set. These will be sold at \$25 a set for cloth binding and \$30 for half morocco. A few additional sets (except the first, second and third reports) will be bound in six volumes to the set. These will be sold at \$20 a set for cloth binding and at \$25 a set for half morocco.

Seek to Annul Charter of Philadelphia Company.—Both branches of the Pittsburg city councils on May 21 passed resolutions authorizing the mayor to ask the governor to instruct the attorney-general to institute quo warranto proceedings against the Philadelphia Company, with a view to annulling its charter. The Philadelphia Company, which is controlled by the United Railways & Investment Company of San Francisco, controls the Pittsburg Railways Company and several gas and electric companies in and near Pittsburg. This step is part of a general agitation against the company and is said to have been influenced by the recent action of the company in raising the price of natural gas from 25 to 30 cents per 1,000 cubic feet. Bills have recently been presented against the Pittsburg Railways Company by the city, aggregating over \$600,000, for street cleaning, and an attempt is being made to secure a reduction of the night fare of 10 cents on the street cars.

Indiana Tax Commissioners Lenient with Electric Railways.—The Indiana state board of tax commissioners, which closed its first session on May 20, has increased the assessed valuation of the corporate property in the state from \$224,377,446, the 1906 figure, to \$236,790,754. Although the assessment of steam roads was increased from \$183,670,955 to \$191,337,619, there was practically no increase in the assessments of the interurban railways, the figures being \$20,616,599 in 1906 and \$20,990,004 for the present year. Various representatives of the interurban railway companies appeared at the preliminary hearings of the board, on April 22-25, as reported in the Electric Railway Review of April 27 and May 4, and argued that their assessments should not be increased because the roads were still in a period of development. The tax board appears to have taken this view of the matter. Another session will be begun on July 2 for the purpose of hearing appeals, after which the final assessments will be fixed.

Butte Cars Being Equipped with Vestibules.—The Butte (Mont.) Electric Railway Company is equipping all its winter cars with vestibules completely enclosing the platforms, in accordance with a law recently passed by the legislature. One side of the platform will be built up solidly, the other is to be provided with doors, which will be closed while the motorman occupies this platform, and will be locked open on the return trip when he changes platforms. This will leave only one entrance to the car and that on the opposite side from the double track, thus doing away with the danger of passengers stepping from one car into the path of another. Manager Wharton says that for many years the company opposed the use of the closed vestibules in Butte; the motormen were protected by windows in front of them, but while the old conditions of smoke and fog prevailed it was necessary for them to depend upon hearing any sound that might give warning of danger, and the sides were left open. These conditions have passed now, and there is no longer any need to sacrifice fullest protection to safety.

American Society of Mechanical Engineers.—The semi-annual meeting of the American Society of Mechanical Engineers, to be held in Indianapolis, Ind., on May 28 to 31, promises to be of especial interest to mechanical engineers. A wide range of subjects will be taken up and discussed, among which will be reports of committees on standard proportions for machine screws; standard tonnage basis for refrigeration, and papers on pumping engines, the heating of storehouses, and kilns for Portland cement. There will be special sessions for papers and discussions of superheated steam, including papers on its specific heat, its flow, furnace and superheat relations, the determination of entropy lines for superheated steam, the performance of Cole superheaters, superheated steam in an injector; the use of superheated steam on locomotives in America, analysis of locomotive tests, and material for the control of superheated steam. An automobile symposium has been planned for the Wednesday evening (May 30) session, at which papers, illustrated by lantern slides, on ball bearings in general and their use on automobiles in particular, air-cooling of automobile engines, materials for automobiles, special automobile steel, and the railway motor car will be read and discussed. These papers have been prepared by authors who have made important investigations in their particular lines of work. Accommodations for transportation and Pullman car service can be arranged for by addressing the secretary of the society. Several excursions have been arranged to different plants and points of interest in and around Indianapolis. One of the professional sessions devoted to superheated steam will be held at Purdue University, and an opportunity will be given the guests after the session of going over the university. The local committee at Indianapolis is endeavoring to secure reserved seats for those attending the convention, upon the occasion of President Roosevelt's speech at Indianapolis on Decoration Day. On Wednesday afternoon, May 29, a visit will be made in special cars to the Atlas Engine Works, and to the plant of the National Motor Vehicle Company. Another excursion on the same afternoon has been arranged for the works of the D. N. Parry Manufacturing Company and to those of the Nurdyke & Marmon Company. An attractive booklet describing Indianapolis and its industries for the benefit of the association has been executed and issued by Russell M. Seeds. The book is well illustrated by halftones and contains a small map and guide to the city of Indianapolis, showing which cars to take to get to the various manufacturing plants in the city of interest to members of the American Society of Mechanical Engineers.

Construction News

FRANCHISES.

Anderson, S. C.—O. W. Kelsey, representing the South Carolina Public Service Corporation, which was incorporated in January of this year to build a system of interurban electric lines in North and South Carolina and Georgia, has applied for a franchise to enter Anderson and to operate its line in several of the streets. A committee of three aldermen has been appointed to report on the proposition. A franchise also will be applied for in Greenville, S. C. Joseph J. Timmes, president, 52-53 Broad street, New York City.

Ensley, Ala.—The city council has granted a franchise to H. S. Meade, R. E. Meade, J. J. Walker, B. R. Pegram and others of this city to operate an electric street railway from Avenue E and Twentieth street to the city limits and back through Ensley Highlands. Work must be begun within six months. The line will develop a large tract of land adjoining the highlands.

Ft. Worth, Tex.—A franchise has been granted to the Northern Texas Traction Company for the extension of its lines in North Ft. Worth. Work is to begin within 90 days and be completed within nine months.

Girard, Kan.—A franchise has been granted to the Girard Coal Belt Electric Railway to build its interurban line in Crawford county. The line will extend from Girard to Mulberry, about 16 miles, with headquarters at Girard. J. B. McFarland, president.

Great Falls, Mont.—The Great Falls Street Railway Company has been granted a franchise to use the north bridge on First avenue for a period of five years, the privilege to be extended at the end of that time unless city traffic shall have increased sufficiently to demand the construction of a new bridge for street railway service. The company will pay one-half of the repairs on the bridge after it has laid its tracks across it. It is stated that the line may be extended to the west side of the river.

High Point, N. C.—Additional franchise rights have been granted to Dee Allen, W. T. Van Brunt and others, associated in the proposed electric line which will connect High Point with Greensboro, N. C., and it is stated that the Greensboro Electric Company and its holdings have been acquired by these interests. Practically all of the right of way has been secured in High Point and to the point connecting with the Greensboro line, and work is said to have been started.

Laurel, Miss.—Application for a franchise to build an electric street railway in Laurel has been made by the Gulf States Investment Company with a provision that the city may have the privilege of taking over the property at the expiration of the franchise in 1930, if desired. The petitioners agree to have one mile in operation within 18 months.

Moscow, Idaho.—The Spokane & Inland Empire Railroad has been granted a franchise to build and operate its line in this city.

Phoenixville, Pa.—A franchise has been granted to the Philadelphia Interurban Railway Company to build an electric line in this city. This is said to be part of an interurban line which the promoters agree to build between Sanatoga and Phoenixville within a year.

Port Angelus, Wash.—F. A. Ballin, H. B. Kennedy and others of Seattle, Wash., have applied for permission to build an electric street railway system in this city.

Port Jefferson, N. Y.—A franchise has been granted to the Suffolk Traction Company to build an electric line from Port Jefferson to Patchogue, L. I. The line is to be in operation within two years.

Tacoma, Wash.—The Pacific Traction Company has applied for a franchise to build a new line to the West End, which will serve the thickly settled district lying between two of the Tacoma Railway & Power Company's lines. The motive power will be either cable or electricity and it will connect with the line now under construction. The application has been referred to the franchise committee. The council has passed an ordinance providing for joint operation by the Pacific Traction Company and the Tacoma Railway & Power Company over the latter's tracks on Pacific avenue.

Whitehouse, O.—The Toledo & Defiance Railway has made application for a franchise in St. Louis avenue. The line, if built, will afford direct connection with Toledo.

RECENT INCORPORATIONS.

Clark's Summit & Lake Winola Street Railway.—Incorporated in Pennsylvania to build an 8-mile electric line from Chinchilla, Lackawanna county, to Lake Winola, Wyoming county. Capital stock, \$18,000. Thomas B. Rodham, president, Scranton, Pa.

Galveston-Houston Electric Company.—Incorporated in Maine with a capital stock of \$6,000,000, to build an interurban line between Galveston and Houston, Tex. Incorporators: William K. Neal, Richard E. Harvey, Charles E. Gurney, Ernest E. Noble, Albert E. Neal, Fred D. Harvey, John H. Ridge and David W. Snow.

Palmyra & Campbelltown Electric Street Railway, Campbell-

town, Pa.—It is announced that incorporation papers will soon be filed in Pennsylvania by this company for the purpose of building an electric line five miles long, from Palmyra to Campbelltown, Pa. Incorporators: Harry Baum, R. F. Dissinger and L. M. Reigert.

Philadelphia Valley Forge & Suburban Railroad.—Incorporated in Pennsylvania to build an electric line from the Sixty-ninth street station of the Philadelphia Rapid Transit Company's elevated road to Valley Forge and Phoenixville, Pa. It is stated that all the surveys have been made, although the exact location of the route has not been determined upon. Capital stock, \$600,000. Incorporators: L. Knowles Perot, Bala, Pa., president; A. D. Whiting, David Rumbold, Jr., Edward W. Johnson, Philadelphia; James A. Bunting, Secane; Morris H. Wetherill, Haverford, and Robert C. Selden, Norristown, Pa.

Piedmont-Carolina Railway.—Incorporated in North Carolina to build an electric railway in Salisbury, N. C. Capital stock, \$100,000. Incorporators: T. H. Vanderford, W. F. Snider and J. H. Horah.

Port Orange & Santa Ana Railway.—Incorporated in California to build a broad-gauge electric line, which will form the connecting link between the seashore and Santa Ana and will provide a direct connection by way of that city with all the principal cities of southern California, as well as with the three transcontinental steam roads. It will afford communication with a harbor 7½ miles long and 1 mile wide, at which point is the proposed site of Port Orange, named in the title. A large hotel, to be built at Creston Point, on the seashore, is one of the projects named in connection with the enterprise. It is stated that much of the material has been purchased and that work will commence as soon as possible. Capital stock, \$500,000, of which \$50,000 has been subscribed. Incorporators: Frank F. Johnson, Walter G. Hopkins, A. F. Lijal, Joseph M. Fletcher, Eugene Germain, C. L. Fredericks, Harry P. Vandever and G. H. McCarthy.

Portland & Northern Railroad.—Incorporated in Oregon to build an electric line from Portland to Bridgton, Ore. The line will be standard gauge to admit of interchanging freight with steam roads, and may be operated by third rail. It will be about 40 miles long and will pass through Windham, Raymond, Casco and Naples. As now planned the road will start from Portland at some point near Morrill's Corner, in the Deering district, and proceed by the old stage line to the terminus in Bridgton. Capital stock, \$160,000. Incorporators: William M. Sturges, N. D. Sturges, Scranton, Pa.; Tracy W. Holland, New York City; Howard Winslow, Henry L. Forham, Llewellyn Barton, Portland; S. O. Hancock, Casco, Ore.

Seymour & Brownstown Interurban Motor Line Railway, Seymour, Ind.—Incorporated in Indiana to build an interurban line between Seymour and Brownstown, Ind. Capital stock, \$10,000. Incorporators: Joseph I. Irwin, L. I. Sweeney, N. I. Sweeney and Z. T. Sweeney, all of Columbus, O.

Tanwax (Wash.) & Western Railway.—Incorporated in Washington to build a 35-mile electric line from Tanwax Junction to Olympia. It is stated that construction work is to be started at once. Capital stock, \$100,000. Henry S. Royce, Tacoma, Wash., is president.

Waynesburg (Pa.) & Monongahela Street Railway.—Application for a charter has been filed by this company, which is planning to build an electric line from Waynesburg, Pa., to East Waynesburg, Morrisville, Jefferson, Clarkesville, East Bethlehem and Millsboro. Thomas S. Crago, Waynesburg, and H. R. Myers, Washington, Pa., are interested.

Western Railways & Light Company.—This company has been incorporated and will be the holding company for the McKinley light and traction properties in northern Illinois, including the Galesburg Railway & Light Company, the Quincy Horse Railway & Carrying Company, the Illinois Valley Railway Company and the Citizens' Light Company of La Salle and Peru, and the Chicago Ottawa & Peoria Railway. The officers are: W. B. McKinley, president; George Duncan, vice-president; Edward Woodman, treasurer; T. H. McCauley, secretary; H. E. Chubbuck, general manager.

TRACK AND ROADWAY.

Albuquerque (N. M.) Traction Company.—This company is planning an extension of its Railroad avenue line to the Highlands; also the construction of one or two short cross-town lines.

Anderson, S. C.—W. L. Hodges of Hartwell, S. C., is interested in a project to build an electric railway from Athens, Ga., to Anderson, S. C., 67 miles, passing through either Carnesville or Danielsville, Ga., and Royston and Hartwell, S. C.

Asheville Rapid Transit Company, Asheville, N. C.—It is stated that a large consignment of trolley poles and cross ties for this company's extension to Overlook Park has been received and that a portion of the rails is expected shortly. Work on the grading of the line is progressing rapidly.

Bay City, Mich.—It is reported that Handy Brothers, who own a mine near Akron, Mich., will build an electric railway from Bay City to Akron and possibly through to Caro, Mich.

Bennington & Hoosick Valley Railway, Bennington, Vt.—This company, which was recently acquired by the Bennington & North Adams Street Railway, controlled by the Consolidated Railway of New Haven, Conn., is reported to have secured the right of way for an extension from Hoosick Falls to Troy, N. Y., 25 miles, via Eagle Bridge, Baskirk, Johnsonville, Valley Falls and Melrose,

paralleling the Boston & Maine Railroad; also branches from Hoosick Falls to Cambridge, N. Y., and Pownal, Vt. The road now has a line in operation from Bennington to Hoosick Falls, 16.5 miles.

Boise & Interurban Railway.—Chief Engineer F. H. Knox is quoted as saying that all but six miles of track have been laid on the line from Boise to Caldwell, Idaho, and that the poles have been set as far as Middleton. The substations at Park and Middleton are practically completed and it is probable that cars will be operated by June 15.

Boston & Worcester Street Railway.—Plans involving the expenditure of about \$300,000 have been completed by this company for the widening of Worcester street in South Framingham, Mass., to permit of the double-tracking of its line from Central square, Framingham, to the Southboro line. A year or more will be required in which to complete the work.

Buffalo & Lake Erie Traction Company, Buffalo, N. Y.—This company has purchased right of way for its crossing under the tracks of the New York Chicago & St. Louis, Dunkirk Allegheny Valley & Pittsburg and Pennsylvania railroads in Dunkirk, N. Y.

Buffalo Rochester & Eastern Railroad.—We are officially advised that this company, whose incorporation was noted in the Electric Railway Review of May 4, proposes to build a steam instead of an electric road, from Buffalo to Rochester and Troy, N. Y.

Chicago Great Western Railroad.—L. S. Cass, third vice-president, St. Paul, Minn., is reported to have announced that the branch line from Rochester to Winona, Minn., is to be electrified.

Chicago Lake Shore & South Bend Railway, South Bend, Ind.—It is reported that tracklaying on this line has now been completed from South Bend to Hudson Lake, Ind., and that rails have been delivered at Michigan City sufficient to build 50 miles of the remaining distance to the Indiana-Illinois state line, where a connection will be made with the Illinois Central Railroad. The Illinois Central has built four miles of track from Kensington to the state line to meet the electric road. Grading is now in progress at Michigan City. J. B. Hanna, president.

Chicago South Bend & Northern Indiana Railway, South Bend, Ind.—It is announced that contracts will soon be let by this company for the reconstruction of its line between Laporte and Michigan City, Ind.

Cincinnati Reading & Middletown Street Railroad.—Surveyors are now locating this company's proposed line from Sharon to Middletown, O. A franchise has been secured in Reading and it is stated that 90 per cent of the right of way has been secured.

Cleveland Southwestern & Columbus Railway, Cleveland, O.—It is stated that work on the Cleveland Ashland & Mansfield division of this company's line between Mansfield and Ashland is progressing rapidly and may be completed by September 1. An effort also will be made to have the line between Seville and Mansfield completed by the first of the year. W. H. Abbott, consulting engineer, Cleveland, O.

Columbus Kenton & Lima Railway.—Engineers are at work on this company's line between Columbus and Magnetic Springs, O., and it is stated that the construction work between Columbus and Kenton will be finished this year. The extension from Kenton to Lima and from La Rue to Marion will not be completed until some time next year. W. H. Ogan of Columbus is interested.

Columbus (Ind.) Street Railway & Light Company.—Preparations are being made to resume work on the extension from Columbus to East Columbus. It is hoped to have the line in operation in two months.

Corinth & Shiloh Electric Railway, Corinth, Miss.—Abe Rubel, president, writes that this company proposes to build an electric railway from Corinth, Miss., to the United States National Park at Shiloh, Tenn., or Pittsburg Landing, on the Tennessee river. Surveys have been made and right of way secured. Special permission to run over the park property has been granted by congress. The road will extend along the top of a ridge and no trestles will be required on the entire line.

Cortland County Traction Company, Cortland, N. Y.—This company has been authorized by the state railroad commission to issue a mortgage for \$2,000,000 and to increase its capital stock from \$320,000 to \$1,000,000. A part of the new funds is to be used for the construction of a double-track extension to Syracuse, 23 miles, three miles of track in Syracuse and two miles in Cortland. W. C. Pearce, chief engineer.

Denver & South Platte Railroad.—Joseph A. Osner, Denver, has the contract for building this electric railway, which is financed by H. W. Hartman, Thomas B. Doane and others of Denver, from Englewood to Roxborough Park, Colo., 21 miles, via Littleton. Surveys have been completed and grading was begun last week. Power will be obtained from the Denver City Tramway Company and connection with Denver will be had over that company's lines. Roxborough Park is to be developed as a summer resort.

Duluth (Minn.) Street Railway.—This company has filed plans with the board of public works for its approval of an extension of its Nemadji line to Allouez.

East Hampton, Conn.—A company has been organized to build an electric line from East Hampton to Moodus, Conn. George F. Marshall of Malden, Mass., is president and Fred M. Hoadley of Providence, R. I., secretary and treasurer.

Edmonton, Alberta.—Contracts have been awarded for the construction of the proposed municipal railway to W. H. Harvey,

Vancouver, B. C., and the Bitulithic Company, Ltd., Winnipeg, Man.

Fairchance & Smithfield Traction Company.—This company's new line from Fairchance to York Run, Pa., about two miles, was opened for traffic last week. When completed, the line will connect Uniontown and Smithfield, a distance of seven miles. Owen Jones is superintendent in charge of both operation and construction.

Findlay-Marion Railway & Light Company.—It is announced that grading on this company's 47-mile line from Findlay to Marion, O., will begin the first week in June at Marseilles, O., and will be continued on to Marion. It is stated that the people of this section, which hitherto has been without electric railway service, have promised the company 400 carloads of freight per year. R. P. Hankey of Detroit, Mich., is president.

Fremont (O.) Street Railway.—George Champe, chief engineer, has announced that this company will begin at once the work of rebuilding its tracks on Front and Tiffin streets, and that the line to Ballville will be extended about one mile to the Oakwood cemetery.

Gainesville Whitesboro & Sherman Railway.—John King, president, Gainesville, Tex., states that grading will probably be resumed about June on this line from Gainesville to Sherman, Tex., which was graded last year from Gainesville to Callisburg.

Galveston-Houston Electric Railway.—The directors of this company, which is controlled by Stone & Webster of Boston, Mass., have authorized an issue of \$5,000,000 bonds for the purpose of constructing the line from Galveston to Houston, Tex. M. M. Phinney of Dallas is interested.

Georgia Railway & Electric Company, Atlanta, Ga.—The work of double-tracking west Peachtree street, Georgia avenue and the three main trunk lines reaching Ponce de Leon springs, has been completed and the line is now in operation.

Grafton (W. Va.) Traction Company.—It is announced that the contract for the construction this company's 2½-mile line in Grafton has been let to Tolbert Brothers of Fairmont and it is stated that a large force of men will be put at work at once. The contract provides that the work must be completed six weeks from May 28. After the completion of the present proposed line, which it is now planned to have in operation by early fall, the company is said to be planning for further extensions. A power plant is to be built and will be equipped with General Electric apparatus.

Indianapolis & Louisville Traction Company, Louisville, Ky.—We are officially advised that this company, which is now building a line from Seymour to Sellersburg, Ind., 41 miles, expects to begin operating from Louisville, Ky., to Scottsburg, Ind., by June 15, using the tracks of the Louisville & Northern Railway & Lighting Company as far as Sellersburg. By August 1 it is expected to begin operating from Louisville to Indianapolis, using the tracks of the Indianapolis Columbus & Southern Traction Company from Seymour north. The latter company is building an extension from Columbus south to Seymour, 19 miles, of which 17 have been graded, with 8 miles of track laid. A. A. Anderson of Columbus, Ind., general manager of the Indianapolis Columbus & Southern, has also been appointed general manager of the Indianapolis & Louisville and the two lines will be operated as one system. A power house and car house have been erected at Scottsburg. The line is to be operated with direct-current at 1,200 volts. John C. Mayo of Paintsville, Ky., is president and W. H. Cost, chief engineer.

Indianapolis Columbus & Southern Traction Company, Columbus, Ind.—The contract for building this company's interurban station at Reddington, Ind., which is on the line of its extension to Seymour, has been let to Dunlap & Co. A. A. Anderson, Columbus, Ind., is general manager.

Indianapolis Columbus & Southern Traction Company, Columbus, Ind.—A. A. Anderson, general manager, writes that eight miles of track, from Seymour to near Azalea, have been laid on the extension from Columbus to Seymour, Ind., 19.01 miles, and that grading has been completed from Seymour to near Columbus, a distance of 17.5 miles. Poles have been set for 15 miles. The overhead construction is of the bracket type. Substations, each containing one 200-kilowatt Stanley rotary converter and three air-cooled transformers, are under construction at Reddington and Columbus. The company is doing the construction work. This line will be operated from Indianapolis to Louisville, Ky., in connection with the Indianapolis & Louisville Traction Company, which is building from Sellersburg to Seymour. The tracks of the Louisville & Northern Railway & Lighting Company will be used from Sellersburg to Louisville. Through operation is expected to begin by August 1. Joseph I. Irwin, president.

Interborough-Metropolitan Company, New York, N. Y.—This company has issued \$15,000,000 of short-term notes, a part of the proceeds of which is to be used in installing the underground trolley system on the cross-town lines of the Metropolitan Street Railway, which are now operated by horse-power.

International Railway, Buffalo, N. Y.—A new line on Fillmore avenue, from Main street to Abbott road, six miles long, connecting with the steel plant district, has been completed and will be opened for traffic on May 30.

Indiana Southern Railway, Aurora, Ind.—C. M. McMullen, secretary, writes that this company proposes to build an electric railway from Aurora to Rising Sun, Ind., a distance of eight miles. Construction will be commenced as soon as a franchise can be secured in Aurora. E. W. Swarthout of Aurora is president.

Jackson (Mich.) Consolidated Traction Company.—It is stated that following the sale of this property to the Michigan United Railways several important improvements are planned for this company's lines and that rails have been ordered for an extension $3\frac{1}{2}$ miles long.

Jackson (Miss.) Electric Railway Light & Power Company.—An amendment to its charter, permitting it to construct and operate interurban and suburban lines, has been secured by this company. F. G. Preutt, Jackson, general manager.

Jefferson City (Tenn.) Electric Railway Light & Power Company.—J. H. Bundren writes that this company, recently incorporated, proposes to build an electric railway from Jefferson City to Dandridge, Tenn., 10 miles. A contract is to be let for a dam and construction of the road is to begin shortly. The company also expects to do a general light and power business. The organization has not yet been perfected.

Kansas Southern Electric Railway.—Frank V. Crouch of Iola, Kan., who is promoting an electric railway from Pittsburg to Girard, Erie and Iola, Kan., is now securing the necessary right of way. Surveys are now being made and Mr. Crouch states that the line has been financed.

Long Island Railroad.—According to the annual report of President Ralph Peters, plans are being prepared for the electrification of the lines from Long Island City to Port Washington and to Whitestone Landing, and as soon as the tunnels under the East river are completed, the lines will be electrified to Jamaica and to Woodhaven Junction, via the Glendale cut-off, a connection between the main line, the Montauk division and the Rockaway Beach division. Plans are also being made for an enlarged terminal at Jamaica, where the change from steam to electric locomotives will be made. It is reported that this company has abandoned the plan for an extension from Wading River to Riverhead and will build instead an extension from Wading River to Manor. Surveys have been started.

Louisiana Bowling Green & St. Charles Interurban Railway.—W. F. Manzke of Bowling Green, Mo., is interested in an attempt to promote an interurban line to run from Louisiana, Bowling Green, St. Clements, Ashley, New Hartford, Marling, Olney, Millwood, Silex, Old Monroe and to St. Charles.

Ludington, Mich.—Work is now in progress on the electric railway between Pentwater and Ludington, Mich.

Marshfield, Ore.—A project is on foot to build an electric railroad from Roseburg to Coos Bay and Marshfield, Ore., about 75 miles. Citizens of Roseburg have agreed to subscribe \$500,000 if a proportionate amount is subscribed in North Bend and Marshfield. It is estimated that the road would cost from \$1,100,000 to \$2,000,000.

Marquette County Gas & Electric Company, Ishpeming, Mich.—This company is planning a number of important extensions and changes of route on its city lines in Marquette, Mich.

Monroe, Mich.—It is reported that a project is on foot to build an electric railway from Monroe to Dundee, Mich.

New York, N. Y.—The shields in the north tube of the Belmont tunnel, from Manhattan Island to Long Island City, met on May 16. It is now expected to operate trains through the tunnel by August 1. The other tube is not expected to be cut through before that time.

Northwestern Ohio Electric Railway.—It is reported that Jerome, Hunter & Co. of Philadelphia have been awarded a contract for the construction of the line from Defiance to Montpelier, O., 34 miles, via Bryan and Evansport. Construction will begin at Bryan and proceed in both directions. M. Steinberg of Defiance, chief engineer.

Peoria Bloomington & Champaign Traction Company, Bloomington, Ill.—This company, which has recently completed its line from Peoria to Bloomington, Ill., and proposes to build to Champaign, as a part of the Illinois Traction System, has filed notice of an increase of capital stock to \$500,000.

Pontiac Oxford & Northern Railroad, Pontiac, Mich.—It is reported that Robert Oakman and Detroit capitalists have secured an option on 60 per cent of the capital stock of this company, which is now in receiver's hands, and will convert the steam road, operating between Pontiac and Caseville, Mich., about 100 miles, to an electric railway.

Puget Sound Skykomish & Eastern Railway, Everett, Wash.—This company is making rapid progress on the surveying of its line from Index to Galena, Wash., 10 miles, and shipments of rails have been delivered. Grading is to begin at once. Nicholas Rudebeck is one of the promoters.

Puget Sound Electric Railway, Tacoma, Wash.—W. S. Dimmock, manager, writes that the Seattle-Tacoma interurban line has just been double-tracked for 12 miles out of Seattle and the company is now undertaking the construction of the second track from Kent to Pacific City, nine miles, and for two or three miles out of Tacoma, leaving about 12 miles of single track through the hills and at points where a double track is not necessary at present, but which will probably be double-tracked within the next year or two. Seventy-pound rail is being used for the running rail and 100-pound rail for the third rail, and the road is ballasted with gravel in the best possible manner.—The new line from Tacoma to Orting, via Puyallup, 21 miles, is expected to be opened for traffic by the last of the summer. Construction materials are being delivered along the line and the right of

way purchases are being completed. About one mile of the line has been built.

Redlands Central Railway, Redlands, Cal.—John H. Fisher, chief engineer, writes that surveying is in progress on this proposed line from Redlands to Riverside, Cal., 18 miles, via Redlands Junction, Loma, Linda and Highgrove. Overhead work is now in progress on the line across the city, 3.67 miles. Ohio Brass Company's No. 00 grooved trolley wire is used. Grading is to begin on the interurban line on June 15. The rails will be 60-pound A. S. C. E. section, using Abbott rail joint plates. The power house will contain a 200-kilowatt General Electric motor generator. The car equipment will consist of two 37-foot Brill convertible cars, equipped with Westinghouse air brakes and GE-90 motors. A. G. Hubbard, president.

Rockford Oregon & Southern Railway, Oregon, Ill.—F. G. Jones, one of the incorporators, writes that this company will build an electric railway from Rockford to Dixon, Ill., 44 miles, via Stillman Valley, Oregon and Grand Detour. The organization of the company is not yet completed and no contracts have been let.

Rockville & Stafford Springs Street Railway.—It is reported that this company has secured the land necessary for its entrance to Rockville, Conn., and has secured options for land for car barns.

Russellville, Ark.—It is reported that plans are being made for the construction of an electric railway from the Arkansas river through Atkins, Economy and Appleton, Wis., with probable extensions to Hattiesville, Cleveland, Pottsville and other points. Local capital is said to be backing the project.

St. Louis Decatur & Champaign Railway, Champaign, Ill.—This company, which is now constructing a line from Champaign to Decatur, Ill., as a part of the Illinois Traction System, has filed a notice of increase of its capital stock from \$100,000 to \$500,000.

Southwestern Traction Company, London, Ont.—The extension to Port Stanley is expected to be in operation about July 1. The entire line is graded, tracklaying is completed to within a mile of Port Stanley and poles have been erected for a large part of the distance. C. P. Raikes, chief engineer.

Springfield (Ill.) Belt Railway.—This company has increased its capital stock from \$5,000 to \$500,000.

Springfield (Mass.) Street Railway.—The work on the Brimfield extension line to Palmer and Fiskdale is progressing so rapidly that it is believed the line may be operated by the middle of June. There still remains the erection of two 100-foot span bridges over the Quobaug river.

Stafford Springs Street Railway.—This company is surveying a new route into Rockville, Conn., using Hale and Grove streets.

Syracuse & South Bay Railway, Syracuse, N. Y.—This company has been authorized by the New York railroad commission to issue a first mortgage for \$1,000,000 for the construction of its line from Syracuse to South Bay, N. Y. William Nottingham is interested.

Texas Traction Company, Dallas, Tex.—H. K. Payne, representing the Fred A. Jones Company, which has the contract for building this line from Dallas to Sherman, Tex., 65 miles, states that one-fifth of the roadbed is completed and that it is expected to have the grading finished by October 1. Rails and equipment have been ordered.

Toledo Wabash & St. Louis Railroad, Toledo, O.—It is reported that the Riggs & Sherman Company, Toledo, is making surveys for this proposed line between Defiance, O., and Ft. Wayne, Ind. The line between Toledo and Defiance is already surveyed. L. A. Chenoweth is in charge for Riggs & Sherman. W. D. Whitney of Toledo, president.

Tri-City Railway, Davenport, Ia.—This company expects to begin work at once on the proposed construction work for the season in Rock Island, Ill. The Bridge line on Third avenue, between Fifteenth and Twentieth streets, will be double-tracked and rebuilt. The Moline avenue line will be rebuilt and the Red line will be rebuilt and possibly double-tracked for a part of its length. Parts of several other lines are to be rebuilt and the double-tracking will be extended.

West Virginia Interior Railroad.—Judge T. P. Jacobs of New Martinsville, W. Va., is interested in a proposition to build an interurban road from either Sistersville or New Martinsville to Middlebourne, W. Va.

POWER HOUSES AND SUBSTATIONS.

Capital Traction Company, Washington, D. C.—This company has contracted with James L. Parsons to build an addition to its electric plant at Grace street, near Potomac street, Washington, D. C. It is stated the improvements to the electric plant will cost about \$25,000 and are to be begun at once.

Choctaw Railway & Lighting Company, McAlester, I. T.—This company has recently purchased through the Knox Engineering Company, Chicago, one 500-kilowatt direct-connected unit from the Allis-Chalmers Company.

Illinois Traction Company.—It has been announced that this company will install mechanical stokers in its power house, and coal bunkers having a capacity of 1,000 pounds. The contract for the coal bunkers will also include the installation of a complete ash and coal handling conveyor.

Personal Mention

Mr. E. R. Kelsey of Toledo, O., has accepted the position of manager of the publicity department of the Toledo Railways & Light Company.

Mr. William W. Tracy, formerly general manager of the Whitman Electric Railway & Power Company, Colfax, Wash., has resigned to engage in other business at Butte, Mont.

Mr. C. Faller, superintendent of the Carlisle & Mt. Holly Railway, Carlisle, Pa., has been appointed superintendent of the Carlisle Gas & Water Company, vice Mr. Charles Ramsey, resigned.

Mr. David C. Young, Newark, N. J., one of the directors of the Lehigh Valley Transit Company, Allentown, Pa., at a meeting of the board of directors on May 21, was elected president of the company, succeeding Col. H. C. Trexler, resigned.

Mr. E. W. Moore of Cleveland, O., president of the Lake Shore Electric Railway, has been elected president of the Cleveland Painesville & Eastern Railroad of Willoughby, O., succeeding Mr. Charles W. Wason, resigned on account of ill health.

Mr. F. A. Bailey has been appointed superintendent of the Camden lines of the Public Service Corporation of New Jersey, effective on May 20. Mr. Bailey has been connected with the Columbus (O.) Railway & Light Company as foreman.

Mr. W. J. Achelpohl will henceforth have charge of the auditing department of the Illinois Valley Railway, Ottawa, Ill., and the street railway systems in Galesburg and Quincy, Ill., controlled by the McKinley interests, with headquarters at Ottawa.

Mr. John Powers on May 21 resigned as superintendent of the Sterling Dixon & Eastern Electric Railway and Lee County Lighting Company of Dixon, Ill. He will take a position with the Galesburg (Ill.) Railway & Light Company, in its lighting department.

Mr. William S. Hurley has been appointed by Mayor McClellan of New York as a member of the board of rapid transit railroad commissioners, succeeding Mr. Lewis Cass Ledyard, who resigned several months ago. Mr. Hurley is president of the Borough Bank of Brooklyn.

Mr. L. K. Burge, heretofore superintendent of the Lake Shore Electric Railway and the Lorain Street Railroad, at Norwalk, O., was on May 22 appointed general superintendent of the Lake Shore Electric Railway and all properties controlled by that company.

Mr. B. E. Van Vliet, treasurer of the Rapid Transit Railway and park manager of the Dallas Consolidated Electric Street Railway, Dallas, Tex., controlled by Stone & Webster of Boston, has been transferred to the home offices of the company in Boston. Mr. Van Vliet formerly was identified with the street railway interests of Des Moines, Ia.

Mr. J. H. Crawford, heretofore master mechanic of the Wheeling Traction Company, Wheeling, W. Va., has resigned, effective on May 1, to become superintendent of mines for the Empire Coal Mining Company, Bellaire, O. Mr. Frank O'Brien, formerly with the Public Service Corporation of New Jersey, will succeed Mr. Crawford.

Mr. L. C. Bradley, superintendent and purchasing agent of the Scioto Valley Traction Company, Columbus, O., has resigned to accept a position with J. G. White & Co. of New York. Mr. Calvin Skinner, heretofore master mechanic, has been appointed to succeed Mr. Bradley as superintendent. Mr. W. S. V. Robb, heretofore chief clerk to the general manager, has been appointed purchasing agent.

Mr. Frederick W. Hild, who has just been appointed general manager and chief engineer of the Havana Electric Railway, was married on May 22 to Georgia Marion Halstead at Dueskirk, O., and will reside at Havana, Cuba. Mr. Hild was formerly construction engineer for the General Electric Company, in charge of the installation of machinery on the Aurora Elgin & Chicago Railway, and was recently chief engineer of the Southwestern Wisconsin Railway, with headquarters at Dubuque, Ia.

Mr. Charles H. Bigelow, who has been superintendent of construction for the Stone & Webster Engineering Corporation, in charge of the recently completed power plant at Dallas, Tex., has resigned to accept a position with L. B. Stillwell of New York, in connection with power station construction of the United Railways & Electric Company at Baltimore, Md. Mr. Bigelow is a graduate of the Massachusetts Institute of Technology and since 1892 has had charge of several extensive electric and power plant installations in various sections of the country.

Mr. W. H. Evans, master mechanic of the Indianapolis Traction & Terminal Company, has resigned to become superintendent of motive power of the International Railway Company of Buffalo, effective on June 1. Mr. Evans began his street railway service several years ago with the Twin City Rapid Transit Company of Minneapolis, Minn., and was later for a short time with the Chicago City Railway Company. He has held his present position at Indianapolis for about two years. Mr. Evans has been prominently identified with the standardization work and besides being a member of the standardization committee of the American Street and Interurban Railway Association, he is also chairman of the standardization committee of the Central Electric Railway Association.

Financial News

American Cities Railway & Light Company, New York.—A. H. Ford, the president, makes the following statement: "In accordance with the proposition dated June 20, 1906, the company has proceeded to acquire a majority of the common and preferred stocks of the Birmingham Railway Light & Power Company, the Memphis Street Railway Company, the Little Rock Railway & Electric Company, the Knoxville Railway & Light Company, and the Houston Lighting & Power Company, upon the basis of the purchase price set forth in that proposition. The offer to purchase the stocks of the Nashville Railway & Light Company was withdrawn, and no stocks of that company have been purchased. On August 23, 1906, sufficient stocks of the five local companies mentioned had been deposited to warrant the directors in declaring the plan operative, which action was taken. The company has since acquired additional shares of the same companies, so that as of December 31, 1906, it owned 64,910 shares out of 77,500 shares of preferred stock of the five local companies, and 84,357 shares out of 94,919 shares of common stock, equivalent to 83.7 per cent and 88.8 per cent of the total respective issues. The income account of the company for the six months' period ended December 31, 1906, is shown below. The undivided surplus net earnings of the local companies are not taken into account in this statement, which includes only the dividends actually paid; as a matter of fact, dividends were paid on the common stocks of the Birmingham, the Little Rock and the Houston companies only. For the year ended December 31, 1906, had the entire surplus earnings of the five local companies, less sinking funds, been declared as dividends, after payment of preferred dividends in full, the amount of the common stock now held by the American Cities Railway & Light Company would have been entitled to \$477,635, which is equivalent to earnings of 4.44 per cent upon the common stock outstanding on December 31, 1906. The surplus earnings, however, have been invested in betterments and new property, which new construction, together with that obtained from the sale of the securities of the local companies, is showing its value by the large increases which are being obtained in both gross and net earnings." The income account of the company shows dividends received during the six months ended December 31, 1906, of \$309,908 and \$152 interest on bank balances, a total of \$310,060. General expenses amounted to \$1,968, and payment of a dividend of 3 per cent on the preferred stock to \$203,371, leaving a surplus of \$104,721. The combined income statement of the five local companies for the year ended December 31, 1906, follows:

Gross income, all sources	\$4,710,638
Operating expenses and taxes	2,675,104

Net earnings	\$2,035,534
Deduct interest charges	\$993,157
Sinking funds and reserve funds	148,315
Dividends paid	674,014
	<hr/>
	1,815,486

Undivided surplus for year\$ 220,048

Auburn & Turner Railroad, Lewiston, Me.—Justice A. R. Savage of the supreme court at Lewiston appointed A. L. Cavanaugh of Lewiston and John T. Burnett of Boston receivers of this road on May 13.

Belton & Temple Traction Company, Temple, Tex.—At the annual meeting of stockholders of this company on May 16 the following directors were elected: Samuel Watts, Calvin Greene, A. C. Mays, H. E. Ahrens, G. K. Watson, J. A. McDonald, L. F. Treaster, W. H. Taylor, J. C. Houser, W. R. Barefoot, W. C. Davies, A. F. Bentley and George W. Tyler.

Brooklyn Rapid Transit Company.—A plan for financing improvements and extensions and funding the floating debt of the Brooklyn Union Elevated Railroad and the Nassau Electric Railroad, subsidiary companies, was announced on May 18 by Charles D. Meneely, secretary and treasurer of the Brooklyn Rapid Transit Company. The amount needed is \$25,000,000, of which \$20,000,000 is for the Brooklyn Union elevated road and \$5,000,000 for the Nassau Electric road. In following the plan special meetings of stockholders of the Brooklyn Union company and the Nassau Electric company will be held on June 10 and 11, respectively, to authorize mortgages in the amounts named. These mortgages will secure certificates of indebtedness which have been issued or will be made by those companies to reimburse the Brooklyn Rapid Transit Company for cash advances. Mr. Meneely says in his statement: "The Brooklyn Rapid Transit Company has entered into agreement with most of its constituent companies to furnish from time to time within the next 10 years such moneys as each of these companies shall require for extensions, improvements, additions, etc., up to a maximum amount, and to take in exchange therefor the certificate of indebtedness of such company payable on demand. The board of railroad commissioners has already authorized such mortgages by the Sea Beach Railway Company, the Canarsie Railroad Company and the South Brooklyn Railway Company, and after the approval by the stockholders of the Nassau Electric and Brooklyn Union Elevated Railroad companies, will be asked to give its consent also to the mortgages to be issued by those. The mortgages for which consent is requested, to the extent that they secure past expenditures, do not add one dollar to outstanding capital charges; to the extent that they secure expenditures hereafter to be made, they carefully limit such expenditures to the actual cost of additions, improvements and extensions. The cer-

tificate of indebtedness shall not be issued at less than par and must represent such actual cost. Under the terms of the Brooklyn Rapid Transit Company mortgage, bonds issued under that mortgage must be issued at par for the par of such certificates of indebtedness, and any deficiency arising from the sale of Brooklyn Rapid Transit bonds at less than par must be made up out of the earnings of the company." Reports of the principal operating lines of the Brooklyn Rapid Transit Company for the quarter ended March 31 were as follows:

Brooklyn Heights Railway.			
January 1 to March 31—	1907.	1906.	1905.
Gross earnings	\$2,624,999	\$2,999,661	\$2,685,164
Expenses	1,685,669	1,837,234	1,786,936
Net earnings	\$ 939,330	\$1,162,427	\$ 898,228
Other income	33,848	52,342	23,666
Total income	\$ 973,178	\$1,214,769	\$ 921,894
Charges	1,025,597	1,170,629	988,666
Surplus	*\$ 52,419	\$ 44,140	*\$ 66,772

*Deficit.

Brooklyn Queens County & Suburban Railroad.			
January 1 to March 31—	1907.	1906.	1905.
Gross earnings	\$356,402	\$334,139	\$267,506
Expenses	238,216	191,253	187,118
Net earnings	\$118,186	\$142,886	\$ 80,388
Other income	5,500	3,647	1,150
Total income	\$123,686	\$146,533	\$ 81,538
Charges	111,821	105,520	103,455
Surplus	\$ 11,865	\$ 41,014	*\$ 21,917

*Deficit.

Nassau Electric Railroad.			
January 1 to March 31—	1907.	1906.	1905.
Gross earnings	\$670,157	\$709,581	\$554,444
Expenses	510,290	451,580	413,076
Net earnings	\$159,867	\$258,001	\$141,368
Other income	23,401	55,976	18,934
Total income	\$183,268	\$313,977	\$160,302
Charges	217,333	216,048	200,706
Surplus	*\$ 34,065	\$ 97,929	*\$ 40,404

*Deficit.

Brooklyn Union Elevated.			
Quarter ended March 31, 1907—	1907.	1906.	1905.
Gross earnings	\$550,029	\$550,029	\$550,029
Expenses	311,892	311,892	311,892
Net earnings	\$238,137	\$238,137	\$238,137
Other income	6,882	6,882	6,882
Total income	\$245,019	\$245,019	\$245,019
Charges	137,436	137,436	137,436
Surplus	\$107,583	\$107,583	\$107,583

Cleveland Painesville & Eastern Railroad, Willoughby, O.—It is reported that control of this company will be purchased by the Northern Ohio Traction & Light Company.

Conway (Mass.) Electric Street Railway Company.—Governor Guild of Massachusetts signed on May 16 the bill giving approval to the purchase of control of this company by the Fitchburg Railroad, which is controlled by the Boston & Maine Railroad. An account of the hearing, at which the motive for the transaction was discussed, was published in the Electric Railway Review of March 2, 1907, page 287. The Conway company was chartered to carry freight, passengers, United States mail, and to do a general railroad business. The road connects the railroad station on the Fitchburg line at South river with the town of Conway. There are no houses at the South river terminus and no residences other than the railroad station occupied by the railroad people. There is no other entrance to South river save by the Fitchburg railroad, and there is no other railroad connection for Conway except this electric railroad. There are only six houses for the entire distance of five miles along the line.

Cortland County Traction Company, Cortland, N. Y.—The New York state railroad commission has given approval to the issue by this company of a first and refunding mortgage of \$2,000,000 and an increase in the capital stock from \$320,000 to \$1,000,000. The proceeds will be used for the retirement of outstanding bonds, the payment of floating debt and extensions.

Interborough-Metropolitan Company, New York.—This company has authorized the issue of \$15,000,000 of 3-year 5 per cent collateral trust notes. The company has recently borrowed from various banks and trust companies about \$3,000,000 on its 6 per cent notes running for six months, and these notes, and whatever similar notes may be issued meanwhile, will be taken up out of the proceeds of the 3-year notes when issued. The \$15,000,000 issue is to be taken by several large banks and trust companies. The security for these notes will be Metropolitan Street Railway 3-year 6 per cent improvement notes to the amount of \$8,000,000, to be

issued; 59,700 shares of stock of the Third Avenue Company, 430 shares of the Forty-second Street and Grand Street Ferry stock, 5,028 shares (the Metropolitan Street Railway Company's entire holding) of Central Crosstown Railroad stock, 1,507 shares of stock of the Second Avenue Railroad and 6,955 shares of stock of the Electric Storage Battery Company. The report of the combined operations of the Interborough Rapid Transit Company and the New York City Railway for the year ended March 31, 1907, compares as follows:

	1907.	1906.	Increase.
Gross earnings	\$43,353,841	\$40,693,671	\$2,660,170
Expenses	21,841,884	21,044,516	797,368
Net earnings	\$21,511,957	\$19,649,155	\$1,862,802
Other income	1,187,464	1,215,781	* 28,317
Total income	\$22,699,421	\$20,864,936	\$1,834,485
Interest and rentals	15,412,229	14,254,959	1,157,270
Balance	\$ 7,287,192	\$ 6,609,977	\$ 677,215
Taxes (excluding Metropolitan franchise tax)	2,544,323	2,511,967	32,356
Balance	\$ 4,742,869	\$ 4,098,010	\$ 644,859
Interest, 4½ per cent on \$70,000,000			
Interborough-Metropolitan bonds	3,150,000	† 2,800,000	350,000
Applicable for dividends	\$ 1,592,869	\$ 1,298,010	\$ 294,859
Dividend, 7 per cent on Metropolitan Street Railway stock	666,368	3,639,888	*2,973,520
Balance	\$ 926,501	*\$2,341,878	\$3,268,379
Dividend, 5 per cent on Interborough-Metropolitan preferred	2,273,990		2,273,990
Deficit	\$ 1,347,489	\$ 2,341,878	*\$ 994,389

*Decrease. †Dividend on Interborough stock.

The New York City Railway reports for the quarter ended March 31:

Quarter ended March 31—	1907.	1906.	1905.
Gross earnings	\$3,800,559	\$3,960,771	\$3,639,467
Operating expenses	2,600,564	2,398,458	2,467,374
Net earnings	\$1,199,995	\$1,562,313	\$1,172,093
Other income	261,605	301,043	282,571
Total income	\$1,461,600	\$1,863,356	\$1,454,664
Charges	2,863,010	2,789,724	2,777,074
Deficit	\$1,401,410	\$ 926,368	\$1,322,406

Gross earnings of the subway division of the Interborough Rapid Transit Company in the first quarter of 1907 were \$2,408,921, as compared with \$2,052,641 in the corresponding period of 1906. Gross earnings of the Manhattan division were \$3,622,978, as compared with \$3,266,088.

Jackson (Mich.) Consolidated Traction Company.—Following the purchase of control of this company by interests identified with the Michigan United Railways, Bird S. Coler, the president, has retired from that office. He is succeeded by Myron W. Mills, president of the Michigan United Railways. The directors now are as follows: Myron W. Mills, Bird S. Coler, James R. Elliott, John C. Tomlinson, Charles B. Hole and Henry L. Haviland.

Liverpool Corporation Tramways.—The total revenue for the year 1906 was £583,619, as compared with £566,628 in 1905. Operating expenses, including rental of leased lines, amounted to £391,282, or 67 per cent of the total revenue. In 1906, as compared with £281,378 and 67.3 per cent in 1905. From the balance of £192,337 in 1906, and £185,250 in 1905, there were deducted for interest and sinking fund £109,580 and £109,291 in 1906 and 1905, respectively, leaving a balance in 1906 of £82,757, and in 1905 of £75,959. Of this balance £55,171 was applied to reserve, renewal and depreciation in 1906, as against £60,639 in 1905.

Long Island Railroad.—In the annual report for 1906 Ralph Peters, the president, makes the following statement: "In the report for 1905, attention was called to the organization of the Long Island Consolidated Electrical Companies. That company Electric Railway Company, and has also purchased during the year the Babylon railroad, a small line in the village of Babylon. The company has also planned the construction of a cross-island line from Huntington to Babylon, via Farmingdale and Amityville, and the necessary franchises for this extension have been secured. It is proposed to obtain the funds for this purpose through the sale of the Electrical companies' bonds, guaranteed by your company."

Mansfield (O.) Railway Light & Power Company.—It is announced that a majority of the \$1,000,000 capital stock of this company has been purchased by F. L. Fuller & Co. of Cleveland. It is stated that the stock was acquired on behalf of the Cleveland Southwestern & Columbus Railway Company.

Milwaukee Light Heat & Traction Company.—Of the new issue of \$30,000,000 refunding and extension mortgage 5 per cent bonds about \$7,500,000 bonds are immediately available, but it is stated that none will be sold in the immediate future. The \$5,000,000 first mortgage bonds are subject to call at 110, and \$5,500,000 of the new issue are reserved to refund these bonds.

Nashville (Tenn.) Railway & Light Company.—The company has completed the acquisition of a one-half interest in the New York & Long Island Traction Company and in the Long Island

has filed a trust deed covering the issue of \$15,000,000 of 5 per cent refunding and improvement mortgage bonds, dated July 2, 1906, and due on July 1, 1956. Of the authorized amount \$6,000,000 bonds are reserved to retire underlying bonds, \$7,000,000 are reserved to be issued at the rate of \$1,000 for each \$1,250 expended for future improvements and equipment, and \$2,000,000 are available for corporate purposes.

New York New Haven & Hartford Railroad.—Charles S. Mellen, president of this company, was questioned on May 15 by Dana Malone, attorney-general of Massachusetts, regarding the interests of the road in Massachusetts electric lines. Mr. Mellen said that the New Haven Railroad of Connecticut owns the stock of the Consolidated Railways Company, and that the stock is voted once a year in order to elect directors of the Consolidated company. These directors vote stock to elect trustees in voluntary associations, who in turn elect trustees of a second series of voluntary associations. The latter trustees elect directors of the individual street railway companies. For instance, he said, the New England Investment & Security Company, a voluntary association, which is controlled by the Consolidated Railways, owns the shares of the Springfield Railways Company, a voluntary association, which in turn owns control of the Springfield Street Railway Company, the Western Massachusetts Street Railway Company, etc.

North American Company.—Redmond & Co. and Lee, Higginson & Co. have purchased \$2,500,000 of an issue of \$5,000,000 of 5 per cent 5-year collateral trust notes. The following official statement was made: The subsidiary companies are largely in debt to the North American Company and besides need large sums to meet the rapidly increasing business. There is practically no market for the bonds of the subsidiary companies except at ruinous prices, and the directors believe that it is better financing to sell short time notes in order to help the subsidiary companies than to sell the long time bonds of these companies at low prices. The bonds of the subsidiary companies will be held in the treasury of the North American Company until such time as the market for investment bonds may assume normal conditions.

Omaha & Council Bluffs Street Railway, Omaha.—Application has been made to list \$10,000,000 common stock, \$5,000,000 preferred stock and \$7,350,000 first mortgage 5 per cent bonds of this company on the Cincinnati stock exchange.

Philadelphia & Western Railroad, Philadelphia.—The property of this company was sold under foreclosure at Westchester, Pa., on May 20, to Frank H. Brewster, representing William C. Sheldon & Co. and Mackay & Co. of New York, who held practically all of the stocks and bonds of the company. Joseph S. Clark, general counsel for the company, made the following statement: "William C. Sheldon & Co. and Mackay & Co. will be the new syndicate managers and will reorganize the company as soon as the legal formalities have been completed. This will require about three weeks. The new company will put out about \$4,000,000 of bonds and bring the capital stock more on a parity with the bond issue than it is at the present time. George J. Kobusch of St. Louis, while having disposed of the major portion of his holdings to the syndicate, will, however, retain a minority interest."

St. Joseph (Mo.) Railway Light Heat & Power Company.—The earnings for the year 1906 and for the four months ended April 30, 1907, were as follows:

	Year 1906.	Four months ended April 30, 1907.
Gross	\$834,438	\$261,289
Expenses	426,803	141,479
Net	\$407,635	\$119,810
Charges	236,454	79,017
Surplus	\$171,181	\$ 40,793
Dividends	38,000	26,000

San Bernardino Valley Traction Company, San Bernardino, Cal.—It is announced that H. E. Huntington has acquired control of this company.

Springfield & Eastern Street Railway, Palmer, Mass.—This company has petitioned the Massachusetts railroad commissioners to approve the issue of \$750,000 stock for building an extension to Fiskdale, acquiring additional real estate and rolling stock, and for paying floating debt.

Syracuse (N. Y.) Rapid Transit Company.—Earnings for the quarter ended March 31, 1907, follow:

Quarter ended March 31—	1907.	1906.	1905.
Gross	\$289,636	\$252,130	\$218,379
Expenses	162,253	144,304	130,411
Net	\$127,383	\$107,826	\$ 87,968
Other income	164	1,501	1,555
Total income	\$127,547	\$109,327	\$ 89,523
Charges	92,452	66,237	61,116
Surplus	\$ 35,095	\$ 43,090	\$ 28,407

Toledo (O.) Railways & Light Company.—The shareholders will vote on June 15 on the recommendation to increase the capital stock of the company from \$12,000,000 to \$15,000,000, and to purchase all the property and franchises of the Toledo Gas Electric & Heating Company.

United Traction Company, Albany, N. Y.—Earnings for the quarter ended March 31 were as follows:

Quarter ended March 31—	1907.	1906.	1905.
Gross	\$456,644	\$411,910	\$401,420
Expenses	292,621	250,317	234,813
Net	\$164,023	\$161,593	\$166,607
Other income	37,641	3,520	1,317
Total income	\$201,664	\$165,113	\$167,924
Charges	87,481	86,581	106,241
Surplus	\$114,183	\$ 78,532	\$ 61,683

United Railways Company, Portland, Ore.—It is reported that control of this company has been purchased by E. E. Lytle, president of the Pacific Railway & Navigation Company.

Utica & Mohawk Valley Railway, Utica, N. Y.—Earnings for the quarter ended March 31 follow:

Quarter ended March 31—	1907.	1906.	1905.
Gross	\$231,206	\$198,727	\$172,724
Expenses	148,581	123,901	126,776
Net	\$ 82,625	\$ 74,826	\$ 45,948
Other income	385	1,117	901
Total income	\$ 83,010	\$ 75,943	\$ 46,849
Charges	77,079	44,964	44,104
Surplus	\$ 5,931	\$ 30,979	\$ 2,745

The balance sheet shows cash on hand of \$40,104 and a profit and loss surplus of \$657,558.

Dividends Declared.

- American Railways Company, quarterly, 1½ per cent.
- Citizens' Traction Company, Pittsburg, 3 per cent.
- Columbus (O.) Railway Company, common, quarterly, 1¼ per cent.
- Grand Rapids (Mich.) Railway Company, common, quarterly, 1 per cent.
- Kansas City Railway & Light Company, preferred, quarterly, 1¼ per cent.
- Northern Ohio Traction & Light Company, Akron, O., quarterly, one-half of 1 per cent.
- Paducah (Ky.) Traction & Light Company, preferred, 1 per cent.
- Pensacola (Fla.) Electric Company, preferred, 3 per cent.

Directory of Electric Railway Associations.

- American Street and Interurban Railway Association. Secretary, Bernard V. Swenson, 29 West Thirty-ninth street, New York. Annual meeting, Atlantic City, N. J., October 14-18.
- American Street and Interurban Railway Accountants' Association. Secretary, Elmer M. White, assistant treasurer Birmingham Railway Light & Power Company, Birmingham, Ala.
- American Street and Interurban Railway Engineering Association. Secretary, S. Walter Mower, general manager Southwestern Traction Company, London, Ont.
- American Street and Interurban Railway Claim Agents' Association. Secretary, B. B. Davis, claim agent Columbus Railway & Light Company, Columbus, O.
- American Street and Interurban Railway Manufacturers' Association. Secretary, George Keegan, 2321 Park Row building, New York, N. Y.
- Canadian Street Railway Association. Secretary, Allan H. Royce, president Toronto Suburban Railway, Toronto, Ont.
- Colorado Electric Light Power & Railway Association. Secretary, John F. Dostal, Denver Gas & Electric Company, Denver, Colo.
- Iowa Street and Interurban Railway Association. Secretary, L. D. Mathes, general manager Union Electric Company, Dubuque, Ia.
- Massachusetts Street Railway Association. Secretary, Charles S. Clark, 70 Kilby street, Boston, Mass. Meetings held in Boston on second Wednesday of each month, except July and August.
- Northwestern Electrical Association. Secretary, R. N. Kimball, Kenosha, Wis. Annual meeting, Milwaukee, Wis., January, 1908.
- New England Street Railway Club. Secretary, John J. Lane, 12 Pearl street, Boston, Mass. Meetings held on fourth Thursday of every month.
- Oklahoma Electric Light, Railway and Gas Association. Secretary, Galen C. Crow, general manager Guthrie Electric Light & Power Company, Guthrie, Okla.
- Pennsylvania Street Railway Association. Secretary, Charles H. Smith, superintendent Lebanon Valley Street Railway, Lebanon, Pa.
- Southwestern Electrical and Gas Association. Secretary, R. B. Stichter, Dallas, Tex.
- Street Railway Association of the State of New York. Secretary, J. H. Pardee, general manager Rochester & Eastern Rapid Railway, Canandaigua, N. Y. Next meeting, Bluff Point, N. Y., June 25 and 26.
- Wisconsin Electric and Interurban Railway Association. Secretary, Clement C. Smith, president Columbia Construction Company, Milwaukee, Wis.

Manufactures and Supplies

ROLLING STOCK.

Chippewa Valley Electric Railroad, Eau Claire, Wis., is in the market for six cars.

St. Thomas Street Railway, St. Thomas, Ont., has placed an order for 12 cars with the Ottawa Car Company.

Jackson Consolidated Traction Company, Jackson, Mich., is reported as about to purchase five new motor cars.

Aurora Elgin & Chicago Railway, Chicago, has placed an order for two interurban cars with the Hicks Locomotive & Car Works.

Louisville & Eastern Railroad, Louisville, Ky., has ordered two express cars from the McGuire-Cummings Manufacturing Company.

Peekskill Lighting & Railroad, Peekskill, N. Y., has ordered one car from the McGuire-Cummings Manufacturing Company and one from the Russell Car & Snow Plow Company.

Indianapolis Columbus & Southern Traction Company, Columbus, Ind., is having three cars built by the Niles Car & Manufacturing Company. These will be equipped with Baldwin trucks and are for use over the line between Indianapolis and Seymour.

Chicago & Milwaukee Electric Railroad, Chicago, has ordered two locomotives from the American Locomotive Company and two from the Baldwin Locomotive Works, in addition to the two ordered from the Hicks Locomotive & Car Works, reported in the Electric Railway Review of May 4.

Georgia Railway & Electric Company, Atlanta, Ga., is building at its own shops 10 single-truck and 20 double-truck cars. To equip these cars the company has purchased from the General Electric Company ten 2-motor No. 80 and five 4-motor No. 80 equipments and from the Westinghouse Electric & Manufacturing Company fifteen 4-motor No. 101 equipments.

Tri-City Railway, Davenport, Ia., has purchased 10 new 2-motor No. 80 equipments from the General Electric Company, to be installed under 10 new cars which have just been built at the shops of the company. The car bodies are 21 feet in length, mounted on Peckham trucks. This will make a total of 20 new cars put into service on this line during the present year.

Hudson Valley Railway, Glens Falls, N. Y., has just received three 51-foot interurban cars, mounted on Baldwin high-speed trucks, equipped with four Westinghouse 93A motors, from the Niles Car & Manufacturing Company. The company has also ordered from the General Electric Company 12 GE-87 4-motor equipments with type M control, and from the American Locomotive Company 12 sets of high-speed trucks.

El Paso Electric Railway, El Paso, Tex., as reported in the Electric Railway Review of April 20, has placed an order with The J. G. Brill Company for four 15-bench Narragansett open cars, to be mounted on Brill 27-G1 trucks, for August delivery, and with the St. Louis Car Company for four 29-foot closed cars, mounted on St. Louis No. 47 trucks. The open cars will be 40 feet 4 inches in length over crown pieces, 7 feet 9½ inches wide over sills and 8 feet 7½ inches over posts. These cars will be finished in cherry and ash, will be equipped with Monitor deck roof, full length of car, will have 18-inch vertical brake wheels, Peacock brakes, Wilson trolley catchers, Brill gates, United States headlights, Pflugst fenders, International registers, Westinghouse air brakes and four GE-81 motors. The closed cars will have a length over bumpers of 40 feet, with a width over all of 8 feet 8 inches. They will have 11 windows on each side, platforms on each end of the car and cross seats upholstered in rattan. The interior finish of these cars will be the best quality of mahogany in natural color, trimmed with nickled bronze. The cars will be equipped with four GE-81 motors, Wood gates, Pflugst fenders, United States headlights, International registers, with rod operation, Pantasote curtains and Westinghouse air brakes. Push buttons have been specified on the side posts.

SHOPS AND BUILDINGS.

British Columbia Electric Railway, New Westminster, B. C.—It is reported that this company has made plans for extensive improvements to its property, including an expenditure of \$100,000 for new buildings. D. J. McQuarrie, manager.

Consolidated Railway, New Haven, Conn.—This company is purchasing property for a car house at Rockville, Conn.

La Crosse (Wis.) City Railway—Several changes are to be made at once in the building now used as a car house, power house and office building at La Crosse. The office rooms at the south side of the building are to be removed to make room for two additional tracks and the offices will be removed to an adjoining residence building, which will be remodeled for the purpose.

Oklahoma City Railway—It is announced that the object of this company, which was incorporated last week, is to build a large office building and terminal station at the corner of Grand avenue and Harvey street, Oklahoma City, for the Oklahoma City Railway.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—This company has built seven new shelter stations on its interurban

line between Albright and Ft. Crook, Neb., and is preparing to build a passenger station at Bellevue.

TRADE NOTES.

C. H. Rockwell has been appointed a representative of the O. M. Edwards Company of Syracuse, N. Y. Mr. Rockwell was formerly general car inspector of the Delaware Lackawanna & Western.

Northern Engineering Works, Detroit, has received an order from the Edison Illuminating Company for a 25-ton electric Northern crane, which has been installed in the Beecher avenue (Detroit) substation of the company.

Cowing Engineering Company will soon move its offices from the Citizens' Bank building, Cleveland, to Collinwood, a suburb of Cleveland, where the company is erecting a new plant, the main building of which will be 100 by 450 feet.

G. P. Blackiston, for the past eight years connected with the Crucible Steel Company of America, has resigned to take a more active interest as president and general manager of the Pittsburg Automatic Vise & Tool Company of Pittsburg, Pa.

Electric Service Supplies Company, Philadelphia, has had plans prepared by Stearnes & Castor, architects, Stephen Girard building, Philadelphia, and has awarded the contract to Lynch Brothers for a new 3-story factory building, 57 by 152 feet, to be built at Ambler, Pa.

John A. Mead & Co., manufacturers of coal crushing, weighing and conveying machinery, the sole manufacturers of the McCaslin overlapping gravity bucket conveyor, have moved their offices from 11 Broadway to the twentieth floor of the new United States Express building, New York.

Frank H. Shipe, for the past two years representative in the railway department of the Acme White Lead & Color Works of Detroit, Mich., has been appointed manager of the Richmond branch of the Philip Carey Manufacturing Company, with headquarters at Richmond, Va.

Recording Fare Register Company, New Haven, Conn., has just closed a 2-year contract with the Consolidated Railway Company, with headquarters at New Haven, whereby Recording fare registers will be used on all cars built for this road or any of its lines controlled or leased by it.

Cross-Lachance Electric Company, New York, has opened offices at 253 Broadway and has equipped a machine shop at 155 West street, for the manufacture of field and armature coils, commutators and switchboards, rewind armatures and do a general repair business. Samuel Cross is engineer in charge of the shop.

Neil S. Buckbee, engineer, of Lake George, N. Y., has been engaged by the General Fireproofing Company and is at present connected with the home office at Youngstown, O. Mr. Buckbee graduated in April from the Thayer School, Dartmouth College. He formerly was with Durkee, White & Towne, engineers and contractors, Springfield, Mass.

J. G. Platt, who recently resigned his position as master mechanic of the American Steel Foundries, Franklin works, on account of his health, has accepted a position as mechanical representative with the Hunt-Spiller Manufacturing Corporation. Prior to Mr. Platt's connection with the American Steel Foundries he was, for many years, engineer of tests on the Erie Railroad.

American Nut & Bolt Fastener Company, Allegheny, Pa., although manufacturing about one million nut and bolt fasteners a month, finds the demand for its products increasing so rapidly that it has purchased a tract of land near its present factory, upon which the company will erect a new building, 80 by 150 feet. The new addition will have a capacity of about three million nut and bolt fasteners a month.

Dossert & Co. have received another large order from the New York Central for cable taps and 2-way connectors, to be used in the electrical installation between New York City and White Plains, N. Y. They have an order from the same road for their emergency jumper clamp connector, to be used on the third rail. They have also received another order from the Pennsylvania Railroad for 160 two-way connectors.

J. H. Wagenhorst & Co., Youngstown, O., manufacturers of electric blue printing machines, report the following sales: Thomson Stationery Company, Vancouver, B. C.; department of forestry, Ottawa, Ont.; New Jersey Zinc Company, New York; James Clark, Jr., & Co., St. Louis, Mo.; Howe Engineering Company, New York; Great Western Sugar Company, Ft. Collins, Colo.; Builders' Exchange Company, St. Paul, Minn.; C. N. Dunham, Philadelphia, Pa.

E. H. Symington, western manager of sales of the T. H. Symington Company, Chicago, while riding in Lincoln park on Saturday, May 18, threw his horse in an attempt to save a boy from being run down. The horse fell on Mr. Symington's head, injuring Mr. Symington so severely that for a time his life was seriously in danger. As we go to press Mr. Symington's physician reports that he is gradually regaining consciousness, and unless unforeseen complications develop, he will doubtless recover.

Preston Car & Coach Company, Limited, Preston, Ont., has recently been incorporated by Don M. Campbell and Charles S. Wright for the purpose of manufacturing electric cars, automobile bodies, railway cars, etc. Mr. Campbell was formerly chief engineer of the Cleveland plant of The J. G. Brill Company and later was

superintendent of the Ottawa Car Company. Mr. Wright has for the past 12 years been superintendent of the carriage department of the Ottawa Car Company. Work on the construction of the plant has been commenced.

F. H. Brown Machinery Company has opened an office at 1102 Park building, Pittsburg, Pa., as a representative of a number of machine tool manufacturers. The company will make a specialty of buying and selling second-hand machinery.

Nathan Manufacturing Company, 416 East One Hundred and Sixth street, New York, is building an addition, 25 by 100 feet, to its foundry building. Some new machinery will be purchased and when installed will greatly add to the capacity of the plant.

Pawling & Harnischfeger, Milwaukee, announce that their Chicago sales office is now located at 1241 Monadnock block, in charge of W. E. Kreamer as manager. Mr. Kreamer was formerly connected with the Denver office of the company and is succeeded by H. N. Steinberger. The company was formerly represented in Chicago by G. P. Nichols & Brother.

R. W. Marshall & Co. have moved into their new quarters on the eleventh floor at 95 Liberty street, New York, where they have more room for carrying on their business in railway materials and second-hand machinery and equipment. The company have just closed a contract for equipping the Ashville Loop Line Railway with two double-truck and two single-truck cars, having 50-horsepower motors, and have also sold three single-truck cars having 45-horsepower motors to the Pittsburg & Westmoreland Railway Company of Irwin, Pa.

Consolidated Equipment Company, 17 Battery place, New York City, has been appointed selling agent for the Emerson pump. This company's well-known triple vertical cylinder contractor's pump will be supplemented by a new product, the Emerson junior. This latter is made with but a single cylinder, weighs but 219 pounds, and has a capacity of 100 gallons per minute against a 25-foot head, and about half of this capacity on a 100-foot head. A stock of regular and junior Emerson pumps will be kept on hand in New York and at the factory in Alexandria, Va., which is to be enlarged to accommodate this new design.

Abner Doble Company, engineers, San Francisco, Cal., has appointed Mitsui & Co. to act as its sole agents in Japan and its territories, Korea, China and Manchuria, for the sale of Doble tangential water wheels and hydraulic apparatus. The industrial development that is now taking place in the orient, and the increasing demand for high-grade water wheel machinery will make this co-operative arrangement an advantageous one for both parties. Mitsui & Co. are a large and progressive engineering house and with their 35 branch offices are in a particularly good position to handle the water wheel products of the Abner Doble Company.

Allis-Chalmers Company, Milwaukee, has recently been awarded what is said to be the largest contract ever placed for alternating-current generators. This order was received from the United States Steel Corporation and includes 32 gas-engine-driven electric generators, aggregating 68,000 kilowatts, 16 of which are to be installed in the new plant at Gary, Ind., now in course of construction by the steel corporation. The other 16 units are for the Homestead plant of the Carnegie Steel Company, the South Chicago and Bay View (Milwaukee) works of the Illinois Steel Company, and for the central furnaces of the American Steel & Wire Company at Cleveland, O. These are Allis-Chalmers standard type, 25-cycle, 3-phase alternators, and will be direct-connected to twin tandem gas engines, operated on blast furnace gas.

Northwest Engineering Company, 153 LaSalle street, Chicago, has recently completed its organization and has arranged the personnel of its engineering forces with reference to doing particularly effective work as constructing and contracting engineers in all branches of the business. The company will undertake surveys, estimates and reports on existing and projected electric and steam railways, the construction and superintendence of power plants and central stations, also the erection of bridges and buildings and structures of reinforced concrete. Water supply, sewers and sewage disposal and kindred problems will be handled by specialized engineers. The engineering talent and experience that has become associated in the management of this company gives promise of thorough and economical methods in the handling of its contracts, the first of which are now being vigorously pushed. R. C. Canterbury is secretary and managing engineer of the company, with headquarters at the Chicago office.

ADVERTISING LITERATURE.

The Arnold Company, 181 La Salle Street, Chicago.—Bulletin No. 17 describes the Elgin & Belvidere Electric Railway. The matter contained in the bulletin is a reprint of much of the matter describing the railway, which appeared in the Electric Railway Review of August 1906, and March 9, 1907, and the Railway and Engineering Review of March 9, 1907.

Joseph Dixon Crucible Company, Jersey City, N. J.—This company has recently issued an interesting pamphlet, the nature of which is sufficiently described by its title, "Philosophy of Protective Paint." Linseed oil is first considered and its method of manufacture and drying properties by which it is converted into a tough and elastic substance. The pamphlet shows the reason for the addition of the pigment, and the reasons are given why the pigment must be inert and not subject to chemical change. An interesting feature of the pamphlet is the mathematics of the paint skin, and attention is called to the importance of proper application and the fallacy of purchasing paint on account of its great covering capacity. Finally, the pamphlet contains a discussion of the physical properties of protective paint pigments and the reasons

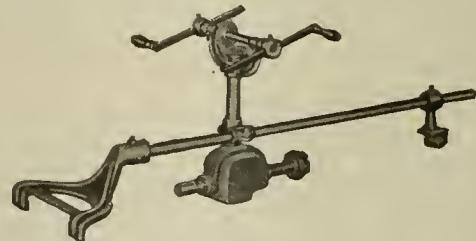
why flake graphite with silica is the ideal pigment for protective paint.

Marion Incline Filter & Heater Company, Marion, O.—This company, which is the manufacturer of feed-water heaters, heaters and receivers and chemical reagent systems, has completely described its feed-water heaters and purification in catalogue G-1. The economy of feed-water heaters is quite generally conceded and the matter of the most economical type of heater is accordingly a matter of interest. It is believed that the heaters and purifiers described in this publication are of the most modern type.

General Electric Company, Schenectady, N. Y.—Bulletin No. 4394-B deals with Form P belt-driven alternators of a design to meet the demand for small alternators to be able to carry a load of mixed character. Bulletin No. 4494 deals with the Edison "Gem" high efficiency incandescent units with bowl holophanes. Bulletin No. 4497 describes the security snap sockets for incandescent lamps. Current transformer panels are described in Bulletin No. 4500, which supersedes a previous bulletin dealing with the same subject and published as No. 4293. Price list No. 5164 covers the existing quotations on Thomson recording wattmeters and supersedes a previous list. Price list No. 5163 furnishes quotations on Gem regular incandescent units and Gem meridian units. Bulletin No. 3556 furnishes an approximate rule for size of wires for 3-phase transmission lines and a table of distances to which 3-phase current can be transmitted over different sizes of wire at different potentials, assuming an energy loss of 10 per cent and a power factor of 85 per cent.

Reed Track Drills.

The Francis Reed Company, 43 Hammond street, Worcester, Mass., has recently brought out a new track drill, which is manufactured in two sizes. That known as No. 18 is provided with two extension cranks located near enough together so that one man can use both arms in operating the drill. They are so placed as to be given direct motion from the body and the cranks may be so adjusted that two men can operate them if required. The drill is provided with automatic friction feed, which can be adjusted to fast or slow movement. This is utilized to secure a quick return of the spindle in reversing the cranks, the drill thus being backed out at a higher rate of speed. The drill is adjustable in every manner required for a track drill. The socket is bored for 41-64-



The Reed Track Drill.

inch straight shank drills and there is also provided a sleeve which will enable the use of drills with 1/2-inch straight shank. One revolution of the crank gives one revolution of the drill. If required the top yoke can be removed and one crank mounted upon the upright shaft, by which a speed of one revolution of the crank to two revolutions of the drill is obtained.

The drill known as No. 19 is heavier than that just described. It was designed to meet the demand for an efficient track drill to drill 7/8-inch holes in heavy rails for bonding. This drill is designed to be operated by two men standing, thus enabling the work to be done to the best advantage. The adjustments are similar to those described in connection with No. 18. The drill weighs 185 pounds and is easily handled by two men. A recent addition to both types of drill is a cast-iron gear casing to protect the lower gears from dust or other obstruction.

THE MILLOY TROLLEY BASE AND RETRIEVER.

Uniform tension between the trolley wheel and the trolley wire is one of the vital requisites for the successful operation of street and interurban cars. To obtain this uniformity it is necessary to provide a substantial, well-designed trolley base. The Milloy Electric Company, Bucyrus, O., has been developing the details of the Milloy trolley base and now announces that it is filling the want along this line for cars used in electric railway operation.

The company has recently equipped its own factory at Bucyrus and is now prepared to manufacture the trolley base and the Milloy trolley retriever in all sizes. The company claims that the base, by furnishing uniform tension, gives longer life to both the trolley wheel and the trolley wire. It has a double roller bearing, has no center post, no fulcrum developer, no friction and requires no lubrication to keep it in good condition. The cable connection is under cover out of the weather. All parts of the base are interlocking and can be assembled or disassembled without tools.

The Milloy retriever aids in making high speed safe. It is self-adjusting and is operated by compressed air. When installed for use the retriever occupies a position on the roof of the car, where it cannot be tampered with and where the suction dust does not reach. The maintenance expense of the retriever is nominal.

Efforts to prevent the manufacture of the Milloy trolley base have been defeated by a sweeping decision of the United States court of appeals in favor of the Milloy Electric Company.

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The value of comprehensive forms is emphasized in a paper read last month by F. C. Randall of Galveston, Tex., at the annual meeting of the Southwestern Electrical and Gas Association at San Antonio, Tex. Mr. Randall spoke of the desirability of reducing the number of forms used by a company to a minimum, and expressed the opinion that if many managers would look over the forms in use they would find many that could have been eliminated by the judicious wording or combining of forms designed for similar purposes. In preparing or revising forms it is most essential to avoid practices which will exact a maximum of clerical time and yield only a minimum of satisfaction or help to the managers or executives of properties.

The Value of Comprehensive Forms.

The new track laid by the United Railroads of San Francisco during the past year, as described in this issue of the Electric Railway Review, conforms to tried and well established practice. There appears, however, an innovation in subgrade construction by the placing of concrete between the ties in the form of two interrupted beams, one under each rail. The broken stone subgrade on which the wooden ties rest is placed in the trench as usual and the rails are lined and surfaced. This ballast is tamped under the ties and filled up to the general level of their upper surface except for a space between the ties and 15 inches on either side of the rails. In this space, under each rail, an interrupted girder of concrete is placed. The use of this concrete filler between the ties has apparent advantages. It assures a continuous firm base for the rails to rest upon, anchors the ties to the ballast below and, uniting with the floor of concrete above the ties, it firmly anchors the rail to the substructure. There is in this design of track a combination of the concrete girder and the more common tie-and-ballast types of substructure. Each of these has its advocates. Thus the engineers of the United Railroads seem to have wisely chosen for standards not only a form of tie construction heretofore

found serviceable on their own lines, but also meritorious features of girder construction that elsewhere have been demonstrated as valuable.

The "Question Box" of the Southwestern Electrical and Gas Association as presented at the recent meeting of that body was well prepared. Among the large number of answers to queries the following one is easily remarked for the brevity with which its author sums the various methods available for lessening accidents. The editor of the "Question Box" asks: "What are you doing, or what have you done since the last meeting of the association to lessen your accident risk or cost?" The reply follows: "Made fewer settlements and more vigorous fight against damage suit attorneys; increased number of air brakes on the rolling stock; better car barn inspection; reconstructed and better maintained track and overhead; safety stops at points of crossings with automobiles on paved roads; formed an instruction department with traveling instructor, and reduced speed at congested points." Such steps are an index of the advancement of any railway operating management.

It is well known that the comparative economy of engines, turbines and gas engines cannot be judged by the steam economy at full load alone, and especially is this true when it is necessary to compare prime movers intended for variable load work. Neither would a comparison at under or overload be correct, unless the form of the economy curves of the engines being compared are identical. The correct method of determining the relative values of several prime movers is to compare the average steam consumption taken over the entire range of loading under which they are expected to operate. Since, however, the economy lines are curved, the arithmetical average cannot be employed. The simplest method of obtaining the true average economy is to find the area under the curves between

Better Service in a Nutshell.

Prime Movers and Economy Curves.

two ordinates, drawn through the minimum and maximum loads, respectively. Dividing the areas, in square inches, by the distance in inches between the maximum and minimum load ordinates, and multiplying by the number of pounds of steam, or coal per hour per inch of the ordinates, gives the true mean economy. If the relative economies alone are required, it is only necessary to compare the areas under the curves, provided the diagrams are all drawn to the same scales.

One of the loose ends of operation frequently found in surface car service in large cities is the failure of conductors, motormen and inspectors to announce temporary changes in routes to passengers about to board cars bound for definite destinations ordinarily reached in a known schedule time. It is natural for a management to

feel that it has done its duty by the public when it has arranged for the delivery of passengers to the desired points by a roundabout journey on a single fare, but it often occurs that considerable inconvenience arises when passengers are deflected from their usual routes without notification. In large systems a suburban passenger may board a car far from the center of the city, planning to connect with some important in-town railroad station in entire ignorance of the blockade, parade or other obstruction ahead which will necessitate a deflection from the usual route when the car reaches the congested district. Unless the conductor announces the fact that the car will be diverted, as soon as he knows it, the passengers counting on traversing the line as usual may be greatly distributed in their schedules and put to much unnecessary delay. The exact route which a diverted car will follow is often unknown to its motorman and conductor except as the diversions follow one another in successive steps signaled by switchmen or street inspectors, but, so far as the route is known, it ought to be announced. The failure to do this is not a grave dereliction; but it contributes to the perfection of the service and costs the company nothing to make known so far as possible to its passengers all temporary changes in routes. From the passenger's standpoint the interests at stake are sometimes serious.

About 20 years ago Elisha Gray invented the telautograph, an ingenious instrument for electrically transmitting handwriting. During the years which have

The Telautograph and Train Dispatching. passed since its invention, the telautograph has, through constant effort, been developed from a complicated experimental curiosity into a simple commercial commodity. Though six wires were required to operate the first telautograph invented by Elisha Gray, and it was necessary to keep the pencil constantly on the paper, thus making the writing difficult to read, the telautograph of today operates with but two wires, and permits using the pencil in the usual manner. The telautograph is no longer an experimental instrument: it is a practical device of great importance for use where it is imperative that orders should be properly received, without chance of misunderstanding, and where it is essential to fix the blame if orders are not properly received or executed. Because it fulfills these conditions, is not affected by vibrations, and noise does not prevent its operation or introduce the danger of misinterpretation of messages, the telautograph has been adopted by the United States war department for communicating between the stations of the range finders of our coast defense. As considerable current is required to operate the telautograph, it is not easily affected by induced currents and by static discharges as is the telephone. From these considerations it would almost seem as if it had been especially designed for issuing train orders on interurban railway lines, as it meets all the conditions of this service perfectly. It has the advantage over the tele-

phone, in that the train dispatcher can issue the orders before the trains get to the boxes, thus all that is necessary is for the motorman or conductor to get off, unlock the box and tear off the order, which is in the train dispatcher's own handwriting and bears a facsimile of his signature. A carbon copy could be made and deposited in a box where the crew could not see it. Thus there would be three copies of each order issued—the original, a carbon deposited in the signal station boxes and the one taken by the motorman. It is obvious that this system removes the possibility of misunderstanding train orders because of line disturbances, of noise of the wind, etc., as well as the errors possible in the telegraphic system due to careless operators. A very effective system could be had by combining the telautograph and telephone, making the one receiving the orders repeat them to the dispatcher by telephone, thus putting him verbally in touch with the operator to report accidents or delays.

THREE-PHASE VERSUS SINGLE-PHASE TRANSFORMERS.

A careful examination of the relative advantages obtained by using one 3-phase or three single-phase transformers, would indicate that at present the location and the transportation facilities are among the most important points to be considered. Owing to the phase relation in a 3-phase circuit, the copper and core of a 3-phase transformer can be made lighter in weight than the cores and copper of three single-phase transformers of equivalent capacity. Further, only one casing, which is also of lighter weight than the casings of the single-phase transformers, is required. A 3-phase transformer for a given service does, however, weigh more than each of the 1-phase transformers for the same service, and for this reason it may sometimes be advantageous to use three single-phase transformers in stations not properly equipped to handle heavy pieces of machinery, or where it is necessary to haul them by wagon. The question of weight also enters into the repair problem. The lighter weight single-phase transformers are cheaper to repair because of the greater facility with which they can be handled. When transformers must be mounted on poles, the advantages are in favor of the 3-phase transformers because of the reduced weight and also because of their appearance.

The 3-phase transformer has the advantage of higher efficiency and simplicity of connections and station wiring. All the connections can be made inside of the transformer case, it being necessary only to bring out the three high and the three low tension leads. Consequently, besides the reduced first cost of the 3-phase transformer, there is also a considerable saving on the cost of cable for making the connections, accompanied by a lower labor cost.

There is a slight disadvantage accompanying the use of 3-phase transformers in instances where it is necessary to bring out a large number of taps for different voltages. This complicates the wiring within the case, but such instances are comparatively rare and unimportant. As the radiating surface of a 3-phase transformer is less than that of three single-phase transformers of equal normal capacity, self-cooled 3-phase transformers cannot be designed (for any allowable temperature rise) for so great a normal capacity in one unit as can three single-phase transformers, but the gain in efficiency and in the reduced danger of breakdown when oil or water cooling is employed should settle this question.

One disadvantage of the 3-phase transformer is that in case of failure of one of the coils, it is highly probable that the remaining coils would be injured, and that it is therefore necessary to keep available a complete unit for emergency purposes. In the case of the single-phase transformers only a third of the total capacity need be kept in reserve. As the art of designing and manufacturing transformers progresses, however, the force of this argument diminishes, for breakdowns are becoming less frequent.

As the cost of a 3-phase transformer is approximately but 80 per cent of the cost of three single-phase transformers of equivalent output, the investment in emergency units will only be greater for the 3-phase transformer when but one transformer is installed, and will probably be less than the investment required for the three single-phase transformers if the installation consists of a number of units.

In cities where real estate is valuable the great saving in floor area, and in a slightly reduced height, furnishes a strong argument in favor of the 3-phase units. This point deserves especial consideration when transformers are installed in subcellar substations, where in many cases only a certain amount of space is available, and additional room, without consideration of the cost, is practically unavailable. The regulation of the 3-phase and three 1-phase transformers is equally good with changes of load or power factor and need not, therefore, be considered.

OPERATIONS OF STONE & WEBSTER PROPERTIES.

The statistical book which is published annually by Stone & Webster of Boston, Mass., contains in the last edition the main financial results for 1906 of 20 companies which operate electric railways either as their principal business or as part of their operations. These companies operate in a wide range of territory, extending from Ponce, Porto Rico, on the south to Sydney, Nova Scotia, on the north, and from Massachusetts in the east to the Washington coast in the west.

While the figures of the operations of these companies are not given in sufficient detail to enable a comparison to be made which would indicate the sources of the variation in their operating results, the percentage of gross earnings used in operating expenses may be presented in order to indicate in a general way the difference in the expenditures charged to operation of the various properties in the year.

The following table shows the gross earnings and percentage of operating expenses in 1906, and the percentage of increase in gross earnings over 1905:

	Gross earnings, 1906.	Operating Increase expenses, in gross 1906— earnings percent- in 1906 age of over 1905 gross —per- earnings. centage.	
Blue Hill St. Ry. Co., Canton, Mass. \$	89,041.34	75.9	5.35
Brockton & Plymouth St. Ry. Co., Plymouth, Mass.	111,775.03	63.4	9.4
*Cape Breton Electric Co., Ltd., Sydney, N. S.	258,416.80	59.7	21.9
Columbus (Ga.) Electric Co.	291,244.01	53.5	.....
Dallas (Tex.) Electric Corporation.	1,023,135.91	68.3	9.4
El Paso (Tex.) Electric Co.	391,655.96	70.5	35.6
Galveston (Tex.) Electric Co.	315,135.35	60.7	†61.9
Houghton County St. Ry. Co., Hancock, Mich.	229,244.76	63.7	37.2
Houston (Tex.) Electric Co.	591,351.37	64.2	14.3
Jacksonville (Fla.) Electric Co.	326,468.29	61.8	6.8
Northern Texas Electric Co., Ft. Worth, Tex.	854,135.52	64.0	29.2
Paducah (Ky.) Traction & Light Co.	227,278.52	65.9	.....
Ponce (Porto Rico) Electric Co.	107,326.95	55.6	21.1
Puget Sound Electric Ry., Tacoma, Wash.	663,206.02	52.8	29.6
Savannah (Ga.) Electric Co.	611,215.19	62.0	4.2
Seattle (Wash.) Electric Co.	3,101,385.77	63.2	20.8
Tacoma (Wash.) Ry. & Power Co.	737,432.79	72.2	21.2
Tampa (Fla.) Electric Co.	469,222.08	59.6	13.9
Terre Haute (Ind.) Traction & Light Co.	823,162.54	56.9	30.7
Whatcom County Ry. & Light Co., Bellingham, Wash.	279,469.45	66.2	43.3

*Includes one-half of Sydney & Glace Bay Railway Company, Ltd., earnings. †Figures for 1905 were for eight months only.

A glance at this table will indicate how greatly the expense of operation and the increase in earnings varied in the different properties. It is found that the lowest operating expense (expressed in percentage of gross earnings) is reported by the Puget Sound Electric Railway, 52.8 per cent, while the highest is the Blue Hill Street Railway Company

of Canton, Mass., 75.9 per cent. Operating expenses of the Columbus (Ga.) Electric Company, the Ponce (Porto Rico) Electric Company, the Puget Sound Electric Railway and the Terre Haute Traction & Light Company were relatively near together.

While the greatest discrepancy in the percentage of gross revenue applied to operating expenses is shown in the results of the Blue Hill Street Railway and the Puget Sound Electric Railway, it should be borne in mind that these companies operate under conditions that are hardly comparable, and attention is called especially to them only because they happen to show the most striking differences of the 20 companies reporting. The Blue Hill Street Railway is located in a territory in which the available business is not at all developed and it terminates in Boston under traffic agreements that add greatly to the cost of operation. Furthermore, the operating expenses are affected by climatic conditions in winter. The Puget Sound Electric Railway, on the other hand, serves a territory in which the available business has been developed rapidly and the conditions of operation are very favorable. It has near at hand inexpensive water power, and, as there is very little snow to contend with in winter, the climatic conditions ordinarily are favorable. Another factor which affects materially the proportion of gross earnings indicated as required for operating expenses is that the Puget Sound railway derives an income on the securities of the Tacoma Railway & Power Company which it owns. No expense is incurred on account of these securities.

That similar striking differences occurred in the gains of the respective companies in gross earnings is a matter not of management but of local conditions peculiar to the various territories served. For instance, the revenue of the Whatcom County Railway & Light Company, which showed a gain in gross earnings of 43.3 per cent over the previous year, reflected the remarkable growth that has taken place in the cities of the northwest, and especially in Bellingham. In this instance no large extensions of track were made during 1906 and the increase represents greater density of travel.

The smallest increase reported by those companies in which comparison is possible was that of the Savannah (Ga.) Electric Company, which gained but 4.2 per cent over 1905. This small increase is due to a boycott to which the company has been subjected by negroes since September, 1906, owing to the passage of a "Jim Crow" law by the city of Savannah, requiring the separation of races on the cars. The boycott conditions have improved materially this year and it is hoped that the earnings will soon assume their normal increases.

The increase of 37.2 per cent in gross revenue of the Houghton County Street Railway Company, Hancock, Mich., is due in part to the fact that in 1905 the company suffered from the effect of a strike and boycott.

The foregoing figures show how the financial results of different electric properties may be affected by local conditions, notwithstanding the advantages of affiliated control and executive management.

According to the Brooklyn Rapid Transit Company officials the new transfer system put in service on the surface lines of the company a few weeks ago is working as well as was expected. The public for the most part has accepted the new system willingly and complaints against its operation come almost entirely from those who had abused the privileges given under the old plan. It is too soon as yet to ascertain just how much the company will be benefited financially by the new system, but the officials believe the benefit will be considerable. The last reports of statistics of New York City traffic published by the state board of railroad commissioners showed that during the nine months ended September 30, 1906, the Brooklyn Rapid Transit Company's cash fares increased only 9.57 per cent, as compared with the corresponding period of 1905, during which the number of transfers increased 58.63 per cent. Since September 30 the number of transfers increased, until a month ago the company's management reported that it was issuing approximately 85 per cent more transfers than a year previous.

TRACK RECONSTRUCTION IN SAN FRANCISCO.

At the time of the earthquake and fire of April, 1906, the United Railroads of San Francisco had 250 miles of single track. Of this trackage there were 84 miles in the burned



San Francisco Track—New Track Ready for Concrete Under Rails, Showing Space Left for Concrete.



San Francisco Track—Condition of New Unpaved Track in Street After Earthquake and Fire.

district, comprising 25 miles of cable track, 57 miles of electric track and two miles of track over which horse cars were operated. The fire left in operating condition none of this total of 84 miles of track, but steps were immediately taken toward rebuilding and electrifying a large proportion of the

cross sections of which are shown in the accompanying illustrations, is of a single type with variations in the weight of rails according to the service required. The substructure might be designated as a combination of ties and concrete stringers. The ties are of standard dimensions, spaced 2



San Francisco Track—Breaking Off Old Cable Yokes and Rolling Bed for New Track.

cable-operated tracks and the rehabilitation of that track which had previously been built for electrical operation.

During the past year there has been approximately 40 miles of single track torn up and replaced by an entirely new structure of accepted permanent design. Two-thirds of the track that has been reconstructed was formerly used for cable cars, and in the reconstruction several interesting meth-

ods for tearing up the old substructure were tried. It is the purpose of this article to describe the standard track that is now being built, and some of the labor-saving methods that have been employed in the work.

The standard track construction for electrical operation,

up about the rails to a height sufficient to afford an even surface for supporting the paving.

In general there are two types of paving between rails, one comprising 9-inch Belgian blocks and the other being an asphalt surface. A cushion of two inches of sand is provided for the blocks. The asphalt rests directly on the concrete. The dimensions of these two types of construction for differing street surfaces are shown in one of the accompanying illustrations.

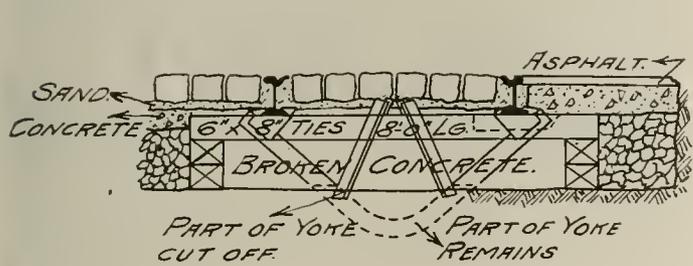
Standard Track.

The sections of rail used under various conditions of traffic include, for the main trunk lines bearing the heaviest traffic, a 9-inch grooved girder rail weighing 141 pounds per yard, or 221.57 gross tons per mile of single track. For the lines of average travel the rail section is likewise nine inches

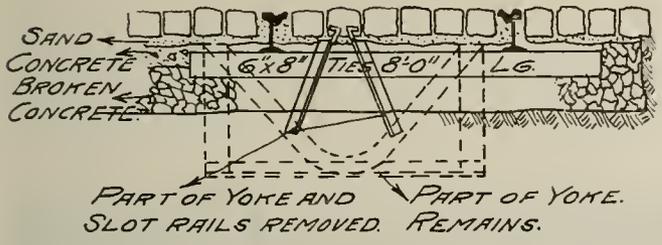
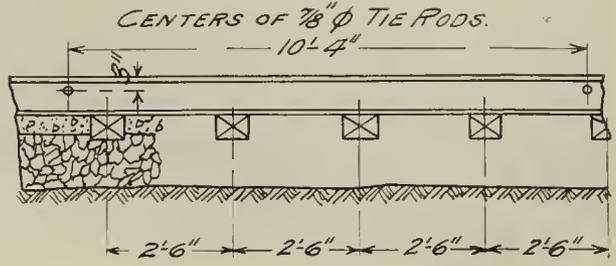
mil bonds. The terminals of the bonds are all screw-compressed to place.

Special Track Work.

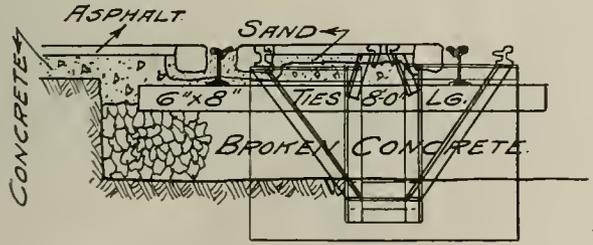
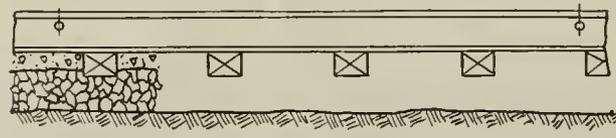
The special work at all intersections is the Lorain Steel Company's hard and renewable-center construction built of 9-inch rails. Uniform standards have been adopted for all special track work. In the older portions of the town, north of Market street, where the streets are narrow, the curves have a 42-foot 7½-inch center radius, and south of Market, in the wider streets, the standard radius is 50 feet 1½ inches. In designing the special track work the integral sections are made to conform to standard dimensions so that it is possible to interchange parts of one layout with those of another. Each section of any layout is known by a designating letter and all pieces of the same letter



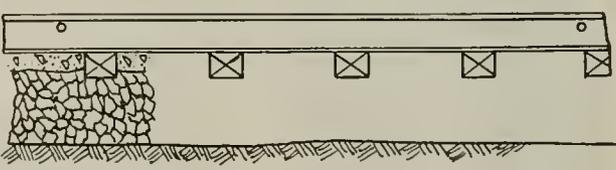
MARKET STREET.



LARKIN STREET.



SACRAMENTO STREET.



San Francisco Track—Rebuilt Cable Tracks, Showing Slot Yokes and Parts Removed.

high and of a similar contour. This latter rail, however, weighs 109 pounds per yard. For curved tracks, serving the same traffic as the latter mentioned rails, a 119-pound guard section is used. These three rail sections just mentioned are illustrated herewith, and are rolled by the Lorain Steel Company. The drilling of rail ends for joints in these sections is also illustrated. Tie rods are spaced from 8 feet 4 inches to 10 feet 4 inches apart and 3 inches below the tread of the rail, depending upon the section used.

For the reconstructed cable lines a 4-inch 81-pound Trilby rail was used, its low height permitting it, on some streets, to be installed above the old cable yokes. On other track, in asphalt paved streets, not subject to heavy teaming, a 9-inch rail of Pennsylvania Steel Company section No. 201, weighing 85 pounds per yard, was used.

The track rails are connected with 36-inch 12-bolt "Continuous" rail joints, and these joints are bonded for the 9-inch rails with four No. 0000 10-inch by 7/8-inch bonds and for the 81-pound rails with 24-inch by 1-inch 400,000-circular-

throughout the city are identical. The value of this scheme for any large company whose mileage is rapidly growing is easily recognized.

Paving.

After the ballast in the trench has been thoroughly rolled with a steam roller the steel is spiked to the ties and put in line and surface; then the concrete mixture which comprises cement, sand and unscreened rock in the proportions of 1-2-6 is tamped between and above the ties, as earlier described. The peculiar shape of the concrete stringer, combined with the larger mass of concrete, assures that the ties and the rails will form a unit, distributing all stresses over the surface of the subgrade.

Generally speaking, the paving is of asphalt or stone blocks, such blocks being of basalt and six inches thick. The asphalt streets have a 2-inch surface of that material. The city requires the railroad company to pave and maintain the streets, not only between the tracks but for two feet outside the rails. It should here be noted that the track centers of

the United Railroads are especially wide, the dimensions being 11 feet $\frac{1}{2}$ inch in the residence portion and 12 feet $\frac{1}{2}$ inch in the business portion. The toothing blocks used are of basalt, alternating 8 and 5 inches in length. All block paving is done by the railroad, the blocks being quarried

the steel work being so strong that it remained unbroken. The second type of yoke would not stand the strain attendant on tearing it from the concrete. The rivets would shear before the iron could be pulled away from the solid mass of concrete. For this reason it was found advisable to leave



San Francisco Track—Lifting Cable Yokes and Concrete with Derrick Car.



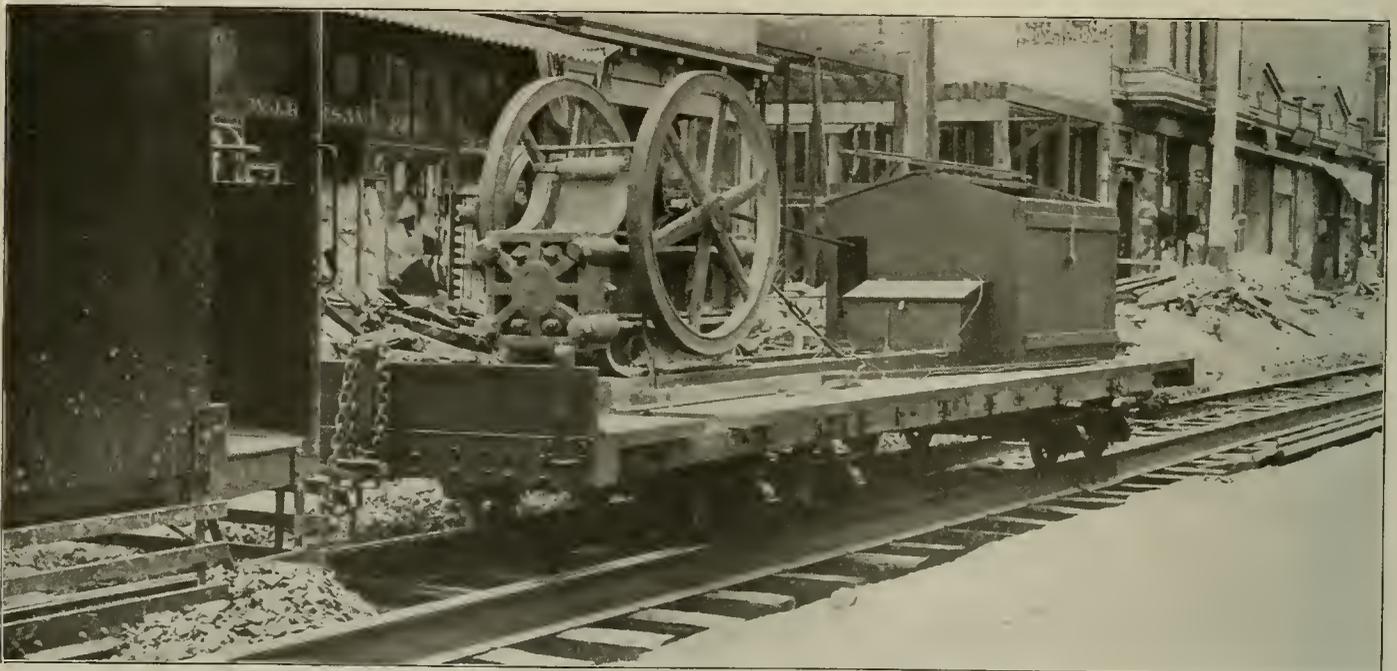
San Francisco Track—Breaking Brick Cable Conduit with Battering Ram.

about 50 miles from San Francisco. The asphalt paving is done by contract.

Reconstruction Methods.

In tearing up the old cable tracks preparatory to rebuilding for electrical operation, two types of substructure were encountered. These are roughly shown in one of the accom-

panying illustrations depicting the disposition of the cable yokes. In the old cable substructure with its concrete bed in the ground, only cutting down the yoke far enough to permit of placing the pavement. As the track center dimension was increased at the time of reconstruction the substructure took the appearance shown in the lower views of the accompanying illustration depicting the disposition of the cable yokes. In



San Francisco Track—Motor-Driven Rock Crusher Plant on Flat Car.

panying illustrations depicting the track structure as rebuilt and showing those parts of the old structure left intact. One of the types of cable yoke comprised a 60-pound T-section, bent to a V-shape, and braced with structural sections. The second type was built up entirely of straight structural iron members. When attempting to tear up these two types of cable tracks it was found that the first-mentioned type of yoke could be lifted from the concrete with a derrick car,

this case the cable conduit was filled with miscellaneous material.

Early in the reconstruction a scheme was tried for placing the rails directly on chairs supported on the old cable yokes, but as this necessitated conforming the surface of the track quite rigidly to that of the old cable structure, it was abandoned.

Several methods were tried for breaking up the old cable

and supplies manufactured in 1905 had an aggregate value of \$4,243,893, as compared with \$3,679,045 in 1900.

NEW ENGLAND STREET RAILWAY CLUB.

P. F. Sullivan, president of the Boston & Northern Street Railway and the Old Colony Street Railway, was the speaker of the evening at the monthly meeting of the New England Street Railway Club at the American House, Boston, on May 23. The meeting was the last before the fall season. President Henry C. Page introduced the speaker, who discussed the public relations and capital interests of electric railways.

Considering public relations, Mr. Sullivan sketched the gradual acquirement of jurisdiction over locations and changes in location by the railroad commission as a desirable step away from a much broadened power on the part of local authorities. The same principle has been applied in the freight and express law of 1907. Mr. Sullivan called special attention to the burdensome excise tax which was inserted in the bill of 1898 at a time when the cost of maintenance was getting high. Last year the street railways of Massachusetts paid \$3,550,000 in dividends and \$1,923,000 in taxes.

In Massachusetts there is one mile of trolley track to every three square miles of area, as compared with 15 square miles in Pennsylvania and 17 square miles in New York. Between 1865 and 1885, in the era of horse traction, the street railway mileage of Massachusetts increased 174 per cent, from 137 to 376 miles, and the income increased 233 per cent. In this period the investment increased 200 per cent. The income per mile of track showed improvement. Electric motive power was adopted soon after 1885, with subsequent development along new lines, and between 1885 and 1905 the miles of tracks increased from 376 to 2,777, or 640 per cent, income increased 420 per cent, indicating lower earnings per mile of track, and investment increased 900 per cent.

Mr. Sullivan defined the ratio of capital to income as the investment required to secure \$1.00 of income and stated that this ratio was as \$3.00 to \$1.00 in the horse traction period, but the ratio had increased to \$5.50 to \$1.00 between 1895 and 1905. The change from horses to electricity required financial risks, especially by Whitney and his confreres in the West End system of Boston. Although electricity means the use of 60 to 65 per cent of gross earnings in operating expenses as compared with 80 per cent on the horse basis, the investment needed to effect this running economy is often overlooked. Earnings per car-mile are not the only figures which tell. If the cars are run at high speeds, the cost of operation is bound to go up, with the exception of car men's wages. High speed means more power and more capital to be supported for the purchase of this power.

To compare the working of two Massachusetts companies of large size, Mr. Sullivan cited the following figures:

	Company 1.	Company 2.
Investment per car operated.....	\$55,000	\$236,000
Power station investment per car operated....	3,400	37,000
Operating expenses—percentage of gross earnings	71	51
Dividends, per cent	7 to 8	showing 6
Maintenance—percentage of income.....	22	13
Track maintenance—percentage of income...	14	3
Ratio capital to income	\$4 to \$1	\$7.50 to \$1

The cost of power in the case of Company 2 was 2.5 times that of Company 1, though the price of coal was substantially the same in each case. There was no water in the stock in either instance.

The ratio of capital to income in 46 Massachusetts companies operating 760 miles of track is \$8.35 to \$1.00. This is a danger signal, and when the ratio climbs to \$20 to \$1.00 and thereabouts, receiverships are inevitable. Massachusetts has dense traffic and populous territory, but the difference in conditions from those prevailing in the west is not often realized. Electric railway service in the east calls for a large investment, and there is danger that facilities may be needlessly duplicated by interurban lines built without regard to the special conditions of the state, and intended to operate on a plan only suited to infrequent service in an open country.

OPERATING ACCOUNTS AS DEFINED BY INTERSTATE COMMERCE COMMISSION.

Prof. Henry C. Adams, in charge of statistics and accounts for the interstate commerce commission, has issued a circular defining in a general way the objects and scope of the operating revenue and operating expense accounts which are to be followed by railways subject to the jurisdiction of the commission in the new system of accounting to be followed after July 1 in accordance with the Hepburn law. Other circulars will be issued defining the scope of "outside operations," "train, engine and car miles" and "construction and equipment expenditures."

Operating revenues are defined as covering revenues derived from the transportation of traffic, including mail and express, for which a specific rate or charge is made, and revenues derived from operations other than the transportation of traffic, the expenses of which cannot be accurately determined and separated from operating expenses. Revenues from operation are consequently divided into two general accounts, revenues from transportation and revenues from operations other than transportation. The aggregate of revenues from operations will produce "total operating revenue," which reduced by "operating expenses," leaves "net operating revenue." From this balance taxes are to be deducted and the remainder, called "operating income," will be carried to the income account. It will be noted that the phrase "total operating revenue" is adopted as a substitute for gross earnings, which is now employed generally by steam railways.

Operating expenses, as defined, cover costs to maintain the integrity of the property operated from which operating revenues are derived, and the costs incident to transportation and administration incurred in performing the services incident to the production of the revenues enumerated in the classification of operating revenue accounts. These operating expenses must not be burdened with expenditures for additions, such as new and additional equipment, tracks, buildings, ballast, etc., the purposes of which are to improve the property; with expenditures for maintaining and operating property, the operations of which are classified under outside operations; or with expenditures for earnings of property used in operation, such as tracks, yards, terminals and equipment. Neither should they be reduced by rents received for tracks, yards, terminals and equipment; nor for buildings and other property, the operating costs of which can be separated from other costs of maintenance and operation.

Operating expenses are divided into five general accounts:

1. Maintenance of way and structures.
2. Maintenance of equipment.
3. Traffic expenses.
4. Transportation expenses.
5. General expenses.

The revenue drawn from and expenses incident to the hire of equipment are to be dealt with through the income account rather than through the operating accounts.

It is intended to make a subject of special investigation the extent to which the rule of depreciation shall be applied to maintenance of way and structure accounts.

Postpones Purchase of Electric Lines.

Plans for the purchase of several additional traction lines in the northern part of New York state which were to have come before a meeting of the directors of the Mohawk Valley Company, a subsidiary of the New York Central & Hudson River Railroad, were not acted upon. It was learned after the meeting that the reason no action was taken in the matter was that the difficulty which the New York Central road, in common with other railroads, has experienced in raising new capital even for necessary improvements, deterred the management from carrying out its plans for the acquisition of these electric lines at this time. It is understood that these purchases, which had been practically agreed upon, have been allowed to go over indefinitely.—New York Times.

RAPID TRANSIT IN BOSTON AND VICINITY.

BY EDWARD HUNGERFORD.

Boston, with an elaborate and practical plan of subway and elevated loops already in successful operation, and more elevated and subway lines under construction, is now not only planning to facilitate transit within the most congested section, but also is following out a definite plan to bind outlying communities more closely to the business center. Boston has, from the first, reduced its transit problem to a scientific basis. It has been decided that the only good theory of passenger operation for a large city is to collect surface car passengers at points outside of the business and congested residence districts and then to carry them in trains with few stops in the residence districts, and these only to exchange passengers with other surface lines. In the business heart of the city there would be many stations which would be the theoretical terminals. For convenience of operation trains would be sent directly across the business center and, serving a second purpose, out into the residence districts again until they reached an outer terminal for physical exchange of passengers with surface and suburban trolley lines. A supplemental idea provided for collecting surface car lines that approached the center of the city and bringing them through its most congested portion by tunnel or subway to a convenient loop terminal.

It was this last idea in Boston that brought the larger transit plans in the end. Tremont street was and is the city's showiest business street, largely devoted to hotels, cafes, theaters and the best class of retail shops. It was so insufferably crowded with surface trolley tracks that some sort of relief was found an absolute necessity. Out of manifold schemes an elaborate plan of relief was found and carried out, surface car tracks torn from Tremont street and general transit quickened.

The Plan for Transit Relief.

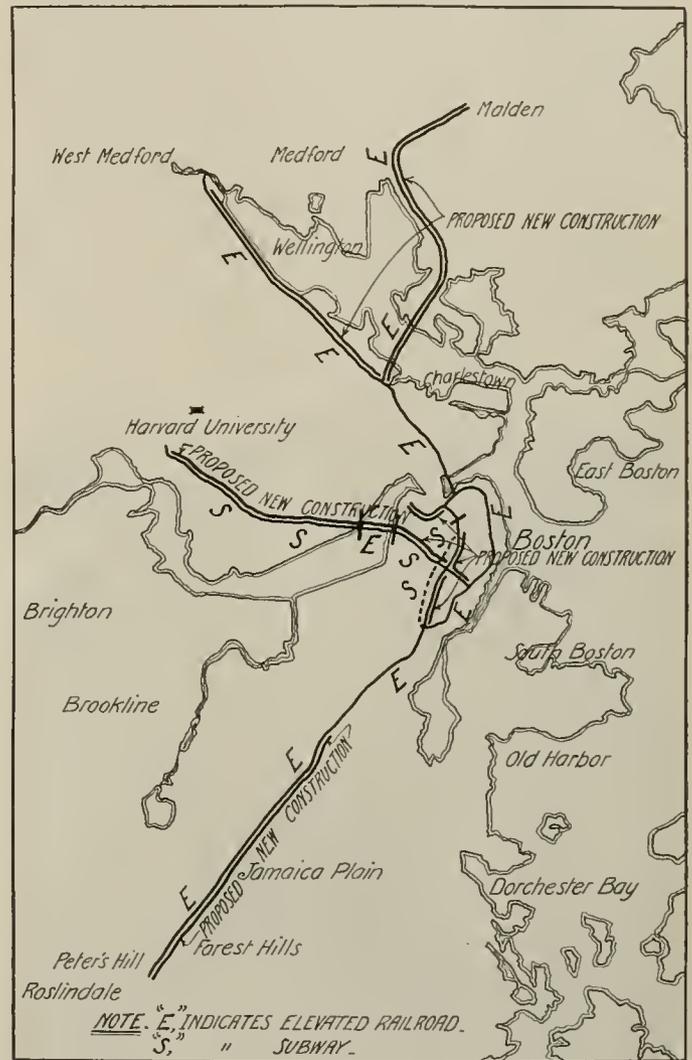
Briefly, the original plan was this: A transfer station was built at Sullivan square, Charlestown, the northerly end of the transit relief scheme, which was then and now is the largest electric railroad station in the world. This station gathered passengers from Malden, Melrose, Everett, Chelsea, Revere Beach, Lynn and many other suburban and outlying districts to the north and gave them free physical transfer to an elevated railroad which crosses the Charles river, sweeps around the water front of old Boston, past the South terminal station of the New York New Haven & Hartford and Boston & Albany railroads, and after two turns continues south to Dudley street, where a terminal station, smaller but similar to that at Sullivan square, distributes passengers to surface trolleys continuing out to Brookline, Forest Hills, Hyde Park and Mattapan.

In addition to this line through the business part of downtown Boston another line forked from it at the south end of the bridge across the Charles river, passed in front of the North terminal station, used by the many lines of the Boston & Maine Railroad, dipped beneath the surface at Haymarket square, followed a devious course beneath Tremont street and, finally rising to an elevated structure again a little south of Boylston street, joined the elevated track again in Washington avenue. The supplementary plan, which was the surface relief of Tremont street, consisted of bringing surface trolley cars from Cambridge, the fashionable and highly populous West End with Newtown and portions of Brookline outlying, by an incline through extra tracks in the elevated subway to a terminal loop under Tremont street at the Park street intersection. Similarly surface cars from Charlestown, East Cambridge and outlying points were brought beneath the surface at Haymarket square and looped around a city block from Adams square to Scollay square, where they were given a terminal. Surface car passengers wishing to go from the

Park street terminal of south and west bound cars to the Scollay square terminal of north and east bound cars were enabled to do so without the payment of an additional fare by use of the elevated trains running through the Tremont street subway.

Elevated Roads.

The elevated train operation was threefold. The first operation consisted of the trains sent from the Sullivan square terminal, which took the Tremont street subway and Washington street elevated cars through to the Dudley street terminal, returning by the same route. The second operation was of trains starting from Sullivan square, taking the Atlantic avenue line along the water front and returning to Sullivan square by the way of the Tremont street subway, with a



Rapid Transit in Boston—Location of Proposed Extensions.

reverse movement also. The third operation consisted of trains starting from Dudley street, continuing along Atlantic avenue and returning through the Tremont street subway, without ever crossing the Charles river, to Dudley street.

This system of operation was found nearly ideal. It kept an even service from both Dudley street and Sullivan square terminals, and yet gave Tremont street, the place of theaters, retail stores and hotels, the location of two important subway surface car terminals, a much better service than was required to handle business on the Atlantic avenue section of elevated railroad. Yet, as time wore on, conditions were found less ideal. Boston, like every other large American city, was growing rapidly and her transit relief plan began to be overtaxed. Tremont street was a bad one to operate through. The physical limitations that have ham-

pered all plans for transit facilities in Boston from the outset were here present in great numbers. The narrow streets and their many twistings made the Tremont street subway a series of sharp and difficult curves, while the dips and curves made necessary in the profile to accommodate the auxiliary feature of surface car operation brought in one case an 8 per cent grade on a descending track and several ascending grades of more than 5 per cent. Then the surface car terminals began to be badly overcrowded. Cambridge people at times almost monopolized the surface car platforms at Park street. It was obvious that some relief would have to be obtained at once.

Washington Street Tunnel.

To obtain first relief it was decided to place a tunnel under Washington street from near the Castle street intersection, where the existing elevated now makes right-angled turns right and left; on the right, to the incline that leads to the Tremont street subway; on the left, eventually, to the Atlantic avenue section. The tunnel would be reached by an incline from near this elevated junction and would terminate on the north at the Haymarket square station and incline of the present system. When dug and completed the Washington street subway will be completely substituted for the Tremont street subway as far as train operation is concerned. Tremont street subway will then be given entirely over to surface car operation, which will be divided into three classes: surface cars crossing the city on the present elevated tracks, and, as at present, surface cars terminating at Park street station and surface cars terminating at Scollay square station.



Rapid Transit in Boston—Concreted Steel Columns in Washington Street Tunnel.

Washington street had once before been suggested as a tunnel or subway route when it was first proposed to take the trolley tracks up from Tremont street. The city passed it by for the time being, built the elevated and subway loop as above described, and even dug a deep tunnel under the harbor to East Boston—a separate and distinct operating proposition and designed for surface cars only—before it finally began operations in Washington street. The narrowness of that busy thoroughfare was a serious obstacle to all subway plans. But the tunnel builders of Boston have had

experience and their experience has resulted in a most successful adaptation of their limited space in at least one point in Washington street, the station platforms in the neighborhood of School and of Milk streets.

It was necessary, close to this point, to depress the Washington street tunnel to pass beneath the East Boston tunnel, which runs through State street from Scollay square to the harbor, the bottom of the tunnel here being from 30 to 48 feet below the street. The feature of interest is that the north-



Rapid Transit in Boston—Uncompleted Platform Over East Track, Washington Street Tunnel.

bound track has been brought beneath the platform of the southbound track, and the passageway leading from that platform to the State street entrance of the tunnel. Even with this radical economy of space the westerly wall of the tunnel for more than 100 feet lies directly beneath the front walls of the buildings above.

The stations, profiles and sections of the Washington street tunnel were shown in the *Electric Railway Review* for August, 1906, page 463. Illustrations here reproduced for the first time give an idea of some of the details of its construction. In one the device is shown by which an extra large number of pipes have been located where the roof of the tunnel is close to the surface of the street. By bringing the roof down in a sharp curve at the outer edge of the bore, accommodation is given to many pipes and conduits without taking away from the material dimensions of the interior of the tunnel.

The other illustration shows how the steel columns are encased in concrete in this Boston construction instead of being left exposed, as in New York, Philadelphia and older Boston subways. This form of construction has so won the favor of the Boston transit commission at the outset as to make it a probable feature of the new Cambridge subway, to which reference is made hereafter.

Four Years of Excavation.

After four years of slow excavation—the city only permitted open-cut work to proceed between 6:45 p. m. and 7:15 a. m., the excavation being temporarily paved with planking during heavy business hours—the Washington street tunnel is practically dug, save for a stretch of about 150 feet in the neighborhood of School street and certain station approaches and exits. Placing the tracks, contact rails, wiring and station fixtures is the business of the Boston Elevated Railway Company, which is to operate this in addition to the other transit facilities of the central portion of the city. It will take a year to place these appurtenances in position, and it is expected that Washington street tunnel will be completed and ready for business in June, 1908.

Once the change is made and Washington street thus becomes for its entire length a route for high speed elevated

trains, the Tremont street subway will quickly be adapted for exclusive surface car operation along the lines heretofore suggested. The spur of subway extending under Tremont street from Boylston street to Pleasant street, about 1,000 feet, will not become absolutely useless after the change is made, for the transit commission has figured that surface cars from outer Tremont street and Shawmut avenue can easily be brought down an incline on the site of the present Pleasant street elevated station and so through the old subway to Haymarket square out upon the incline there and to outlying districts to the north of Boston. But for the 1,000 feet of elevated structure extending from the incline at Pleasant street station to Washington street no operating use is planned after the change. It is probable that it will be torn down.

Track Arrangement at Haymarket Square.

At Haymarket square there is at present a 4-track dip into the Tremont street subway. Two outer tracks carry the elevated trains and the two inner, surface cars from Charles-ton and outlying points to the Scollay square terminal. In order to accommodate the Washington street tunnel, which also has its terminal at Haymarket square, two additional tracks must be built upon the incline so that the six tracks when completed will be divided as follows: The two tracks to the east will be given wholly to elevated trains passing from the structure in Canseway street to the new Washington street tunnel. The other four tracks will be given exclusively to surface cars, cars which have Scollay square for a terminal using the two middle of these two tracks, and cars bound for Park street, Pleasant street and outlying points using the two outer. The present Haymarket square subway station is to be remodeled for exclusive surface car use, the Washington street tunnel building a new Haymarket square station at lower level.

To make these changes with the heavy Haymarket square traffic in constant progress will involve some engineering niceties. Fortunately for the engineers, there is spare space on each side of the present incline. That structure was built on the site of the former passenger station and yard of the Haymarket square terminal of the Boston & Maine Railroad, which was of more than ample size. It is planned first to build the two additional tracks needed, then transfer the elevated route into Washington street, and finally to adjust the various surface car tracks to meet the situation.

The Cambridge Subway.

Before the Washington street tunnel is ready for business, work on Boston's next move toward transit relief, the subway to Cambridge, will be well under way. This structure will afford a needed relief to the overtaxed surface lines leading to the college town. On the Boston side of the Charles river the subway will be built by the Boston transit commission and operated by the Boston Elevated Railway Company as its predecessors have been built and operated. It will cross the Charles river on a center and reserved section of the new West Boston bridge, an elaborate structure rapidly approaching completion. Through Cambridge the line becomes subway after crossing the river and will be both built and operated by the Boston Elevated Railway Company. It will extend through to Harvard square, where many surface lines will have their terminals and reach for long distances out into the country. One station will be built at Central square, where a number of other surface lines intersect, but many persons in Cambridge are pleading for two more subway stations. One station at the Cambridge end of the West Boston bridge the railway company is not disposed to grant in any event, holding that passengers from a section so closely adjacent to Boston itself can find both quick and convenient transit on existing surface lines. The other station, which is demanded on Massachusetts avenue, half way between Central and Harvard squares, the railroad company is opposed to, because of its desire to make the new Cambridge subway a

genuinely high-speed line for long-distance passengers, letting the surface lines take care of short-haul and short-distance passengers.

No unique types of construction are planned in the Cambridge structure, but the subway as it passes through Boston to Tremont street will be unusual in several ways. It was originally planned to bring it through Cambridge and Court streets to Scollay square, as was shown upon the map published in connection with the article to which previous reference has been made, but the extreme narrowness of these thoroughfares, with their many turnings, led to an ultimate abandonment of this idea and a decision to turn the road under Beacon hill and bring it through a third of a mile of private right of way and under a corner of the Common to a stub-end terminal directly under Park street station of the present Tremont street subway. Property is being rapidly acquired by the Boston transit commission in the fulfillment of this plan and after the subway has been dug structures can be erected and leased for a variety of purposes over its right of way. Light and air openings can be secured at short intervals by this style of construction.

Unfortunately this new Cambridge road will have no track connections with the other subway or elevated lines in Boston so as to render an interchange of train equipment possible. Yet already the plan is being pressed in the Massachusetts legislature for an enactment to enable the Cambridge subway, through Winter and Summer streets to the South terminal, with an elevated extension into South Boston, left for a vague and distant future. There is no direct route from the hotel and theater district to South station by ele-



Rapid Transit in Boston—Washington Street Tunnel Under Construction.

vated or subway as yet and such a line would render itself popular from the outset.

Contemplated Elevated Extensions.

At the north end of the Boston metropolitan district two elevated extensions are now contemplated from the Sullivan square terminal. One of these will turn toward the northeast and run along Broadway until it reaches South Everett, where it will turn north again and be built, according to present plans, past Everett and into Malden, along the marsh land

which reaches back from the Malden river and Malden canal. At Malden connection will be made with more outlying surface lines of the Boston Elevated Railway as well as with the suburban lines of the extensive Boston & Northern system which stretch north to Lynn, Salem and Newburyport.

The other arm north from Sullivan square will reach more toward the west and will follow the short straight stretch of old Mystic avenue into Melrose, where it will also have extensive ramifications by means of suburban surface car lines. Each of these arms will be approximately three miles long.

From the Dudley street terminal at the south of the present elevated system construction has progressed steadily throughout the hard winter on an elevated extension south two miles in Washington street to Forest Hills. The matter of terminal facilities at this last point is still a matter of doubt and discussion and the Boston Elevated Railway Company seems now to favor extending its structure south of the heart of Forest Hills and building a loop terminal in private right of way.

When these arms are complete Sullivan square and Dudley street will be retained as part terminals. "Short line" trains will continue to be turned on the loops at each of these points and a large number of suburban lines will continue using them as their downtown terminals.

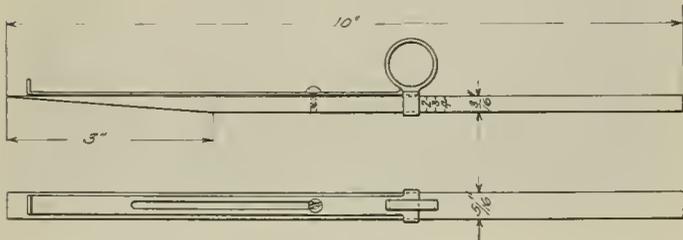
Other Plans Tentative.

Other transit relief plans in Boston are still tentative. The most definite of these is the building of an elevated structure from the existing elevated and incline at Haymarket square through Causeway street, past the North station and across the Charles river into East Cambridge for surface car operation. Owing to the existence of nearby freight terminals and the extreme narrowness of Causeway street it is often badly congested with trucks and other street traffic, causing much delay in surface car operation. Such an elevated structure for a little more than half a mile would greatly relieve the situation.

An elevated railroad, of ornamental design and architectural appropriateness, has also been suggested for the Charles river bank extending from the existing system out toward Newton. This road will undoubtedly follow the others in due time. At present it is a vague suggestion of the indefinite future.

ARMATURE CLEARANCE TESTING DEVICE.

Charles Munson, master mechanic of the Cedar Rapids & Iowa City Railway Company, has devised, at the company's Cedar Rapids (Ia.) shops, a gauge that has proved very useful



Gauge for Accurately Determining Armature Clearance.

in taking and recording the clearance between the armatures and pole faces of motors.

The gauge is marked out in detail so as to show a variation of the sixty-fourth part of an inch in the clearance. It is made of steel and is 10 inches long, 5-16 inch wide and 3-16 inch thick. One side of the scale has a straight edge and the reverse side tapers from a point at one end to the full thickness of the bar at a distance of three inches from the end. On the straight edge a sliding scale, which has a 1/4-inch lip at the lower end and a circular hand finger clip at the other,

is attached by a screw which fits in a slot, 2 3/4 inches long, cut lengthwise of the slide.

In testing motors for armature clearance the hand-hole plates are removed as usual and the gauge is inserted so that the lip of the slide engages with the pole piece, while the tapering end of the gauge is inserted as far as possible between the pole and the armature. By carefully removing the gauge the relative positions of the slide and the gauge proper indicate the exact clearance. The taper given to the end of the gauge is such that a variation of a sixty-fourth part of an inch in the clearance is marked by a longitudinal variation of one-fourth of an inch on the straight edge.

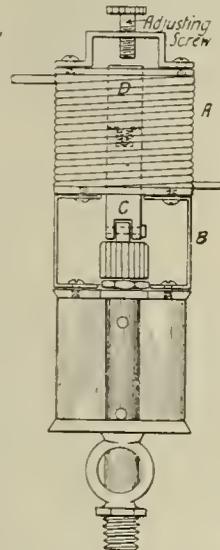
COMMUNICATIONS.

An Automatic Oil Cup.

To the Editors:

There are many operations in the car shop and barns which require intermittent power, conveniently supplied by means of small electric motors. For such service, however, unless the bearings are of the ring oiling type or special provision is made to oil the bearings, they are very apt to be neglected. Particularly is this true of motors operated by a number of different employes. If the motor is in an out of

the way place, each man assumes that the motor was oiled the last time it was used, and if located where it is easily reached, each man using it gives it a little oil, with the result that the oil overflows from the bearings, soils the floor and works its way into the armature and field coils. Ordinary oil cups are not very satisfactory for such service, as they are apt to be turned on and forgotten, resulting in flooding the bearings and surrounding floor.



Automatic Oil Cup.

To obviate these difficulties which presented themselves to the writer in the operation of a small portable air compressor, the automatic oil cup illustrated herewith was designed by him. The operation and construction of this oil cup are clearly shown in the cut. The solenoid A was taken from an old Mosher arc headlight and rewound with wire of the same size as that on the armature of the motor. The supporting brackets, B, are made of 1-16 by 3/4 inch phosphor bronze. The lower portion of the solenoid plunger, C, is iron and the upper part is brass. The solenoid plunger was in this case attached to the needle valves of standard Lunkenheimer Sentinel snap-lever, sight-feed, glass oil cups.

The solenoid coils are connected in series with the armature, hence when the current is turned on the solenoids are energized, pull up the needle valves and supply the bearings with oil. When the current is turned off the springs and weight of the plungers force them down and shut off the oil supply. The oil cup attachments are easily made and work perfectly.

SHOP KINK.

Lexington, Ky., May 22, 1907.

Wrong Motor Connections.

To the Editors:

I noticed a communication in the May 4, 1907, issue of the Electric Railway Review, from "Car Trouble," stating the symptoms of some motor trouble experienced by him. I inclose a diagram showing controller and motor connections for a K-6 controller and four G.E.-1,000 motors. As will be seen by reference to this diagram, the difficulty in your correspondent's case probably arose through the crossing of the A² with the A¹ and the AA² with the AA¹ wires on or near

IMPROVEMENTS OF THE OTTUMWA (IA.) RAILWAY & LIGHT COMPANY.

During the last year the properties of the Ottumwa (Ia.) Railway & Light Company have been rebuilt and they are now among the best equipped railway and lighting properties of the state of Iowa.

Ottumwa is a city of about 22,000 people and is located in a prosperous farming and mining community in the south-western part of the state. Early in 1906 the electric railway and lighting interests were purchased by H. M. Byllesby &



Ottumwa Railway & Light Company—Exterior of Power House.

Co. of Chicago and the following officers were elected: President, A. S. Huey, Chicago; secretary, R. J. Graf, Chicago; treasurer, J. J. O'Brien; general manager, W. F. Raber. Since the new management has had control of the properties a new power house, car barn and machine shop and office building have been constructed, the overhead lines and the railway tracks have been rebuilt and several new cars have been added to the rolling stock.

The company operates cars over 12 miles of track, which, for convenience in operation, is divided into six divisions. Cars are operated on a 10-minute headway. The rolling stock equipment consists of 35 cars, 30 feet in length, of which 14 are required to maintain the schedule on the various divisions.

The Office Building.

The office building, containing the general offices of the company, the public waiting room, trainmen's quarters and other apartments essential for the comfort of the employes, is situated at Second and Market streets, approximately the traffic center of the city. At this point all cars are started on their outgoing runs and all transfers of passengers are made. The office building is of brick construction. It has a frontage of 67 feet 7 inches, is 64 feet 2 inches deep, and three stories high. On the first floor are the waiting room and the general offices. The basement is furnished for the use of trainmen. The second and third floors of the building are to be leased for public office purposes.

The main public waiting room, located in the corner of the building, has large plate glass windows, which allow an unobstructed view of all cars as they approach the transfer corner. A door connects this room with the public lobby, which is used as a waiting room for patrons who have business to transact at the company's offices. Doors open from the lobby into the general manager's and the superintendent's offices, and windows open into the cashier's and treasurer's offices at the north side of the room. The offices are all finished in nut brown color and are designed after the mission style of architecture.

Car House and Repair Shops.

The new car house and repair shops are located on a triangular plat of ground on West Second street. They cover

a floor space 155 and 190 feet long by 107 feet wide. At the side of the main building there is an addition, 26 feet deep by 85 feet long, which is divided into rooms designed respectively for the storage of coal, sand, salt, tools, oil and general supplies. The car house and storeroom buildings are constructed of brick and are one story high. The floors are of concrete. The armature winding room occupies a space immediately at the rear of the machine shop, which is shown in the accompanying car house layout.

The Power House.

In the rehabilitation of the Ottumwa property much thought was given to the arrangement of the power house. The new building is 150 feet long, 80 feet wide and 25 feet high. The walls are of brick, the floors of concrete and the roof is of tar and gravel construction.

The engine room equipment consists of two Fulton Iron Works engines, each 20 and 40 by 48 inches, which are direct connected to a Western Electric 500-kilowatt, 2,300-volt, 60-cycle alternator and a 500-kilowatt, 550-volt, direct-current generator. These engines have 17-foot flywheels. The other generating units are a 30-kilowatt, 125-volt steam-driven exciter, which is used in starting the alternator, and a General Electric induction motor direct connected to a 125-volt direct-current generator. In addition to these units the company has installed for a reserve equipment the following machines which were formerly in service in the old power station: Edward Allis engine, 16 by 42 inches, belt connected to a Western Electric 100-kilowatt, 2,300-volt, 60-cycle, 3-phase alternator; a Hamilton-Corliss engine, 24 by 48 inches, belt connected to a

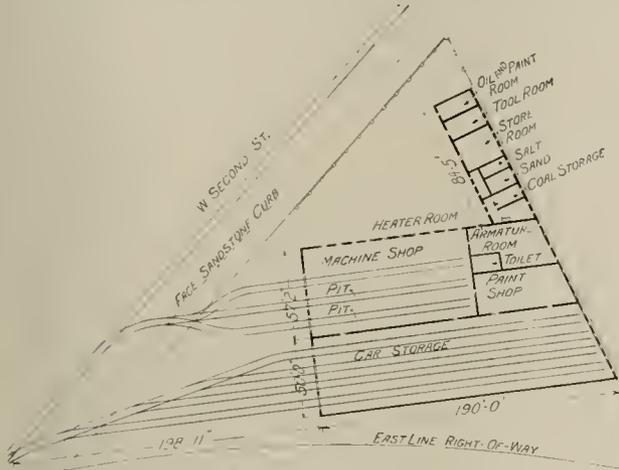


Ottumwa Railway & Light Company—Office Building.

300-kilowatt, 2,300-volt alternator; a Ball engine, 20 by 18 inches, belt connected to a 200-kilowatt, 550-volt generator; an Edison-General Electric bi-polar 100-kilowatt, 500-volt motor and generator, which is used in supplying current for the city metallic circuit.

The switchboard has 27 panels, which are divided as follows: Seven for the railway circuits, two for stationary motor circuits, two for the exciter sets, three for synchronizing, seven for incandescent lighting, two for 3-phase power, four for arc circuits.

The switchboard panels are made of blue marble and are equipped with the necessary recording and measuring apparatus. A space 9 feet wide and 40 feet long is provided between the switchboard and the west wall of the building for the oil switches, busbars and cable connections. The cables are carried overhead in order that there may be free passage around the board. The floor at the rear of the switchboard is three feet lower than the floor of the balance of the engine room. The kicking coils, lightning arresters, etc., are arranged along the west wall of the building, where



Ottumwa Railway & Light Company—Layout of Car Barn and Shops.

the main cables leave the structure. The lighting circuits throughout the building are laid in lead covered conduits.

A gravity oiling system has been installed in the engine room. This consists of a 100-gallon tank, which is near the roof, and a Turner oil purifier in the basement. Oil from the tank is fed by gravity, first to all parts of the engines requiring a lubricant, then to the purifier, and finally returned to the tank.

The boiler room is equipped with five Stirling boilers, three of which have a rated capacity of 410 horsepower and two of 300 horsepower. These are arranged in three banks and are worked under a steam pressure of 150 pounds. Between the first and second banks of boilers are located two Blake duplex feedwater pumps, each 10 and 6 by 10 inches, and a Hoppes exhaust heater.

The feedwater is obtained from the Des Moines river at a point about 100 yards from the boiler room. The suction pumps, 6 and 5¼ by 6 inches, are of the Worthington manufacture. The suction pipe is 4 inches and the exhaust pipe is 3 inches in diameter. The pumps are at the south end of the boiler room in a pit 10 feet deep. Between the pumps and the heater is a Kennicott water softener, which has given very satisfactory service.

Along the east side of the boiler room is a bin 12 by 100 feet, which is used for storing coal. By the use of a Hunt conveyor coal is carried overhead in spouts from the coal hopper located beneath the coal track at the south side of the building to the coal bins in front of the boilers. Before entering the spouts the coal passes through a crusher. An ash elevator carries the cinders from the boiler room to a bin located above the coal track, and the cinders are dumped into a car and drawn away. The coal and ash conveyors and the coal crusher are driven by separate motors.

A number of fire exits opening into the ventilating shafts have recently been installed in the New York subway for the use of passengers as a means of escape in case of a fire or blockade without the necessity of groping their way to stations. Signs marking the points by which escape may be made are five feet long and a foot high and bear the word "Exit" in white on a ground of blue enamel. Shaded electric lights are placed over them. Near the illuminated legend is a door which opens into the air chambers at the side of the tracks. An iron ladder with a rail leads to the top of the pit.

A NOTEWORTHY SAVING IN OIL.

Although the value of an automatic oil feeder system for power houses is recognized, the first cost of installation is often considered too great for adoption in the smaller plants used in supplying current for railway or lighting purposes. Some time ago Levi Paxson, chief engineer of the Fort Branch (Ind.) power house of the Evansville & Princeton Traction Company, installed an oil feeder system that, because of its initial cost, and the oil and labor-saving features which it has developed, is worthy of comment.

Exclusive of the oil filters the system referred to cost but a trivial amount to install and has for nearly a year reduced the engine room expense more than \$140 a month. Previous to its installation an oiler was employed on both the day and night shifts and the quantity of oil used was unusually large. At present no oiler is necessary and the oil consumption has been reduced to 40 gallons of engine oil and 30 gallons each of high and low pressure cylinder oil per month.

In installing the oiling device old gas pipe and other second-hand materials were utilized. The main storage tank, 60 gallons capacity, is located near the roof of the plant. Leading from this to the basement is a 1-inch pipe which passes up to the engine and is reduced to ¼ inch where it enters the oil cups. The oil supply is furnished to the cups by gravity. The waste oil from the engine passes by gravity through another pipe line to a tank in the basement, from where it is forced by a small air pump to two Acme filters located in an oil room adjoining the engine room. From these filters the oil is returned to the storage reservoir by air pressure. The air pipe in this case is attached to the top of the filter reservoir. When it is desired to fill the storage tank the air cock between the filter and the filter reservoir is closed and the oil is forced to the top of the structure through a ¾-inch pipe, which completes the circuit of the oil.

As a precautionary measure a small air whistle has been placed in the pipe leading from the filter to the storage tank. When the oil supply in the filter tank has been exhausted the air in passing through the pipes blows the whistle, which is a signal to stop the air compressor.

The machinery supplied by this automatic oiling device consists of two (18 and 36 by 42) engines, direct connected to a 400-kilowatt generator; two high-speed engines direct connected to excitors, and a 300-kilowatt rotary converter.

The Wastefulness of Chimney Draft.

In a discussion of the methods for the utilization of waste heat, the wastefulness of the usual method of producing draft by the ascent of heated air in a chimney must be considered.

Taking the boiler as the wasteful member in a steam plant, its efficiency varies from 60 per cent in a bad boiler to 80 per cent in a very good one, these proportions of the heat produced by the combustion of the coal being realized in steam available for the engine in each case.

The difference may be said, without greatly stretching the truth, to go up the chimney. It is not to be disputed that much of the waste heat might be caught and utilized; but there are reasons why it is not so caught. In the first place, the gases must be hot when they go into the chimney, or there will not be a draft.

As a matter of fact, a draft obtained in this way is the most expensive possible, save one. The exception is a steam jet in the chimney. A fan can be run for about one-tenth of the power represented by the waste heat required to command a good draft. A tall chimney will cost from \$5,000 to \$25,000, very much more than will a fan plant. But the fan is not used and the chimney is—largely because it is essential to discharge the products of combustion high up in the air over the roofs of surrounding houses. This necessity must be taken into consideration in so far as factories are concerned, yet it is believed that in some cases a chimney stack 100 feet high would be sufficient, because with a fan combustion could be more easily controlled than is possible with a chimney, to the end of preventing the giving off of smoke.

DEPRECIATION.*

BY ROBERT HAMMOND.

The object of the present paper is to invite the members of the institution to consider the question of depreciation in all its bearings as applicable to electricity supply undertakings, in the hope that some definite conclusion may be arrived at as to the proper provision which should be made in the case of undertakings owned, whether by companies or by local authorities.

The word "depreciation" is used in a wide sense, and it is desired to include in the inquiry not only the consideration of the provision which should be made to cover the depreciation in value of the assets of an undertaking, but also as to what other charges beyond the ordinary working costs should be debited to the revenue account before arriving at the net profits of the undertaking.

Following these lines, we have first to consider the question of depreciation proper, then the advisability of creating a reserve fund to provide for unforeseen expenses which may be incurred owing to accident or other emergency, and, lastly, the provision of a further fund to cover antiquation of machinery, apparatus and mains, thereby preparing for the possible necessity of scrapping machinery, etc., which may be in good working order, but which may have become obsolete owing to improvements introduced in methods of generation and distribution.

Companies.

Whether the undertakings are owned by companies or by local authorities, the conditions governing their working are such that in order to give a continuous supply of electricity it is essential that machinery, apparatus and mains should be kept in a high state of efficiency.

The cost of so maintaining the plant is, of course, regarded as part of the working costs, and is assumed to be so dealt with. Plant, well maintained as it may be, must, however, gradually depreciate, and a time will come when the frequency and extent of repairs and renewals necessitate so heavy an item of annual expenditure that it is preferable to replace it with entirely new plant.

In order to arrive at the amount with which the gross profits should be debited annually in order to cover this depreciation, it is necessary to settle the number of years which will elapse before the various classes of plant and apparatus in use will arrive at the scrapping stage and will require entire renewal.

At the outset we are confronted with the difficulty that the life of machinery so largely depends upon the way in which it is maintained, that a definite period, at which any particular class of machinery or apparatus would in the ordinary course be entirely worn out, can hardly be taken as of universal application.

On the basis, however, that all plant would be carefully maintained and faulty parts renewed out of revenue, it is suggested that the periods named below represent a fair approximation of the life of the various classes of machinery and apparatus, etc., named:

Estimated Years of Life.

	Years.		Years.
Land and buildings	60	Accumulators	15
Machinery and plant—		Transformers, static	15
Boilers	20	Converters, rotary	20
Pumps and pipework.....	25	Switching apparatus and instruments	20
Conveyors	10	Meters	10
Engines	25	Mains—	
Turbines	20	Armored	25
Dynamos and alternators..	25	Solid system	30
Motors	20	Ducts	30
Tools and sundries	10		

The "lives" set forth will doubtless provoke some criticism, but it is repeated that the "life" largely depends upon the degree of thoroughness with which the plant is maintained.

With accumulators, for instance, it seems sanguine at first sight to give a life of 15 years. Further consideration shows, however, that for all practical purposes, with careful upkeep, the life given is merely that of the boxes containing the plates, connections, etc. There is no reason why a battery of accumulators should not last considerably longer than 15 years if the plates are regularly renewed out of revenue.

If the above periods be accepted, it becomes a simple calculation as to the amount which must annually be written off or set aside to a sinking fund.

So far, the formation of a depreciation fund in the narrow sense of the word has alone been dealt with. The formation of such a fund, apart from the method of accountancy adopted,

appears to be essential whether the company is working at a profit or a loss. In the event of its working at a loss for, let us suppose, the first few years, it seems only sound that before any moneys are distributed as dividends, not only should the trading losses be made good, but the contributions to the depreciation fund which otherwise would have been set aside should also be made.

General Reserve Fund.

As regards the second item, to which reference has already been made as coming within the purview of the paper, namely, the provision of a general reserve fund, it seems to the author that, however wise the formation of a general reserve fund might be for the purpose of equalization of dividends, it nevertheless does not rank as a strict necessity as does a depreciation fund. Further, he does not agree with those who hold that such a fund is necessary, not only for the equalization of dividends, but for the purpose of providing against extraordinary expenditure due to unforeseen emergencies.

Such emergencies are caused by accident in one form or another and such risks should be fully insured against and the premiums regarded as part of the ordinary working costs.

Antiquation.

Lastly, there is to be considered whether a fund to cover antiquation should be deemed obligatory.

It has been urged on the one hand that no provision whatever need be made under this heading. Those who hold this view contend that any great revolution in engineering methods which would cause their present plant to become obsolete would necessarily carry with it its own advantages either in the direction of a great improvement in efficiency or in an extension of the uses to which electricity might be put. They contend that these advantages if really extensive would in themselves more than pay for their adoption, and that unless a company could see its way to larger dividends by adopting an improvement, it would, of course, continue on the old lines.

On the other hand, many hold the view that an antiquation fund is of vital importance, and they point out that a radical improvement might arise which would entirely supersede the existing methods of generation and distribution, and while such an improvement would entirely take the field in opposition to the present methods, nevertheless, the improvement might not carry with itself a sufficient margin of profit to cope with the dead weight of interest on capital expended upon superseded plant. A company which was without an antiquation fund would then be faced by the possible competition of a new concern not so overburdened with capital charges, which could completely relieve it of its business.

The author does not share the latter view to the full extent, but, on the other hand, he thinks that no electricity supply undertaking can be regarded as in a thoroughly sound position unless some provision has been made in the direction of an antiquation fund. At the same time this provision is, in his opinion, not one which would rank on the same footing as a depreciation fund per se, but is one which might wisely be contributed to out of profits as a sort of nest egg for the future.

The distinction which he desires to draw between the contributions to a depreciation fund and contributions to an antiquation fund is practically that the former should be built up whether the undertaking is working at a loss or not, while contributions to the latter fund need only be regarded as advisable when a concern is in a flourishing condition.

Residual Value.

To arrive at an absolutely accurate amount of annual contribution to a depreciation fund it would be necessary to determine the residual value of the machinery, apparatus, etc., at the end of their respective lives. In the case of land it, of course, remains, and the scrap value of machinery, apparatus, mains, etc., containing a fair amount of copper and other metals, is appreciable. As, however, a depreciation fund must in its nature be based upon an estimate, it has seemed to the author wise to regard the residual value as an item which the undertaking would have to the good at the end of the respective lives, and one which to that extent would be in hand as a contribution toward the cost of new plant.

An auto-car line in Pennsylvania was opened on May 20. Cars seating 20 passengers are operated between Picture Rocks and Montgomery, via Muncy, a distance of 20 miles.

A. E. Reynolds, president of the Indianapolis Crawfordsville & Western Traction Company on May 24 drove the last spike at Crawfordsville, Ind., in the track connecting Indianapolis and Crawfordsville. The new cars from the Jewett Car Company, Newark, O., are to be delivered on June 1 and regular passenger traffic started very soon thereafter.

*Abstract of paper read before the Institution of Electrical Engineers of Great Britain April 25.

DISCUSSION OF TRANSFORMERS BY AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

A special meeting of the Chicago branch of the American Institute of Electrical Engineers was held on May 24, 1907. The meeting was attended by about 175 members and guests. H. W. Tobey, engineer with the General Electric Company, Schenectady, N. Y., presented a paper entitled "Relative Merits of Three-Phase and One-Phase Transformers." John S. Peck, electrical engineer with the British Westinghouse Electric & Manufacturing Company, read a paper on "Relative Advantages of Single-Phase and Three-Phase Transformers." These papers were discussed together.

In the discussion it was stated that the Commonwealth Electric Company of Chicago had adopted the 3-phase transformer about six years ago, and now has about 45,000-kilowatt capacity in these units and 6,000-kilowatt capacity in single-phase transformers. Less trouble had been experienced with the former total installation than with the 6,000-kilowatt capacity of three 1-phase transformers. Some allowance must be made for the three 1-phase transformers, as they have been in use considerably over six years, and, therefore, the design, insulation, material and workmanship cannot be considered equal to those of the later 3-phase transformers.

The patent situation has had much to do with the slow progress of the 3-phase transformer; competition being barred by the patents, the financial advantages of the 3-phase transformer did not materialize, and the manufacturers did not wish to sell 3-phase transformers, as there is more profit in three 1-phase transformers.

It was suggested by one speaker that in the smaller companies at least, which do a combined power and lighting business, the three 1-phase transformers have the advantage over the one 3-phase transformer, in that the same transformers can be used either for lighting or power work, and hence it is necessary to carry less than one-third the emergency capacity of various transformers, than is the case with 3-phase transformers.

A paper on "Potential Stresses as Affected by Overhead Grounded Conductors," was read by R. P. Jackson, Westinghouse Electric & Manufacturing Company. Overhead grounded conductors were said to be of considerable value in reducing the strain on the insulators, especially with the steel tower construction. Mr. Jackson suggested that by the use of a ground wire the static strain on the insulators on metallic poles or towers would be reduced one-half. If the maximum strains to which insulators are subjected is four or five times the normal strain, then a reduction of one-half would not be of much avail, but on the other hand, if the maximum strain only exceeds the normal strain by half, a reduction to half the maximum amount would no doubt almost eliminate the breaking of insulators.

It was also pointed out that the value of the overhead grounded conductor is not so great if wooden poles are used as in the case of steel poles or towers. As concrete is a better insulating material than wood (when wet) the overhead grounded conductors should be of less value on concrete poles than on wooden poles.

Prof. Morgan Brooks of the University of Illinois discussed the rise of pressure accompanying the closing of transformer circuits and the breakdown effect on the insulators. He cited the results of some experiments which are being made at the University of Illinois, which showed a rise of potential from 50,000 to about 71,000 volts in cases where the switch was closed at the "peak" of the pressure wave. W. J. Andree, a student of the University of Illinois, described these experiments, saying that they showed conclusively that the surge following the closing of a transformer circuit could be entirely eliminated if the switch were closed at the proper instant, that is, when the generator pressure wave is passing through zero. His experiments also showed that residual magnetism in the transformer had no effect upon the value

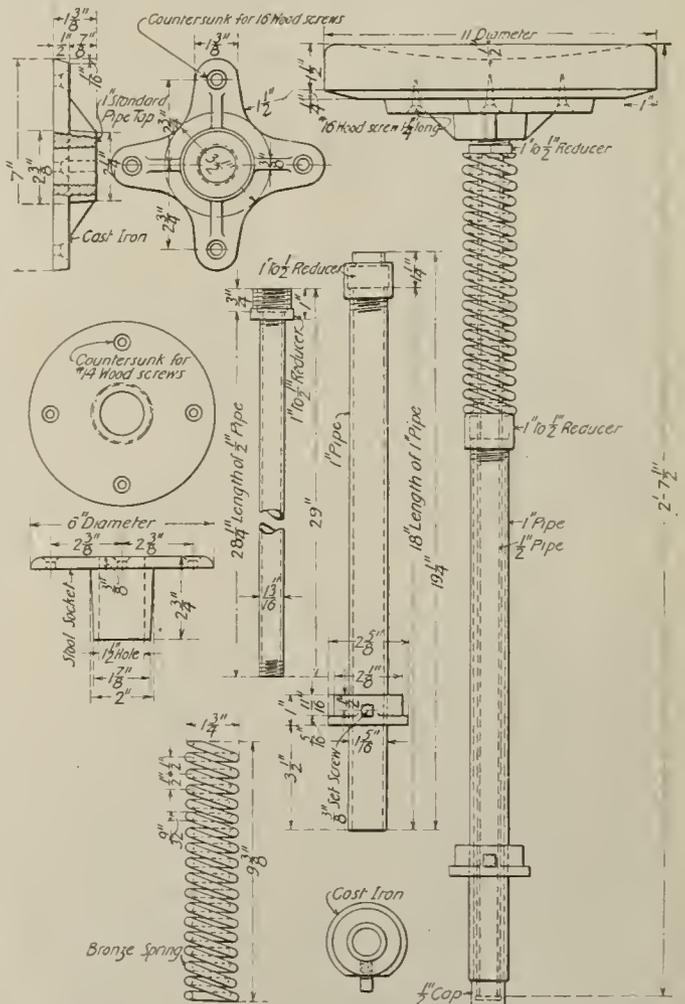
of the surge electro-motive force, the same rise in pressure being noted whether the transformer core was demagnetized or magnetized in a positive or negative direction, provided always, that the circuit was closed at the same point of the pressure wave. He then described how the same result was obtained by inserting a coreless reactance in the generator circuit between the generator and transformer. Though the reactance coil does not entirely prevent the surge, it reduces it by about 90 per cent. After three or four cycles, the coreless reactance coil is shunted and cut out of the circuit.

C. C. Chesney, chief engineer Stanley Electric & Manufacturing Company, read a paper on "Forced Oil and Water Circulation for Cooling Oil Insulated Transformers." The paper was freely discussed by a number of members, after which F. O. Blackwell's paper, "Open Versus Inclosed High-Voltage Station Wiring," was read.

The entertainment features of the meeting included a visit to the Fisk street station of the Commonwealth Electric Company in Chicago and an excursion to the Grand Rapids-Holland substations across Lake Michigan from Chicago.

A PORTABLE SPRING SEAT.

The Los Angeles Railway Company provides its motormen with seats built after the design shown in the accom-



Los Angeles Railway—Portable Spring Seat for Motormen.

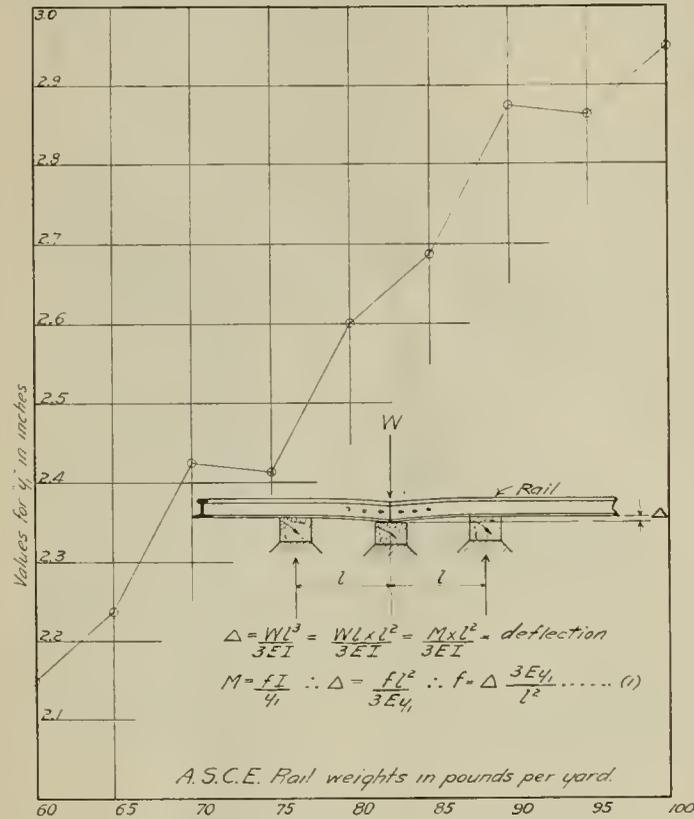
panying drawing. One seat is provided for each car and is moved from the front to the rear platform when the trolley is turned. The stool socket, 6 inches in diameter, is countersunk in the platform floor, and by means of the collar and set screw the height of the standard seat can be varied by moving an adjustable collar up and down the pipe. A bronze spring, as shown, provides elasticity to the upper part of the stool. To prevent motormen from habitually riding with their shoes on the varnished dashboard special foot rests are fastened at a convenient height, one on either side of the center of the dash.

THE RAILWAY TRACK OF THE PAST AND ITS POSSIBLE DEVELOPMENT IN THE FUTURE.*

BY J. W. SCHLAUB.

No concerted effort has been made to analyze the rail problem, other than to blame the rail manufacturer for the poor quality of the rails, but there is another side to this question that has not received proper consideration. To begin with, is the difficulty due entirely to the poor quality of the rail? We have heard much of the speed with which rails are rolled, and of the high temperature of the steel when on the cooling bed. This may account for some of the difficulty; but, on the other hand, is the structure upon which the rail rests free from blame?

Let us see what are some of the defects of the present cross-tie system of rail support: In the first place it is not mechanical. Given a line of rails which have to carry moving loads reaching 20,000 or 30,000 pounds and more per wheel, the loads which they carry must be distributed over large areas. The cross-tie system accomplishes this by inserting 16 to 20 independent supports under each 30 feet of rail, and

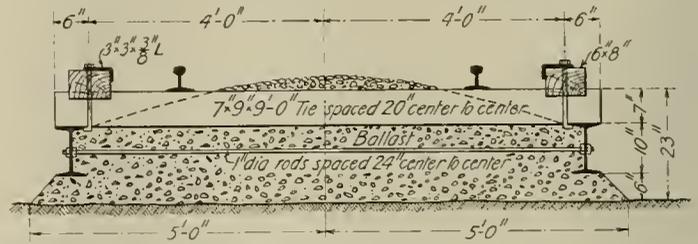


Railway Track in the Future—Figure 1—Diagram Showing Stress in Rails of Various Weights for a Given Deflection.

upon the track department is placed the impossible task of so adjusting these supports that each shall bear an equal part of the load. This is the real secret of the enormous amount of labor spent on surfacing a track, in order to carry trains at high speed, and it is a work that goes on forever. Moreover, assuming a joint has not been kept up to surface, what happens when a wheel passes over it? Within certain limits the ends of the rail will deflect until the tie receives a firm bearing; and all track shows, more or less, the effect of the lack of continuity in the rail by the dip of the rail at every joint. This happens in an instant, when the operation is repeated by the next wheel, and so on. In Figure 1, assuming the deflection of the end of the rail to be "delta" when the tie reaches a firm bearing, the equation shows that for a given deflection of a rail the fiber stress varies directly with the distance of the outer fibers from the neutral axis, and nothing else. In other words, if the rail deflects until the tie brings up on a firm bearing, regardless of the wheel load, then the stiffer the rail the more work it will be called upon to do, and consequently the higher the fiber stress on the steel will be. Now, is this not approximately what takes place under ordinary conditions? The load comes on the rail, and if the rail lacks a firm bearing it will deflect until

it finds a reaction. The equation tells us that in order to reduce the work done by the rail it will be necessary to reduce the deflection. In other words, make the ballast and substructure as unyielding as possible so that the rail will be relieved from a duty which it is not qualified to perform, and which it should never have been called upon to perform.

The usual argument against an unyielding roadbed is offered by the railroad manager about as follows: He says the track must be elastic, otherwise the rails would be destroyed or broken, and therefore the present form of track must be maintained. Yet this same manager will order the heaviest rails to be placed in the track, to be supported on the heaviest ties that he can procure and laid on the deepest ballast, to make a firm and unyielding roadbed as near as can be made by such devices. If a rail could be laid on a solid bed uniform throughout its entire length, so that every

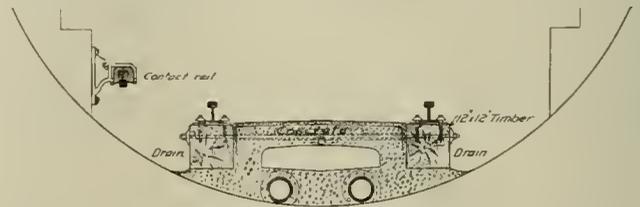


Railway Track in the Future—Figure 2—Design for Rigid Permanent Way, by Gustav Lindenthal.

part is supported exactly the same as every other part, where will the rail break?

But how shall a roadbed be built that will meet such conditions? In the first place, the substructure upon which it is to be laid must be absolutely unyielding, and its foundation must be free from all moisture or below the action of frost. In some cases concrete walls must be built upon which the superstructure is to rest. In other cases piles must be driven, each case being treated as the conditions require. Upon this the superstructure must be laid. This must be some departure from the cross-tie laid on ballast. Nothing can be expected from any longitudinal support laid on ballast, for it can be shown that unless some transverse support is given to the longitudinals, it will be impossible to keep such a track in surface.

But how can this be accomplished? Take the present form of track, with cross-ties sawed to dimensions and surfaced on one side to uniform thickness, laid on a rock ballast at least 16 inches deep. Insert steel I-beams temporarily under the ends of the ties, so that each tie will have a full bearing on the beam at each end (see Figure 2). The steel beams are to be of the "Special" type, with broad flanges as rolled by the Bethlehem Steel Company. The beams are tied together by tie rods spaced two feet on centers, so as to confine



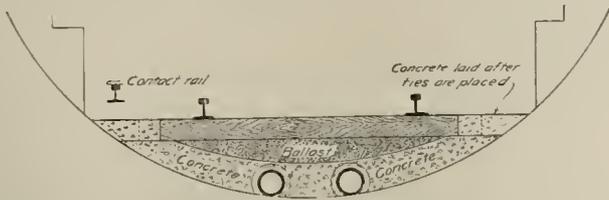
Railway Track in the Future—Figure 3—Proposed Design for Track in the East River Tubes.

the ballast between the beams. On the ends of the ties previously laid, place a bond timber, notched over the ties at least one inch, and hold it down by means of hook bolts, passing through the tie, and anchored to the inside flanges of the beams. An angle iron nosing on the inside of the bond timber serves as a guard rail. After all is in place, the extraneous ballast, that outside of the beams, is removed. No part of this operation need interfere with traffic. In bringing such a track to surface, the entire structure is to be lifted by means of track jacks placed under the flanges of the beams. After the ballast is once in place, very little work should be necessary to keep such a track in surface. The ballast is confined between the beams, so that an arch action can take place, with the thrust of the arch taken up by the tie rods. This assumption makes it possible to find the tension on the rods and properly proportion them.

But, how does this form of track offer any advantage over the present form of track? Solely in the introduction of the longitudinal beams. These beams are to perform two distinct functions. First, the special beam, with a moment

*Abstract of a paper read before the Western Society of Engineers, Chicago, on May 29, 1907.

of inertia equal to five times that of an 80-pound rail, should do just five times the work done by the rail when both are working together under the same conditions, neglecting the work done between the cross ties in either case. The work done by the rail would then be principally to distribute the load over the ties, and not to make up for the deficiencies in the substructure, as it does now. Second, in confining the ballast, and thereby preventing the track structure from



Railway Track of the Future—Figure 4—Proposed Design for Track in the East River Tubes.

working its way down through the ballast as it does now in the present form of track. After this form of track has been proved by experiment to be correctly designed, the timber should be removed, and the ballast replaced by concrete flush with the tops of the beams, forming a permanent substructure, upon which the superstructure is to be placed. At the same time the steel beams can be removed. This superstructure should be some form of longitudinal support bedded in concrete, so as to distribute the loads over large areas, offer perfect drainage and be absolutely imperishable and unyielding.

MOTIVE POWER FOR ELECTRIC TRUNK LINE OPERATION DISCUSSED.

In the *Electric Railway Review* for May 25, page 685, there appeared in abstract a paper on electric trunk line operation by Frank J. Sprague. The statements of the author were the subject of an especially interesting discussion, an abstract of which follows:

Discussion by W. J. Wilgus.

With respect to the conditions that will justify the use of electricity as a motive power in trunk line operation, I believe that evolution will govern rather than revolution. It now looks as if the first movement in this process of evolution is the substitution of electricity for steam in congested passenger terminals at large centers of population, where the public demands a cessation of nuisances incident to steam locomotives, and where the increasing volume of traffic requires increased capacity that cannot be secured by present motive power. The success of the New York Central installation in both of these particulars is an illustration of what can be accomplished, and imitation will surely ensue at other places where like conditions exist.

With a start in the substitution of electricity for steam in the operation of congested terminals, connecting lines between large centers of population and long pusher grades with heavy freight traffic, we may look with confidence to a gradual expansion of the use of the new motive power in other directions. For example, in the case of the New York Central the primary object of the use of electricity was to abate the smoke nuisance in the Park avenue tunnel and increase the capacity of the Grand Central terminal. When this decision was reached it became self-evident that the use of the motive power should extend to the end of the suburban territory at Croton on the Hudson division, a distance of about thirty-five miles. While the northerly terminus of the main line is thus planned for the present at Croton, it is probable that just as soon as the developments in the electrical field will warrant such action, the electric zone will be extended as far as Albany, a total distance of 142 miles.

This brings up the question of the respective merits of the three electrical systems now warmly advocated by their respective friends—the direct current, the single-phase alternating current and the 3-phase alternating current.

If, instead of blindly teaching the merits of one system to the exclusion of others, the electrical engineers could unite upon the axiom that each special condition should be carefully studied and the system best suited to it adopted, I feel certain that the cause will be further advanced.

Entirely apart from any arguments, pro and con, of the relative merits of the two systems, it will be seen that the physical and legal conditions prevented the adoption of any other system than the direct current. The question of rela-

bility is much more important with a trunk line steam railroad carrying passengers from remote points as well as suburbanites, and mail and express from all over the country, than with local street car systems. The New York Central to secure reliability has not only provided storage batteries, but it has also provided duplicate power stations with access for fuel by both rail and water. Duplicate transmission lines have been adopted for like reasons.

Further commenting on the necessity for a study of local conditions, I have recently had in my charge the adoption of an electric system for operating combined freight and passenger service through a double-track tunnel now under construction. In view of the claims made by the advocates of different systems it seemed wise to prepare the specifications so as not to cramp or restrict the best judgment of the competitors, but leave the widest latitude for ingenuity and exercise of skill, consistent with the accomplishing of the desired object. The invitation to domestic and foreign companies, in addition to asking for bids, also requested the filling in of blanks to show the annual costs, including interest charges, depreciation, taxes and operation. The result showed conclusively that, for that particular installation, the direct-current system was the cheapest in both first cost and annual cost, to the extent of being from 20 to 25 per cent less than its nearest competitor.

We are often told that the overhead single-phase system should be used because of the advantage of requiring no substations and substation attendance, but nothing at the same time is said about the higher cost of alternating-current locomotives for performing the same service, nor the higher cost of overhead construction as compared with the third rail.

I do not know of any important question of the day that so much requires absolute openness and frankness, with a careful examination of all sides of the case, as the adaptation of electricity to trunk line practice. Any concealment of the facts sooner or later reacts to the detriment of those responsible therefor and to the financial embarrassment of the suffering company.

In making a selection between the rival electric systems, relative acceleration should be compared not only in connection with the movement of suburban trains but also with through trains hauled by electric locomotives. Some recent observations have demonstrated to me the marked difference of acceleration between the two principal electric systems.

Always having in mind the primal elements of safety and reliability, all the inventive genius of the great manufacturing corporations should be bent on devising means of accomplishing a desired result at less cost, as this will mean in the end such an increase in the use of electricity as a motive power as to more than compensate for the comparatively small loss in decreased unit prices of apparatus. One of the promising movements in this direction is the hints that have been given of the possibility of substituting for the expensive rotary converters and substation attendance with the direct-current system a very simple device which will cost very little and require no attendance.

Discussion by N. W. Storer.

When it comes to statements in regard to single-phase equipments, I desire to take issue with the author of the paper, as information I have, based on the present practice of the Westinghouse Electric & Manufacturing Company, is entirely inconsistent with what appears in the paper. In the first place, there are given 15 so-called differences between direct-current and the alternating-current single-phase motors. These might have been headed "the advantages of direct-current motors as compared with single-phase motors," as this is what they are made to appear. Although many of these are of little consequence they will nevertheless be considered in order.

Comparison of Direct and Alternating Systems.

1. "The input of current in one is continuous, in the other, intermittent." Quite true, but the drawbar pull is quite as effective in one case as in the other.

2. The direct-current motor has a solid frame like the single-phase motor. It has, further, two or more laminated poles bolted in and if the interpole construction is used has as many more relatively small and delicate poles. The alternating-current motor as built by the Westinghouse company has, in all sizes up to a diameter of 38 inches, field punchings made in a single piece and built up and keyed in the frame, making it as solid a construction as an armature on its spider. A claim for less rigidity in the single-phase motor is hardly sustained.

3. "One has exposed and hence freely ventilated field coils, the other has field coils embedded in the field magnets." It is known to most motor designers that coils in contact with iron will dissipate heat much faster than when in the open air. This is especially true of coils in an inclosed motor. I

have repeatedly noticed that motor field coils which have been removed on account of roasting out have shown the insulation in contact with the pole pieces to be in good condition, while other sides were badly roasted. I therefore know that in respect to ventilation of field coils the single-phase motor is superior to the direct-current motor. Smaller cross section of coils also allows the heat to be radiated better with the single-phase motors, and the fact that a large part of the loss in the motor is concentrated in the field iron will enable the motor to dissipate a much larger amount of heat for a given temperature rise than a direct-current motor.

4. Concerning "polar clearances." Many thousands of direct-current motors are today in operation with a clearance of $\frac{1}{8}$ to 3-16 inch between poles and armatures and in practically all cases where more than 3-16 inch clearance is used it is for electrical reasons. Further, while the smaller air gap used for single-phase motors was at first much feared, the fears have proved to be without foundation, and the present clearances of from 0.1 to 0.15 inch have proved to be ample and fully as good as 0.15 to 0.25 inch on direct-current motors because there is no unbalanced magnetic pull.

5. Concerning "torque." The torque of an armature is the pull it will exert at 1-foot radius. It therefore makes no difference in the result whether it is obtained with large flux and few armature conductors, or vice versa.

6. "Much larger diameter of armature and commutator and much higher speed." This is a very general statement; what are the facts? The armature diameters ordinarily run from 5 to 15 per cent larger than for direct-current motors of corresponding output. It is undoubtedly true that the armature speeds of the earlier single-phase motors were much higher than the speeds of corresponding direct-current motors. At present, however, the speed at the nominal rating of the motor is practically the same as that of direct-current motors and the maximum operating armature speeds are within the safe limits set for direct-current motors.

7. Concerning "gear reduction and gear pitch." The gear reduction, of course, depends upon the speed, and as far as gear pitch is concerned, the same gear pitch is used for single-phase motors as for direct-current motors of the same capacity.

8. Windings of one subject to electrical strains of one character; in those of the other strains of rapidly variable and alternating character. No conclusion is drawn from this. It may be of interest to know that there have been a number of instances where the single-phase motor has broken down in service on a direct-current section of the line, necessitating cutting it out of the circuit, but when the car reached the alternating-current section of the line it has been again connected in circuit and operated satisfactorily, thus indicating that the electrical strains on alternating current are less severe than with direct current.

9-10. Concerning the "variable torque of the single-phase motor." No comment is made as to the relative merits of uniform or pulsating torque. In a recent discussion before the institute, Mr. Potter called attention to certain characteristics of the torque exerted by an alternating-current motor, especially when it reached the slipping point of the wheels. It was stated that there was an apparent advantage in the pulsating torque, because, when the motor starts to slip it does not immediately decrease its mean torque as is done in the case of the direct-current motor, but slips in a series of jerks, apparently regaining the hold on the rail at every pulsation.

11. Concerning the "number of poles." The paper states that the direct-current motor has "two or four main poles only." No direct-current motors built in the last 15 years except those on the New York Central locomotives have less than four poles. The paper states that the alternating-current motor has "8 to 14 poles." The single-phase motors built by the Westinghouse Electric & Manufacturing Company have four poles for all sizes up to and including 125 horsepower. The largest single-phase motor thus far built has a capacity of 500 horsepower. It has but 12 poles.

12. Concerning "a high torque while standing still." As we understand the matter, railway motors are designed to move a train rather than hold it at rest. At the same time we know that the single-phase motor is amply protected against mistakes of motormen in leaving the current on the motor for a half minute or so with brakes set.

13. Concerning "resistance in commutator leads." It is well known that the resistance leads which are used in single-phase armatures are used for the purpose of reducing the loss due to the transformer action in the short-circuited coil to a minimum. Their presence is fully justified and the efficiency is higher than it would be if they were not used.

14. This refers to relative weights, concerning which we shall have something to say further on.

15. On this point I agree absolutely with the author. There is one type of construction to which the single-phase

motor is not adapted. This is so far employed in only a single case.

More or less has been said in the paper concerning the lower efficiency of the single-phase motor and inference might be drawn that it is about 10 per cent lower than that of the corresponding direct-current motor. Just to show what modern motors are capable of doing, I give below in parallel columns the efficiencies of corresponding sizes of direct and alternating current motors at different percentages of their full load torque.

Per cent of full load torque	.....125	100	80	60	40	25
Direct-current 90-horsepower motor	\$6.25	\$6.8	87	86.5	85	82
Alternating-current 25-cycle 100-horsepower motor	.....82	\$5	\$6	\$6.8	86	82.5
Direct-current 200-horsepower motor	.....88.8	89	89.2	88.8	87	84
Alternating-current 15-cycle 200-horsepower motor	.....87.3	88	88.3	87.7	85	82

From this it does not appear that within the ordinary range of tractive efforts exerted by railway motors the single-phase motor is so far deficient. In fact, it comes remarkably close to that of the direct-current motor.

Mr. Storer attacked the comparison between direct-current and single-phase motors made by Mr. Sprague on the ground that it was unfair. In conclusion he said:

Now, concerning the use of high-voltage direct current. Motors can certainly be built to commute satisfactorily on 1,200 volts direct current. Such motors, however, must restrain the voltage between bars to a safe limit and have extra space for insulation. The construction of this motor would, therefore, put it on a par with the 15-cycle single-phase motor both in weight and dimensions. Moreover, it would have practically the same air gap in moderate sizes of motors and might possibly have to be designed with the same style of compensating winding on the field as is now used for single-phase motors. It would have in addition the disadvantage of a high voltage always present on the windings and brush holders. If it were not for the greater possibilities of the single-phase system there is no question but that the high-voltage direct-current motor would be quite attractive.

General Discussion.

L. B. Stillwell, consulting engineer, thought the author's comparisons were defective for various reasons, among which are that it compares two motors of equal weight, that the comparison is made with a direct-current motor weighing only 23 pounds per horsepower, while the latest motors offered weigh 28 and 30 pounds per horsepower on one hour rating, and that the comparison is between a direct-current and an alternating-current motor operating at 25 cycles and not at 15 cycles, which was the efficiency suggested by the speaker and Mr. Putnam. In conclusions as to capacity, attention should not be limited to the motor, but should be given to the comparative methods of transmitting power to trains.

W. B. Potter, General Electric Company, said that it was not the intention of the company which he represented to be the advocate of any particular system for the sake of the system itself. In nearly every case there are controlling conditions which determine which particular form of operation is best suited. Within the past few years there has been made a distinct and radical improvement in respect to the mechanical features of the direct-current motor. One of the particular difficulties with the single-phase motor has been in the matter of commutation. Since the presentation at a previous meeting of the paper by Messrs. Stillwell and Putnam, such improvements had been made in the single-phase motor that the armature speed would not be more than 15 per cent higher, and with a larger air gap than had been used heretofore. He believed that these improvements would make that motor much more nearly comparable to the direct-current motor than anything that had been seen thus far, and in which the weights would still be in the neighborhood of 25 per cent more than those of the direct-current motor of the same horsepower. He suggested that in consideration of higher voltages, the step should be made from 600 to 1,200 volts at once and not by successive stages, which would introduce great complication.

Charles F. Scott, Westinghouse Electric & Manufacturing Company, indorsed the view of Mr. Potter, that it was not the function of the engineer to advocate a particular sys-

tem for all cases. He questioned the data upon which the author of the paper had arrived at his conclusions. It seemed to him that a number of points made by Mr. Sprague had been upon comparisons upon a particular basis, and that he had not considered fully the different methods or conditions under which the two motors may operate. Under the control of a motorman the alternating-current motor may have different characteristics of acceleration. It may accelerate to a high point, or it may have the same mean acceleration from start to maximum speed with a less maximum rate of acceleration. With the alternating-current motor any increasing voltage applied to the motor allows an increased output with the same current going through its armature.

William McClellan, Westinghouse, Church, Kerr & Co., was disappointed in the paper, that no definite information had been given with regard to the 1,200-volt system. He was also sorry that the author had thought wise to take up the question of the motor only. The real question is on the general system.

A. H. Armstrong, General Electric Company, referred approvingly to the statements made by Mr. Wilgus. He could not feel the same confidence in the future of any one type of equipment as expressed by Mr. Sprague and Mr. McClellan. Some previous impressions which he had had of the alternating-current motor had been badly broken up.

Prof. C. P. Steinmetz agreed with Mr. Wilgus that the great problem was to replace the steam locomotive by electric motors in those cases where conditions of service have grown beyond the capacity of steam locomotives to handle, and the question whether alternating or direct current motors had the advantage was a secondary one.

BOILER ROOM RECORDS.

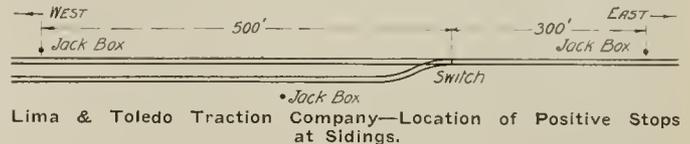
BY R. W. PARRY.

A novel form of boiler room log is shown in the accompanying illustration. Its use would no doubt materially reduce the work of keeping records of the repairs made to boilers. A further advantage of this form of log is that the time required to find any desired information about any of the boilers is much less than in the case of a card index system, or where the records have been kept in a book, and,

REGULATION OF TRAINS AT MEETING POINTS.

The operating department of the Lima & Toledo Traction Company has given much attention to the regulation of trains and trainmen at car meeting points. On the Ft. Wayne division of this railway iron-clad rules have been made which are designed to prevent east and west bound cars from approaching, on the same track, nearer than 500 feet from each other.

The sidings at meeting points are all of the stub-end type and are laid with the switch point to the east. Unless otherwise directed from the dispatcher's office eastbound cars are



given the right of way and westbound cars are required to get into clear. In working out a system of operation whereby the dangers of head-on and "side-swipe" collisions at meeting points are reduced to a minimum three positive stop points have been designated, as shown in the accompanying illustration. These are located respectively 500 feet to the west and 300 feet to the east of the switch point and 100 feet back of the switch point on the siding. At each of these points a telephone jack-box which connects with the dispatcher's wires, has been located. As each car is equipped with a portable telephone communication is readily established with the train dispatcher. If both "meeting" cars are running on their schedule the westbound car is switched to the siding without special orders from the dispatcher, but if either of the cars is running behind the schedule the "stop" points are not passed until orders to proceed are received. When a westbound car has entered a siding the eastbound car does not leave its "stop" point until the conductor of the car on the siding signals that the track is clear. Before doing this, however, it is necessary that he ascertain that his car has reached a point at least 100 feet back of the switch stand. He must then lock the switch and step to the opposite side of the track, after which he can flag ahead the

	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
BOILER NO. 1	REPAIRED TUBES CLEANED TUBES CLEANED TUBES				
BOILER NO. 2	REPAIRED TUBES CLEANED TUBES CLEANED TUBES				
BOILER NO. 3	REPAIRED TUBES CLEANED TUBES CLEANED TUBES				

Form for Keeping Boiler-Room Records.

moreover, a glance at the log diagram gives a graphical indication of the proportion of the total time each boiler has been in use. The paper used for this diagrammatic log is the ordinary "contractor's" cross-section paper ruled in 1/8-inch squares. This paper can be obtained easily for a few cents a sheet. The sheets are cut into strips wide enough to receive a record of all the boilers in a plant and are sufficiently long to accommodate about a four months' log, additional strips being pasted to the first, so as to have the whole year's record in one piece.

The writer has also used this same graphical system for keeping a record of the repairs and running hours of the engines and has found it to give entire satisfaction in both instances.

Once or twice a year this record is copied into the log book to avoid losing the record should the graphical log be lost.

eastbound car. In taking and leaving sidings the rule that a conductor must always lock the switch and step to the opposite side of the track before signaling his motorman is adhered to. This prevents an accidental opening of switches and the resulting damage to track and car equipment.

This system of operation at car meeting points has been used successfully for more than a year and it is now proposed to adopt the same regulations on the other divisions of the company's lines.

Successful trial trips have been made on the line of the Indianapolis & Louisville Traction Company between Scottsburg and Henryville, Ind. It is now believed that regular service will be started as far as Scottsburg in a few days and, within a few weeks thereafter, the Seymour-Columbus division of the Indianapolis Columbus & Southern Traction Company will be completed and service between Louisville and Indianapolis commenced.

"QUESTION BOX" OF THE SOUTHWESTERN ASSOCIATION.

An especially interesting feature of the third annual convention of the Southwestern Electrical and Gas Association which was held at San Antonio, Tex., on May 14, 15 and 16, and was briefly reported in the Electric Railway Review of last week, was the "Question Box," edited by Samuel Kahn, resident engineer of the San Antonio Traction Company. The "Question Box" forms a book of 75 pages, bound in cloth, with an index of contributors and of topical headings, and is well gotten up. The list of questions and answers is large and varied and provoked some very interesting discussions at the convention, the latter part of each session and one entire afternoon session being devoted to the discussion of the "Question Box."

The questions and answers are arranged under headings, each indexed by a letter of the alphabet and numbered in series under each heading. The subjects taken up include practically every branch of gas, electric lighting and railway work, but are especially concerned with the mechanical and engineering departments. It was the plan of the editor to make the "Question Box," a publication of general interest to every individual, ranging from the president and manager to the fireman, in order to bring forth every phase of management and operation.

TRAINING MOTORMEN FOR CAR REPAIR WORK.

In the successful operation of an electric railway the hiring and training of motormen are among the most vital problems that confront operating officials. As the speed of cars and the travel increase and as the construction of car equipment becomes more complicated, these problems become more intricate.

The Scioto Valley Traction Company of Columbus, O., has given much attention to the training of motormen and is obtaining gratifying results from the stringent rules adopted for training new men who are to serve as motormen. For the account of the practice of this company, as herewith given, we are indebted to C. Skinner, superintendent of the company. The account supplements Mr. Skinner's remarks on the subject at the March meeting of the Central Electric Railway Association at Dayton, O.

The company requires that, to be employed as a motorman, a man must have had at least four years' experience in the operation of trains on a steam railway and must pass a rigid examination on the rules for train service adopted by the American Railway Association.

After the examination has been passed and the man has been accepted as a desirable employe he is required to spend two or three weeks in learning the road and the company's method of handling cars. He is then sent into the company's shops and is given practical work in caring for motors and tracing out the causes of trouble that develop in cars. After he has become moderately efficient in this work he is transferred to the car electrician for three or four days, during which he is shown the different car wiring circuits and is instructed as to the results of too rapid acceleration and as to the improper use of the controller. A shop record is kept of all troubles that have arisen in the car equipment and the student is taught how to make the requisite repairs.

He is then taken to the air brake inspector who, for two or three days, instructs him in air brake operation. After this the man is given an examination by the master mechanic or shop foreman and is required to reassemble and connect up parts and wires that, without his knowledge, have been disassembled and disconnected. To fit the man better for his work the wire circuits are often broken by removing the fuses and by substituting blank fuses in their places; the wires are tampered with at points where troubles have previously been found; the air pipes are opened and the

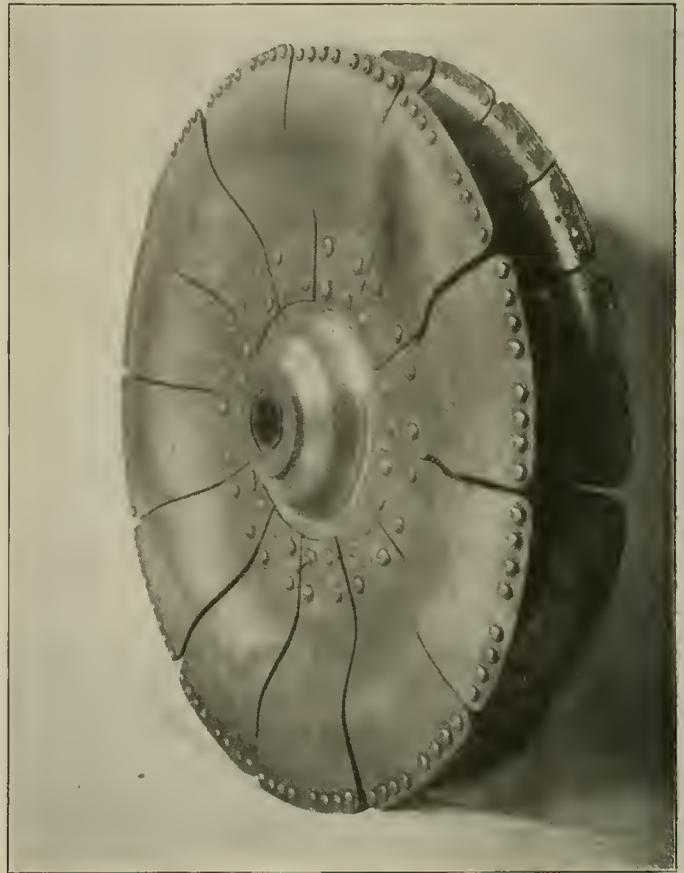
compressor governor is blocked; and the compressor brushes are insulated so as to break the circuit.

The candidate is then taken to the car and asked to make the necessary repairs, beginning with the air compressor, as this part of the equipment should always be in working order before the car is set in motion.

After the air apparatus is in good condition the student is allowed to make the other repairs in his own way. If he proves himself competent to do the work expected he is placed on the motormen's list, but if he has not yet become efficient he is kept in the shops until he can satisfy the master mechanic that he is capable of tracing and repairing almost any troubles that may arise in the equipment of a car.

A FLEXIBLE TROLLEY WHEEL.

The accompanying illustration is reproduced from a photograph of a trolley wheel, patents for which have been obtained by Edward S. Cobb, consulting engineer, Los Angeles, Cal. The design of this wheel is novel, in that the flanges are made of stiff spring metal, but so divided into



Flexible Trolley Wheel.

sections, all riveted to a common center, that the wheel when in position against the wire offers an increased contact surface and elasticity which prevent it from jumping at sharp angles in the wire. The principle involved in making the flanges of the wheel flexible and in providing spring contact surface between the flanges is novel.

The first consignment of 15 new cars ordered by the Lake Shore Electric Railway has arrived. They will cost about \$10,000 each. They are furnished with Westinghouse automatic air brakes. They are also equipped to run in trains. The cars are geared for 75 miles per hour in actual service. One new feature is the all-glass partitions, enabling a passenger in any part of the car to see ahead of the car and thereby enjoy a better view of the scenery. The lavatory is tile finished and modern in every particular. All of the 15 cars ordered will be put into the limited service on the main line as soon as they are delivered.

PIPING AND POWER STATION SYSTEMS—XLI.

BY W. L. MORRIS, M. E.

Many large power stations are either located in small towns or have feeder lines running through them. Such towns generally have waterworks and lighting systems that are both expensive to operate and frequently out of service. A suburban railway will invariably find that it can profitably sell a considerable amount of current to such customers along its lines. The lighting load generally occurs at times when the traffic load is lightest, and the pumping load should be arranged so that it can be thrown on when the station load is light.

Owing to the loss of economy of steam engines operating under light loads that steam turbines are able to make such a favorable showing, the best economy of the steam turbine being considerably less than the best economy of a reciprocating engine, but the economy of the turbine is not affected to such a great extent by load variation. The highest economy possible in the operation of a railway power station would be obtained from units having an auxiliary load, which increases or decreases as the railway load decreases or increases, thus keeping the load constant. This result can be accomplished by the use of storage batteries, but the fixed charges and depreciation on this system are a large item of loss.

To secure the highest economy by the use of a waterworks load it would perhaps be necessary to use a separate feeder system from the power station to the different pumping stations, this feeder being fed with current of variable frequency depending upon the railway load. Either synchronous or induction motors could be used to operate the pumps. The waterworks pumps might then run at full speed and in a fraction of a minute the speed might be reduced nearly to zero, and vice versa, the speed varying constantly with changes in the railway load. This service may appear to be severe on the motors, but it should be no more so than the variable speed at which railway motors are operated. The engines that drive the railway generator would also have to drive the generator carrying the pumping load either on the same shaft or by means of a motor generator. A separate engine for the waterworks load run at varying speed would be a readily developed detail, but this arrangement would merely keep a constant load on the boiler plant and not maintain a uniform load on the railway generating engine. To secure the highest possible efficiency with such a system there should be but one set of feeders, and possibly a controller circuit of small carrying capacity running from the power plant to all the pumping stations, this controller circuit operating magnets or small motors which lengthen or shorten the stroke of the pump, the pump motors in this case being run at a constant speed. This combined traction and pumping load could be supplied with power in so many different ways that it is quite possible a satisfactory method can be developed to control the water discharge.

Railroad operators are inclined to look upon the waterworks scheme as merely an additional consumer of current and do not give proper consideration to the economy which results from keeping the units in the station properly loaded. The fact that the total load of the station is large is no indication that more load is not wanted. A 1,500-kilowatt average load may be the full load of the station if there is but one 1,500-kilowatt generator in service, and a 3,500-kilowatt average may be a light load if three units are in operation. This feature of underload and overload is known only at the generating station. A difference of six to eight pounds of steam per kilowatt-hour is possible with these extreme load conditions, and this is equivalent to about one pound of coal per kilowatt-hour. A 5,000-horsepower plant will deliver about 50,000 kilowatt-hours per day, and if the load could be kept practically constant a saving of nearly 25 tons of coal per day would be possible.

City Water Connections to and from the Meter—Class K 2.

A suitable location for the water meter is sometimes difficult to find. The meter in any case should be properly protected from frost. If located in the basement of the building it is liable to be subjected to low temperatures which injure the meter, and in such cases the meter should be placed in a brick well outside of the building with a tight cover over it, and a small drain run from the bottom of the well to a sewer or to low ground. To further protect the meter from extremely low temperatures straw should be placed over it to prevent air from circulating in the well. These meter pits are objectionable, as they are generally damp and cause the iron parts of the meter to become rust eaten, and are in inconvenient places to get into to read or make repairs. Ordinarily a well-constructed wooden box around the meter would protect it from the lowest temperatures found in the basement, and if arranged so that the well can readily be removed repairs are more easily made. To prevent freezing it is first necessary to confine the air surrounding the part to be protected, and, second, to prevent the air from circulating as far as possible.

If the meter is placed inside of a building, proper means should be provided for shutting off its and all other inside piping to prevent waste of water in case of fire. Such an arrangement is illustrated in Figure 280, in which a valve is shown outside of the building. If the water lines from the meter carry only city water and have no connection with any other water supply system, then the check valve and stop valve on the discharge side of the meter is unnecessary. If the meter is constantly in service there should be a by-pass around it with a valve in it which can be sealed by the water department to prevent water being drawn from the system without registering on the meter. A by-pass is necessary to permit uninterrupted service while repairs or adjustments are being made to the meter. Before making such provisions, however, the details of the arrangement with a sketch should be submitted to the city water department for approval.

City Water to Plumbing Fixtures—Class K 3.

Ordinarily this service presents no unusual features, the most conspicuous feature being that the city water enters the building quite cool, and, if the lines pass through warm basements, the course of the pipe line is generally outlined along the floor by the constant dripping from the cold pipe. This difficulty can be overcome by burying the pipe line, but in power plant work the pipe lines are wherever possible kept out of the ground to facilitate repairs, etc. By encasing the pipe with a cheap wool felt covering, the annoyance of sweating is overcome and at the same time the water is thus kept at a lower temperature. The different wrought-iron pipe lines used for conveying water to and from the plumbing fixtures should be galvanized to avoid as far as possible the stain caused by rust from black pipes, which gives the plumbing fixtures a very untidy appearance. This point should be observed both for cold and hot water lines to the plumbing fixtures.

Before determining what faucets are to be used for the city cold water it would be advisable to ascertain what water is to be used for hot water service, since it may be found simpler to use high pressure valves and take hot water from the feed main under boiler pressure. This point is more fully explained under Class D 10. The washstands in power plants would become exceedingly dirty if some care were not exercised over the men using them, and although white enamel basins are difficult to keep clean they are the only kind that should be used. Their untidy appearance assures that greater care will be taken in keeping them clean.

City Water to Low Pressure Water System—Class K 4.

This service is shown in Figure 280 and would ordinarily only be an emergency connection, the regular service being taken from the station water supply. Such connections as

this are quite necessary to insure continuous operation, and how to avoid the abuse of these provisions is oftentimes a serious problem. It is a well-known fact in station operation that systems having two or more means supplied for meeting an emergency are not as carefully looked after as those having no reserve supplied. The result is that where city water is connected to the station system for emergency service it is generally quite extensively used, even though it be at a loss to the company and could to a great extent be avoided.

Possibly as effective a method as can be followed for reducing the waste of city water is to have the water meter reading placed on the daily station log, showing from day to day the amount of water used; also a line from the operator to state the reason why the valve, d, in Figure 280, was open. The most satisfactory method of taking these readings is to

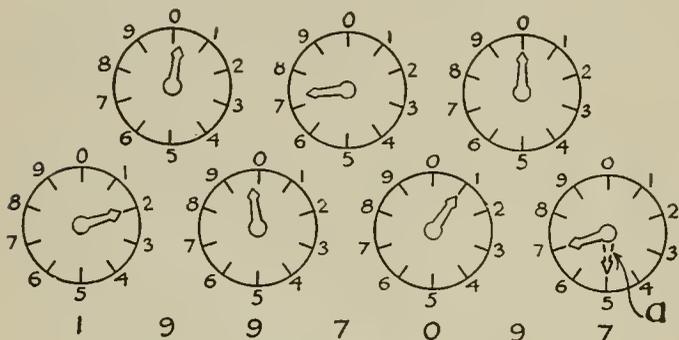


Figure 281 (K4-1).

print the dials on the record sheet and let the operator mark the position of the pointers, as shown in Figure (281) K4-1, from which the chief engineer can figure the water consumption instead of entrusting it to an assistant. Mistakes are easily made in reading meters, and if the chart, as shown, were used it would reduce the possibility of error to a minimum.

The reason dials are confusing is due to the incorrect registering of the pointer, caused by the wear or inaccurate workmanship. If this inaccuracy allows the pointer to be on a graduation when the pointer of the next lower dial is on 5, then the meter can be read in two ways

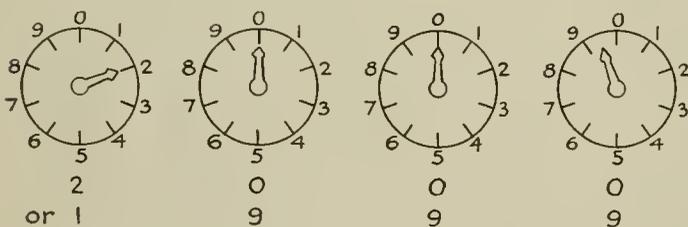


Figure 282 (K4-2).

and with no certainty that either reading is correct. For example, if the unity dial shows 5 as indicated at a, then the meter can be read 105 or 95, the assumption being that it is 7105, as the pointer of the fourth dial has passed 7. There are two different methods of reading a meter, that of placing the unit figure first being the most direct and least liable to cause errors on the part of those who have not become skilled in reading meters. If the high figure (on the left dial) is to be put down first, note must be taken of the next lower dial as to the position of its pointer; if the next lower dial has its pointer at some other point than zero, then it is known whether the number is approaching or following the higher number. In case the unit dial is between divisions the reader would have to assume one, the variation or inaccuracy being negligible. Figure (282) K4-2 shows two readings, either being correct, as the unit pointer is half way between 9 and 10.

(To be continued.)

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL.B., OF THE CHICAGO BAR.

Right of Action of Passenger Given Wrong Transfer.

Montgomery Traction Company v. Fitzpatrick, 43 Southern Reporter, 136.—The supreme court of Alabama says that while it may be admitted that the weight of authority is that the conductor must rely entirely on the ticket in determining his action, and one could not be guilty of a wrong for ejecting a passenger who did not produce a proper transfer, yet all of the authorities recognize that, while in such case there may not be a right of recovery on the ground of a wrongful ejection, yet there can be a recovery for the failure to fulfill the contract to carry, or for the negligence of the agent in giving the wrong ticket or transfer.

Running-Time Orders and Care—Uniform Spacing.

McGahan v. St. Louis Transit Company, 100 Southwestern Reporter, 601.—The supreme court of Missouri, Division No. 2, holds that whatever order a motorman might have been given respecting the running time of the car, that would in no way release him from the duty of exercising due care in the handling or operation of the car, and avoiding the danger of collisions with cars or other obstructions which might be on the track.

The court also says that no such thing as a uniform spacing of cars is practicable on a street railway, as it is matter of common knowledge that blockades frequently occur on the streets which the operators of the lines are powerless to prevent.

Immunity as to Paving Not Transferred.

Rochester Railway Company v. City of Rochester, 27 Supreme Court Reporter, 469.—The supreme court of the United States says that in this case the city sued the railway company to recover \$18,274.02, the expense of making new pavements of two streets within the space between the tracks, the rails of the tracks, and two feet in width outside the tracks of the railroad.

The Rochester Railroad was incorporated for the purpose of acquiring the property of the Brighton Railroad, which was accomplished by a lease of the property, franchises, rights and privileges of the Brighton Railroad, followed by the purchase of its capital stock. This was done under the authority of a statute which provided that a railroad corporation, being the lessee of the property of another railroad corporation, might acquire the whole of the capital stock of the latter, and in such a case its "estate, property, rights, privileges and franchises should vest in and be held and enjoyed by" the purchasing corporation. It was contended that the effect of the transfer under this law was to vest in the Rochester Railroad the exemption from the expense of street pavement which the Brighton Railroad enjoyed through a contract with the state of New York. But the court holds against the company.

The court says that it thinks it is now the rule, notwithstanding earlier decisions and dicta to the contrary, that a statute authorizing or directing the grant or transfer of the "privileges" of a corporation which enjoys immunity from taxation or regulation should not be interpreted as including that immunity. It, therefore, concludes that the words, "the estate, property, rights, privileges and franchises" did not embrace within their meaning the immunity from the burden of paving enjoyed by the Brighton Railroad Company.

The requirement of permanent repair includes the duty of laying new pavements.

Nor does the court agree with the contention that this was not a case of transfer of an exemption; that the rules governing transfer were not applicable here; that the Brighton Railroad had not ceased to exist as a corporation; that

it had been merely joined by merger with the Rochester Railroad, which controlled it by stock holdings, and operated it by virtue of its franchises; and that, therefore, the Rochester Railroad might claim and enjoy the exemption of the Brighton Railroad in its behalf in respect of its property.

The court says that the Rochester Railroad first took a lease of the Brighton Railroad, apparently for the purpose of bringing itself within the provisions of the act of 1879. Then all the stock of the latter corporation was acquired by exchange of shares of stock of former corporation. Then a certificate of the transfer of stock was filed with the secretary of state. Thereupon, by operation of the law, the "estate, property, rights, privileges and franchises" of the Brighton Railroad vested in the Rochester Railroad, to be thereafter controlled by the Rochester Railroad in its own corporate name. The law does not expressly dissolve the selling corporation, but it leaves it without shareholders, property or franchises. A corporation without shareholders, without officers to manage its business, without property with which to do business, and without the right lawfully to do business, is dissolved by the operation of the law which brings this condition into existence.

Interurban Roads Not Subject to Grade-Crossing Act.

Commissioners of Ross County v. Scioto Valley Traction Company, 80 Northeastern Reporter, 176.—The supreme court of Ohio says that the question presented in this court was whether the company was within the act of April 25, 1901, "to provide how railroad and highway crossings may be constructed," its construction being for the operation of its cars by electricity conducted upon a third rail, and its cars being in fact so operated. The scope of the act is indicated by its first section, which provides that, "except as in this act elsewhere provided, all crossings hereinafter constructed, whether of highways by railroads or of railroads by highways, shall be above or below the grade thereof." The conclusion is that an interurban railroad for the operation of cars by electricity and by the tractive friction resulting from their own weight is not within the act of April 25, 1901. Obviously the word "railroad" needs not to be used in a strained or unnatural sense to include an interurban road operated by electricity. But the court thinks that in the provisions which the legislature has made for the safety of those who are participating in the common use of crossings and highways and the tracks of common carriers it has preserved a distinction on account of the motive power or the tractive methods employed by the carriers. A substantial basis for such distinction is found in the greater weight and momentum of trains drawn by locomotives in comparison with cars for whose propulsion reliance is had upon the tractive friction produced by their own weight, and the promptness with which the latter may be stopped.

Duty and Liability Arising from Muddy Step.

San Antonio Traction Company v. Flory, 100 Southwestern Reporter, 200.—The court of civil appeals of Texas does not think an instruction erroneous which told the jury that if they believed from the evidence that the step or platform, or both, was muddy and slippery, that the conductor failed to assist the plaintiff's wife to alight, that his failure to assist her from the car was negligence, that it was the proximate cause of the accident to the plaintiff's wife, and that she was injured thereby, then the jury must find a verdict for the plaintiff.

The court thinks it is safe to say that, when the carrier sees fit to maintain a place of exit that is dangerous, such duties then become entailed upon it as warning or assisting the passenger, in the exercise of proper care due to that situation. What omissions, in such a situation, would amount to negligence, are questions of fact for the jury.

Take the case of a young and robust person, unencum-

bered with luggage, who is about to alight from a car. If the exit is a safe one, there is nothing either in respect to the exit, or to the person alighting, to present or suggest the appearance of danger to the mind of the conductor. In such a case there would be no such issue to submit as the necessity of warning or assisting such person, because clearly no duty in that regard could be said to have arisen.

The rule, upon principle, is the same whether the appearance of danger arises from the condition of the passenger or from the condition of the means of egress. The rule has frequently been applied in cases where the car was stopped so that the descending passenger would step into a dangerous place, where such danger was known, or should have been known, to the carrier. It is obvious that whether the dangerous agency is upon the ground or upon the car step is immaterial.

Injury to Bystander by Runaway Car—Risks Taken in Operation of Cars in Hilly Country—Bad Weather.

Small v. Pittsburg Railways Company, 66 Atlantic Reporter, 76.—The supreme court of Pennsylvania says that at the foot of a slope where the company's street railway runs for a distance of a mile and a quarter upon a grade of 6 per cent the tracks terminate directly across the street from a railroad station. On an evening in January, shortly before 8 o'clock, the plaintiff, who was standing on the station platform, was struck by a piece of wood broken from a near-by telephone pole. A car of the company had gotten beyond control while going down the hill, and had left the track at the terminus, crossed the street, and collided with the telephone pole, breaking it and running against the wall of the railroad station. A fragment of the broken pole was thrown against the plaintiff, and inflicted serious injuries.

The testimony showed that the car escaped from control while going down the hill by reason of the slippery condition of the tracks upon the grade. Rain had fallen, which froze to the rails as it fell. The car was in good condition and properly equipped with brakes, and was provided with sand; but the tracks were so incased in ice that, when the motorman attempted to apply the sand, the wheels would not take hold, even when reversed. In consequence the car slid down the grade.

A judgment for the plaintiff is reversed, the court feeling that the facts of this case negated any inference of negligence arising out of the mere attempt upon the part of the motorman to operate the car, proceeding, as he did, slowly and cautiously, feeling his way, as it were, until unfortunately he found by trial that the conditions were so unusual that, contrary to his expectation, based upon long experience, the sand would not enable him to control his car.

The sole fault which could be imputed to the motorman, under the evidence, the court says, was that he erred in his judgment when he started his car down the grade. As the sequence showed, he underestimated the difficulty caused by the presence of ice on the rails. The motorman of the car immediately ahead of him made the same mistake. But the exercise of judgment—even though it be mistaken judgment—is not negligence. He occupied the place of greatest danger on the front platform, and regard for his own safety would naturally quicken his instinct to anticipate danger if, in his judgment, there had been any real occasion for it.

Negligence is not to be presumed upon the happening of an occurrence which is the result of exceptional and extraordinary conditions. It must be presumed that in a hilly country, such as that in the region of Pittsburg, some risks must be taken in the operation of street cars. It will not do to stop them at every change in the weather. The public need for them is greatest in bad weather.

Hindsight is better than foresight, no doubt, and it is easy to criticize after the event; but the law holds men responsible only for such consequence as can, in the exercise of reasonable prudence, be foreseen.

News of the Week.

Cambridge Subway Stations.

William Barclay Parsons of New York, the expert employed by Mayor Wardwell of Cambridge, Mass., to advise with him and City Engineer Hastings in regard to the construction of the new Cambridge subway, has submitted his report as to the number of stations needed from and including Charles river and Harvard square. He gives it as his opinion that four is the proper number, and that these should be located at Harvard square, Dana street, Central square and Sixth street. Mr. Parsons anticipates that with the institution of the subway the traffic is likely to increase beyond expectation, because of additional population. In different localities in upper New York the travel has increased from 60 to 300 per cent as a result of the subway's operation, and it is to be expected that this experience will be repeated in Cambridge, with an additional traffic of between 40 and 50 per cent inside of six months after the opening of the subway. Mr. Parsons regrets that the subway is not to be a four-track line, and agrees with the Boston Elevated Railway Company that Kendall square is an undesirable location for a station on account of the grade.

Legislation Affecting Electric Railways.

New York.—Mayor McClellan of New York City on Tuesday of this week sent the public utilities bill back to the legislature without his signature. The bill, which was passed by the legislature on May 22, provides for the appointment by the governor of two commissions to have jurisdiction over public service corporations, one for New York City and one for the remainder of the state. In a memorandum accompanying the measure the mayor explains that, while he is in accord with the general principles embodied in the bill, it is as a whole so destructive of the principle of home rule that but one course was open to him. This was his basic objection, but the mayor adds, in effect, that such legislation would result inevitably in the appointment of partisan commissioners, who in times of party stress would use their power to coerce the transportation companies into furnishing funds with which to corrupt the electorate. It is considered probable that the bill will be passed over this veto, as only a majority in the legislature is required. As the bill was formulated by Governor Hughes, and as the amendments have met his approval, there is no doubt as to its becoming a law. The bill was submitted to Mayor McClellan for approval because it provides for a commission for the city alone, to supersede the present rapid transit commission.

Illinois.—Governor Deneen has signed a bill providing that no steam or electric road shall cross the tracks of another without permission of the state railroad and warehouse commission.

Stockholders of Underlying Chicago Roads Ask Representation.

Stockholders of the Chicago West Division Railway Company and the North Chicago City Railway Company, underlying companies of the Chicago Union Traction Company, have asked Judge P. S. Grosscup of the United States circuit court to direct that an attorney representing them be permitted to participate with G. W. Wickersham and L. C. Krauthoff, attorneys for the New York interests in the property, in the reorganization plan which is now being framed. The request was made by Cyrus H. McCormick, representing a committee of stockholders of these two underlying companies. The members of the committee are Cyrus H. McCormick, Thomas Templeton, Charles W. Ware and John F. Bass for the West Chicago company and Leon Mandel, Charles A. Mair, James F. Porter, John A. Chapman and John F. Bass for the North Chicago company.

Certificates of deposit representing the stock of the Chicago Union Traction Company which has been placed with the Central Trust Company, New York, have been listed on the New York stock exchange. These certificates show the deposit of \$14,168,200 of common stock and \$10,044,300 of preferred stock, or 50.8 and 84 per cent, respectively, of the outstanding issues.

The United States supreme court denied, on May 27, the petition for a writ of certiorari in the cases of the North Chicago Street Railroad Company and the West Chicago Street Railroad Company versus the Chicago Consolidated Traction Company, the effect of which, if granted, would have been to take the cases to that court for review.

The cases involved charges against the methods of the late Charles T. Yerkes in bringing about the consolidation of Chicago street railroads.

Rapid Transit Affairs in New York.

The rapid transit commission on May 23 began advertising for bids for the construction of the last three sections of the bridge subway loop, from Delancey to Norfolk streets, from Center street to the Bowery, and from Pearl street to Park Row. Bids will be opened on June 13. The contract for the second section was awarded to the Cranford Company. Several property owners on Broadway and Fifth avenue are seeking to enjoin the commission from accepting bids for the construction of section 5 of the Lexington avenue route by the open cut method. No bids have been received.

F. B. Behr, who is seeking a franchise for a monorail line from Brooklyn to Coney Island, has accepted the terms imposed by the commission and has agreed to deposit \$25,000 to insure the construction of the road if the plans are approved.

The New York Tunnel Company, which has a subcontract for the actual boring of the tunnel under the East river, from the Battery to Brooklyn, was placed in the hands of a receiver on May 23. It was stated at the offices of the Rapid Transit Subway Construc-

tion Company, however, that this would in no way affect the progress of the tunnel work.

Justice Fitzgerald of the supreme court has decided that the city and the board of rapid transit commissioners are entitled to an injunction to restrain the Interborough Rapid Transit Company, which operates the subway under lease from the city, from delivering to the New York City Railway the use of electric currents through certain ducts or masonry chambers built in the walls of the subway. The court also enjoined the New York City Railway Company from receiving the electricity from the Interborough Rapid Transit Company. The court also holds that the railroad companies mentioned must account to the city for the electricity already used. In this decision Justice Fitzgerald said that the ducts are the property of the city.

Mayor McClellan on May 28 vetoed the public utilities bill, because of its violation of the home rule principle.

Chicago Employes Accept Wage Increase.

The differences between the Chicago City Railway Company and its motormen and conductors in regard to wages were settled on Tuesday of this week when the men voted to accept the company's offer of approximately two cents an hour increase. Previous to the recent city election, at which the "general settlement" ordinances were approved by the voters, the company offered to make a new agreement with the men, if the ordinances passed, for a new wage scale, effective as of April 1, of 23 cents an hour for the first three months, 25 for the following nine months and 27 cents thereafter, instead of the old scale of 19, 24 and 25 cents, which has been paid under an agreement expiring July 31, 1907. The union met on April 13 and voted not to accept the increase unless a similar one were granted to the employes of the Chicago Union Traction Company. Later a demand was made for 25 cents an hour for the first six months' service and 33 1-3 cents thereafter, with a 9-hour day, which President Mitten last week finally refused to grant. On May 23 a general ballot was held and the men voted by a majority of more than two to one to accept the company's offer.

The executive committee of the union met with President Mitten on Wednesday and signed an agreement on this basis running to July 31, 1908. The company also agreed to make the same scale effective for car house employes, to increase the pay of men employed on snowplows and sweepers from 30 to 35 cents an hour, and that in the event of a strike on the other lines of the city the men should not be forced to work as strikebreakers.

The employes of the Chicago Union Traction Company have made similar demands to those of the south side men and an answer is expected early next week on the return of General Manager J. M. Roach from New York.

Tests of Reinforced Concrete.

The results of important tests on reinforced concrete beams which have been carried on in the testing laboratories of the University of Wisconsin for the past four years have been published in a bulletin prepared by E. A. Moritz of the college of engineering entitled "Tests on Reinforced Concrete Beams." The bulletin calls attention to the fact that to Rudolph Hartman, formerly instructor in the testing laboratory, belongs the credit of discovering several years ago the fact, now commonly recognized, that the concrete in a beam really cracks much earlier than is shown on the surface. The tests have included investigation of the efficiency of different methods of reinforcing and preventing inclined tension failures, and other interesting matters connected with these beams.

The investigation showed that the concrete cracks before evidences of the break can be detected with the eye, and that after it has cracked, though only minutely, its strength in tension is zero. Comparative tests of reinforced and plain concrete beams show that the first indications of cracking appear on the reinforced beams at about the same load at which the plain beams fail. It is evident, therefore, that concrete reinforced with steel will not stretch more before cracking than plain concrete, and that consequently the tensile resistance of concrete should not be taken into consideration in reinforced concrete design.

When reinforced concrete first came into general use it was thought that horizontal bars of steel were sufficient, and the peculiar failures which often occurred were usually ascribed to the rods pulling out. The latter idea led to the invention of various forms of deformed bars now on the market. It has been found that even beams reinforced with deformed bars often fail along inclined cracks, and something besides horizontal rods is necessary to prevent such failures. Stirrups have been used extensively to overcome the difficulty, but although they assist in carrying internal stresses to some extent, their use will not always prevent inclined tension failures.

Various tests were made in the laboratory as to the best form of steel reinforcement for concrete. The anchoring of the rods at the ends of the beams, which has been advocated heretofore, did not seem to strengthen them materially. The experiments apparently demonstrated that the cracking in the plane of reinforcement is not due to the pulling out of the rods, but rather to the pulling of the concrete upward away from the rods, and that it therefore cannot be prevented by anchoring the rods at the ends. In most reinforcement with bent rods, the angle of these rods with the horizontal has been too large, and consequently the adhesive area of the rods has been too small. Numerous tests on both large and small beams made in connection with this work have shown that these methods are not effective in preventing inclined tension failures.

Accident on the Grand Rapids-Muskegon Line.—A passenger car running from Muskegon to Grand Rapids, Mich., on the line of the Grand Rapids Grand Haven & Muskegon Railway, on May 24 collided head-on with a westbound baggage and express car

and the two motormen were killed and five passengers were injured. The two cars were wrecked.

"Jim Crow" Law Declared Unreasonable.—The city court at Montgomery, Ala., has annulled the city ordinance requiring separate street cars for white and black passengers, holding that it is not reasonable or just to the street railway company.

Accident on the Cleveland & Southwestern.—Four persons were killed and 13 injured, according to newspaper reports, in a rear-end collision on the Cleveland & Southwestern Traction Company's line at Elyria, O., on Thursday evening of this week.

Flood Suspends Traffic in Salt Lake City. Several of the street railway lines of the Utah Light & Railway Company in Salt Lake City, Utah, were obliged to suspend operations last week on account of a flood caused by melting snow in City Creek Canyon, which overflowed the ditch on North Temple street, leading to the Jordan river.

Mail Carriers Ask to Ride Free.—The United States mail carriers of Buffalo, N. Y., have submitted a request to the International Railway Company that they be allowed to ride free on the street cars while off duty. This privilege is granted to the policemen and firemen. The mail carriers are now given free tickets good only while they are on duty.

Attractive Folder Issued for Jamestown Visitors.—The Newport News & Old Point Comfort Railway & Electric Company of Hampton, Va., has just issued an especially attractive 16-page folder advertising the service which it affords in the vicinity of the Jamestown exposition grounds. The folder is largely made up of halftones and colored maps, thus presenting a very attractive appearance.

Accident on East St. Louis & Suburban Railroad.—A passenger car on the East St. Louis & Suburban Railroad was struck on a crossing near Brooklyn, two miles from East St. Louis, Ill., by a Toledo St. Louis & Western switch locomotive running light and 12 passengers were injured, one probably fatally, on May 27. Different versions of the story vary; the car had partly passed the crossing and the motorman was unable to get it entirely across after he saw the engine.

Evansville Strike Settled.—Most of the motormen and conductors of the Evansville & Southern Indiana Railway, who declared a strike on May 15, as reported in last week's issue of the Electric Railway Review, returned to work on Sunday of this week. By the terms of the settlement the men get platform time, an 11-hour day instead of 12 hours, and will be paid 16, 17 and 18 cents an hour, instead of 15, 16, 17 and 18 as formerly. The men struck for a flat scale of 20 cents an hour and a 9-hour day.

Terminal Station Planned for South Bend.—Samuel Murdock, president of the Chicago South Bend & Northern Indiana Traction Company, together with a party of interurban men, inspected the traction terminal station at Indianapolis during the past week with a view to building a similar station in South Bend. The station in South Bend, while not on so large a scale as the Indianapolis station, will be artistically finished and provided with all the late improvements and equipment desired for an up-to-date terminal station.

Strike at Oil City, Pa.—The motormen and conductors of the Venango Traction & Power Company, controlling the electric railways in Oil City and Franklin, Pa., with other lines in Venango county, declared a strike on May 24, tying up service on 32 miles of track. About 75 of the men had formed a branch of the Street and Electrical Railway Employees the night before. The reason for declaring a strike is said to have been the dismissal of seven men by the company and because the men objected to paying fare when not in uniform. No disorder has resulted.

Vote to Strike in Detroit.—The motormen and conductors employed by the Detroit United Railway on Monday of this week voted to strike for higher wages. The vote, which was taken by secret ballot, was 1,002 to 235. The men are asking for 28 cents an hour, time and a half for overtime and holidays, and pay while waiting for "trippers." The present wage scale, under an agreement made last June, is 23 cents an hour for the first year, 24 cents for the second, and 25 thereafter. The matter has been placed in the hands of W. D. Mahon, president of the National Association of Street Railway Employees.

Chicago City Railway Offices Moved.—The general offices of the Chicago City Railway Company, which are now located at 2020 State street, as well as the offices of the legal and claim departments, now located in the Ashland block and those of President T. E. Mitten and Purchasing Agent R. B. Hamilton, on the seventh floor of the First National Bank building, are to be transferred on June 1 to the sixteenth floor of the First National Bank building. The vacated State street offices are to be used as headquarters for the rehabilitation work and will be turned over to the engineers and the construction department.

Willow Grove Park.—A 48-page booklet, describing Willow Grove park, which is owned by the Philadelphia Rapid Transit Company, and which is located on that company's lines, 13 miles north from the center of Philadelphia, has just been issued. The pamphlet is filled with attractive halftone illustrations of views of the park, one of the finest in the country, which contains 130 acres of land, whose natural beauties and picturesque surroundings make it an ideal outing place. Besides a large number of attractions of the usual sort, the park contains a casino, whose piazzas accommodate 500 guests, the Lakeside cafe, with tables for 750 persons, and many unique forms of entertainment, which are all described and illustrated. The chief distinguishing and most popular feature of the park is the superior order of band and orchestral music that is provided for the enjoyment of the park patrons. For the season

of 1907 this form of entertainment will be furnished by Walter Damrosch and the New York Symphony Orchestra, Arthur Pryor and his band, Victor Herbert's orchestra and Sousa and his band.

Views of the Twin City Lines.—A. W. Warnock, general passenger agent of the Twin City Rapid Transit Company, Minneapolis, Minn., has issued a series of handsomely illustrated lithograph postal cards, containing a large number of different views of beauty spots on the company's suburban lines, which reach many lakes and other points of interest and attractiveness, including the company's magnificent amusement resort, Big Island park, at Lake Minnetonka. Interior and exterior views of the type of cars used and of the excursion boats on Lake Minnetonka are also included.

Judgment Against Manhattan Railway.—The appellate division of the New York supreme court has affirmed the report of Referee Hamilton Odell in regard to a judgment of \$275,538 against the Manhattan Railway Company in favor of the city of New York. The amount is due under a law passed in 1867, authorizing the West Side & Yonkers Patent Railway to construct an elevated railroad in Manhattan on the condition that it should pay the city 5 per cent of the net income from passenger traffic. The company has been acquired by the Manhattan Railway Company and the litigation was caused by a dispute as to what items constituted the net income.

Officials of United Railroads of San Francisco Indicted.—The grand jury at San Francisco on May 24 returned true bills against four officials of the United Railroads on the charge of bribing fourteen members of the board of supervisors to grant a franchise permitting the company to operate its lines by the overhead trolley system. The four officials indicted are: Patrick Calhoun, president; Thornwell Mulally, assistant to the president; Tiley L. Ford, general counsel, and W. M. Abbott, attorney. President Calhoun has issued a long statement denying the charges and claiming the entire affair to be the result of a conspiracy by Rudolph Spreckels and the labor party.

Exception to Fellow-Servant Principle.—The Indiana supreme court has decided that the Ft. Wayne & Wabash Valley Traction Company is liable for the injury to a conductor occasioned by the running into his car from the rear of another car under the charge of a motorman who had gone to sleep by reason of long hours of labor. The court said that an electric railroad company that negligently required a motorman to operate a car after he had been continuously working without sleep for more than 24 hours, cannot take advantage of the fellow-servant principle if his omission of duty by reason of the resultant physical condition causes an injury to the conductor on another car.

Sight-Seeing Car for Omaha.—Beginning on June 1 the Omaha & Council Bluffs Street Railway Company will operate a sight-seeing car from Omaha to South Omaha, Benson, Florence and Council Bluffs. The arrangements are now for two trips, one in the forenoon and one in the afternoon of each week day. One of the larger cars from the Council Bluffs line will be fitted especially for this service and a lecturer will accompany the car on all trips to point out the places of interest along the route. Each trip is expected to consume about three hours and to cover between 35 and 40 miles. A photographer will take the picture of the people as they start and will have the photos ready for delivery upon the return from the trip.

Electric Railways in the Central West.—The series of three articles on "Electric Railroads as a Factor in Twentieth Century Transportation," by Charles N. Wilson, president of the American Engineering Company of Indianapolis, which recently appeared in The Tradesman of Chattanooga, Tenn., has been reprinted and issued in pamphlet form, together with some of the comments and commendations from the newspapers and others. The articles outline the history of the development of the electric railway industry in the central west and discuss some of the benefits which have been made possible by this comparatively new form of transportation. Some especially interesting information is given with regard to the progress of the electric railways of Indiana.

San Francisco Union Leaders Arrested.—Three officials of the street railway employees' union of San Francisco were arrested on May 29 on a charge that they were responsible for an explosion on the line of the United Railroads about a week ago, by which a switchboard in the main station was destroyed and the entire plant put out of commission. Two of the men arrested are members of the executive committee of the union. While there appears no immediate prospect of a cessation of the strike, the United Railroads has been able to operate many of its cars with non-union men. On Friday of last week 200 cars were in service on 28 lines, covering about 200 miles of track, or about 25 miles less than the total mileage within the city limits. About 125,000 passengers a day were carried last week. Each day fewer disturbances caused by the strikers are reported.

New Suit Against Air Line.—Certain stockholders of the Chicago-New York Electric Air Line Railroad Company on Wednesday of this week filed a bill of complaint against the company before Judge Windes of Chicago, reiterating the charges of mismanagement made in the recent suit of Theodore Nemoier, as reported in the Electric Railway Review of May 11, and petitioning for an injunction against the practices complained of, an accounting and the appointment of a receiver. Mr. Nemoier's motion for an injunction and the appointment of a receiver in Judge Honore's court was withdrawn last week, when the court declined to appoint a receiver or grant an injunction without a full hearing. The company has filed a general demurrer to Nemoier's allegations. Nemoier charged that the proceeds from the sale of stock were being wasted and that the officers were drawing large salaries.

Construction News

FRANCHISES.

Bucyrus, O.—The Columbus Marion & Bucyrus Railway, which is building an extension of the Columbus Delaware & Marion Railway from Marion to Bucyrus, has been granted a franchise to enter this city. The council also granted a franchise to the Toledo Bucyrus & Columbus Electric Railway, a proposed interurban line from Fremont to Bucyrus, via Tiffin and Melmore, O. It is stated that surveys have been completed and franchises secured by the latter road. When completed these two lines will afford a connection between Toledo and Cincinnati.

Chicago, Ill.—An ordinance was introduced into the city council on May 27 to permit the Chicago Milwaukee & St. Paul Railway to operate by the electric trolley system from a connection with the Northwestern Elevated Railroad at Wilson avenue, north to the city limits, and to build an additional track. The electric tracks are to be used by the Northwestern Elevated and possibly by the Chicago & Milwaukee Electric Railroad. The ordinance was referred to the committee on local transportation.

Coffeyville, Kan.—The Union Traction Company of Kansas has been granted a franchise on North Penn avenue.

Cleburne, Tex.—W. L. Martin has applied for a franchise to build an electric line in this city.

Granite City, Ill.—A franchise has been granted to the Danville & Edwardsville Terminal Railroad, a part of the Illinois Traction System, for a new single-track line through the city on G street, which will give the system two lines to the proposed bridge across the Mississippi river to St. Louis.

Menominee, Mich.—C. O. Johnson of the Hydro-Electric Water Power Company, Oshkosh, Wis., is seeking a franchise for an electric railway to connect Menominee, Mich., with Marinette, Wis., in connection with the company's proposed power plant on the Peshtigo river.

Middletown, O.—The Cincinnati & Middletown Traction Company has applied for a franchise.

Napoleon, O.—The Toledo Wabash & St. Louis Railroad has applied for a franchise.

New York, N. Y.—A franchise has been granted to the Ft. George Street Railway to build an electric line from the Dyckman street station of the Interborough Rapid Transit Company, along St. Nicholas avenue, to West One Hundred and Ninetieth street.

Oakland, Cal.—The Oakland Traction Company has secured a 50-year franchise for the extension of its line on Over street, Allendale, Glen, Boulevard Park and Leise avenues. The bid of this company of \$500 for the privilege was the only one received by the board of supervisors.

Olympia, Wash.—The Pacific Traction Company of Tacoma, Wash., has applied for a franchise on several streets for its proposed line from Tacoma.

Phillipsburg, N. J.—The Easton Transit Company, under the charter of the Phillipsburg Horse Car Railroad, has been granted a 20-year franchise for the construction of five miles of additional track through the Fifth and Sixth wards. Harrison R. Fehr, president and general manager, Easton, Pa.

Richmond, Va.—At a special meeting of the common council the ordinance recently passed by the board of aldermen granting consent to the transfer of all rights, franchises and privileges of the Citizens' Rapid Transit Company to the Richmond & Henrico Railway Company, was ratified, with the provision that a bond for \$5,000, together with acceptance in writing by the company, be filed within 30 days.

Russellville, Ark.—A 50-year franchise has been granted to the Southern Engineering Construction Company to build an interurban line between Russellville and Dover, Ark. The company also will operate a light and water plant in Russellville. Adam J. Robinson, Pine Bluff, Ark., president; J. C. Wilson, St. Louis, Mo., secretary.

South Bend, Ind.—The Chicago Lake Shore & South Bend Railway, which is building from South Bend, Ind., to Kensington, Ill., has secured an extension of time under its franchise until July 1, 1908, in which to have its line completed, although the promoters say the line will be in operation by January next. J. B. Hanna, president, South Bend, Ind.

Summit, N. J.—The Morris County Traction Company has been granted a 40-year franchise for its extension from Elizabeth to Summit, which is now built to within a mile of the latter place.

Tenino, Wash.—Janson M. Averill, Seattle, Wash., has applied for a franchise to build an electric railway in this city.

RECENT INCORPORATIONS.

Bridgeport & Danbury Electric Railway.—Incorporated in Connecticut to build an electric railway 20 miles long, connecting the towns of Bridgeport, Trumbull, Monroe, Newtown, Bethel and Danbury, Conn., covering a section at present without electric railway service. Capital stock, \$2,000,000. Incorporators: John T. King, Henry E. Reilly and William H. Marigold.

Buffalo Genesee & Rochester Railway.—Incorporated in New York to build a 60-mile interurban electric line from Buffalo to Rochester, N. Y. The line will follow practically the same route as that laid out by the Buffalo & Rochester Traction Company, whose application early in the year for a certificate of public necessity was refused in April by the state railroad commission, on the ground that the territory was sufficiently provided with transportation facilities. It is stated that the main line of the new company will not touch Le Roy, as was the intention when the Buffalo & Rochester Traction Company was incorporated, but will reach it by a branch line, which will, in part, overcome one of the objections raised by the state railroad commission to the Buffalo & Rochester. The latter road, after the refusal of its petition to the railroad commissioners, obtained an order from the appellate division of the supreme court requiring the commissioners to show cause why a certificate should not be granted, but as the law allows no proceedings within one year after the refusal of a certificate by the commission, the incorporation of the Buffalo Genesee & Rochester was resorted to in order to avoid delay in the work already started. Capital stock, \$7,500,000. Incorporators: Henry H. Kingston, Jr., Samuel Welch, Philadelphia; John Baker, Herbert P. Bissell, Buffalo, N. Y.

Joplin & Pittsburg Railroad.—Application for a charter has been filed by this company at Topeka, Kan., and Jefferson City, Mo., for permission to construct and operate an 80-mile interurban railway in southwest Missouri and eastern Kansas. The line will connect Joplin and Webb City in Jasper county, Missouri, extending to Baxter Springs and Pittsburg, Kan., and to the Quapaw Indian reservation. The charter also empowers the new company to take over the Pittsburg Railway & Light Company, now operating from Columbus to Pittsburg, Kan., and the new Heim street railway system, now under construction in Joplin, Mo. Capital stock, \$5,000,000, of which \$2,800,000 is paid in. J. J. Heim, Kansas City, Mo., is interested.

Ohio Electric Railway, Cincinnati, O.—Incorporated in Ohio with power to build, own, operate and acquire electric railways from Zanesville to the Indiana state line, near New Paris, and from there to Richmond, Ind., Cincinnati, Columbus, Washington Court House, Springfield, Dayton, Defiance, Lima, O., and Ft. Wayne, Ind. Capital stock, \$100,000. As the incorporators are all employees in the office of W. Kesley Schoepf, it is stated that the object of the company is to effect a merger of all of the Schoepf-McGowan properties in the state, which now operate in the cities and towns named, and which include the Indiana Columbus & Eastern Traction Company, the Lima & Toledo Traction Company and the Cincinnati Northern Traction Company.

Philadelphia Valley Forge & Suburban Railroad.—Incorporated in Pennsylvania with a capital stock of \$60,000 to build a link in the system of electric railway lines projected by the Public Service Investment Company, a holding company, to connect Philadelphia with Lower Merion, East and West Conshohocken, Norristown, Valley Forge, Phoenixville, Royersford and Pottstown. With this charter there has also been granted for the system other charters for the following railways: Valley Forge, Colonial Springs & Phoenixville, Cynwyd Fairview & Ardmore, Fairview & Merion Square, Merion Square & Barren Hill and the Audubon Lower Merion Bala & Wynnefield. All of these, financed by L. Knowles Perot of Bala and others, are included in the holding corporation. Mr. Perot is president. The other incorporators are: A. D. Whiting, David Rombold, Jr., and Edward W. Johnson, Philadelphia; James A. Bunting, Secans; Morris H. Wetherill, Haverford, and Robert C. Seldon, Norristown.

Portland (Me.) & Northern Railroad.—We are officially advised that this company has been incorporated in Maine, instead of Oregon, as incorrectly reported in last week's issue of the Electric Railway Review, and will build an electric line 40 miles long from Portland to Bridgton, Me., through Windham, Raymond, Casco and Naples. Capital stock, \$160,000. Incorporators: William M. Sturges, N. D. Sturges, Scranton, Pa.; Tracy W. Holland, New York City; Howard Winslow, Henry L. Forham, Llewellyn Barton, Portland; S. O. Hancock, Casco, Me.

Putnam (Conn.) & Rhode Island Street Railway.—Incorporated in Connecticut with a capital stock of \$200,000, to build an electric railway from Putnam to Gloucester, Mass., using the old Hartford and Providence turnpike road.

S. E. Jackman Railway, Seattle, Wash.—Incorporated in Washington, with \$40,000 capital stock. Incorporators: A. Warren Gould, E. E. Carpenter, C. E. Patton and Charles A. Spirk.

Windsorville & East Hartford Railway.—Governor Woodruff of Connecticut has vetoed the house resolution incorporating the above company.

TRACK AND ROADWAY.

Accomac Traction & Power Company, Onancock, Va.—It is reported that Truberhauer & Co. of Philadelphia have arranged to underwrite this company's issue of \$100,000 5 per cent bonds, which will make possible the construction of the proposed line from Onancock to Tasley, Accomac Courthouse and Metompkin Bay, Va., nine miles.

Barberton Doylestown & Orrville Railway.—The Cleveland Engineering Company, which has the contract for making plans, specifications and profiles for this proposed line from Barberton to Orrville, O., has begun the work of surveying the line.

Buffalo Batavia & Rochester Electric Railway.—Owing to the failure of this company to cancel the mortgage for \$3,500,000, and the \$117,500 bonds issued by the Buffalo & Williamsville Electric

Railway, the New York board of railroad commissioners has withdrawn its consent to the issuance of a first mortgage for \$3,500,000 by the Buffalo Batavia & Rochester company.

Chicago & Milwaukee Electric Railroad, Highwood, Ill.—This company has begun condemnation proceedings to secure a right of way in the southern part of Milwaukee, Wis.

Chicago South Bend & Northern Indiana Railway, South Bend, Ind.—Seven carloads of rails have been delivered at Rolling Prairie, Ind., to be used for the construction of the track from that point to La Porte. Options have been secured on two routes. S. Riddle, South Bend, general manager.

Cleveland Ashland & Mansfield Railway.—Work on the grading of this company's line near Mansfield will be begun in the near future by William E. Burke & Son, South Akron, O. This firm also has the contract for grading the line between West Salem and Seville, O., about four miles.

Cleveland Southwestern & Columbus Railway, Cleveland, O.—This company is said to be considering the construction of a line from Wellington to Medina, O.

Cortland & Auburn Railroad.—The New York railroad commission has consented to an issue of a first mortgage for \$1,000,000. The company proposes to build from Cortland to Auburn, N. Y. W. L. Weber of Philadelphia, chief engineer.

Covington & Southwestern Traction Company.—This company has filed a mortgage for \$275,000 in favor of the Collins Construction Company of Chicago to secure payment on a contract for building the first eight miles of this road, which is to be operated by gasoline power, from Covington to Coal Creek, Ind. President, W. G. Ruhl, Chicago, states that this section will be in operation in six months. It is intended to extend later to Crawfordsville.

Edmonton (Alberta) Electric Railway.—Surveys have been made for the municipal street railway on Jasper avenue, First and Strathcona streets, seven miles. Track and power house will be built by the city. R. R. Keely, chief engineer.

El Paso, Tex.—It is reported that Chicago capitalists are planning to build an electric railway from El Paso, Tex., to Las Cruces, N. M., and that they will apply for franchises within the next few days.

Eugene & Eastern Railway, Portland, Ore.—A. Welch, president of this company, writes that surveys are being made from Eugene to Blue River, Ore., the terminals of the line, and that grading will commence next September. The line, which will be operated by both steam and electricity, will be 52 miles long and will serve the intermediate towns of Corvallis, Springfield and Wendling. Power for the electrical operation of the road will be generated at the power house in Springfield, now being built. Six miles of the overhead construction work, which is of the single-phase type, already has been completed from Eugene to Springfield, with three miles now under construction in Eugene. The electrical equipment of the power house and substations will be furnished by the General Electric Company. The J. G. Brill Company has the contract for furnishing the cars. A. Welch, president and chief engineer, 502 Fenton building, Portland, Ore.; E. W. Hall, secretary.

Evansville & Southern Indiana Traction Company, Evansville, Ind.—A large force of men is engaged in rebuilding the line of the Evansville Princeton & Vincennes Interurban Railway, which has been absorbed by this company, from Evansville to Princeton, Ind., 23 miles. The line was built about four years ago, and has some very steep grades and several short-radius curves. When the work now in progress is completed the maximum curvature will be 4 degrees and the maximum grade 2 per cent. This involves the rebuilding of about half the line. R. H. Cole, chief engineer.

Fairfield, Me.—It is reported that arrangements for an electric railway to Shawmut, Me., together with plans for the construction of a car house, 24 by 90 feet, have been completed by A. F. Gerald. Surveys are now completed and the route decided upon.

Grand Valley Railway.—The Grand Valley Railway and the Brantford Street Railway of Brantford, Ont., and the Woodstock & Ingersoll Railway have arranged for a consolidation under the name of the former company, which will be headed by M. A. Verner of Pittsburg, and several important improvements have been planned. The track mileage in Brantford will be doubled and Colborne street double-tracked. The system will be extended to Cainsville on the east and a new line will be constructed on the private right of way, via Burford and Cathcart, to Woodstock, there connecting with the Woodstock & Ingersoll line, which will be extended to London. It is also planned to build by private right of way to Port Dover, via Mt. Pleasant, Boston, Waterford and Simcoe.

Greenfield Bernardston & Northfield Street Railway, Greenfield, Mass.—This company, which was recently incorporated to build an electric railway from Greenfield to Northfield, Mass., 13 miles, has elected C. H. Webster of Northfield president and A. D. Flower of Greenfield secretary and treasurer. It has been decided to enter Greenfield on Chapman street and to proceed to Northfield via Bernardston and past the Country Club golf links.

Greensboro (N. C.) Electric Company.—It is reported that this property, including an electric line from Greensboro to White City, and electric lighting and gas plants, has been purchased by W. T. Van Brunt and associates of New York, who will extend the line to High Point, N. C.

Hattiesburg (Miss.) Traction Company.—H. A. Camp, presi-

dent, states that this company will begin operating cars over its new line by August 1. Five miles of track has already been laid and the remaining two miles will be completed by the time the cars arrive.

Helena & Butte Electric Railway.—Surveys are being completed for this line from Helena to Butte, Mont., which will connect these two cities with the pleasure resorts at Lake Hauser and the Broadwater natorium, and will run through a rich mining district. It is estimated that the line can be built with 30-pound rails for \$40,000 per mile. H. G. Pickett, president.

Helena (Mont.) Light & Railway Company.—The Eighth street line in Helena has recently been rebuilt and work is to begin soon on the reconstruction of the Harrison street and other lines. The State street line is to be extended.

Illinois Traction Company, Champaign, Ill.—Work on the Lincoln-Mackinaw line was begun last week. The Crescent Construction Company, subcontractors under Tuttle Brothers of Decatur, has pitched a camp six miles south of Mackinaw, where there is some of the heaviest work on the line. Work is also in progress between Lincoln and Congerville.

Indianapolis & Western Traction Company.—Chief Engineer Hohn of the Keystone Construction Company announces that the track from Indianapolis to Plainfield, Ind., will be completed this week. This will enable the operation of a through service between Greencastle and Indianapolis.

Indiana Union Traction Company, Anderson, Ind.—Several important improvements are to be made on the Muncie-Union City division. The roadbed is to be improved and widened and the overhead work is being overhauled. New rails are being laid on several of the city lines in Muncie.

Jackson (Mich.) Consolidated Traction Company.—This company has begun the work of constructing an extension of the Vandercook lake line to Wolverine park, where several new amusement devices are being installed.

Kalamazoo Lake Shore & Chicago Traction Company, Kalamazoo, Mich.—It is stated that the construction of this company's proposed branch line from Toquin to Paw Paw Lake has been decided upon. James Grant, general manager, Kalamazoo, Mich.

Kansas City Springfield & Southern Railway, Nevada, Mo.—C. C. McFaun, general manager, states that a change in the company's route has delayed the date of beginning construction. It was originally planned to build the road from Springfield to Stotesbury, Mo., 94 miles, but it has now been decided to build to terminus at Nevada by a shorter route, which will necessitate making new right of way contracts. Construction is to begin at Carthage.

Lewisberry & Strinestown Street Railway.—Governor Stuart of Pennsylvania has approved this company's application for an extension of its chartered route from New Market to New Cumberland and Harrisburg, Pa. It is stated that the company will soon apply for franchises on several streets in Harrisburg.

Mexico Perry & Santa Fe Traction Company, Mexico, Mo.—An officer is reported to have stated that contracts are to be let this month for building this proposed electric line from Mexico to Perry, Mo., via Molino and Santa Fe, 27 miles. The work will include two steel bridges and three trestles. S. L. Robinson, president, Mexico; C. O. Thon, chief engineer, Brilleville.

Mineral Wells (Tex.) Electric Railway.—It is reported that this company's new street railway line in Mineral Wells will be in operation in about two weeks.

Mississippi Valley Electric Railway, Nauvoo, Ill.—Between the dates of June 1 and June 15 this company will let contracts for grading its 45-mile interurban line between Carthage and Nauvoo, Ill., and is now ready to receive bids on ties, poles and other electric railway equipment. T. R. Smith, principal assistant engineer, 1034 Rookery building, Chicago, Ill.

Nashville (Tenn.) Interurban Railway.—President H. H. Mayberry has announced that actual construction work on the interurban line from Nashville to Mt. Pleasant, Tenn., will be started some time during the present week. Surveys have been completed and the deals for right of way are being closed up. The Interurban Company of New York has the contract. D. A. Proctor, chief engineer, Nashville.

Negaunee, Mich.—Work on the proposed 14-mile interurban electric line from Negaunee to Marquette, Mich., has been postponed until next fall. Right of way has been secured and surveys are being made by the Lake Superior Construction Company, Cleveland, O., which has the letting of the contracts for the road. T. F. Laist, Lennox building, Cleveland, O., is chief engineer.

Nipissing Central Railway, Cobalt, Ont.—It is reported that this company is considering the construction of an electric railway from Cobalt to New Liskeard.

Oklahoma City El Reno & Southwestern Interurban Railway, Oklahoma City, Okla.—It is reported that this company expects to begin work in about 90 days on the electric line to connect Oklahoma City, El Reno and Shawnee, and that G. W. Martin, representing the company, has closed a contract with the Oklahoma City Railway for the use of its terminals and tracks within the city.

Oregon Electric Railway, Portland, Ore.—This company is now securing right of way from Beaverton to Hillsboro, Ore., for its proposed line from Portland.

Philadelphia & Western Railroad.—Regular operation over this company's new elevated line from Sixty-ninth and Market streets, Philadelphia, Pa., was started on May 22. A half-hour schedule will be maintained for a short time, but it is expected to install a 15-minute schedule later. W. H. Simms, general superintendent.

San Bernardino Valley Traction Company, San Bernardino, Cal.—It is stated that the Arrowhead extension will be opened for traffic by June 7. The rails have been laid and the ballasting is being completed this week. F. R. Harris, chief engineer.

San Joaquin (Cal.) Power Company.—It is reported that surveys have been completed for this company's proposed line to the Yosemite valley, through Wawona, Crane valley and Pollasky, and that financial arrangements are being made for the construction of the line. A. C. Balch of Los Angeles is president.

Seymour & Brownstown (Ind.) Interurban Motor Line Railway Company.—This company, incorporated to build a traction line between the two cities named, is to be constructed of concrete upon which to operate automobiles and motor cycles as common carriers. Joseph I. Irwin of the Indianapolis Columbus & Southern Traction Company and Z. T. Sweeny of Columbus, Ind., are back of the project.

Sioux City Traction Company.—Material for building three miles of additional track has been ordered by this company and six new cars and four trailers are now being built. E. L. Kirk, manager, Sioux City, Ia.

Spokane & Inland Empire Railroad, Spokane, Wash.—Passenger and freight service is expected to be started within a few days between Oakesdale and Garfield, Wash. The line has been operating between Spokane and Spring Valley Junction for several months and service was recently extended to Oakesdale. The poles are up as far as Garfield and the overhead work is nearly completed. Track is laid between Garfield and Palouse and when the electric operation is extended to Garfield it is expected to run the trains into Palouse by steam temporarily. Rapid progress is being made on the grading between Palouse and Moscow, Idaho.

Springfield (Ill.) Consolidated Railway.—This company has started grading on the extension to the Zoo park, north of the city, and it is expected to have cars running some time this summer. Several of the city lines are being relaid with 73-pound rails.

Suitman, Ark.—It is reported that R. L. Kane and W. T. Hammock are interested in a project to build an electric railway to Conway.

Syracuse, N. Y.—It is understood that the street railway interests headed by Mr. C. D. Beebe of Syracuse have decided to construct a new line from Auburn to Seneca Falls, N. Y., 14 miles. This line will necessitate a 2-mile bridge or viaduct over Cayuga lake. Preliminary surveys have been completed.

United Traction Company, Albany, N. Y.—Michael F. Dollard has the contract for grading an extension from Madison avenue and Allen street, 1,500 feet west to the city limits.

Washington (D. C.) Railway & Electric Company.—This company has decided to build an extension of the Washington & Rockville Railroad, a subsidiary company, from Rockville to Gaithersburg, five miles. The Rockville & Gaithersburg Railroad will be incorporated to build the new line, it is stated, and right of way will be acquired at once. Surveys have been started and construction is to begin as soon as the preliminaries can be arranged. H. W. Fuller, general manager.

West Shore Railroad.—The first electric car was operated over the newly electrified road between Utica and Syracuse, N. Y., on May 21, to test the new electrical equipment.

POWER HOUSES AND SUBSTATIONS

Claremont (N. H.) Railway & Lighting Company.—This company will build an extension to its power plant, in which a Deisel oil engine of 1,000 horsepower and a Fort Wayne generator of 600-kilowatts capacity will be installed. Material for a 17-mile 11,000-volt transmission line will also be purchased. I. N. Wheelock, Claremont, N. H., is manager.

Edmonton (Alberta) Municipal Railway.—Contracts have been let to the Allis-Chalmers Company of Milwaukee for gas engines and to the Power & Mining Machinery Company of Milwaukee for producers for the power house of the new municipal street railway system. The power house is to be built by the city.

Hattiesburg (Miss.) Traction Company.—This company announces that work on a new power house will be begun at once. H. A. Camp, president.

Ontario Light & Traction Company, Canandaigua, N. Y.—It is announced that this company will spend about \$30,000 on overhauling its plant. J. H. Pardee is general manager.

Springfield (Mass.) Street Railway Company.—This company is planning to improve its power house at Goulds Mills, Mass. During the coming summer the height of the dam will be increased one foot, giving a fall of 24 feet, which can be increased to 25 feet by flash boards when necessary. A pair of waterwheels, driving 200-kilowatt General Electric generators, will be installed. This work will be done by the Black Company, Keene, N. H.

Western New York & Pennsylvania Traction Company, Olean, N. Y.—This company has let a contract for building a substation at East Bradford, Pa.

Personal Mention

Mr. Eugene V. Maling has resigned as superintendent of the Sheburne Falls & Colerain Street Railway, Sheburne Falls, Mass., effective on June 1.

Mr. F. L. Reed has been appointed superintendent of the Sheburne Falls (Mass.) & Colerain Street Railway, succeeding Mr. A. V. Maling, resigned.

Mr. Wade Watterson, assistant superintendent of the Illinois Traction System at Carlinville, Ill., has been appointed superintendent of terminals at Springfield, Ill., and St. Louis, Mo.

Mr. W. A. Satterlee, assistant general manager of the Kansas City Railway & Light Company, has been appointed assistant to the sales manager of the Ohio Brass Company at St. Louis, Mo.

Mr. H. F. Scott, formerly with the New Jersey & Pennsylvania Traction Company, Trenton, N. J., has been appointed master mechanic of the Roanoke (Va.) Railway & Electric Company.

Mr. Frank Shorton has accepted a position with the Evansville (Ind.) Electric Railway as superintendent of its recently completed line between Evansville and Rockport, Ind. The line will be formally opened on June 1.

Mr. P. Barnard, Jr., has resigned his position as superintendent of the Central Kentucky Traction Company to become secretary and general manager of the New Tuscarawas County Electric Light & Power Company, New Philadelphia, O.

Mr. C. E. Flynn, second vice-president of the Conneaut & Erie Traction Company, Erie, Pa., has resigned, effective on June 30, and Mr. B. E. Walker, now superintendent and engineer of the power station, has been appointed to succeed him.

Mr. Joseph Burdreau, heretofore superintendent of the Hartford (Conn.) lines of the Consolidated Railway, and associated with this road for the past 13 years, has resigned to become superintendent of the Scranton Railway, with headquarters at Scranton, Pa.

Mr. S. K. Holland, formerly of Springfield, Ill., has been appointed traffic manager of the Peoria Bloomington & Champaign Traction Company, a part of the Illinois Traction System, which recently opened its line from Peoria to Bloomington, Ill. Mr. Holland will have headquarters at Peoria.

Mr. E. L. Schmock, who resigned in February as auditor of the Kokomo Marion & Western Traction Company, to become assistant secretary of the Cleveland Painesville & Eastern Railroad, has been appointed purchasing agent of that company, with headquarters at Willoughby, O., effective on May 20.

Mr. C. F. Bryant, heretofore auditor of the Connecticut Railway & Lighting Company, Bridgeport, Conn., has resigned to become assistant to Mr. A. L. Linn, Jr., auditor of the Mohawk Valley Company, the holding company for the electric properties of the Andrews syndicate and the New York Central & Hudson River Railroad. Mr. Bryant's headquarters will be in New York City.

Mr. A. L. Gillette has resigned as superintendent and electrical engineer of the Escanaba (Mich.) Electric Street Railway to accept a similar position with the Sterling Dixon & Eastern Electric Railway at Sterling, Ill., succeeding Mr. John Powers, who resigned recently, as noted in the Electric Railway Review of May 25, to become connected with the Galesburg Railway & Light Company.

Mr. John Hanf has resigned as master mechanic of the International Railway Company, Buffalo, N. Y., on account of ill health. Previous to his appointment with the International Railway in 1900 Mr. Hanf was connected with the Wilmington (Del.) City Railway and still earlier with the Philadelphia Rapid Transit Company and the Hestonville Mantua & Fairmont Park Railway. He also at one time was connected with The J. G. Brill Company of Philadelphia. Mr. W. H. Evans, master mechanic of the Indianapolis Traction & Terminal Company, has been appointed to succeed Mr. Hanf, as noted in the Electric Railway Review of May 25.

Mr. C. V. Wood, formerly superintendent of the Pittsburg and Cleveland divisions of the Wheeling & Lake Erie Railroad, the Wabash-Pittsburg Terminal Railway and the West Side Belt Railroad at Canton, O., has been appointed general freight and passenger agent of all the electric lines in Massachusetts under the control of the New York New Haven & Hartford Railroad, with headquarters at Worcester, Mass. This appointment marks the first definite step in the inauguration of through passenger, freight and express business on the lines controlled by this company in Massachusetts. Mr. Wood is well qualified to fill the position, having had an extensive steam railway experience dating from 1881, when he entered the service of the Grand Trunk Railway as telegraph operator. Since that time he has filled important positions on various steam roads of the east and middle west. In 1899 he became general manager of an electric freight line in Pittsburg, where he remained until October, 1902, when he was appointed superintendent of the West Side Belt Railroad at Pittsburg, and later division superintendent of the Wheeling & Lake Erie, as noted above. Mr. Wood's jurisdiction will extend over the Worcester Consolidated, the Worcester & Southbridge, Worcester & Blackstone Valley railways and the Springfield and Berkshire systems, and will include entire charge of the excursion as well as the through passenger and parcels express business of

the company. He will be assisted by Mr. A. B. Smith, general traffic manager of the New England Investment & Security Company.

Mr. Calvin Skinner, heretofore master mechanic of the Scioto Valley Traction Company, Columbus, O., has been appointed superintendent, succeeding Mr. L. C. Bradley, resigned, as reported in last week's issue of the Electric Railway Review. Mr. Skinner's experience in mechanical work covers a period of 27 years, most of which, until his connection with the Scioto Valley company, was spent in steam railway work. He was born on August 22, 1855, near Zanesville, O., and obtained his first experience with the Pittsburg Cincinnati & St. Louis Railway, where he remained until 1890, serving consecutively as apprentice machinist, locomotive fireman and locomotive engineer. From 1890 to 1891 he was road foreman of engines with the Chicago & Erie Railroad; from 1891 to 1894 master mechanic of the Ohio & Mississippi Railway, serving in the same capacity with the Alabama Great Southern from 1894 to 1899. Since that time he has served on several other steam roads, among them the Chicago & Alton and the Peoria division of the Cleveland Cincinnati Chicago & St. Louis. He has been connected with the Scioto Valley company since its reorganization in 1903.

Mr. J. N. Shannahan has resigned as general superintendent of the Fonda Johnstown & Gloversville Railroad, and as president of the Adirondack Lakes Traction Company of Gloversville, N. Y.,



J. N. Shannahan.

to become general manager of the Washington Baltimore & Annapolis Electric Railway of Baltimore, Md., now under construction between the cities mentioned in its title, and soon to be placed in partial operation. Mr. Shannahan was graduated from Rensselaer Polytechnic Institute in 1894. Entering the employ of the government he worked for nine months as a draughtsman at the Watervliet arsenal. This position he resigned to enter the service of the New York Central & Hudson River Railroad at Rochester, N. Y., as inspector of signals. After several years' service with this company he became connected with the Fonda Johnstown & Gloversville Railroad as chief engineer. This was in 1899,

and just about the time the Fonda Johnstown & Gloversville Railroad was being partially equipped for electrical operation. In this way, during the next four years Mr. Shannahan had charge of building the double-track electric line between Gloversville and Schenectady, N. Y., and the single-track line between Amsterdam and Hagaman. On January 1, 1903, Mr. Shannahan was made general superintendent of the company, in charge of both steam and electrical operation, and at the same time was elected manager of the Edison Electric Light & Power Company of Amsterdam, N. Y. Early in 1904 he was elected president of the Adirondack Lakes Traction Company. For several years Mr. Shannahan has taken an active interest in the affairs of the Street Railway Association of the State of New York, of which body he is at the present time president, having been elected to that office in June, 1906. Mr. Shannahan also is an associate member of the American Society of Civil Engineers and during 1905 and 1906 served as president of the Rensselaer Society of Engineers. He will be succeeded on the Fonda Johnstown & Gloversville Railroad by Mr. W. H. Collins, master mechanic of the company.

The directors of the Scioto Valley Traction Company have re-elected Mr. F. A. Davis president and general manager, Mr. W. S. Courtright vice-president, and Mr. E. R. Sharp secretary and treasurer. The directors also accepted the resignation of Mr. L. C. Bradley and passed the following resolution: "Whereas, Mr. L. C. Bradley, who has been the superintendent of this company since it began operation, has tendered his resignation, to accept a position with J. G. White & Co., be it resolved by the board of directors of this company that the resignation of Mr. Bradley be accepted with regret and that in accepting said resignation, this board takes the opportunity to express its appreciation of the careful, faithful and efficient service which Mr. Bradley has rendered to the company, with notable ability and capacity. Be it further resolved that we extend to Mr. Bradley our best wishes for his future success, and commend him to his new employes as a capable and efficient operator of electric railways." At the close of the directors' meeting Mr. Davis, on behalf of the officers and employes of the company, presented Mr. Bradley with a Patek Philippe watch. In accepting the watch Mr. Bradley expressed his regret at leaving the company and spoke of the pleasant relations which had existed between the company, its officers and himself. Mr. Davis has issued the following circular: "The resignation of Mr. L. C. Bradley as superintendent of this company will become effective on May 25. Effective on May 26 the following appointments are hereby made: Mr. W. V. S. Robb, purchasing agent and chief clerk to general manager, with authority to use the name and signature of the general manager in matters of operation. Mr. C. Skinner,

superintendent in charge of transportation, mechanical and roadway departments; trainmaster, shop foreman and roadmaster will report to and receive instructions from him. Mr. L. K. Leggett, trainmaster; dispatchers and trainmen will report to and receive instructions from him. Mr. George A. Stiles, shop foreman; all employes of the mechanical department will report to and receive instructions from him. Mr. P. Maloney, roadmaster; all employes of the roadway department will report to and receive instructions from him. Mr. J. O. Bradfield, general freight agent, in charge of the freight traffic department; all local agents and station employes will report to and receive instructions from him. Mr. C. Skinner, superintendent, and Mr. J. O. Bradfield, general freight agent, will report to the general manager. Mr. F. K. Young, auditor; Mr. Julian Griggs, chief engineer; Mr. R. Fullerton, chief electrician; Mr. R. W. Parry, chief engineer power house; Mr. N. E. Rees, passenger and claim agent; and Mr. R. E. Wood, storekeeper, will continue in charge of their respective departments and will report to the general manager."

Mr. L. C. Bradley, for the past three years superintendent of the Scioto Valley Traction Company at Columbus, O., has resigned his position, effective on May 25, to become associated with J. G. White & Co. of New York City. Mr. Bradley was connected for a number of years with Stone & Webster of Boston, Mass., serving in an engineering capacity on some of the important western properties of this company. For several years previous to his connection with the Columbus property he was superintendent of the Puget Sound Electric Railway, formerly the Seattle-Tacoma Interurban Railway, resigning in May, 1904, to accept a similar position with the Scioto Valley Traction Company. This company, which has the distinction of being the first in Ohio to operate its interurban lines by the third rail, has since become one of the most important of the third-rail systems of the country, and to Mr. Bradley is due, in large measure, the rapid development to its present high state of efficiency. His familiarity with third-rail operation has led to his present appointment, although a more extended range of work covering the supervision of the reorganization details and actual operation of properties will be included in his new duties and will afford a wider scope for his executive ability. He will be succeeded by Mr. Calvin Skinner, master mechanic of the Scioto Valley company.

Mr. Edward W. Moore of Cleveland, O., president of the Lake Shore Electric Railway, the Lorain Street Railroad and the Sandusky Fremont & Southern Railway, has recently been elected

president of the Cleveland Painesville & Eastern Railroad of Willoughby, O., as announced in last week's issue of the Electric Railway Review, succeeding Mr. Charles W. Wason, resigned. Mr. Moore was born in Ohio on July 3, 1864, and was educated in the public schools. He began his career with Everett, Weddell & Co., bankers, with whom he remained from 1880 to 1883, and was later with the construction company that built the New York Chicago & St. Louis Railway. From 1883 to 1888 he was in the treasury department of the railway. From 1888 to 1890 he was with the East End Savings & Banking Company and was one of the organizers and the first treasurer, from 1891 to 1899, of the Dime Savings



Edward W. Moore.

& Banking Company. From 1899 to 1901 he was vice-president of this company. He was also one of the organizers of the Western Reserve Trust Company. He is a director in numerous electric traction and telephone companies in and around Cleveland, Toledo and Detroit, many of which he helped organize, and now devotes his whole time to looking after his large financial interests. Mr. Moore has long been connected with the development of electric railways and it is estimated that since he made his first street railway investment in the East Cleveland Railroad in 1889 he has been interested in traction lines aggregating about 3,000 miles. The more important properties in the promotion of which he has been interested include the Aurora Elgin & Chicago Railway, the Scioto Valley Traction Company, the Washington Baltimore & Annapolis Electric Railway, the Montreal Street Railway and the Syracuse Rapid Transit Company. He is at present largely interested and a director in the Detroit United Railway, the Toledo Railways & Light Company, the Northern Ohio Traction & Light Company, the London Street Railway, the Cleveland Painesville & Eastern Railway, the Lake Shore Electric Railway and the Eastern Ohio Traction Company. He was elected president of the Lake Shore Electric Railway in January, 1906. An extended biography of Mr. Moore was published in the Street Railway Review of March 15, 1906.

Obituary.

George F. Chapman, vice-president and general manager of the United Railroads of San Francisco, died in that city on May 23, after a brief illness resulting from a cold contracted the previous Saturday, which rapidly developed into pneumonia. ▲

Financial News

Manufactures and Supplies

ROLLING STOCK.

Barre & Montpelier Power & Traction Company, Barre, Vt.—Control of this company has been sold to a syndicate represented by Frank M. Corey, president of the First National bank of Montpelier, Vt.; Edward H. Devitt, Vermont state treasurer; and J. M. Frost, electrical engineer. The company operates 9.2 miles of road, extending between Barre and Montpelier.

Detroit United Railway Company.—It is announced that this company has purchased the property of the Jackson Ann Arbor & Detroit Electric Railway Company, which has done some construction work in the vicinity of Dearborn, Mich.

Ft. Wayne & Wabash Valley Traction Company, Ft. Wayne, Ind.—Gross earnings for March amounted to \$92,500.22 as compared with \$79,991.82 in March, 1906. Operating expenses were \$58,844.24 in March, 1907 and \$51,472.90 in March, 1906, leaving net earnings of \$33,655.98 and \$28,518.92, respectively.

Grand Rapids Grand Haven & Muskegon Railway Company, Grand Rapids, Mich.—At a meeting of stockholders on May 21 the following directors were elected: George C. Smith of Pittsburg, Pa.; Wallace Franklin of Detroit, Thomas F. Carroll of Grand Rapids, Sydney E. Junkins and Carl M. Vail of New York City.

Grand Valley Radial Railway, Brantford, Ont.—It is announced that this company will be formed to acquire the properties of the Brantford Street Railway Company, the Grand Valley Radial Company and the Woodstock & Ingersoll Railway Company.

Hudson Valley Railway, Glens Falls, N. Y.—Earnings for the quarter ended March 31 were as follows:

Quarter ended March 31—	1907.	1906.	1905.
Gross	\$107,884	\$96,698	\$80,993
Expenses	103,602	73,453	72,821
Net	\$ 4,282	\$23,245	\$ 8,172
Other income	1,788	2,664	3,969
Total income	\$ 6,070	\$25,909	\$12,141
Charges	50,029	64,178	63,171
Deficit	\$ 43,959	\$38,269	\$51,030

North American Company.—In offering for sale the new issue of short-time notes of this company, Lee, Higginson & Co. and Redmond & Co. give the following statement of earnings: "The surplus earnings for 1906 of the principal companies in which the North American Company is interested, after deducting all operating expenses, reserves, interest charges and dividends paid, amounted to \$1,193,934.66, of which, if distributed, the share of the North American Company would have been \$886,518.58. The net cash income of the company for the fiscal and calendar year 1907 is estimated at \$1,850,000, or \$1,600,000 in excess of the total interest charges upon the entire authorized issue of notes.

St. Joseph (Mo.) Railway Light Heat & Power Company.—The New York stock exchange has listed \$58,000 additional 5 per cent first mortgage bonds of this company. These bonds were issued on account of the following expenditures for improvements to the property:

Extension and reconstruction of tracks, including special work	\$ 3,377.52
Extension of overhead lines—railway	561.50
New paving	17,326.86
New electric cars, trucks and motors	9,654.93
Construction of tunnel	4,650.83
Power house equipment	26,265.91
New car shops	563.64
Extension of overhead lines, new transformers and new meters, light and power department	6,819.52
Extension of steam heat lines	5.00
Total	\$69,225.71

Western Railways & Light Company.—We are officially advised that this company has been organized as a holding company, which will take over the following properties, controlled by W. B. McKinley of Champaign, Ill., and W. B. Duncan of Portland, Me.: Quincy (Ill.) Railway Company, Galesburg (Ill.) Railway & Light Company, Citizens' Lighting Company of La Salle and Peru, Ill., Illinois Valley Railway Company, La Salle, Ill., and Wichita (Kan.) Railway & Light Company. The Western Railways & Light Company will have no connection with the Illinois Traction Company.

Wilmington New Castle & Southern Railway Company, New Castle, Del.—Wilmer Palmer and J. Chester Gibson of Wilmington, Del., were appointed receivers of this road on May 23. The company operates 16 miles of road between Wilmington, New Castle and Delaware City.

Dividends Declared.

Chattanooga (Tenn.) Railways Company, preferred, quarterly, 1 1/4 per cent.
 Metropolitan Street Railway, New York, quarterly, 1 3/4 per cent.
 Metropolitan West Side Elevated Railway, Chicago, preferred, quarterly, three-fourths of 1 per cent.
 Norfolk (Va.) Railway & Light Company, 1 per cent.

Tramway Rural, Buenos Aires, S. A., is reported in the market for 75 electric cars.

Eugene & Eastern Railway, Portland, Ore., now under construction, has placed an order with The J. G. Brill Company for a number of cars. E. W. Hall, secretary, Portland, Ore.

Waupaca Electric Light & Railway Company, Waupaca, Wis., expects to purchase soon one double-truck closed car, with a seating capacity of 48 passengers.

Sioux City Traction Company, Sioux City, Ia., is building four trailer cars at its own shops, in addition to the six summer cars reported in the Electric Railway Review of February 9.

Delta Electric Light Power & Manufacturing Company, Greenville, Miss., is in the market for two closed vestibuled cars, having cross seats, with a seating capacity of 28 to 32 passengers.

Whatcom County Railway & Light Company, Bellingham, Wash., is building an electric locomotive and one express car at its own shops and has also placed an order for three passenger cars.

Worcester Consolidated Street Railway, Worcester, Mass., is receiving bids on five large closed suburban cars and will award the contract in a few days. The cars are for use on the Clinton Hudson & Leominster Railway.

Mexico Santa Fe & Perry Traction Company, a projected line from Perry to Mexico, Mo., a distance of 27 miles, will be in the market for rolling stock in about 30 days. S. L. Robinson, president, Mexico, Mo.

Wagner Lake Shore & Armour Traction Company, recently incorporated to build a new line in South Dakota, it is reported will purchase new rolling stock in about 90 days. A. H. Pease, Wagner, S. D., may be addressed.

Indianapolis & Eastern Railway, Indianapolis, Ind., has placed an order with the Cincinnati Car Company for five combination passenger, smoking and baggage cars, to be 61 feet 6 inches in length, in addition to the 10 similar cars previously reported.

Pittsburg & Westmoreland Railway, Pittsburg, Pa., will soon place an order for four or seven semi-convertible cars, to be equipped with Monitor roofs and four 50-horsepower motors each. R. W. Marshall & Co., 95 Liberty street, New York, will place the order.

Chicago South Bend & Northern Indiana Railway, South Bend, Ind., as reported in the Electric Railway Review of March 9, has placed an order with the Cincinnati Car Company for 10 interurban cars 61 feet 6 inches in length. These will be the same width as standard steam passenger coaches and will be mounted on Baldwin M. C. B. trucks.

Virginia Passenger & Power Company, Richmond, Va., as reported in the Electric Railway Review of May 18, has ordered 20 semi-convertible cars from The J. G. Brill Company. The specifications call for the following details:

Seating capacity..42 passengers	Height, track to trolley base.....
Wheel base .....4 ft. 6 in.	.....11 ft. 11 in.
Width over all.....8 ft. 4 in.	Body
	Underframe ....Wood and steel

Special Equipment.

Air brakes .....Westinghouse	Headlights .....12-inch—Dash
Curtain fixtures	Interior finish .....Cherry
.....Curtain Supply Co.	Motors .....4 GE-90
Curtain material.....Pantasote	Retrievers
Destination signs...Four—glass	Trucks
Fenders	Platform
Heating system .....Providence	.....Detroit
.....Electric	

Sacramento Electric Gas & Railway Company, Sacramento, has placed an order for 44 closed cars, to be built at the Sacramento shops of the company. These cars are now under construction and will be put into service by the Union Traction Company at Santa Cruz, Santa Clara Interurban Railway at Palo Alto, San Jose & Santa Clara County Railroad at San Jose, and the Sacramento Electric Gas & Railway Company. The specifications call for the following details:

Seating capacity..44 passengers	Height, inside
Weight .....62,500 lb.	Sill to trolley base...9 ft. 7 in.
Wheel base .....4 ft.	Track to trolley base.....
Length, body .....20 ft. 6 in.	.....11 ft. 11 in.
Over vestibule ....39 ft. 5 in.	Body
Width, inside .....7 ft. 6 in.	Underframe
Over all .....8 ft. 6 in.	.....Steel

Special Equipment.

Fenders	Seats.....Hale & Kilburn
Gears and pinions.General Elec.	Trolley poles and attach-ments
Headlights .....	.....General Electric
Boesch Lamp & Reflector Co.	Trucks .....Builders' standard
Interior finish	Varnish
.....Ash—natural wood	Ventilators
Motors	Vestibule
.....2 GE-54	Couplers ....Builders' standard
Paint .....	.....Valentine's
Roofs .....	.....Heavy duck

SHOPS AND BUILDINGS.

Buffalo & Lake Erie Traction Company, Buffalo, N. Y.—This company's car house at Blaisdell, N. Y., was destroyed by fire on May 22, together with 25 cars.

Grand Rapids Grand Haven & Muskegon Railway, Grand Rapids, Mich.—The directors at the recent annual meeting decided to erect a new freight depot and car house at Muskegon at once.

Kalamazoo Lake Shore & Chicago Traction Company, Kalamazoo, Mich.—This company is planning the construction of a passenger station and freight yards at Kalamazoo and South Haven, Mich.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—This company has completed a deal for the purchase of a piece of land, 262 by 685 feet, on the corner of Tenth and Dorcas streets, Omaha, on which will be erected a car house, 150 by 450 feet, for the accommodation of the Harney, Farnam and Dodge street cars.

TRADE NOTES.

Patrick H. Joyce, president of the Illinois Bolt, Nut & Forging Company, Chicago, died suddenly of apoplexy on May 24.

Francis Ludlow Clark, chief engineer of the Westinghouse Air Brake Company, Pittsburg, died on May 26 from paralysis. He was 65 years of age.

Lord Electric Company, New York, has been incorporated with a capital stock of \$100,000, by Frederick W. Lord, Thomas P. Curtis and Robert H. Hallowell.

Fred A. Daley, formerly treasurer and manager of the Under-feed Stoker Company of America, Marquette building, Chicago, has been elected president and treasurer of the company, effective on May 24.

Fairbanks, Morse & Co., Chicago, have leased for 20 years the property on the southwest corner of Eldridge court and Wabash avenue, upon which the company will erect an 8-story building of brick and steel construction, with ground dimensions of 42½ by 165½ feet.

Interurban Construction Company has been incorporated in Colorado with a capitalization of \$150,000, for the purpose of conducting a general contracting and engineering business. George S. Van Law of Denver, Henry P. Dickinson and Eben N. Reaser are interested.

E. H. Symington, western sales manager of the T. H. Symington Company, who was seriously hurt on May 18 while riding in Lincoln park, is slowly recovering. Although he has not entirely regained consciousness, there is a marked improvement in his condition since our issue of last week.

Columbia Metal Supply Company, Brooklyn, N. Y., has been incorporated for the purpose of manufacturing engines, boilers, machinery, tools, etc. The incorporators are: Charles A. Wessell, 300 Carlton avenue, Brooklyn; F. H. Wessell, and Burnham W. King, 318 West Eighty-fourth street, New York.

Stanley-G. I. Electric Manufacturing Company, Pittsfield, Mass., has had plans prepared for a 3-story foundry building. A portion of this will be the main casting room for generator frames, beds, etc., while another department will be used to cast small parts of machinery. The structure will cost approximately \$300,000, and a large amount will be expended for new machinery, including cranes, pattern making and casting machinery.

Joseph H. Berry, prominent in industrial affairs and the head of Berry Brothers, manufacturers of varnishes, Detroit, Mich., died on May 22 from inflammatory rheumatism. He was born in Elizabeth, N. J., in 1839, and went to Detroit at the age of 17 years. He was the projector of the Detroit Terminal Railroad and carried its construction forward until it was purchased by other roads. He was president of the Dwight Lumber Company and of the Detroit Heating & Lighting Company, and was actively interested in numerous other companies, with lines of manufacture covering car wheels, pressed steel barrels, pig iron and sugar. He was also a director of the Commercial National bank of Detroit.

Sirocco Engineering Company has recently been incorporated in New Jersey for the purpose of the American manufacturing rights of the Sirocco Engineering Works of Belfast, Ireland. The company has been capitalized at \$500,000 and has opened offices in the new West Street building, 140 Cedar street, New York. A temporary plant will be erected at the Bush Terminal stores, South Brooklyn, and later on permanent works will be built near New York City. The plant is to be devoted to turning out ventilating fans, blowers, engines, pumps and other apparatus made at the Belfast works. Samuel C. Davidson of Davidson & Co., owner of the Belfast works, is president of the company. The vice-president is William C. Redfield, formerly president of J. H. Williams & Co. of Brooklyn.

Industrial Engineering & Supply Company, S. A., of Mexico City, Mex., has recently been organized to do a general machinery and supply business, and for this purpose has acquired a 4-story building at Alcantera No. 27, where the company will keep in stock a large portion of its goods and where the headquarters of the company will be located. The president of the company, W. W. Wheatly, was formerly president and general manager of the Mexico City Tramway. James A. Pierce, general manager, was formerly general superintendent of the Mexico Tramway Company and was at one time connected with Rossiter,

McGovern & Co. of New York. The general sales agent is William C. Benbow, who for many years has been in Mexico engaged in selling mining, milling and manufacturing machinery and electrical supplies. Mr. Benbow will represent in the future the Wellman-Seaver-Morgan Company of Cleveland, as well as the Industrial Engineering & Supply Company, S. A.

Under-Feed Stoker Company of America, Marquette building, Chicago, reports among recent sales one to the Amoskeag Manufacturing Company, operating the largest cotton mill in the United States, which has placed its fourth order for 28 Jones stokers, making a total of an even 100 purchased by that company and its allied interests. Sixty of this number have been in operation for some time past in the Manchester mills, controlled by the Amoskeag Manufacturing Company, and 12 in the Amoskeag plant since 1902, where the fourth order for 28 will be installed. The York Manufacturing Company, Saco, Me., now operating 21 Jones stokers, the result of three orders, the first of which was placed in September, 1902, has contracted for an additional 12 stokers, which will make a total of 33 in its plant.

G. U. G. Holman has been appointed manager of the electrical department of the Boston branch of the H. W. Johns-Manville Company, New York, and has already entered upon his new work. Mr. Holman is well known in electrical circles. After graduating from the Massachusetts Institute of Technology, he was for several years with the Thomson-Houston and General Electric companies in Lynn, Mass., New York City and also in Minnesota. He left the General Electric Company in 1892 to become railway engineer of the Mather Electric Company of Manchester, Conn., and later was engaged in the lighting field in Philadelphia for five years. In the last few years he has been connected with the construction and operation of electrical enterprises in New York, Philadelphia and Canada, and is ably qualified to make the most of the opportunities offered him in his new field.

Electric Service Supplies Company, Philadelphia, manufacturer of electrical and mechanical supplies, announces that Willis V. Sweeten, formerly with the Elmer P. Morris Company, New York, has been appointed to a position with the Electric Service Supplies Company. Mr. Sweeten will travel through New York state and will make his headquarters at the New York office of the company, 2 Rector street. F. C. Peck, formerly real estate agent for the Delaware & Hudson, is now connected with this company in Philadelphia, covering the Philadelphia trade. T. F. McKenna, who for some years has been traveling for Machado & Roller of New York City, is now traveling in Pennsylvania for the Electric Service Supplies Company, making his headquarters at the Mayer & Englund department in Philadelphia. This company is the general sales agent for the National trolley guard, which was described in the Electric Railway Review of May 18, on page 667.

John A. Walker, vice-president, treasurer and a director of the Joseph Dixon Crucible Company, of Jersey City, N. J., died of heart disease on May 23, at his home in that city. He was born in New York City on September 22, 1837. He entered the employ of Joseph Dixon & Co. in 1867 and in the following year became secretary of the newly organized Crucible company. Since that time he has spent his business life in official capacities directing the interests of the company. His ability and foresight as a manager and his knowledge of industrial and commercial conditions made him the recipient of many honors. At the convention of the National Association of Stationers and Manufacturers at St. Louis, in October, 1905, he was elected first vice-president. He was appointed by the governor of New Jersey as a representative delegate to the national convention for the extension of the foreign commerce of the United States, held in Washington, in January, 1907. He was first vice-president of the Colonial Life Insurance Company and a director of the Title Guarantee & Trust Company. He was a member of the board of trade, the Union League Club, the Cosmos Club, the Carteret Club and the Twilight Club of New York City.



John A. Walker.

He was first vice-president of the Colonial Life Insurance Company and a director of the Title Guarantee & Trust Company. He was a member of the board of trade, the Union League Club, the Cosmos Club, the Carteret Club and the Twilight Club of New York City.

Tweedy-Randolph Company, dealer in railway supplies, with offices in the Fisher building, Chicago, was incorporated in November, 1906, with the following officers: President, S. F. Randolph, Jr.; treasurer, O. S. Tweedy; secretary and manager, P. W. Hood. Mr. Hood was for four years manager of the western railway department of the Diamond Rubber Company of Akron, O., with headquarters in Chicago. The company is railway representative in Chicago of the Gutta Percha & Rubber Manufacturing Company of New York City, manufacturer of air brake, steam, water, car-heating and tender hose; also packings, matings, etc. The company is also the representative of the Washburn Steel Castings & Coupler Company of Minneapolis, Minn., manufacturer of couplers for locomotives, locomotive tenders, freight and passenger

cars, as well as steel couplers for interurban and city electric cars; also for J. H. Gautier & Co., Jersey City, N. J., manufacturers of crucibles. In addition to these cited the company handles hard rubber battery jars for train lighting, rubber and leather belting, cedar and cypress poles and seat springs for railway coaches, etc., the latter article being manufactured by the company at its Jackson, Mich., factory.

Union Electric Company and the General Railway Supply Company, both of Pittsburgh, have consolidated their interests and will be operated hereafter under the name of the Union Electric Company. The new company is capitalized at \$250,000. The following officers have been elected: George W. Provost, president; Percy R. Frost, vice-president and manager of lighting department; J. P. Provost, treasurer; L. H. Keller, secretary. Thomas M. Cluley has been appointed manager of the railway department. The new company will continue the sale of railway, power, marine and telephone supplies and will also continue the agencies carried by the General Railway Supply Company, namely, R. D. Nuttall Company, gears, pinions and trolleys; International Register Company's products; General Electric line material and rail bonds; Crouse-Hinds arc headlights; Locke high-tension insulators, and Wilson trolley clutches; also motor and controller parts for Westinghouse and General Electric apparatus.

CHANGES IN THE REVIEW STAFF.

Mr. John B. Bennett, formerly connected with the Street Railway Journal and more recently manager of the Municipal Journal and Engineer, has joined the business staff of the Electric Railway Review as eastern manager, with office at 150 Nassau street, New York City. Mr. Bennett's strong individuality, his wide acquaintance in the street and electric railway field and his large practical experience in the business of publishing technical journals make him a strong addition to our already strong organization.

Mr. C. R. Mills, who has for several years been advertising representative of The Railway Age, has been appointed western advertising manager of the Electric Railway Review, with headquarters at the general offices in Chicago.

Mr. E. J. Hunt has been transferred from the circulation to the advertising department and will be district manager in charge of advertising in the central territory, with office at Cleveland, O.

Mr. William Padget, who has hitherto represented the Review in the east, has been appointed district manager of The Railway Age, with office at Cleveland.

HAWLEY DOWN DRAFT FURNACE.

At no time during the history of the steam engine and boiler has there been carried on such a lively crusade as that which is now being prosecuted by municipalities against factories, lighting and railway plants which are producing smoke. With ordinary grates it is well known that it is an absolute impossibility to prevent the formation of smoke. It is quite impossible to secure firemen who will properly work the fires so as to coke the coal and to regulate the upper draft so that the volatile gases which are distilled from the green fuel are properly mixed with the required volume of air at a sufficiently high temperature to insure complete combustion.

There are practically no engineers who do not recognize the coking method as the only satisfactory and proper method of obtaining complete combustion, and as this method is acknowledged superior to all others, it has been adopted as the operating basis of the improved Hawley down draft furnace, manufactured by the Hawley Down Draft Furnace Company of New York and Chicago.

These furnaces, as it will be seen from the illustration, consist of an ordinary grate, above which is located a second grate formed of water tubes expanded into front and back headers, which are connected respectively with the lower and upper portion of the boiler, the exact location of the connections depending upon the type and the design of boiler to which the furnace is fitted.

The operation of the grate is as follows: The fire on the upper grate distills the volatile matter from the green coal as it is fired, which is then drawn downward and mixed with the proper amount of air directly above the incandescent coke, thus maintaining the temperature of the gases sufficiently high to insure perfect combustion and preventing the formation of at least 90 per cent of the smoke. The coke, formed by the distillation process on the upper grate, gradually falls onto the lower grate, where it burns freely with an intense heat; the two processes (being thus separate) are carried out under the most favorable conditions.

The green coal may either be charged onto the water-tube grate automatically through chutes from overhead bunkers or may be charged by hand through the upper firing doors. It is self-evident that besides insuring complete combustion, further economies are assured by the use of this grate, because of the materially increased circulation, resulting from the method of connecting the

furnace to the boiler. This is especially valuable in the Scotch marine type of boiler, largely used in electric railway and pumping stations, since by connecting the down-comers to the shell of the boiler directly beneath the furnaces, a rapid positive circulation is established in that portion of the boiler in which ordinarily the circulation is almost totally missing.

A further gain resulting from the use of the Hawley furnace is an increased heating surface. This materially adds to the capacity of the plant without the installation of further boilers, and is a point of considerable importance in plants working beyond their normal capacity.

This system of combustion is installed by the company under rigid guarantees of performance which insure the customer against risk of any kind, and the better operation of the furnaces effects a large economy in fuel consumption. The furnaces, it is stated, practically earn their cost in less than two years. During the past 17 years of the company's existence over 6,000 furnaces, with an aggregate horsepower of about 1,650,000, have been installed, both in this country and abroad.

RED "E" SOLDERING PASTE.

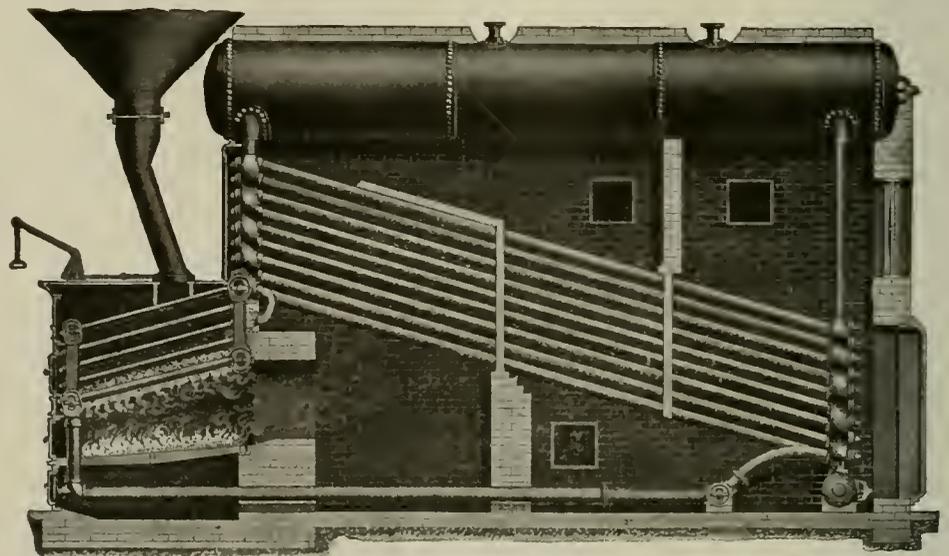
The desirability of securing a soldering flux put up in such form as to be convenient and cleanly to handle, easily and quickly applied and at the same time achieve satisfactory results and "keep" indefinitely, is realized by electricians, linemen or repair or shop men having use for a preparation of this nature in either large or small quantities. The demand for a combination of these desirable features also has been recognized by manufacturers and from time to time there have been placed upon the market pastes designed to meet these requirements.

A soldering flux which, although new to the public, has been tested and said to have proved satisfactory in every way is known as the Red "E" soldering paste and is a product of the Chase-Shawmut Company of Newburyport, Mass. This paste is put up in collapsible tubes of sizes convenient for carrying in the pocket or the tool bag, the smaller size being $\frac{1}{2}$ by 4 inches and the larger 1 by 6 inches. It is said to be non-corrosive and therefore does not eat into but cleans the surfaces to which it is applied, thus allowing the solder to run freely and affording more satisfactory results. The paste also is said to be but little affected by temperature, weather or the material with which it comes in contact, and therefore will keep indefinitely.

The combination of these desirable qualities, together with the low price for which it is sold, should serve to make this product of considerable value.

Electric Railway Guide for Chicago and Vicinity.

The Chicago and Interurban Trolley Guide Company of Chicago has issued an electric railway guide to Chicago and vicinity, a booklet of 40 pages containing schedules of the cities, towns,



Hawley Downdraft Furnace.

villages, suburbs and amusement, summer and fishing resorts which may be reached by electric railways, giving maps, fares, time and mileage to such points. Chicago is now well provided with electric railways, both trolley and third rail, which put the residents of the city within easy reach of the many points of interest. The lines out of Chicago include the Aurora Elgin & Chicago Railway, the Chicago & Joliet Electric Railway, the Chicago & Southern Traction Company, the South Chicago City Railway, the Chicago & Milwaukee Electric Railroad, the Calumet Electric Railway and the Chicago Riverside & Lagrange Suburban Railroad.

Joseph T. Ryerson & Son, Chicago, have had plans prepared by Ritter & Mott, 204 Dearborn street, Chicago, for a warehouse and office building, to be built at Rockwell and Fifteenth streets. The building will be one and three stories in height, of fireproof construction, with brick exterior and concrete foundation.

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In the designs for axles recommended by the standardization committee of the Central Electric Railway Association and presented in the Electric Railway Review

Key Seats In Axle Gear-Fits.

for May 25, page 677, it will be noted that the key seat in the gear-fit is shown with its bottom surface rounded at the ends to a 1½-inch radius and not made as usually, by drilling two holes in the shaft and slotting-out the metal between these holes. Experience has shown that when key seats are cut by the latter method breaks in the shaft frequently start with a crack originating at the end of the key seat where one of the holes has been drilled and where a sharp angle exists. To remove this weak point it is suggested that the key seats for the gears be made with a milling cutter instead of a key-seating machine. This will provide a fillet at either end of the seat, sloping from the inner surface to the gear-fit. Trouble might be expected from the round-end keys not staying in place while the gears were being pressed on. This difficulty, however, can be overcome by using a collar that will fit closely over the shaft and one end of the key during the pressing-on process, and which, in turn, will be pressed off as the gear assumes a permanent position.

The desirability of keeping tension springs on trolley poles properly adjusted is generally recognized. Various methods are adopted for performing this task. On some roads where a uniform pressure between the wheel and the wire assures satisfactory operation for all cars, a weight is provided equal to the number of pounds pressure required. This weight can quickly be hung on the trolley harp and the condition of the springs ascertained. With such a weight, equal to the trolley pressure desired, hung from the harp, the springs can be regulated to just hold the wheel against the wire. Then with the weight removed it is known that the tension in the springs is adjusted correctly. On other systems it is found desirable for different cars to operate over different divisions with the

Adjusting The Trolley Springs.

tensions in the trolley-pole springs adjusted to suit the particular requirements of each division or car. To permit of such adjustments one extensive system in Indiana uses a spring-balance which by means of the trolley rope can be hooked to the end of the pole. When the pole is drawn down to the proper height above the roof the rope can be tied and the tension springs in the trolley base adjusted until the spring-balance shows on its scale that the proper tension will exist between the trolley wheel and the wire. These two practical methods are outlined here, not so much to suggest how the details should be carried out, but rather to emphasize the recognized need for a careful consideration of the desirability of thoroughly inspecting car equipments.

There are many interesting details included in the design of the portable substations of the Northern Electric Railway described elsewhere in this issue. The desirability of using portable substations is well recognized by companies which have rapidly extending mileages and which desire to operate new track as rapidly as it may be laid. The type of substation adopted for the Northern Electric lines does not differ in general from other portable substations, but it is noticeable for the thoroughness with which the details of construction have been executed. For example, portable jacks and rail clamps are hung under the car sills to permit of quickly leveling the car body so that no undue stresses will be thrown on the electrical apparatus supported by the car floor. The proper adjustment of the jacks is ascertained by the inspection of level bubbles recessed in the sheathing of the car and protected by glass. To permit of greater freedom of movement inside the car body all the low-tension wiring carrying both direct and alternating current is placed in a conduit below the car floor. Over this conduit the floor is made usable by placing, as a cover for the boxes containing the wiring, a removable wooden grille-work strong enough to bear the weight of the occupants of the car and yet light enough for portability. The openings

Well-Built Portable Substations.

in the grating provide ventilation and means for observing whether or not the cables are all in normal operating condition. The transformers receive current at 60,000 volts potential. It is thought that these portable equipments are the only ones now operating under such a high transmission voltage. The entrances to the car for the transmission wires are made through large glass plates. This satisfactory method not only affords sufficient insulation, but amply serves to light the transformer end of the car body. Where it is feasible to use portable substations as auxiliaries to the permanent equipment and where it is known that such stations will be required for some time, it would seem wise that special care should be taken, as exemplified in the Northern Electric Railway substations, to provide, by careful construction, an assurance of as few possibilities of breakdown as might be expected from the types of permanent substations now in general use.

Discussion on the subject of freight accounting forms and methods at the Indianapolis meeting of the Central Electric Accounting Conference on June 1 revealed the entire absence of uniformity in the forms used by the various roads for handling freight accounts. As the interchange of freight between connecting roads in

Forms in Freight Accounting.

Ohio and Indiana will increase steadily in the natural course of events, the adoption of uniform forms by the various lines will facilitate the work of the accounting departments. Although the requirements of the different lines may vary, the committee which has been appointed to consider the subject will endeavor to frame standard forms which will meet the needs of each road. The exchange of ideas and consideration of forms now in use may point the way to improvement in the practice of different lines even if the preparation of uniform forms, on account of different conditions of business, should prove difficult. The committee will undoubtedly bear in mind in its work the patent fact that the handling of freight on interurban roads contains promise of great growth, and will recommend forms which, viewed in the future with heavier traffic conditions, will be found satisfactory.

Though the New York public utilities law may do no more harm under an able, well-meaning governor than to inconvenience and harass the railways and to bring about a gradual reduction of enterprising construction and improvement work, which would assist in upbuilding the state, its possibilities for evil in the hands

New York Public Utilities Law.

of demagogic authorities are enormous. No one can read thoughtfully the abstract of the new law, which is printed in another part of this issue of the Electric Railway Review, without a full realization of the extreme limits which the public agitation against corporations has reached. Fares, rates, schedules, equipment, appliances, capitalization, franchises, accidents, reports, improvements, terminals, tracks, investments, new issues of securities—all these and many other essential matters in the operation of street railroads are hereafter to be supervised. The soul of the new law is supervision run riot. Hereafter the people who are most familiar with local conditions and requirements are not to decide how roads shall be operated; commissions which may be removed by the governor on 10 days' notice have the fullest power in the decision of important questions which the law can give. Stockholders may continue to elect directors, and directors to choose officers; but the commissions, and not these officers, may be supreme in the management of the properties. The companies may petition for a rehearing on any question, but the bill has become a law without any provision for a court review of the findings of the commissions. The endeavor to be fair to the public stirred the framers of this law intensely, but the law would not have been

weakened had there been included a provision for a court review in the event of unwarranted decisions.

A GOOD ROADBED AND TRACK.

The maintenance of track in satisfactory condition is so essential to perfect service and such a large proportion of the total operating expenses of a road are spent for this purpose that more consideration of the subject may well be given. At the outset it should be remembered that the expense of maintaining track in surface is greatly reduced if a proper and solid foundation is provided for the ties and ballast. Only the soundest and hardest material should be used to form a satisfactory foundation upon which the track may be built. Spongy or water-holding clay and quicksand should never be used, and where the roadbed is built on such soils at least three or four feet of some solid material should be placed on top of the surface. In grading through cuts, any spongy clay or quicksand should be removed to a sufficient depth to allow placing three or four feet of proper ballast under the ties. These considerations of proper foundation are intimately related to the drainage problem, which is one of the most important in the proper and economical maintenance of track.

The first essential of a good roadbed is that it should be kept well drained. If the roadbed is built of material which will hold water, frequent cross drains should be provided, say, every 500 feet. To maintain surface ditches in an efficient condition the shrubs and growth should be removed at least once a year. It is likewise important that all ditches should have a free outlet to prevent any obstruction to the flow of water from them. Difficulty may be experienced in maintaining the drainage ditches in cuts if the proper slope is not maintained.

The short-sighted policy of making the top of fills barely wide enough to support the ties has been followed by a goodly number of railway companies, with the result that a large amount of money is spent yearly for reclaiming ties, ballast and rails which have rolled down high banks. When this needless expense is considered, the wisdom of a slightly increased first investment in a sufficiently wide roadbed will be evident.

The depth of ballast on new roadbeds should be at least 12 inches. Hard stone ballast is a good investment, for not only does it materially reduce the cost of maintenance of the track, but a uniform and even surface can be maintained, resulting in smooth riding at high speeds, and the absence of dust is a point which receives the most favorable consideration of the passengers. When gravel ballast is employed, if possible, it should be washed to remove dust and clay, for if this is not done it becomes soft in wet weather, and in spite of the most careful precautions to properly drain the roadbed it will soon heave out of surface. We recall a western road that obtains excellent gravel ballast from gold-dredger tailings. Stone ballast has an advantage over gravel in that it can be worked in wet weather.

In selecting ties particular attention should be given to uniformity of dimensions, as an equal extension of the tie beyond the rail on both sides is of considerable importance in maintaining track in true surface. When ties are to be renewed, if permissible to make a general renewal of the track, the best results are obtained by raising the rails with jacks to a sufficient height to remove the ties without disturbing the roadbed under them; new ties can then be put in place and the track carefully resurfaced. The ballast under the ties should be carefully tamped, the best method for surfacing being to raise one end of the tie, tamp the ballast under it and then raise the other end and tamp the ballast until the rails are in true surface. The tamping should be hardest near the end of the ties and comparatively light near the center, since this will prevent the ties from becoming centerbound. To obtain a thorough job when re-

surfacing is done, the tamping the first day should be comparatively light, and then for the two or three days following the track should be carefully tamped and resurfaced. This prevents the track from sagging, due to the natural settling which will occur for the first few days after the track has been resurfaced.

It is hardly necessary to comment on the absolute necessity of perfect gauging and having the track absolutely straight on tangents. On curves the gauge of the track should be increased slightly, depending upon the radius, the general increase of gauge on curves for steam railroad practice being from $\frac{1}{8}$ to about $1\frac{1}{2}$ inches. Breaks of grade in the track may make it impossible to line up long tangents without the use of instruments. The value of using surveying instruments for correctly lining up tracks and for properly locating the center line of long curves should not be overlooked.

While these essential requirements for a good roadway may read like an elementary treatise of the subject, it is well to remember that the traveling public forms its opinion of any service largely from the relative degree of comfort which it is afforded. With a smooth track, comfortable riding is assured, and together with that desirable feature is the one of lower cost of rolling stock maintenance which is assured by not "rattling" good cars over a poor roadway.

PERMANENCE IN POWER HOUSE DESIGN.

One of the most notable features of modern power-house design is its substantial and lasting character. In very few of the later stations is there any evidence of temporary or uncertain work, and this is why each new installation completed by responsible engineers and built along progressive lines is of so much interest as representing the most modern tendencies of practice. Thus, the keynote of the design of the new railway lighting and power plant of the Potomac Electric Power Company near Washington, D. C., is permanence and solidity of construction. The plant represents standard practice in many features of the cycle between the coal pile and the outgoing feeder system, but in its large capacity, liberal use of concrete in walls and foundations, and provision for continuous service it is of special interest.

The use of concrete piles in power-house construction is a marked tendency of the times in the later installations. The extensive applications of concrete in the field of power-plant building, both reinforced and plain, contribute to the permanence of the construction and tend to reduce the first cost of the station as well. By the use of concrete piles there has already resulted in not a few cases a decided saving in the investment for foundations, and this without much regard to the condition of the soil. For a given load fewer concrete piles are required, and less excavation and a smaller amount of masonry are needed than when wooden piles are used. The first cost of the concrete pile itself is generally much higher than that of its wooden competitor, often from 50 to 100 per cent more per foot, but the concrete pile has a much larger bearing surface in proportion to its cost. In average practice the area of the concrete pile at the top may be 2.5 or 3 times as great, and the greater amount of tapering possible enables a much less quantity of lineal piling to be used than when the wooden pile of small taper is driven. The speed with which concrete piles can be driven is another favorable point; in a single day from twenty to thirty can be sunk under average conditions of driving. Of course, the driving must be properly done—and thus far there has not been much success in the driving of concrete piles after they have been built. This is a matter of arranging a suitable guarantee in the contract with the pile makers, for at present the processes of concrete pile driving are rather closely controlled. The larger the plant the more likely it is that the use of the concrete piles will pay, though in all cases costs,

results and material should be carefully figured in advance of deciding whether or not wood shall be used. In a plant as large as the Potomac station, which is designed for a normal rating of 19,000 kw., the advantages of concrete pile construction should be easily demonstrated. The reinforcement of the foundations of the main generating units with steel rails and the tying together of all the foundations to prevent uneven settlement and to distribute the load properly is an excellent feature of the construction. In street railway work there is often no need of buying expensive patented reinforcing steel bars of special shapes when old rails are available.

In compactness, the Potomac plant makes a good showing, even in comparison with recent gas engine stations. To develop a kilowatt on 1.52 square feet of total floor area is doing better than the reciprocating steam and high-class gas engine plants of the day show, though the latter type are as yet installed in such small sizes that perhaps a fair balancing must come later. It is impossible, however, to study the layout of the Potomac station without being impressed with the concentration of equipment, which allows straightforward production of power with very little doubling back of main steam lines or auxiliaries. The double-aisle arrangement of the boiler room is not objectionable from the standpoint of ease of control, particularly as mechanical stokers are used, but in all such cases there is little doubt that all the steam gauges—or one extra set—should be produced on a single central tablet or panel, so that the boiler room foreman can at all times be instantly acquainted with the situation. It may pay to duplicate the water columns, too, where the attendance is small, though the low-water column and fusible plug ordinarily are enough to prevent trouble of any serious nature.

The use of equalizer pipes, long-radius bends, concentration of auxiliary piping in the basement and the installation of two feed-water heaters all make for continuous service, and the control of the feed supply from two points is an economical feature. The removal of the auxiliary machinery from the more or less unskilled supervision of the boiler house is also commendable, as is the use of dull finish on the switchboard instead of the trying glaze of older practice.

Economy of operation should be well served by the choice of two sizes of generating units, enabling the station to be run with highly efficient combinations as to lighting, railway and power loading. In a plant of this kind the load factor is so much more flexible than in a pure and simple railway station that the use of two sizes of generators ought to be thoroughly satisfactory in relation to the efficient production of current. The relatively large heating surface of each boiler—6,040 square feet—should also tend toward economy in the consumption of fuel. Superheated steam in such an installation is a matter of course.

Defrauding with Duplicate Registers.

An ingenious conspiracy by which two employes have been systematically robbing the Calumet Electric Street Railway Company of Chicago out of a large portion of their collections of fares was discovered by officials of the company last Saturday, June 1. The two men, one a motorman and the other a conductor, had taken a fare register of the removable type from the storeroom at the car house and had been using it during rush hours in place of the official register. The stolen register was used on the trip out, and at the end of the line, or whenever it could be done unobserved, the official register was replaced and the fares registered on the "dummy" register were pocketed by the men. The attention of the company was first called to the practice through the auditor's trip reports, which showed an abnormal decrease at times, and detectives were employed to watch the men. The detectives caught one of the men last Saturday in the act of changing the registers and they were arrested on charges of embezzlement.

THE NORTHERN ELECTRIC RAILWAY.

On April 25, 1906, regular service was started on the portion of the new line of the Northern Electric Railway Company between Chico and Oroville, Cal. On December 3, 1906, this service was extended to Marysville, 35 miles south of Oroville. Reference to the accompanying map will serve to show the geographical location of the present operating line

surveyed, right of way has been secured and grading camps have been established, so that roadbed construction work can be started in the near future.

Other than this extensive interurban system with a straightaway mileage of 131.5 miles of main track and 38.1 miles of branch line, the Northern Electric Railway Company operates local service in Chico and Marysville. There are 5.5 miles of track in the latter town.



Northern Electric Railway—Standard Trestle and Bridge Spans.

of this company, the mileage now under construction and the proposed extensions. The towns which the new road will serve derive a substantial support from the exceedingly fertile valley of the Sacramento river, along which the route of the new line extends.

Routes.

The new road is now in complete operation between Chico and Marysville, 48.8 miles. Near the middle point of this

The topography of the valley through which the new line is built is such that an excellent roadbed suitable for high-speed operation has been obtained.

Roadway.

The tracks outside of the towns are built along a fenced private right of way, varying in width from 80 to 100 feet. In Sacramento this private right of way extends to the center of the city. There are few curves and one 9-mile tangent.



Northern Electric Railway—Locomotive with Freight Train.

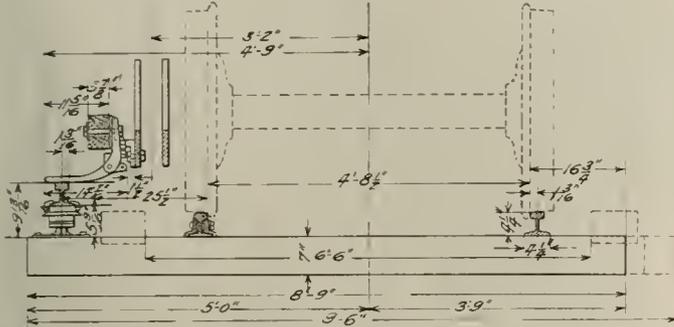
section of the line is a branch 5.5 miles long to Oroville. South from Marysville, 41 miles to Sacramento, grading has been completed and service is planned for September 1 of this year. From Marysville west to Colusa, a distance of 21.6 miles, a right of way has been purchased and preparations have been made for early construction. From Chico west 11 miles to Hamilton, all preparations have been made for immediate construction of a branch line. The route of an extension north from Chico 41.7 miles to Red Bluff has been

The ruling grade and curvature, which, however, are comparatively light, occur on the Chico-Oroville division. The curve of shortest radius is one of 6 degrees, this occurring near Oroville, on the branch line. In the 48.8 miles of route between Chico and Marysville there are only three curves outside of the city limits, and none of these is sharper than 3 degrees. The maximum grade of the entire road is 0.5 per cent.

The track construction is of standard dimensions, using

60-pound rails bonded at the joints with two 500,000-circular-mil Chase-Shawmut soldered bonds. This track is gravel ballasted from an excellent supply obtained in the company's pits at Oroville, near the middle of the route. The company also is establishing a rock-crusher plant and will use part of its output as ballast, selling the rest for commercial purposes. Sidings are approximately five miles apart.

Except in towns where standard overhead trolley construction is necessary, and here the Brown pantagraph trolley



Northern Electric Railway—Track and Third Rail Measurements.

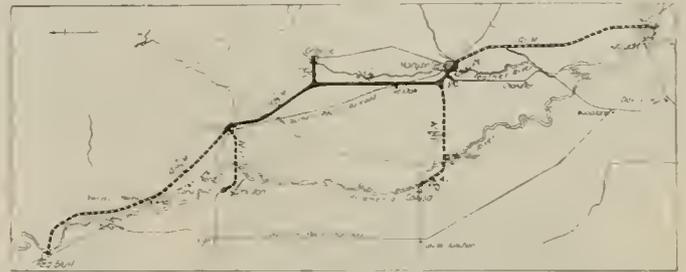
is used, current will be distributed to the cars through a 60-pound third rail. Thirty-five miles of the route is now so equipped. The third rail is bonded at the joints with two 250,000-circular-mil Chase-Shawmut soldered bonds. At road crossings the ends of the third rail on opposite sides of the highway are connected with a copper conductor of 500,000-circular-mils cross section inclosed in a bituminized fiber conduit and buried. The ends of this conduit are filled with insulating compound to keep out water. One of the accompanying illustrations shows the general arrangement of track and third rails at a switch. It will be noted that a variation from the usual practice occurs in the omission of the drop rail opposite the switchpoint.

Substations.

Current for the operation of the entire line is purchased from the Pacific Gas & Electric Corporation, being delivered to the substations at 60,000 volts potential from the Bay Counties transmission system, which is fed by numerous hydroelectric plants. The selling company owns the step-down

side walls are covered with a cement plaster supported on metal lath. The gable ends have metal lath on both sides and are covered with cement mortar, thus forming a double wall. The roof structure is supported on a timber truss with iron rods as tension members. The weather surface comprises No. 24 corrugated galvanized iron, laid with 10 inches lap. Inside the building the roof is ceiled with No. 28 painted corrugated iron. Accompanying illustrations will serve to show the interior arrangement of the structure and the disposition of the apparatus.

The equipment for each standard substation comprises a



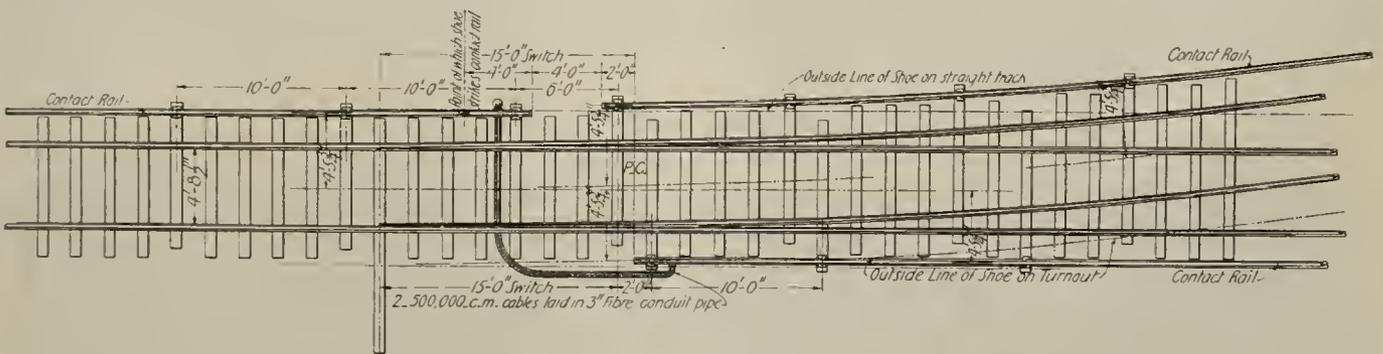
Northern Electric Railway—Map of Lines in Operation and Under Construction.

three-phase 60-cycle 2,200-volt induction motor, direct-connected to a 400-kilowatt 600-volt railway generator, both machines of this unit being of Westinghouse manufacture. Three transformers, each of 150-kilowatt capacity, oil-insulated and water-cooled, step down the line pressure from 60,000 volts to that of the motor-generator set, 2,200 volts. The switchboard comprises the following panels: Starting, induction motor, railway generator and two feeder panels.

Opposite each substation a circuit-breaker sectionalizes the third rail. Current is taken from the feeder panels underground through fiber conduit to the track.

Portable Substations.

The Northern Electric Railway now has in operation two 60,000-volt portable substations, each of 400-kilowatt capacity, that were designed and built at its shops in Chico. These substations, illustrations of which are shown, are believed to be the only portable stations in existence which receive current at 60,000 volts potential. The equipment in each substation is similar to that in the permanent substations earlier



Northern Electric Railway—General Arrangement of Track and Third Rails at Switches.

transformers in the substations and delivers current to the Northern Electric Company at 2,200 volts pressure.

There are five substations of the type shown in the accompanying illustration, located along the route adjacent to the right of way. The equipment in all these stations is similar except in one instance, where there is a duplication of the standard apparatus. The substations are approximately 10 miles apart.

The construction of the substation buildings differs somewhat in appearance and materials from the type used on eastern roads. The building frame is of timber supported on concrete foundations. The floor is made of concrete and the

described, except that the three 150-kilowatt transformers are oil-cooled. The high-potential current is led to the transformers, which are mounted over one pair of trucks through entrance windows insulated with large sheets of glass. All the 2,200-volt wiring is carried in ducts below the level of the car floor. Above the ducts the floor is made of wooden grating, so that any disturbance below can quickly be noted. Repairs are thus facilitated and ventilation provided. All potential and current coils and the autostarter for the induction motor are also carried under the car floor.

The cars which contain the portable substation apparatus were built especially for this purpose. Each is 40 feet long

over all, 10 feet wide and 14 feet from rail to roof. It will be noted from the illustration that special means are provided for leveling the car. On each side of the car body, recessed in the sheathing, is a level tube with its glass and bubble unobstructed to view from the outside. Underneath the car, hanging from special anchors bolted to the bottom of the sills, are eight portable screw jacks. These jacks connect with their anchors by through pins, so that while the car is being moved they may be hooked up close to the floor. When it is desired to place a car for operation the jacks are let down. Next, portable tongs are clamped over the rail and then the jacks are manipulated, the level bubbles being observed meanwhile, until the car body is in such position that

company's engineering offices is shown. The buildings include a general car house and repair shop, with six tracks, two of which are over open pits, as illustrated. It will be noted that this building is a timber structure, sheathed and roofed



Northern Electric Railway—Typical Substation Structure.

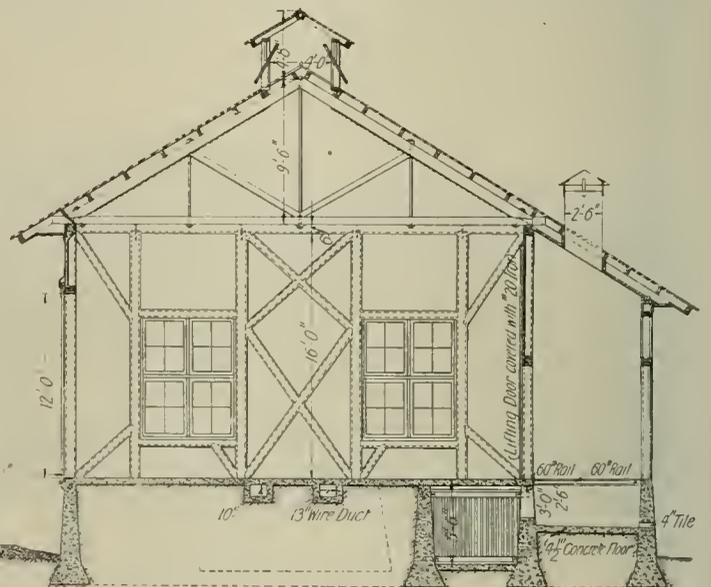
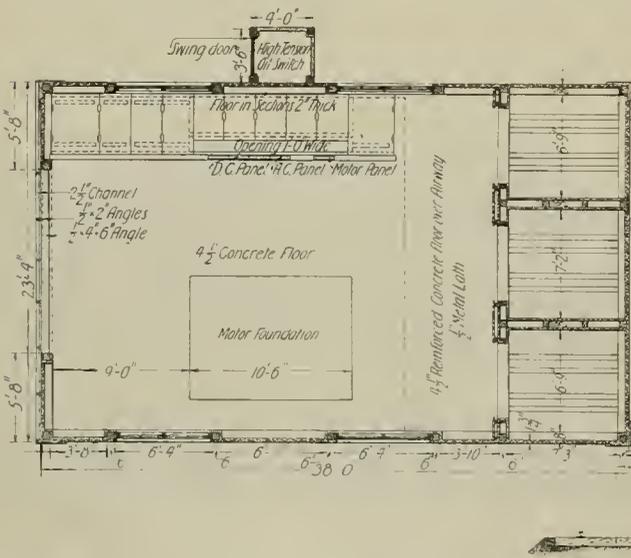


Northern Electric Railway—Interior of 60,000-Volt Portable Substation.

the shaft of the motor-generator set takes a horizontal position. It is stated that this operation can be performed in 10 minutes.

The complete weight of a portable substation equipment ready for operation is 90,500 pounds. Some of the details making up this total are machinery, 42,000 pounds; trans-

formers, 30,000 pounds; switchboard and electrical equipment, 10,000 pounds. The portable substations are equipped with automatic couplers and automatic air brakes. These latter mentioned departments are housed



Northern Electric Railway—Floor Plan and Vertical Section of Substation.

formers, 30,000 pounds; switchboard and electrical equipment, 10,000 pounds. The portable substations are equipped with automatic couplers and automatic air brakes.

Shops.

The main shops for the through line and branches are located at Chico. A front view of these buildings and the

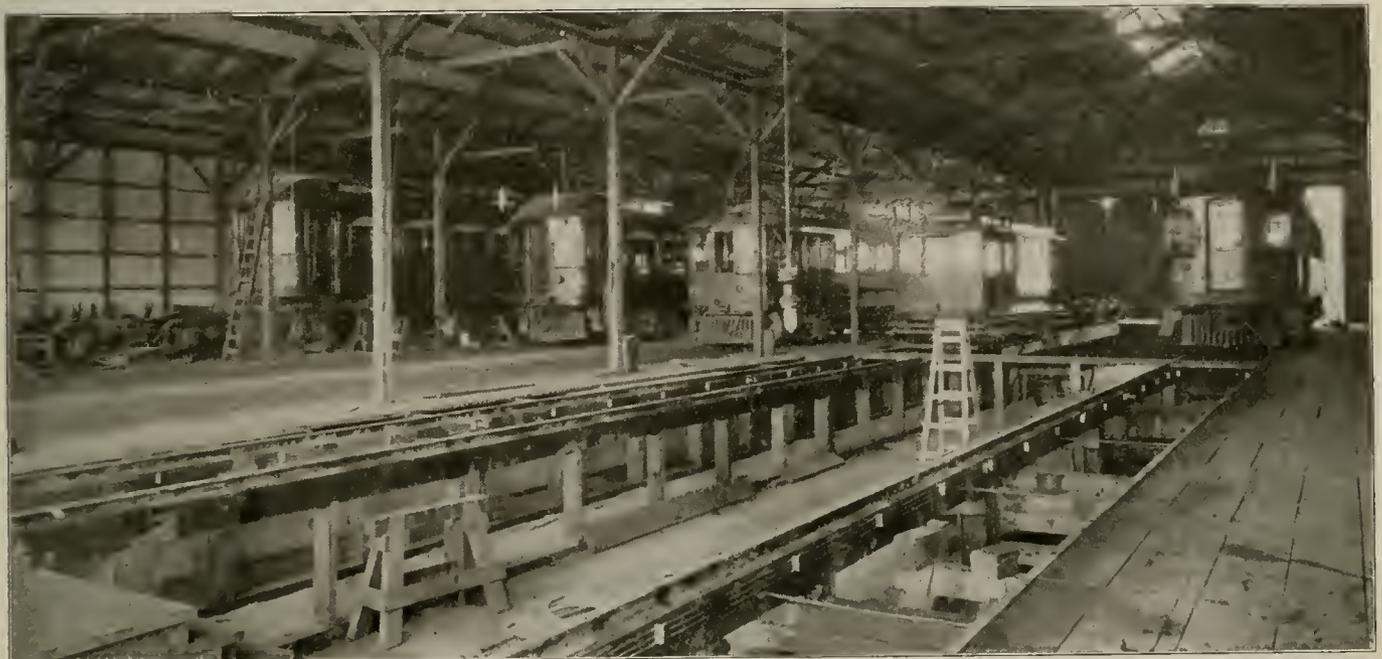
in one bay, the front of which is utilized as a substation.

At the rear of the shop just described is a similarly built structure in which are the painting, erection and mill departments. The paint and erecting shops each have two tracks and the mill is well equipped for the carpenter work necessary in the construction of freight and passenger cars.

The blacksmith shop is a separate building supplied with



Northern Electric Railway—Shops and Engineering Offices at Chico.



Northern Electric Railway—Interior of General Repair Shops.



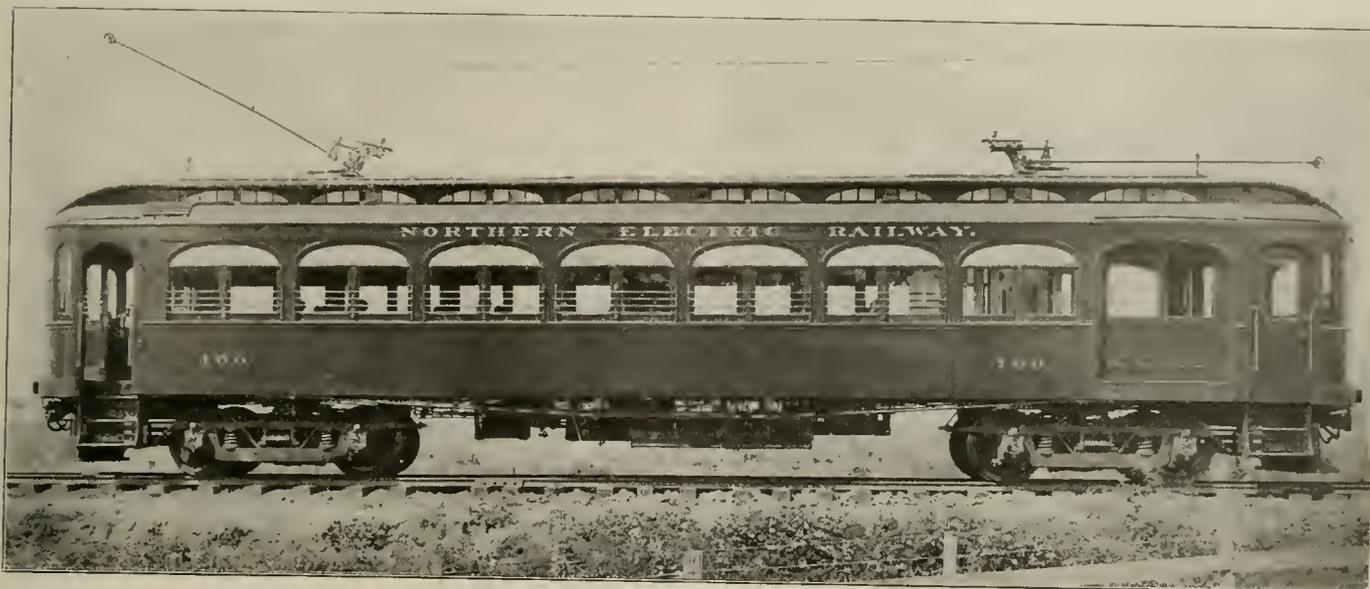
Northern Electric Railway—Portable Substation with 60,000-Volt Transformers and Motor-Generator Set.

and the cars are fitted with Westinghouse automatic air brake equipments and Gould radial couplers, with coupling heads conforming to the Master Car Builders' standard contour. The seats in the new cars will be upholstered in pantasote.

Locomotives and Miscellaneous Equipment.

The electric locomotive, as illustrated, has the same truck

Other miscellaneous equipment includes the following: One construction locomotive built as a flat car, having the same motor and brake equipments as the previously described locomotive and weighing about 40 tons; three 16 by 24 inch Baldwin steam locomotives, used for construction purposes; one 15-ton wrecking car, as illustrated, without motors; two hundred 40-ton standard M. C. B. flat cars, built by the Fitz-



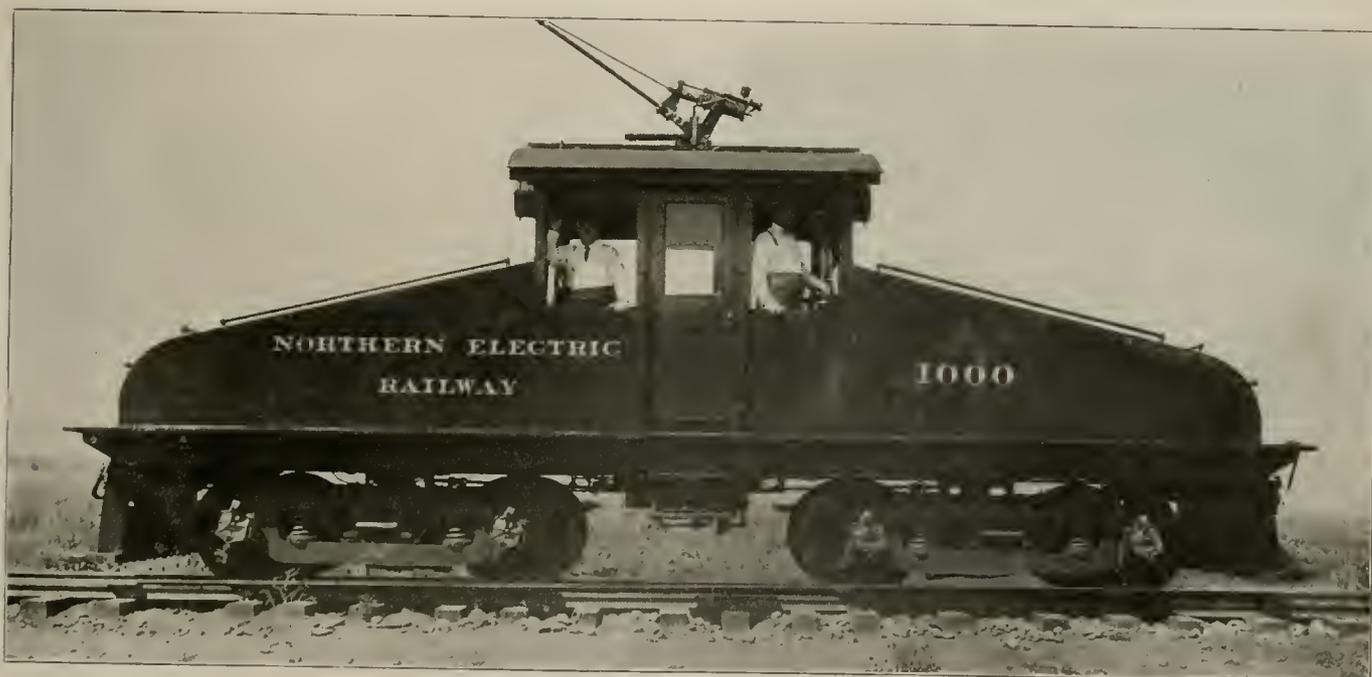
Northern Electric Railway—Standard 56-Foot Passenger Coach.

and motor equipment as the passenger cars. It is provided with General Electric type M control and Westinghouse schedule E T automatic air brakes. It weighs 32 tons and is regularly operated in freight service.

Material has been ordered for two steel-frame express

Hugh, Luther Company; 30 side-dump ballast cars; 20 flat cars of 30,000 pounds capacity each, and 30 box cars of 40,000 pounds capacity each. There have also been ordered recently 100 standard box cars to be used in freight service.

The equipment used in local service in Chico and Marys-



Northern Electric Railway—32-Ton Electric Locomotive.

locomotives of the type shown in one of the line drawings. The total weight of these equipments will be 41 tons each. The locomotives will be provided with Baldwin trucks, 36-inch steel-tired wheels, M. C. B. automatic couplers, Miner draft rigging, and Westinghouse 121 motors. Each car body is designed to carry a weight of 25 tons.

ville includes two California type cars, seating 40 passengers and weighing 24.7 tons each. These cars are equipped with four Westinghouse No. 93 motors and General Electric type M control. There are also in similar service four single-truck closed 28-foot cars and two double-truck 13-bench open cars, equipped with two G.E.-67 motors.

Traffic and Schedules.

The freight and passenger rates for the various services offered by the road are the same as those charged by the competing Southern Pacific Railroad. Passenger fares are based on a rate of three cents per mile. Eight passenger trains are run each way daily, which, with one freight train each way daily and four construction trains, comprise the regular service on the through line. In Chico, where there are eight miles of local track, a 15-minute headway is main-

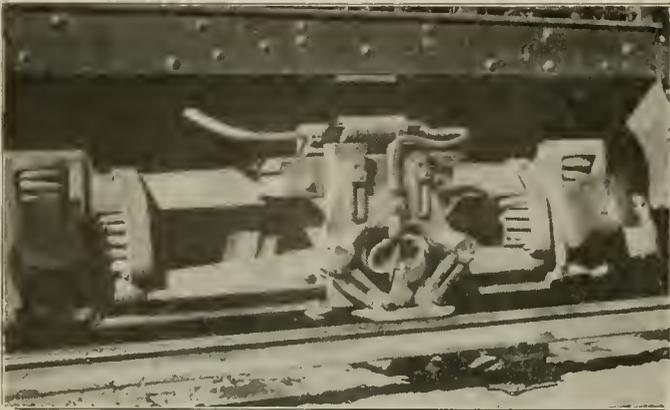


Northern Electric Railway—15-Ton Wrecking Car.

tained with four cars, and in Marysville a similar headway is maintained with two cars.

The passenger trains between Chico and Oroville make the run of 25 miles in 50 minutes and between Chico and Marysville, 48.8 miles, in 1 hour and 45 minutes. The competing steam line, which has a route four miles shorter than the Northern Electric, makes the run with no stops in 1 hour and 50 minutes. As soon as the new track of the Northern Electric is more thoroughly settled, the running time between Chico and Marysville will be cut to 1 hour and 15 minutes, or 35 minutes less than that of the limited steam trains.

The freight traffic at present, having had but a few



Northern Electric Railway—Method of Supporting Third-Rail Shoe and Connections.

months in which to be developed, amounts to the satisfactory total of from 15 to 20 carloads a day. The Northern Electric Railway interchanges freight with the Butte County (steam) Railway.

The car mileage for an average day in March of this year was 2,010 car-miles, made up as follows: Passenger cars on the interurban, 967.30; local in Chico, 540.72; local in Marysville, 124.80; freight mileage, 146; switching, 31.61, and construction, 200. The power used on this same day was 13,965 kilowatt-hours on the interurban lines and 1,256 kilowatt-hours on the city lines.

The dispatching of trains is handled by telegraph from a dispatching office at Chico. There is also a telephone circuit with instruments in the telegraph stations, which equipment

can be used in emergency. On an average there are issued in a day 45 train orders of the standard No. 19 and No. 31 forms.

The Wells Fargo Express Company maintains offices at the electric railroad station and handles its business with messengers on the regular cars.

Personnel.

The personnel of the Northern Electric Railway Company is as follows: President, Henry A. Butters; vice-president, Louis Sloss; general manager, A. D. Schindler; general superintendent, E. A. Dimmock; chief engineer, C. S. Compton; electrical and mechanical engineer, J. P. Edwards.

SECOND MEETING OF CENTRAL ELECTRIC ACCOUNTING CONFERENCE.

The Central Electric Accounting Conference held its second meeting at the Claypool hotel, Indianapolis, on June 1. There were present 19 officials, representing the following companies:

Columbus Delaware & Marion Railway Company; Dayton Covington & Piqua Traction Company; Dayton & Troy Electric Railway Company; Indiana Columbus & Eastern Traction Company; Indianapolis & Cincinnati Traction Company; Indianapolis Traction & Terminal Company; Indiana Union Traction Company; Indianapolis Columbus & Southern Traction Company; Lima & Toledo Traction Company; Scioto Valley Traction Company; Terre Haute Indianapolis & Eastern Traction Company; Western Ohio Railway Company.

Together with accounting representatives of the roads interested a number of representatives of traffic departments of the various lines were present on invitation and they discussed matters relating to the handling of freight and passenger business.

Checking Mileage Coupons.

In addition to further discussion of the plan of settlement of interline accounts, which was adopted at the first meeting of the conference at Dayton, O., on March 2, several other subjects were taken up. Among them was the method which is followed in checking Central Electric Railway Association and other mileage coupons. It was found that all roads check coupons daily, separating the collections by lines and making a recount of all coupons at the end of each month before forwarding them to the issuing lines.

Recording Interline Waybills.

The method of recording interline billing passing junction stations was considered. The discussion developed the fact that most lines have a system for recording interline waybills passing junction stations, using a book record. The general opinion of those who were present was that it is advisable to have a report of all interline waybills passing junction stations made in triplicate; a copy to be forwarded to the accounting departments of both the receiving and the forwarding line and a copy to be retained for the agent's record. It was decided to have a form embodying this arrangement printed and it will be adopted by a majority of the lines handling interline billing.

The handling of freight and express shipments from non-agency points was also discussed. The general practice of the roads is for conductors to make waybills for all shipments handled from stations where no agents are located. Some lines require the conductor to make a forwarded report covering all shipments handled and others require such report to be made by the next regular agent. In the latter instance the conductor turns over to the agent a copy of the waybills made. Other lines which do not require the conductor to make waybills follow the practice of steam roads and have the waybills for such shipments made by the next regular agent.

Freight Accounts.

There was a full discussion on the subject of freight accounting forms and methods. It was found that each road has different forms of waybills and reports, and that while

there was a similarity in some cases between the forms used by certain lines, the forms were entirely different. After the consideration of this subject it was the unanimous opinion of all who were present that it would be advisable for roads interchanging business to adopt uniform waybills and accounting forms as far as practicable, and on motion of W. F. Forse, Jr., assistant treasurer of the Indiana Union Traction Company, Anderson, Ind., a committee was appointed to obtain copies of all freight accounting forms in use on the different roads and to make a report at the next regular meeting of the conference recommending the best forms to be adopted for handling freight accounts. This committee is as follows:

R. A. Crume, auditor Dayton & Troy Electric Railway Company; Walter Shroyer, acting auditor Indiana Union Traction Company; H. A. Baymiller, freight auditor Toledo Urban & Interurban Railway Company; C. B. Baker, freight auditor Western Ohio Railway Company; M. W. Glover, auditor Indiana Columbus & Eastern Traction Company.

The hope was expressed that the committee may be able to investigate fully the necessities of the different lines and that it will succeed in preparing forms which will be acceptable and also adaptable to all conditions which may arise. The members of the conference were requested to forward to C. B. Baker, the secretary, freight auditor of the Western Ohio Railway Company, Lima, O., samples of all freight accounting forms in use on their respective roads, together with any suggestions which they desire to offer the committee in assistance of the work.

Interline Freight and Ticket Accounts.

In the discussion of the plan of settlement of interline freight and ticket accounts adopted at the Dayton meeting the fact was brought out that some lines are unable to have their reports made and forwarded by the date fixed in the agreement. The unanimous opinion was that it was not advisable to extend the date, but that all lines should endeavor to conform to the date and to forward their interline freight and ticket reports as soon after the 15th day of the following month as possible.

Interline Billing, Ohio and Indiana Roads.

As considerable freight and express is handled between Indiana and Ohio roads and a definite understanding was necessary in order that this business might be taken care of properly, arrangements were made for interline billing between the lines. The secretary was instructed to prepare the details of this interline agreement and to forward the agreement to the lines interested. The agreement will not interfere with the agreement for interline billing which is now in effect between Ohio lines. Up to the present time there has been no written agreement between the Indiana and Ohio roads for the interchange of interstate business.

Cash Fare Register.

On the invitation of J. W. Moore, roadmaster and chief engineer of the Indianapolis & Cincinnati Traction Company, Rushville, Ind., the conference examined a working model of a cash fare register which he has invented. The register presented a number of improvements and the explanation of Mr. Moore was very interesting to all the members.

W. L. Egly of the Egly Autographic Register Company of Dayton, O., addressed the conference on the subject of billing and his address indicated that he had given the subject much thought. This subject was referred to a committee to be handled in connection with the subject of freight accounting forms and methods.

As E. C. Spring, president and general manager of the Dayton Covington & Piqua Traction Company, invited the conference to visit West Milton, O., and offered the use of the club house at that place, it was decided that the next meeting of the conference will be held at Dayton, O., on July 13, 1907, when the invitation of Mr. Spring will be accepted.

PUBLIC UTILITIES LAW IN NEW YORK.

Governor Hughes of New York signed on June 6 the public utilities bill, following its passage by the legislature on June 5 over the veto of Mayor McClellan of New York City. The main features of the law as it affects street and inter-urban railways are given in the following abstract:

Two public service districts are created, the first including the counties of New York, Kings, Queens and Richmond and the second all other counties in New York state. There shall be one commission consisting of five members for each district. The commission in the first district shall have the powers conferred upon the rapid transit commission in 1891 and the acts amendatory thereto. The annual salary of each member of each commission shall be \$15,000, of counsel to commissions, \$10,000, and of the secretary, \$6,000.

The governor may remove any commissioner for inefficiency, neglect of duty or misconduct in office upon not less than 10 days' notice.

Every commissioner and every person employed is forbidden to solicit, suggest, request or recommend directly or indirectly to any common carrier, railroad corporation or street railroad corporation or to any officer, attorney, agent or employe thereof the appointment of any person to any office, place, position or employment. Every such corporation is forbidden and prohibited to offer to any commissioner, to counsel, to the secretary or to any person employed by the commission or by counsel any office or position or to give any free pass or transportation or any reduction in fare to which the public generally is not entitled, or free passage for freight or property, or any present, gift or gratuity of any kind. If anyone identified with the commission violates any provision of this section he shall be removed from office.

Power to Examine.

If a person subpoenaed to appear before a commission or commissioner fails to obey the command without reasonable cause or if a person shall without reasonable cause refuse to be sworn or examined or to answer a question or to produce a book or papers when ordered to do so or to subscribe and swear to a deposition after it has been reduced to writing, he shall be guilty of a misdemeanor and may be prosecuted in any court of criminal jurisdiction. If a person refuses without reasonable cause to answer "a legal pertinent question" or to produce a book or paper the commissions may apply to any justice of the supreme court, directing such person to show cause why he should not be committed to jail.

No person shall be excused from testifying or from producing books or papers upon the ground that the testimony or documents may contain incriminating matter, but no person shall be prosecuted, punished or subjected to any penalty for or on account of any act concerning which he shall under oath have testified or produced documentary offense; provided, however, that no person so testifying shall be exempt from prosecution for any perjury which may be committed in the testimony. Nothing herein contained is intended to give any corporation immunity of any kind.

After orders have been made by commissions application may be made for a rehearing and the commissions may grant such rehearing in their judgment. An application for a rehearing shall not excuse any corporation from complying with any order or operate to postpone enforcement thereof except as the commissions may direct.

Service and Facilities.

Every corporation performing the service of transportation of passengers, freight or property shall furnish such "service and facilities as shall be safe and adequate and in all respects just and reasonable." All charges made shall be just and reasonable and every unjust and unreasonable charge for any such service is prohibited.

Every common carrier shall file with the commission schedules showing rates. Unless the commissions order, no change shall be made in any rate which shall have been filed and published by a common carrier in compliance with this act, except after 30 days' notice. For good cause the commissions may allow changes in rates without requiring this notice and publication. Any common carrier shall not directly or indirectly by any special rate, rebate, drawback or other device or method charge a greater or less compensation for any transportation service, except as authorized, than it charges any other person or corporation for a like service. There shall be no undue or unreasonable preference, advantage or prejudice to any person or corporation or to any locality or to any particular description of traffic. Schedules of rates must be filed and published in accordance with the act by November 1, 1907. Free tickets or transportation may be given under certain familiar conditions.

A railroad corporation and a street railroad corporation shall not be required to interchange cars except on such terms as the commissions may direct.

Cars and Motive Power.

It is provided that railroad and street railroad corporations shall have sufficient cars and motive power to meet all requirements for the transportation of passengers and property which may reasonably be anticipated unless relieved therefrom by order of the commissions.

Every railroad and street railroad corporation shall upon demand issue either a receipt or bill of lading for all property delivered for transportation. No clause shall exempt such corporation from liability, loss or damage.

Examination and Reports.

Each commission shall have power to and shall examine railroads and street railroads and keep informed as to their general condition, capitalization, franchises and the manner in which their lines are conducted, not only with respect to the adequacy, security or accommodation afforded, but also with respect to compliance with the law. Each commission and commissioner shall have power to examine all books, records, contracts, documents and papers of any person or corporation subject to its supervision and to compel production thereof.

The form of annual reports required shall be prescribed. The commissions may also require corporations to file monthly reports of earnings and expenses. The annual report, covering the fiscal year ended June 30, shall be filed on or before September 30 of each year, but this time may be extended for a period not exceeding 60 days. Any corporation which fails to file its annual report within the time set or to make monthly reports, when required, within 30 days from the time required, shall forfeit \$100 for each and every day it shall continue to be in default. No other accounts except those prescribed by the commissions shall be kept, save those prescribed by or under authority of the United States.

To Investigate Accidents.

In its judgment each commission shall investigate the cause of all accidents which result in loss of life or injury to persons or property. Every common carrier, railroad and street railroad corporation is required to give immediate notice to the commission of every accident happening upon its line. Such notice shall not be admitted as evidence or used for any purpose against such corporation in any suit or action for damages growing out of the matter mentioned.

Each commission may investigate or make inquiry as to any act or thing done or permitted to be done by any such corporation.

Fares, Appliances, Etc.

Whenever either commission shall be of the opinion, after a hearing, that the rates or fares charged by any common carrier or railroad or street railroad corporation for transportation or that the regulations or practices of such corporation are unjust, unreasonable, unjustly discriminatory or unduly preferable, the commission shall determine the just and reasonable rates to be thereafter observed as the maximum to be charged for the service. Whenever the commissions shall be of the opinion that the regulations, practices, equipment, appliances or service of such corporations are unjust, unreasonable, unsafe, improper or inadequate the commissions shall determine upon changes to be made.

The commissions shall have power to require any two or more common carriers or railroad corporations, the lines of which form a continuous line of transportation or could be made to do so by the construction and maintenance of a switch connection, to establish through routes and joint rates, and in case this is not done the commission shall establish joint rates and declare the portion to which each carrier or corporation shall be entitled.

Improvements and Service.

If in the judgment of the commissions repairs, improvements or changes in the tracks, switches, terminal facilities or terminals, motive power or any other property or device used by any common carrier, railroad or street railroad corporation ought reasonably to be made or additions should be made thereto in order to promote the security or convenience of the public or employes, the commission shall, after a hearing, make an order directing such changes, and every corporation is required to make such changes.

If in the judgment of the commissions any railroad or street railroad corporation does not run trains or cars enough or operate motive power enough to reasonably accommodate the traffic, or does not run its trains or cars with sufficient frequency or at a reasonable or proper time with regard to safety, or does not run trains or cars upon a reasonable time

schedule the commissions shall have power to order an increase in the number of trains, cars or in motive power or a change of schedule.

Franchises May Not be Capitalized.

No franchise or any right under a franchise to own or operate a railroad or street railroad shall be assigned, transferred or leased, nor shall any contract or agreement affecting such franchise or right be valid unless the assignment or transfer shall have been approved by the commission. No railroad corporation or street railroad corporation shall purchase or acquire any part of the capital stock of any railroad or street railroad or other common carrier organized under the laws of the state unless authorized to do so by the commission; and except where stock shall be transferred or held as collateral security only with the consent of the commission, no stock corporation of any description other than a railroad or street railroad corporation shall purchase or acquire, take or hold more than 10 per cent of the total capital stock issued by any railroad or street railroad corporation or other common carrier organized under the laws of the state. Nothing in the law shall be construed to prevent the holding of stock heretofore lawfully acquired.

A common carrier, railroad corporation or street railroad corporation may issue stocks, bonds, notes or other evidence of indebtedness, payable at periods of more than 12 months after the date thereof when necessary for the acquisition of property, the construction, completion, extension or improvement of facilities, or for the improvement or maintenance of service or for the discharge or lawful refunding of obligations, provided that there shall have been secured from the commission an order authorizing such issue in a definite manner and stating that the capital to be raised is reasonably required for the purposes of the corporation. Such carrier or corporation may issue notes for proper corporate purposes, payable in periods of not more than 12 months, without such consent, but no such notes shall be refunded by any issue of stock or bonds or any evidence of indebtedness for more than 12 months without the consent of the commission having jurisdiction.

The commissions shall have no power to authorize the capitalization of any franchise or the right to own, operate or enjoy any franchise in excess of the amount (exclusive of tax or annual charge) actually paid to the state or to a political subdivision thereof as the consideration for the grant of such franchise.

The capital stock of the new corporation formed to merge the property of two or more other corporations shall not exceed the par value of the capital stock of the corporations involved, or such sum and such additional sum as may be actually paid in cash. No contract for consolidation or lease shall be capitalized in the stock of any corporation nor shall any corporation hereafter issue any bonds as a lien upon any such contract. Any street railroad corporation which shall violate any provision of this act or fail to comply with any order or requirement of the commission shall forfeit not to exceed \$5,000 for each offense.

It is provided that the new law shall go into effect on July 1, 1907.

Correction.

In the Electric Railway Review of June 1, page 718, in the article on the "Railway Track of the Past and Its Possible Development in the Future," an error is noted in the titles of Figures 2 and 3. Figure 2 was marked "Design for Rigid Permanent Way by Gustav Lindenthal." It should have been "Design for Rigid Permanent Way by J. W. Schaub." Figure 3 should have been "Railway Track in the Future—Design Proposed by J. W. Schaub for Track in the East River Tubes."

Traffic on the Chicago elevated roads for the month of May was large in spite of the unfavorable weather, and in every case shows favorable increases over last year. The South Side Elevated Railroad set a new high record for average daily passengers carried of 109,880, an increase of 13.09 per cent over 1906. The opening of the Englewood extension is principally responsible for the showing. The average number of passengers per day carried by the Northwestern Elevated Railroad was 94,204, a gain of 15.24 per cent, and by the Metropolitan West Side Elevated Railway 151,423, an increase of 10.70 per cent.

TURBO-GENERATING PLANT OF THE POTOMAC ELECTRIC POWER COMPANY, WASHINGTON, D. C.

The Potomac Electric Power Company, Washington, D. C., has recently built a new power house on the outskirts of the city, near Bennings Road Bridge. This interesting turbine installation, which develops a kilowatt for each 1.52 square feet of total floor area, was installed under the direct supervision of L. E. Sinclair, general superintendent of the Potomac Electric Power Company, and was designed and built by J. G. White & Co. of New York, to whom we are indebted for illustrations and data.

The general arrangement of the Potomac power station



Potomac Electric Power Plant—Exterior View.

is in many ways similar to a large number of the most modern plants except for a number of improvements in the disposition of the auxiliary machinery. The boiler room, which is arranged at right angles to the generating room, is 164 feet long by 180 feet wide; the turbine room is 164 feet long by 45 feet wide and the switchboard is located in a separate room 164 feet long and 15 feet wide. In the annex in which the switch compartment is located are also the offices for the engineer and the employes of the power house. The foundations rest on piles of the Raymond concrete construction, 30 to 40 feet long. The walls of the building are made of hollow concrete blocks manufactured by the Lake Stone Company, Washington, D. C. These, with the exception of the window and door lintels, are of a uniform size, 3 by 1 by 1 foot. All the wall and column footings are made of solid concrete, upon which is supported the superstructure of steel.

Boiler Room.

Provision has been made in the boiler room for 24 Babcock & Wilcox boilers, but at present only 16 are installed. The boilers are arranged in batteries of two, in four rows, forming two firing aisles, which are at right angles to the generating room. Four boilers provide steam for each turbine. Equalizing headers are installed, insuring against shut-down in case of accident to the piping system. The boilers are arranged in groups of eight to each one of the three 12 by 200 foot Webber reinforced-concrete chimneys, four boilers having one breeching in common. Each breeching is provided with an automatic damper-regulator.

The boilers are designed for a working pressure of 175 pounds per square inch. Each has a total water-heating sur-

face of 6,040 square feet. They are fitted with Babcock & Wilcox superheaters of the 2-loop type, each having a heating surface of 1,180 square feet, and capable of superheating to 150 degrees F. Roney stokers 12 feet 6 inches wide, having a grate area of 111.8 square feet, are installed. A Westinghouse simple engine is provided for operating the stokers of every two boilers by means of a weigh-shaft extending across the front of both.

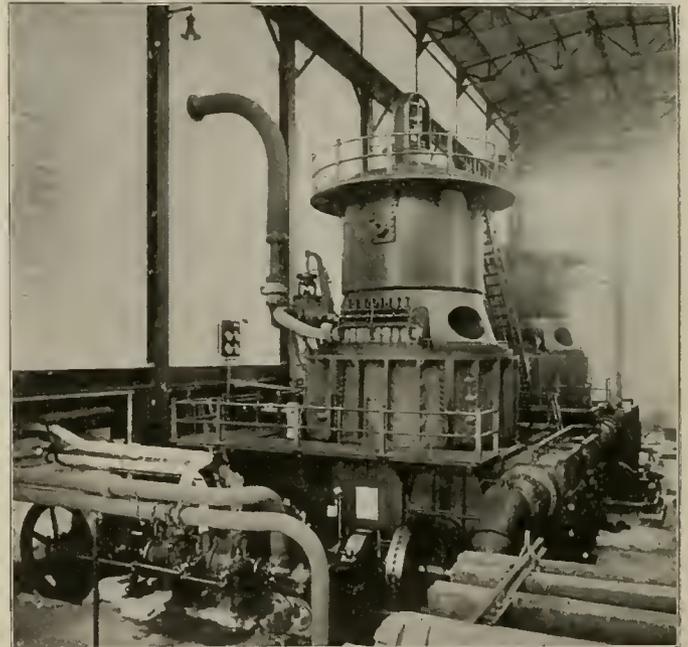
Coal and Ash-Handling Apparatus.

The coal will be fed to the stoker hoppers by gravity from steel coal bunkers suspended from the steel superstructure above the boilers. These bunkers have a capacity of 650 tons each and are filled by belt conveyors manufactured by the McGarlin Conveyor & Belt Conveyor Company. The conveyors have a capacity of 40 tons per hour. Reinforced concrete ash hoppers are installed in a similar manner between each end row of boilers and the boiler-room walls. These will have a capacity of approximately 50 cubic yards each.

Piping and Pumps.

Steel pipes and semi-steel flanges and fittings have been employed throughout the piping system. The Van Stone flange which is of the loose type is standard. The leads from all the boilers are 7 inches in diameter and are connected to the main header system by means of flexible bends as seen in the illustration of the main piping system presented herewith. The main steam header is 12 and 14 inches in diameter, depending on the number of boilers which discharge their steam into it, as is shown on the high-pressure piping plans.

An equalizer pipe 14 inches in diameter connects all the



Potomac Electric Power Plant—General View of Turbine Room, Showing Two of the 5,000-Kilowatt Units with Condensing Auxiliaries.

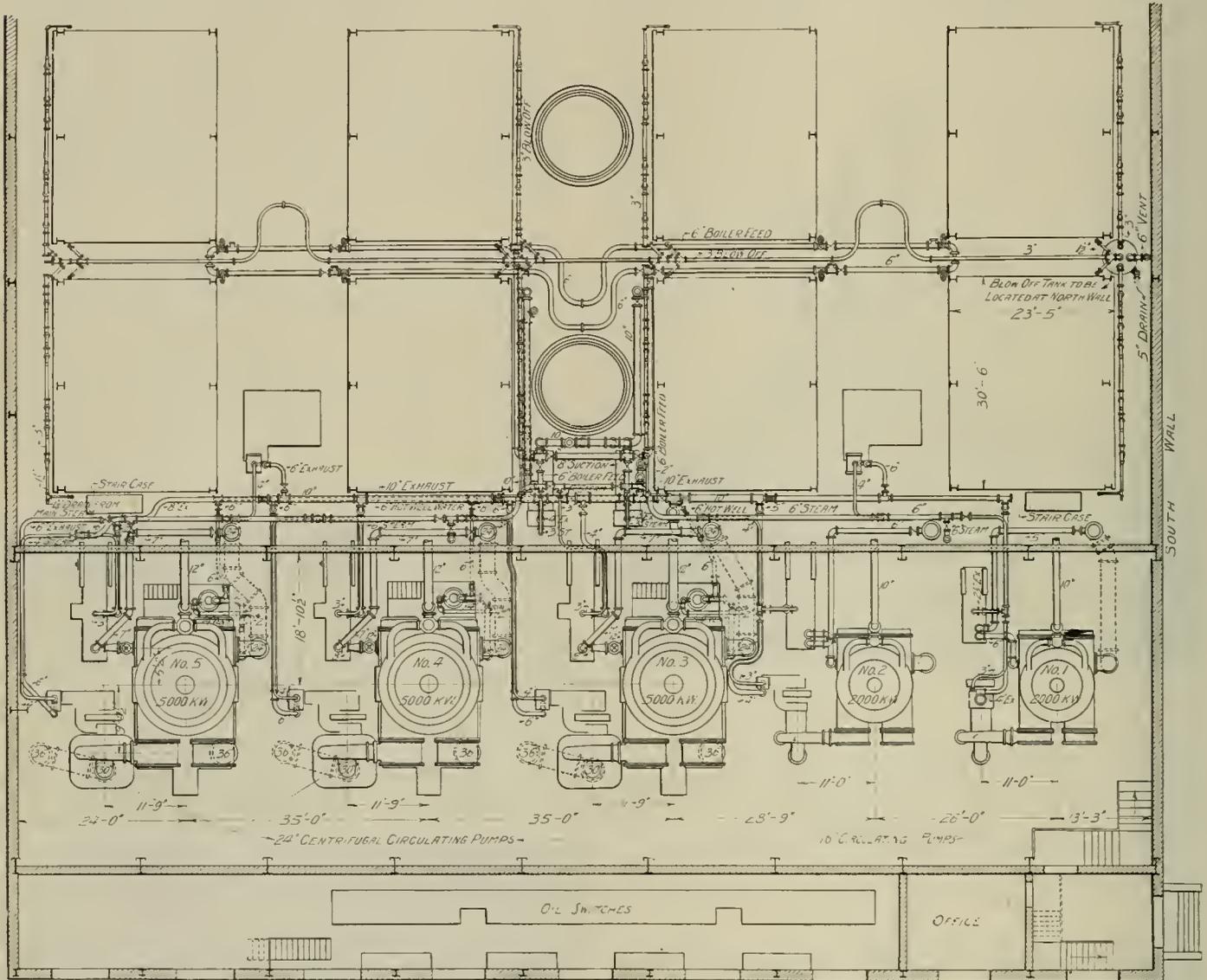
batteries of boilers. An examination of the illustration will show that regardless of where a break took place, under the most unfavorable conditions, not more than three boilers could be disabled at one time.

As the steam in normal operation in a superheated condition and a small amount of water passing to the turbines will cause no serious difficulty, it was not deemed necessary to install separators on the pipe line. To drain the pipes, however, a drip system was installed which is fitted with four 1¼-inch Squires steam traps, which are placed in the basement of the boiler room. Return water from these drips is passed into the feedwater heater.

The auxiliary header is all of 6-inch pipe. The main auxiliary header draws steam from the 14-inch header by taps at three points, and is provided with a drip system and two $\frac{3}{4}$ -inch taps. All the auxiliary piping as well as the blow-off and feed piping has been placed in the boiler-room basement, thus preventing the liability of accidents, and making it more accessible for repairs. Loss of heat is prevented by a covering of 85 per cent magnesia which is fitted to all the live steam piping.

Two Warren-Webster open feedwater heaters have been

direct-connected to a 15-horsepower General Electric three-phase 220-volt induction motor. The discharge from the hot-well is led to the feedwater heater. Laidlaw-Dunn-Gordon dry-vacuum pumps 12 by 25 by 18 inches, making 125 revolutions per minute, are installed to remove the air and vapor from the condensers. The vacuum pumps for the 2,000-kw. turbine are 10 by 22 by 18 inches, 125 revolutions per minute, and of the same type and make as the larger units. The step-bearing pumps are 9 by $3\frac{1}{2}$ by 10-inch Worthington duplex pumps, and a 30-gallon pressure storage reservoir has been provided



Potomac Electric Power Plant—General Arrangement of Turbines, Piping and Boilers.

installed designed to heat the feedwater from 80 degrees to 205 degrees F.

Pumps.

Two Epping-Carpenter horizontal duplex feed pumps 16 by $10\frac{1}{4}$ by 16 inches have been installed. These feed pumps, which are controlled by Ford feed regulators, discharge into a 6-inch ring header from which branches are carried to each boiler.

The circulating pumps for the condensers of the 5,000-kw. units are 24-inch Worthington centrifugal pumps direct-connected to a medium-speed Harrisburg engine with cylinders 12 by 14 inches, making 250 revolutions per minute. A 16-inch Worthington centrifugal pump and Harrisburg engine are provided for each of the condensers of the 2,000-kw. turbines.

The condensation from the condensers is handled by a vertical-shaft, 4-inch, two-stage Worthington turbine pump

to guard against failure of the pumps. Three are provided at present, but provision was made for installing another pump when the additional turbine units are added. The house pumps are $7\frac{1}{2}$ by 10 by 10-inch Epping-Carpenter steam pumps and the two auxiliary pumps are of the same manufacture, but are only 6 by 4 by 6 inches.

The valves on all the main lines are of Chapman manufacture and the 24-inch atmospheric relief valves on the turbines were furnished by Worthington.

The feed pumps, feedwater heaters, steam traps and the exciter units are located in a part of the boiler-room basement which is separated from the remainder by a hollow concrete-block wall.

Main Generating Units.

The foundations for the turbines are not built on piling as are the walls, owing to the arrangement of the circulating

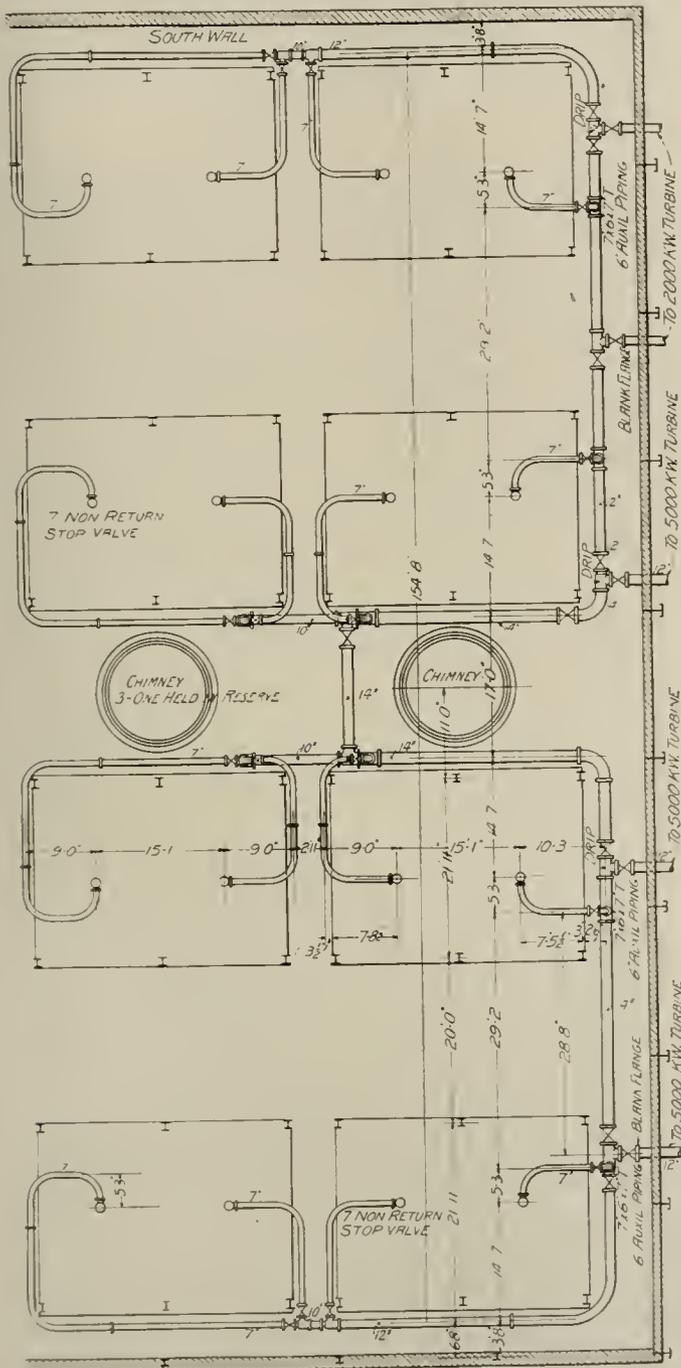
water conduit which passes through the turbine foundations and extends the entire length of the building. These conduits, which each have a cross-sectional area of 40.5 square feet, are constructed of concrete in which are embedded a large number of rails, thus uniting all the foundations, preventing the uneven settlement of the turbines and also distributing the load over a larger area. There will be eventually three

valve. The atmospheric relief pipe is taken out of the condensers instead of from one of the intermediate stages, as was the former practice as exhibited in the turbines at the Old Colony Street Railway plant in Providence.

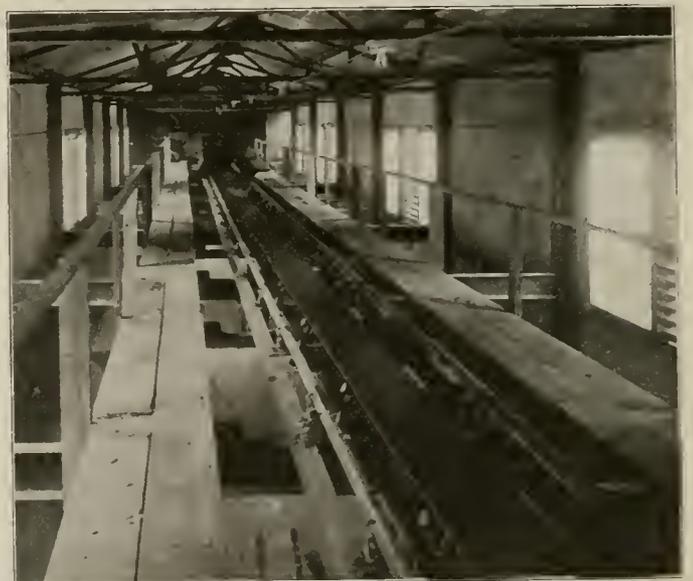
The generator room is served by a 50-ton traveling crane. There are two General Electric exciter units direct-connected to 12 by 15 Harrisburg engines running at 250 revolutions per minute. These are installed under the boiler room. A 1,600-gallon Turner oil filter and storage tank has been installed in the boiler-room basement for handling the oil supply.

Switchboard and Electric Wiring.

The electrical bay, as previously stated, is 15 feet wide and extends the entire length of the generating room. This annex is three stories high. In the first floor, which is flush with the generating floor, are located the manholes for the generator leads and the outgoing cables. These are run in double-duct tile conduits on the side of the wall, whence they lead by underground conduits to the various substations and to the generators. The field rheostats are also located in this room. At one end are located toilet and locker rooms and shower baths for the engine-room employes, the toilet,



Potomac Electric Power Plant—Plan of Main Steam Piping.



Potomac Electric Power Plant—View from Monitor over Boiler Room, Showing Coal-Handling Apparatus and Conveyor over Coal Pockets.

5,000-kw. Curtls turbines and two 2,000-kw. Curtis turbines, but at present only two of the 5,000-kw. turbines have been installed and the two 2,000-kw. turbines.

The turbines are of the vertical, base-condenser type. The generators are of the standard 4-pole revolving field turbo type designed for 25-cycle current at 6,600 volts. The speed of all the generators is 750 revolutions per minute.

The cooling surface in the surface condensers is 4 square feet per kilowatt. Each turbine has an atmospheric exhaust 21 inches in diameter fitted with an atmospheric relief

shower baths and lockers for the firemen being located in the east end of the boiler-room basement. The ceiling of this room is 9 feet 5 inches and above it is a gallery on which are located the oil switches which control the generators and outgoing feeders.

The main generator switchboard is found on the second gallery directly above that on which the oil switches are located. A division wall separates the entire switching compartment from the main generating room, but is provided at the upper switchboard gallery with large openings which afford a clear view of the generating-room floor.

The first attempts at turning the current into the new electrical overhead system of the New York New Haven & Hartford Railroad between New York and Stamford, Conn., are reported to have set up induced currents which seriously affected the transmission of messages on the telegraph and telephone wires within 50 feet of the track.

Twenty-four employes of the Cincinnati Traction Company who have been voted by their fellow-workers the most popular will be sent on a sight-seeing tour of the eastern cities during June at the expense of the company.—Third Rail.

PERSONALITY IN HANDLING EMPLOYEES.*

BY H. H. VREELAND, PRESIDENT NEW YORK CITY RAILWAY COMPANY.

The New York City Railway Company was employing several thousand men when I came to it, but I found that they were constantly changing. Practically the entire force would renew itself every two or three years. There were not 50 men who had been with the company five years. At that time, if an employe had committed a minor offense he would be laid off for a couple of days. No account was kept of the affair, and as soon as he was back at work the matter was forgotten. I heard repeatedly of division superintendents discharging men under them whom they had never seen; and the man was given no chance to defend himself.

It was in 1895 that our record system began working. The improved conduct of the men was wonderful. The knowledge that facts concerning their ability, and their disposition to make use of this ability, were placed on record, brought a new interest. The men were well aware that their errors were placed against them, but they also knew that statements relating to their good conduct and efficient service had space in the record.

The most marked effect of installing this system, an effect which has continued throughout its life, is in bringing out the staying qualities of the men. Before these personal records of the employes were started, as I have said, there were not 50 of them who had been with the company five years; now 50 per cent have been in the service that length of time. The gold bar on a motorman's or a conductor's sleeve is a common sight today.

Trials of Accused Employes.

A man would fight now to keep his record clean; while prior to the installing of this system the same man would have thought nothing of being suspended for a few days. Punishment by suspension is a final warning, occurring but once before discharge. The general system of suspension is a thing of the past among the forces of the New York City Railway Company.

If an employe is accused of misconduct or neglect he is brought up for trial. An opportunity is given him to secure all the witnesses possible, even if he has to take two or three days in finding them. When everything is ready, the division superintendent tucks the volume of the records containing this man's service under his arm and goes to the "court" room and holds the "trial." The division superintendent is both judge and jury in most cases; and as he has, in all probability, never seen nor heard of the man on trial, there is nothing to influence the decision but the actual facts in the case. If the employe is acquitted he is paid for all the time lost during the trial. Should he be found negligent to a certain extent, but not sufficient to cause his discharge, he is fined only for the time consumed by the hearing of the trial.

Sources of the Information.

The sources of our information, it may be said, are only two: the public in general and our officials in particular—rather a complete information bureau.

Often patrons of our lines will come to me, or write a letter, saying they had been riding with the same conductor every week-day morning for a number of months or possibly for two or three years. They had noticed at various times how courteous he was and careful to avoid all possible damage to the company's property. First of all, we would endeavor to find out whether this statement was above suspicion or if the person had been prompted to do this by the conductor. If it proved to be genuine, the statement which had been made, along with the informant's name, would be entered on the employe's page to whom it related.

In addition to this general information there are the complaints and commendations made by the officials of the company, as they come in contact with the employes.

It is the custom for the superintendent of a division, or his assistant, to see each man personally in reference to any charges which may be brought, in order to prevent the employe from being the victim of an unjust accusation. It also does away with any uncertainty in the employe's mind as to how he stands with the company. In this way, so far as is possible, an effort is made by the superintendent to keep in personal touch with his men and at all times to accord them a hearing.

Promotion Dependent on Good Record.

The New York City Railway Company never considers a man for promotion until he has been in its employ for five years. It takes that long to know a man. And this does not seem unreasonable when one considers the many

thousands of employes who are scattered over several hundred miles of tracks at all hours of the day and night.

Yet it is from the eligible men that we fill the higher positions, for it is our policy to take the men from the lower ranks and appoint them to the openings in the higher grades of the service, in preference to choosing outsiders to fill such vacancies. Whenever the vacancies occur the fact is made public on the bulletin board so that candidates may have an opportunity to file their applications. In determining their fitness for the position involved, their records are very carefully gone over. From the list of the apparently eligible ones those men are chosen who seem to give promise of most satisfactorily meeting all requirements. These are promoted on probation and if they prove their ability to perform the new duties they receive permanent appointments.

Records Open for Inspection.

Another cause which stimulates the men in their work is the fact that the records are always open for their inspection. They can find out at any time just what the company knows about them; and this in actual facts and not general impressions. We often have requests from the police and fire departments for information relating to men who have applied to them for appointments. Applicants for police and fire department service are more desirable when recruited from street railway ranks, for they are as a class very well conditioned and disciplined, and are accustomed to handling crowds and unusual situations arising in the busy streets.

These personal records are entered in volumes, approximately 11 by 15 inches, containing 800 pages each, closely ruled. These pages are indexed and a page is reserved for each man.

The first entry is that of the name, date of birth, date of appointment, the capacity in which he serves and the division to which he is assigned. Notations are then made in chronological order of any facts which are reported regarding the fidelity with which this employe's duties are performed; the violations of which he may be guilty; the regularity and punctuality of his attendance, and complaints and commendations made by the officials of the company, or received from outside sources. There are also recorded whatever disciplinary measures are adopted from time to time, the date of his promotion, or the reverse, and any information reaching us which throws light, either directly or indirectly, upon the man's habits, personal conduct and efficiency.

In the case of employes who remain in the service for a number of years, it is obvious that the records become somewhat voluminous. To facilitate their examination the use of colored inks has been adopted when making entries of a particular character.

On the first of each month statements are sent to me of the number of men hired and discharged. Those among the latter who have been with the company for more than a year will have their records sent along so that their standing during the period of their employment may be examined. This presents another safeguard against a man being removed from his place through any mistake or prejudice. This rule is carried out regarding the entire 15,000 employes.

This system is now employed by railroads controlling 90 per cent of the trackage laid in this country. The opinion is general that it has gone far to solve one of the problems which ever confronts the employer of great numbers of men—the ability to know them. To me, the use of this record is as great a benefit as it is to our men.

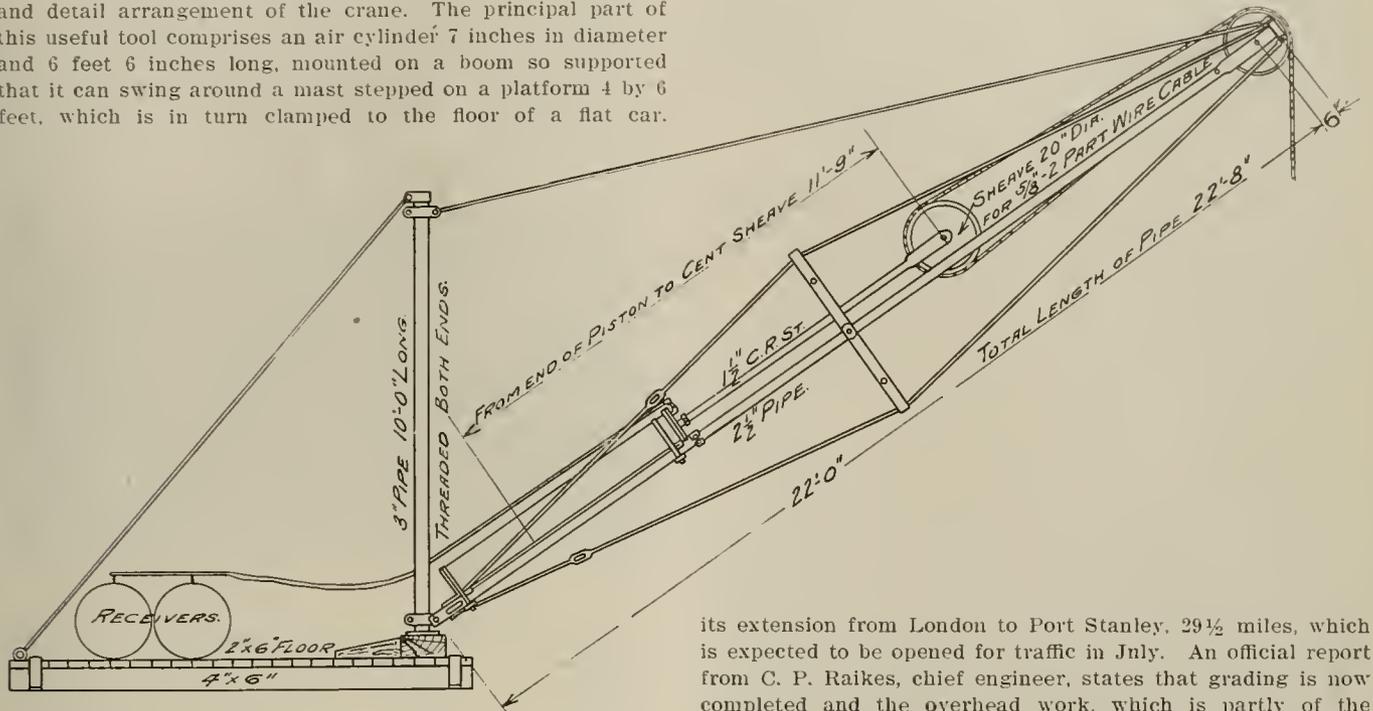
Cement Insulated Trolley Hangers.

S. H. Anderson, chief electrician of the Pacific Electric Railway, Los Angeles, Cal., has been experimenting with a novel type of insulated hanger for trolley construction. The variation from the present type of hanger consists in the use of Portland cement as an insulating compound. The outside or shell of the new type of hanger will not differ from the design now generally adopted. The interior stud, however, which supports the ear will be made in a die in the form of a spool with the threaded portion as an extension from the face of one end. This spool-shaped piece will be centered in the shell and the interior of the shell then be filled with Portland cement. Insulation will be provided by covering the stud with two or three coats of enamel baked on so that it will be unaffected by water. The cement which will replace the usual insulating material will therefore not be called upon to act as a dielectric, but only to perform the mechanical duty of retaining the hanger bolt in the position in the center of the shell. It is expected that this method of construction will effect a saving in first cost.

*Abstract of article in System.

AN AIR-OPERATED YARD CRANE.

The air crane shown in the accompanying illustrations was built in the shops of the San Francisco Oakland & San Jose Railway (Key Route), Oakland, Cal. It has been of considerable value in handling material in the general storage yards. The line drawing will serve to give the dimensions and detail arrangement of the crane. The principal part of this useful tool comprises an air cylinder 7 inches in diameter and 6 feet 6 inches long, mounted on a boom so supported that it can swing around a mast stepped on a platform 4 by 6 feet, which is in turn clamped to the floor of a flat car.



Key Route—Air-Operated Crane as Mounted on Flat Car.

Fastened to the end of the piston in the air cylinder is a 20-inch sheave, carrying a 3/8-inch wire cable, which passes over the top of a second fixed sheave at the end of the long boom.

By means of suitable tongs fastened on the free end of this wire cable and a supply of air from the motor-driven

EXTENSION OF THE SOUTHWESTERN TRACTION COMPANY.

The Southwestern Traction Company of London, Ont., which has had a line in operation between London and St. Thomas, 18 1/2 miles, for the past 12 months, is now completing

its extension from London to Port Stanley, 29 1/2 miles, which is expected to be opened for traffic in July. An official report from C. P. Raikes, chief engineer, states that grading is now completed and the overhead work, which is partly of the bracket type and partly double-pole span construction, is finished as far as Union, 26 1/2 miles. Sixty-pound rails are used throughout. The steepest grade is 4 1/2 per cent. A power house of 1,000-horsepower capacity is located at London, and contains 10,000-volt, 3-phase generators, operated by vertical compound inclosed engines, operating at 375 revolutions per minute. Three substations are now under construction. The equipment for the substations and the cars is fur-



Key Route—Air-Operated Crane Handling Track Material in Yards.

compressor mounted on the platform, it is possible to load and unload rails or other heavy supplies with comparatively little manual labor. Current for the operation of the air compressor motor is obtained from the trolley through a hook-stick connection. It is necessary to clamp the flat car to the track in some manner in order that the heavy weights at the end of the boom may be more steadily handled than would be the case if the platform were free to move.

nished by the Canadian Westinghouse Company, and the overhead and track equipment by the Canadian Electric Traction Company.

The original line to St. Thomas has three steel bridges with spans of 60, 120 and 180 feet. Six double-truck cars with a seating capacity of 44 are now operated on a 55-minute schedule, with a 5-minute layover at each end. Six new cars with a capacity of 54 passengers are now being delivered for

the new line to Port Stanley, on which a similar schedule will be maintained during the summer months. During the remainder of the year this section will be operated on a 2-hour headway.

Surveys are now being made for another extension from Lambeth to Delaware, six miles, and construction is to begin in August.

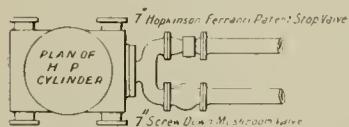
F. G. Rumball is president and S. W. Mower general manager of the Southwestern Traction Company, with offices in the Bank of Toronto chambers, London, Ont.

VALVES OF REDUCED DIMENSIONS.

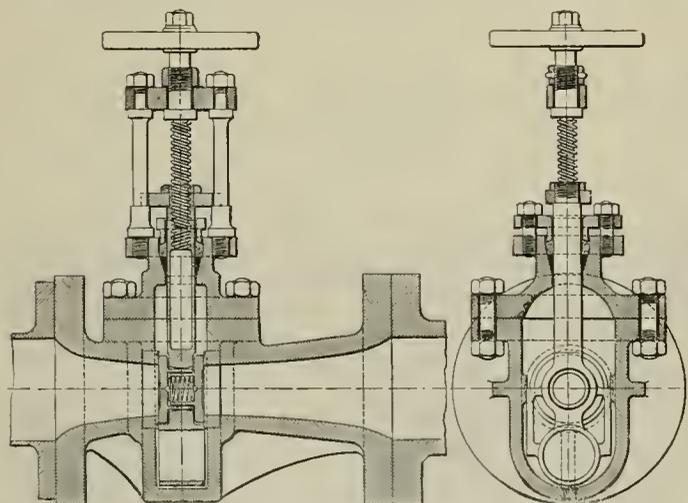
Mr. S. Z. de Ferranti has recently invented a stop valve for steam and fluids at any pressure, which is less than half the size and weight of the ordinary mushroom or straight-way valves. This valve has been perfected by J. Hopkinson & Co., Huddersfield, Eng. It has been demonstrated by a large number of practical experiments that the drop in pressure through a mushroom or gate valve of ordinary construction is about three pounds greater than that through the new valve.

To demonstrate this a test was made on a 17 by 34 by 36 inch vertical compound engine, piped to the boiler by a double pipe line, one branch of which was fitted with a screw-down globe valve, and the other with a Hopkinson-Ferranti valve. It was found that with the mushroom valve closed and the Ferranti valve open the initial pressure in the cylinder at full loading under the same conditions was three pounds higher than with the Ferranti valve closed and the mushroom valve open.

These results are accomplished by locating the valve at the throat of a Venturi tube. The principle made use of is that governing the flow of steam through converging-diverging nozzles. It has been found that in passing through the converging portion of the nozzle the potential, or heat energy, in the steam is converted



Hopkinson-Ferranti Valve—Arrangement of Valves During Test.



Hopkinson-Ferranti Valve—Sections Showing Construction of Valve.

into kinetic energy and in leaving through the diverging mouthpiece the kinetic energy is again converted into potential energy with practically no loss of pressure, provided the ratio of the pressure at the mouth to that at the throat of the converging nozzle is comparatively small.

Attempts have been made to use this principle for valves on large water mains, but it was found that the drop in pressure caused by eddies and friction in passing through a common gate valve was so great that little of the kinetic energy in the water was returned to the potential form.

To overcome the difficulty arising from even a slight amount of roughness or unevenness at the throat, the new valve is built so that the gate when raised to open the valve is replaced by a smooth continuous tube. When the valve is full-open a perfectly smooth passage is presented for the flow of steam.

The valve discs are so mounted that they are free to rotate and move. They wipe over the seats each time the valve is moved and thus keep themselves free from deposit and prevent the wearing of ridges in the valve seats.

An advantage presented by this valve is that it halves the possible leakage, since the circumference of the valve seats is only half that of an ordinary valve. The reduction in size also prevents warping under high superheat, and thus further reduces the leakage. As the valve is only half the diameter of an ordinary valve, it has but one-fourth the area and need only be moved half the distance of an ordinary valve. Therefore the work done in opening or closing the valve is but one-eighth that required for an ordinary valve of the same capacity. Owing to the form of the valve a graded opening is secured preventing any sudden rush of steam. This makes a by-pass valve unnecessary. The steady flow of steam through the nozzle of this type of valve tends to reduce considerably the vibration of steam pipes. A reduced loss of pressure on the pipe lines is also secured. The reduced size and weight makes the new valves cheaper to install and lessens the danger of valve chambers exploding.

A further important advantage secured by the use of these small valves is that the flanges of the valves can be made small enough and with a small enough bolt circle to connect directly with ordinary pipe flanges, thus avoiding the necessity of extra large flanges where the pipes are attached to valves.

IMPORTANT CONSOLIDATION DESIRED IN MASSACHUSETTS.

By petitioning the Massachusetts railroad commission for permission to consolidate, the Springfield Street Railway and the Western Massachusetts Street Railway have opened the way to a comprehensive service in the Berkshire and Connecticut valley regions. The completion of the western Massachusetts extension between Huntington and Lee, a distance of 20 miles, will close the last gap in a continuous line of electric roads extending completely across Massachusetts from end to end, making it possible to travel from New Bedford, Newburyport or Boston to Barrington, Pittsfield and Williamstown. This total distance of about 200 miles represents nothing remarkable at present in the way of through service, but the possibilities of a more centralized management suggest an important future for through service in Massachusetts.

If the petition is granted, which seems probable at this writing, the New York New Haven & Hartford Railroad will control electric roads extending throughout the western and central parts of the state as far east as Worcester. There can be little doubt that the welding of these local systems will result in generally improved physical conditions and enlarged through service. The varied topography of the country through which the interurban lines are operated adds greatly to their attractiveness for tourist travel, and the attention paid to this class of business in eastern Massachusetts at the present time warrants the belief that through cars between Boston and Pittsfield, certainly between Boston and Springfield, will not be delayed many years longer. Considering the developments in the middle west, and especially the distances traversed by through cars, these eastern projects look somewhat commonplace; but, when the nature of the country, the character of the travel, the lack of motive power and rolling stock standards, and the present separate managements in Massachusetts are taken into account, the possible gains from consolidation are seen to be of great public benefit. Com-

petition with steam railroads flourishes in the relatively short routes of eastern Massachusetts; how far this will extend westward is largely a matter of physical limitations to high schedule speed.

TEMPORARY HOODS FOR OPEN PLATFORMS.

At Scranton, Miss., where the Pascagoula Street Railway & Power Company's line is located, there are only a few days

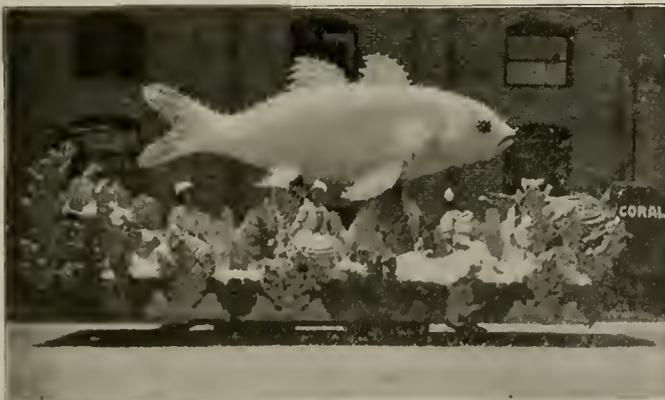


Car Equipped with Temporary Vestibule.

during the winter months that a closed cab is desirable. Therefore it is not considered profitable to provide vestibuled cars for operation during this short period. The cars are, however, fitted with temporary vestibules, as illustrated. These have been found very satisfactory. The attachment consists of a canvas hood, fitted with windows at the front and sides. This is fastened to the car by carriage buttons. A steel rod located at the front of the dash holds the canvas away from the controller and brake handles.

FIESTA FLOATS AT LOS ANGELES.

During April of this year the annual fiesta parade took place. In this celebration, fostered by the business and com-



Los Angeles Fiesta Float Built on the Platform of a 4-Wheel Motor Car.

mercial interests of the community, were a large number of especially attractive floats carried on single-truck motor cars. The accompanying illustration of one of these floats will serve to show how elaborate were the decorations for this event. As a substantial contributor to the welfare of the enterprise, the Los Angeles Railway Company furnished the railway equipment and car crows. Each float, of which there were some 50, was built upon the floor of a single-truck motor car, originally of the cross-bench open type. The decorating scheme

used this year included a series of floats illustrative of the various precious stones. A halftone engraving from a photograph of the float representing the coral is shown.

A ONE-MAN DRUM CARRIAGE.

As a general rule cable drums are moved about on common trucks which have no facilities for handling such cumbersome and heavy objects. Consequently the labor required in loading and unloading the drums from the trucks and moving them from place to place is much greater than it should be with a truck built especially for this purpose.

The accompanying illustration shows such a truck manufactured by John Ruscoe & Co., Limited, Manchester, England. It is built of steel and consists of an inclined plane with suitable bearing blocks for the spindle of the drum and a small crane with reduction gearing, by means of which the supports can be moved along the inclined plane. At the rear of the inclined plane are steel drop shoes which are let down during the process of loading and unloading, at which time the carriage stands on four legs, thus relieving the horse of any burden. It is stated that one man can easily load a 4-ton drum on this truck in four minutes and unload it in somewhat less time.

The framework is built to take drums up to 7 feet 4



A One-Man Drum Carriage.

inches in diameter and 3 feet 11 inches wide. The weight of the truck in proportion to the load which it carries is very much less than that of an ordinary truck used for this purpose, consequently one horse can easily pull a 4-ton drum when mounted on this carriage. Thus by reducing the number of horses and men required to load and move cable drums a saving of 60 per cent on the cost of trucking is said to be accomplished.

The traffic on the suburban electric lines out of Philadelphia showed a large increase last week on account of an increase in suburban fares on the Philadelphia & Reading Railway.

The Kokomo Marion & Western Traction Company has inaugurated Sunday excursion rates on its lines from Kokomo to Marion, Ind., and the first Sunday taxed the capacity of the road to the fullest extent. If the same patronage continues through the summer, the innovation will prove a good financial undertaking.

Results of tests of wooden poles for carrying overhead transmission wires were given in a paper submitted recently to the Institution of Electrical Engineers, London, by C. J. Wade. The tests proved the flexibility and recuperative power of wooden poles after severe deflections from the perpendicular, caused by abnormal stresses.

BOOK TABLE.

The Engineering and Electric Traction Pocketbook. By Philip Dawson. Fourth edition. London, 1906. Published by Engineering, 36 Bedford street, Strand, W. C., and New York, by John Wiley & Son, 43-45 East Nineteenth street. 1,053 pp., illustrated, 4½ by 6¾ inches. Leather. Price, \$5.00, net.

The subjects pertaining to electric traction engineering are very completely covered in this excellent volume, though naturally the contents are based more upon English and European practice than that of America. The book will, however, be of great value to traction engineers and many interesting and educational ideas may be gathered from it. This is especially true of the chapters on overhead construction, subway and track construction.

The first part deals with materials of construction for track and roadway, presenting many types of construction illustrating the best European and American practice. Valuable tables relating to track construction, and data for laying out curves and special track work are presented.

Chapter II deals with rail bonding and rail joints and presents the best types of bonds and joints found in service.

Chapter III deals with the overhead distribution system, many tables being presented for calculating feeders, etc., and a large number of cuts are used to illustrate the standard types of fittings and accessories used in overhead construction. Data are given of strength and insulation tests of strain and line insulators, which, no doubt, will be found of value.

Besides presenting a vast number of minor details, illustrating the mode of constructing and erecting pole lines and overhead work, tables and data pertaining to wooden and steel poles, giving the strength, weight, cost and standard specifications for poles, are given, with notes on their preservation. American engineers will find the material presented on the design of artistic trolley poles of especial interest and value, as American engineers have been rather lax in their attention to the artistic details of overhead construction.

Section 2 treats of the power station. In the first chapter the thermodynamics pertaining to the engine and boiler room is given, with notes on superheated steam and entropy and indicator diagrams. The theory and the design of the steam engine and the steam turbine are presented. Tables accompany the theory showing the steam consumption of engines and turbines under varying conditions during tests and in actual practice.

This section also deals with the powerhouse auxiliary, interesting notes being given on condensers, cooling towers, pumps, etc. The design of steam piping and piping auxiliaries is excellently treated.

Section 3 includes chapters on the design, construction and operation of steam boilers, considerable space being given to the design and care of auxiliaries, such as boiler settings, grates, safety valves, gauge columns, valves and blowoff cocks. Notes on superheaters, force draught systems, ash and coal conveyors, and details of water-softening plants are dealt with in separate chapters. Economizers, feed-water heaters, chimneys, the results of tests and data on the practical operation of representative boiler plants are presented with notes on the burning and properties of various kinds of fuels.

Section 4. The theory of electric generators and motors is briefly presented and tables showing the values of the units of electricity are given. A large number of illustrations, curve sheets and tables give the details of construction of generators and motors, as well as their characteristic curves under various conditions of operation. The value of insulating materials is given and many valuable notes on the care and management of dynamos, motors, motor-generators and rotary converters. Particular attention has been given to the subject of alternating-current generators, motors and transmitting apparatus, many illustrations and diagrams being used to show the various connections used for the polyphase transmission system.

Switchboards and electrical indicating instruments form

the subject matter of Section 5. The design of low and high tension switchboards is very completely covered in this section and the most improved forms of high-tension oil switch for local and remote control are illustrated. Various control systems are described, as well as electrical measuring instruments, synchronizers, lightning arresters, etc.

A very comprehensive treatment of gas engines, gas producers and accessories required in a gas engine installation is given in a very thorough manner in Section 6. As this is the first extended treatment of this comparatively recently introduced prime mover it will, no doubt, be of great interest and value to designing engineers.

The succeeding chapters deal in a very thorough manner with powerhouse buildings, storage batteries, surface and conduit systems, rolling stock and motors, train resistance, etc. An especially valuable part of the book is that which treats of the efficiency, maintenance and depreciation of electric railways.

Long-Distance Electric Power Transmission. By Rollin W. Hutchinson, Jr. New York, 1907. D. Van Nostrand Company, 13 Murray street. Cloth, \$3.00.

High-tension transmission lines are now becoming so numerous that a book treating of this subject is particularly timely and valuable. As a greater part of the long-distance transmission systems serve hydro-electric installations, the author has wisely included in this volume the laws of hydraulics dealing with the flow of water and the construction of dams, canals and flumes, besides introducing the theory and operation of turbines, impulse wheels and the auxiliary governing apparatus. A considerable amount of information is given on the proper gauging of streams, determining the probable minimum flow and the designing of dams, flumes, etc. A large number of cuts illustrate the various types of flumes, dams and canals usually employed, showing by half-tone reproduction from photographs of systems actually installed many details, such as devices for removing leaves and twigs from flume lines, methods of overcoming ice difficulties and methods of constructing and anchoring flume lines. Though most of the information given on construction, operation and efficiency of water wheels and water wheel governors is taken from the catalogues of the various manufacturers, it is collected in convenient form, which makes it of value to the busy engineer.

Various types of alternating-current generators are shown and described, including a few curve sheets showing the efficiency and characteristics of high-tension alternating-current generators and transformers. The major portion of the book treats in detail of high-tension switchboard and pole-line apparatus. Special chapters are devoted to high-tension oil and air brake switches, lightning arresters and synchronizing instruments. The effect of the power factor on the cost of transmitting power and the causes for low power factor are mathematically discussed, including also calculations on the most economical size of transmission wires and the relation of power factor to the capacity and inductance of the lines. This and other portions of the book require a knowledge of the calculus and considerable knowledge of electrical engineering is also assumed. Particular attention has been given to those details almost wholly neglected in previous works on electrical transmission, viz., the practical features and details of constructing pole lines. In this portion of the work calculations on economical pole-line construction are included, showing the electrical leakage with various pole spacings and its effect on the cost of power transmission. The chapters on transformers, motors and rotary converters are much the same as those chapters in most books on electrical engineering. The final chapters in the book describe some practical plants which are in actual operation, giving details of the architectural designs of the buildings, arrangement of the machinery, dams, etc., and include a few notes on the parallel operation of plants, regulation and cost of electrical power transmission.

PIPING AND POWER STATION SYSTEMS—XLII.

BY W. L. MORRIS, M. E.

City Water Connections to Boiler Feed Main—Class K 5.

If the power station has its own water supply the city water supply should not be connected with the boiler feed main. The pressure carried on a city main is not sufficient for boiler feeding. This necessitates joining the city water connection to the auxiliary feed main. Here the supply can be used under a low pressure without interfering with the regular boiler feeding. If the plant is run with city water only then this latter connection should be used, since it enables the operator to wash or fill boilers without running any pump.

Figure 283-(K 5—1) shows an auxiliary main arranged so that under ordinary conditions it will be supplied with city

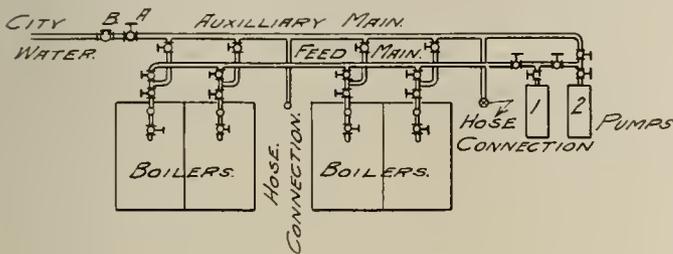


Figure 283-(K5—1).

pressure as far as the pumps, thus making this water available for wetting down ashes, etc. When pump No. 2 is supplying the auxiliary main with water under high pressure for operating turbine tube cleaners there will be no water at high pressure available as far as valve A. This, however, would not be a serious objection in most boiler rooms. To avoid damage to the low-pressure city lines, if an operator should start the pump without closing the valve, A, a check valve, B, should be fitted in the low-pressure main, as shown.

Feedwater can in an emergency be obtained by means of a fire hose if the city fire plugs are properly located. The use of fire hose is, however, poor practice, as it is troublesome to make the connections and shows that the city service has been overlooked.

City Water to Pump Suctions—Class K 6.

Plants which have city water available should have the city service connection of sufficient size to feed all the boilers. All continuously operated plants should have two separate feed pump suction, whether there are two different sources of water supply or only one. Plants having both their own and a city water supply should have the city water delivered directly to the pump suction, as shown in Figure 284-(K 6—1). It is not best to deliver the water into the suction well, since it may be found necessary to empty this well for making repairs.

The city connection may be made quite small, possibly one-third the diameter of the regular suction pipe. Water is delivered through the city lines under pressure, and such lines are too seldom used to justify a reduction of pipe line losses by the use of a large pipe. If a plant is operated entirely on city water there should be two separate city connections, as shown in Figure 285-(K 6—2). To provide this arrangement it may be necessary to use two meters. If two taps are not provided the plant might be without water if the city main to which it was connected should be shut off for repairs, or for any other cause. Figure 285 shows a power plant located at the intersection of two streets and connections made to two mains with two valves in the city mains between the connections. If there were but one valve, either A or B, then it would be necessary to connect with the city mains beyond another valve, as shown by the dotted lines in Figure 285.

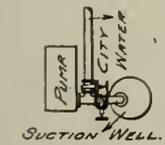


Fig. 284-(K 6—1).

This would necessitate the use of another meter, also shown dotted. By connecting to the mains in this manner water is obtainable whenever it is necessary to shut off the water on both sides of a city valve. The use of two meters permits a more accessible piping layout. It also affords means for repairing any part of the main and yet have one pump in service.

The most satisfactory piping layout is one with two separate suction lines from the pump to the water supply. A valve should be placed between these two suction mains to separate them whether water is obtained from two city or two private sources of supply.

If the suction is taken from two private sources, such as a pond and its tributary stream, they should be from two points which are as far from each other as possible. Thus, if the stream is muddy the suction can be taken from the pond, or, if the pond should be empty, the suction can be taken from the stream. If water is available from only one source, such as a small stream, which is not continuously available

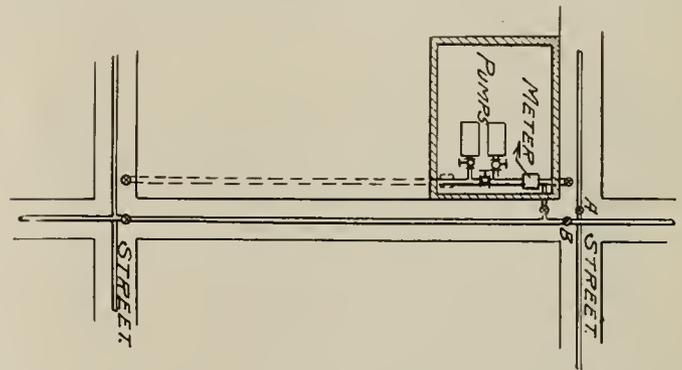


Figure 285-(K6—2).

either because of too little or too much water, which would oftentimes cause it to be very muddy, then another reserve supply is necessary, either in the form of a pond or an artesian well.

City Water to the Heater—Class K 7.

A plant operated entirely on city water should have a connection to the float controlling-valve if an open heater is used, in which case this would be a regular service connection. If the plant has its own water supply it will also have a low-pressure water service and a connection from this low-pressure service to the heater. To supply city water for emergency purposes it is ordinarily delivered to the low-pressure water mains which are connected to the heater.

If these mains are not properly laid out, necessitating their being entirely out of service when repairs are made, it will be more satisfactory as regards reliability to connect the city water directly to the heater. This connection can be a permanent pipe line or a temporary hose connection may be employed if a hose valve is attached to the heater. If the valve is of the proper size to fit fire hose, the water supply during periods of repairs can be taken from a fire hydrant.

City Water to Fire System—Class K 8.

The pressure carried on city water mains is generally low, about 20 to 30 pounds per square inch, and consequently when a large number of streams are taken from a fire hydrant this pressure is almost entirely lost in overcoming the friction in the pipes. Power stations are generally large and high buildings, necessitating the use of high pressure on the fire lines. If city water only is available for fire protection it should be connected to the fire pump suction, the water at such times not passing through the meter. This subject will be taken up more fully in "Fire Protection," Class M.

City Water for Priming Pumps—Class K 9.

Any water may be used for priming pumps, as the quantity used is so small that its quality is immaterial. Priming water should be taken from the city mains only where city

water alone is available, or in plants which have no storage tank to furnish water for this service.

City Water to Hydraulic Elevators—Class K 10.

Water which is suitable for boiler feeding is also suitable for hydraulic rams, etc. It would be necessary to remove any loose sand from the water for either service. If the plant is run with city water then the ram should be of such area that the lowest city pressure would operate it. The resistance of the ram stuffing box and the loss of head due to the velocity of flow are usually so great that the theoretical pressure under the ram should be twice that which is actually necessary to operate it. This subject will be taken up more fully in "Hydraulic Elevators—Class O."

City Water to Engine Journals—Class K 11.

City water instead of the regular station water would be used for cooling journals if the latter supply were too warm to be effective. Rather than use city water it would be more economical to use a greater quantity of the station water. If city water has a temperature of 50 degrees F. and the station water is 15 degrees warmer and the discharge from the journals has a temperature of 150 degrees F., then the city water is raised 100 degrees, whereas the station water is raised 85 degrees. This difference in practically all such cases is too slight to justify the use of city water.

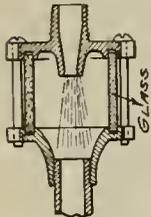


Fig. 286-
(K 11—1).

If city water is used exclusively then it should be discharged into a drip main located so that the water will drain into the heater. Funnels should be fitted so that the drip flow may be observed. If the heater is located too high to permit the use of a gravity discharge, the sights may be made air-tight, as shown in Figure 286-(K 11—1), permitting a back pressure on the engine journals, sights, etc. To avoid the loss of the air confined in the glass body such sights should be placed where there is the least pressure.

Another method of determining the flow is to use in addition to the regulating valve a three-way valve, one discharge being into the heater and the other into an open funnel connected to the sewer. To determine the amount of water flowing the valve can be turned to discharge into the funnel, and again placed in its normal position, thus turning the discharge into the heater.

City Water to the Damper Regulators—Class K 12.

If no other water constant pressure is available to operate the damper regulators city water may be used for this service. Especially is this true if the pressure is low, say about 30 pounds to the square inch. The use of boiler feed-water or steam condensation is extremely objectionable due to the destructive effect on the controller valves.

The working piston of a regulator should be of sufficient diameter and stroke to operate the dampers while under low pressure. The work of moving the damper must be done by one stroke, the return of the damper being effected by a counterweight. Therefore the capacity of the regulator cylinder must be twice that necessary to move the damper alone. If a force of 40 pounds is required to move the damper when in any position, then the effective capacity of the regulator cylinder should be 80 pounds, or twice this, which would be about 150 pounds pressure on the piston rod. If the lowest pressure on the water main from an overhead tank is 15 pounds, the regulator would require a piston about $3\frac{1}{2}$ inches in diameter, a much larger size than the manufacturers of regulators care to furnish. However, if constant and satisfactory service is desired low pressure must be used.

(To be continued.)

According to Power, at Columbus, O., where the water is excessively hard, a water-softening plant with a capacity of 30,000,000 gallons per day is being constructed.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B., OF THE CHICAGO BAR.

Injury from Fall Due to Tobacco on Station Stairs.

Kaplowitz v. Interborough Rapid Transit Company, 103 New York Supplement, 721.—The supreme court of New York, appellate term, holds that a judgment for the plaintiff in this case should be reversed, and a new trial ordered, the evidence showing that, although there was much dirt upon the stairs, the plaintiff fell on a piece of tobacco, while there was nothing to indicate that the tobacco had been there a sufficient length of time to impute notice to the defendant. It says that the case did not come within the authority of *Cooley v. Trustees of N. Y. & B. Bridge*, 46 App. Div. 243, 61 N. Y. Supp. 1, as in that case it appeared affirmatively that "the occasion of the fall was a pile of dirt, composed of earth, banana peelings, cigar stumps, etc., situated on the fifth or sixth step from the bottom of the stairs, and about 3 inches in depth and 18 inches long," and it also appeared affirmatively that the defendant's servant had, previously to the accident, swept the dirt from step to step—an inference being deducible therefrom that the said servant was responsible for said pile of dirt which caused the accident.

Motorman Entitled to Rely on Orders from Starter.

Doe v Boston & Worcester Street Railway Company, 80 Northeastern Reporter, 814.—The supreme judicial court of Massachusetts says that according to certain evidence a motorman had been given by the starter a clear right of way for a certain run. Acting under this order he went forward and just before a collision the car passed around a curve at a speed estimated by the motorman and other witnesses as from 10 to 40 miles an hour. His declarations contained the further statement that he did not see the other car until it was in such proximity that a collision was inevitable. But while running rapidly and, unable to ascertain if the track was clear until he passed the radius of the curve, under the company's system of operating this portion of its railway it could have been found that this motorman's car had the right of way, and that he had no reason to apprehend that at the same time an eastbound car would be passing over the track at this place. When employed at his usual work and acting under the assurance or order of the person charged by the company with the duty of seeing that the track was clear between the points, the motorman had a right to presume that he could safely proceed. If the track was properly supposed to be clear, the jury could find that the rate of speed was not excessive, and that his conduct while operating the car in the ordinary way, as he appeared to have been doing, was not careless. It plainly could not have been ruled as matter of law that he was negligent, and this question was an issue of fact for the jury's determination.

Good Faith Required to Recover Transfer Penalty.

Nicholson v. New York City Railway Company, 103 New York Supplement, 695.—The supreme court of New York, appellate division, first department, holds that, under Section 105 of the railroad law of that state, which commands that a railroad shall carry for a single fare between any two points on its road "any passenger desiring to make one continuous trip between such points," a person in order to maintain an action to recover the statutory penalty of \$50 for a refusal to furnish a transfer must prove that he or she became a passenger in the first instance in good faith, and for the purpose of going to some point on the line to which he or she wished to be transferred. It says that it will be noticed that only a passenger who has been "aggrieved" can maintain an action to recover the penalty. The plaintiff was not "aggrieved." Indeed, she would have been disappointed, had she received the transfer demanded, because in that event the purpose of her taking the car would have been frustrated. The object of

the statute is to promote the public convenience. It is not to put money in an individual's pocket, unless such individual comes fairly within the provisions of the statute, viz., a passenger in good faith who has been aggrieved by the railroad company's refusal to give a transfer to some point on a connecting line to which he desires to go. Again, it says that the statute is not only limited to a passenger, but to one who desires to go to some point on the connecting line. The statute, therefore, by express provision precludes one from suing for a penalty who has no intent to go to a point on the connecting line, but who takes the car merely for the purpose of putting himself in a position to bring an action.

Demanding Second Fare Not Gross Negligence nor Creative of Excessive Charge.

Robinson v. International Railway Company, 103 New York Supplement, 588.—The supreme court of New York, special term, says that it is provided by Section 39 of the railroad law of that state that any railroad corporation which shall ask or receive more than the lawful rate of fare, unless such overcharge was made through inadvertence or mistake not amounting to gross negligence, shall forfeit \$50. The proof in this case revealed that after the plaintiff had paid one fare and the car had proceeded a short distance the conductor came in again and demanded his fare. It was quite apparent that whatever the conductor did relative to the second fare was done under the impression and belief on his part that the first fare had not been paid. The conductor was simply mistaken about the first fare, and the second fare was demanded through inadvertence or mistake. Such transaction did not amount to gross negligence. There was no proof whatever that the company asked or demanded more than 5 cents for a single fare of this plaintiff. The proof showed that what the conductor did was to demand two single fares of 5 cents each, not 10 cents for one single fare. If the conductor had demanded 10 cents for a single fare a case would have been made out of an excessive charge being made not through inadvertence or mistake. But the second demand for the 5-cent fare being made, under the mistaken belief that no prior fare had been paid for the ride, the provision of the statute did not apply, and the plaintiff's remedy was to recover the overcharge and damages resulting therefrom, not an action for the statutory penalty.

Ejection of Passenger with Expired Transfer Taken on Conductor's Assurance—Rules—Damages.

Nicholson v. Brooklyn Heights Railroad Company, 103 New York Supplement, 310.—The second appellate division of the supreme court of New York says that the jury were at liberty to find from the plaintiff's evidence that he demanded a transfer, which he noticed, upon receiving it, was so punched that the time limit indicated had already expired; that, upon calling this fact to the attention of the conductor and demanding another transfer, he was assured that it was all right; that at the intersection with the line which he desired to take he alighted, boarded the proper car, and tendered the conductor the transfer; that the conductor refused to take it, demanded his fare, and, upon his refusal to pay the fare, ejected him from the car.

It was not disputed that the defendant was bound to give the plaintiff a transfer entitling him to a continuous trip for a single fare, and that for its refusal to do this the plaintiff could have recovered the penalty of \$50 provided by statute. He could also recover any excess fare exacted of him, but it did not follow that he could knowingly board a car with a ticket, which, upon its face, did not entitle him to a ride, and recover for being ejected by a conductor who acted strictly within his duties. The act of the conductor in ejecting him was not wrongful or unlawful.

Passengers must know that conductors cannot dispense with the rules of the company, and, if they do not, the law charges them with such knowledge. The plaintiff knew that

the time indicated by the ticket within which he could be carried on the line to which he intended to transfer had expired, and he had no business to act upon the assurance of the conductor, or to expect that the conductor on the line to which he transferred could take his word in direct contradiction of the ticket. The plaintiff's ejection from the car was not consequent upon the wrongful act of the conductor who issued the transfer, but rather upon his own disregard of the defendant's rules, to which he, as well as the conductor, was subject. As well might the plaintiff recover if the conductor had refused to issue any transfer at all.

The actual damage resulting from such refusal, as a rule, would be measured by the value of the transfer, i. e., five cents. In order to compel obedience to the law requiring street surface railroads to give a passenger a continuous trip over connecting lines for a single fare, the legislature has provided a penalty; but the law does not contemplate that, in addition to that, the passenger may recover for indignities to which he voluntarily subjects himself.

Company Not Liable for Loss of Hand Baggage.

Sperry v. Consolidated Railway Company and another, 65 Atlantic Reporter, 962.—The supreme court of errors of Connecticut says that a suit case belonging to the plaintiff was handed to the conductor when she boarded a car. She took a cross seat near the middle of the car, and the conductor placed the suit case close to the forward end of the rear side seat. Later there was a change of conductors. The new conductor was not told to whom the suit case belonged. He saw an Italian sitting near it, and saw him walk off with it. The court affirms a judgment for the defendants.

To have entitled the plaintiff to a verdict, the court says, it was necessary that there should have been sufficient evidence before the jury to justify them in finding either that the defendants, or one of them, had accepted the baggage under a contract, express or implied, to carry and deliver it as common carriers, or that its loss was due to the negligence of the defendants, or one of them.

It is a matter of common knowledge that electric street passenger cars are never furnished, either in the manner in which they are constructed or in the way in which they are operated, with facilities and means to enable the companies themselves to take into their custody and control the baggage of passengers. The well-known facts that there are in such cars no places for the separate storage of baggage beyond the control of its owners, and that the duties of the conductor and motorman, who are the only agents of the company upon the cars, necessarily prevent them from taking charge of baggage, indicate that the companies do not assume control of such baggage as passengers may bring with them into such cars. When the carrier does not take full possession of the baggage, and it remains under the control of the passenger, the former, in the absence of special agreement, does not assume the common carrier's liability of an insurer, but becomes responsible only when it is shown that the carrier has failed to exercise reasonable care to protect from loss or injury such baggage or property as the passenger has the right to bring with him into the car.

In the present case the conductor was not requested to take the plaintiff's suit case into his charge, and the fact that he took it when it was handed to him, and placed it in the car within the sight and control of the plaintiff, manifestly for the purpose of assisting her, would not justify the inference that he assumed the custody of it.

Nor does the court think that there should have been submitted to the jury the question of whether the defendants exercised reasonable care to prevent the loss of the suit case. It says that it is true that this is ordinarily a question of fact for the jury; but, as in this case the evidence was clearly insufficient to sustain a verdict for the plaintiff upon that question, no error was committed in not submitting it to the decision of the jury.

News of the Week

Electric Railway Accidents.

Seven persons were injured in a derailment of a Fitchburg & Leominster Street Railway car on May 30, near Fitchburg, Mass. The cause is said to have been the spreading of rails on a curve.

A street car of the Birmingham Railway Light & Power Company collided with a train loaded with pots of molten metal at Birmingham, Ala., on June 5. The metal set fire to the car and it is reported that several persons were badly burned.

As a result of the rear-end collision on the line of the Cleveland Southwestern & Columbus Railway, near Elyria, O., on May 30, in which seven persons were killed and several injured, as reported in last week's issue of the Electric Railway Review, the motorman in charge of the car which caused the accident was indicted for manslaughter on June 4 by a special grand jury. W. O. Jackson of Springfield, O., inspector of the state railroad commission, is investigating the accident. It was stated that the two cars were running closer together than the rules permitted and that the motorman of the rear car was looking back and did not see that the car in front had stopped.

Chicago Traction Reorganization.

G. W. Wickersham and L. C. Krauthoff, attorneys for the Chicago Railways Company, have returned to New York without making announcement of the plan of reorganization. The committees representing stockholders of the North Chicago City and the Chicago West Division railroads, underlying companies, want to have the reorganization plan submitted to them before it is presented to Judge Grosscup and Prof. John C. Gray, the arbitrators. They have also demanded that the plan be submitted to them before the stocks of the roads included in the Chicago Union Traction Company are deposited with the Chicago Title & Trust Company in accordance with the terms of the ordinance. This deposit must be made by July 26.

Edward B. Burling, attorney for the committees representing the majority of stock of the North Chicago City and the Chicago West Division railroads, has sent a letter to Messrs. Krauthoff and Wickersham concerning the valuation of the properties of the various companies. The letter asks that certain assurances be given regarding the safeguarding of the interests of stockholders in the underlying companies.

The Illinois supreme court refused on June 5 to grant the petition for a rehearing of the Mueller case.

Brooklyn Subway Authorized.

The rapid transit commission on May 31 voted to authorize the construction of the Fourth avenue subway in Brooklyn. This action was made possible by the presence of Alexander E. Orr, president of the board, who arose from a sick bed to make up the necessary number of votes. The route extends from Chrystie street, Manhattan, across the new Manhattan bridge, and thence by subway through the Flatbush avenue extension and Flatbush avenue to Fourth avenue, and thence to Coney Island and Fort Hamilton. It will be a 4-track line to Fortieth street, Brooklyn. Beyond that two tracks will run to Coney Island and two to Fort Hamilton. The line will connect with the subway loop on the Manhattan side of the river. A resolution was adopted requesting the board of estimate to permit the advertising for bids for construction alone, instead of for construction and operation. It is estimated that the subway will cost about \$23,000,000.

The board of estimate held a meeting on Tuesday and complied with the resolution of the commission. The commission can now advertise for bids for the construction of the subway. As the new public utilities law, which legislates the commission out of office, goes into effect on July 1, it is doubtful if contracts can be let by the present board, but the plans will be in such shape that the new commission may proceed at once.

Hearing on Philadelphia Ordinance.

A hearing on the proposed Philadelphia Rapid Transit ordinance was held before a committee of councils on June 4. Francis Shunk Brown and ex-Judge Gordon made arguments in behalf of the plan of settlement. Mr. Brown said in part:

"It is unfair to compare Philadelphia with any other city, because conditions are nowhere near the same. This city contains 129½ square miles, St. Louis 60, Cleveland 34, New York 42 and Boston 40 square miles.

"Some of the opponents of this ordinance say that there should be a provision of 'no seat, no fare.' That is utterly absurd, and it is also a physical impossibility. Between 5 and 6:30 o'clock in the afternoon there are 100,000 people to be found in the district bounded by the Delaware river and Broad street, and Walnut and Arch streets. Of this number 85,000 are surface car riders. The Rapid Transit company manages to transport this number in an hour and half. It is a greater number than any standard steam railroad carries in a day. To give each of these 85,000 persons a seat would require 2,125 cars, with an individual capacity of 40. Each of these cars would be 36 feet long. To take care of these cars would require a terminal of monstrous size. Should such a terminal be built on Second street it would reach from Vine to Spruce streets, a width of 3,060 feet, and would contain 154 tracks extending back to Front street.

"The Brooklyn bridge congestion in New York, held up as the worst in the world, is not as great as the congestion in this city in the territory I have named. New York only carries 56,770 passengers between 5 and 6:30 o'clock in its congested center, to 85,000 in Philadelphia. To move this New York crowd 403 surface

cars are used, which carry 19,497 passengers, while the elevated and subway, with 92 cars, carry 37,273 riders."

Mr. Brown said that a ride of 25 miles can be secured in Philadelphia for 4 1-6 cents.

Labor Affairs.

The United Railroads of San Francisco has now extended its service to all of its lines that have been reconstructed since the fire, and although there have been occasional disturbances caused by the strikers, the situation continues to improve each day. On Friday of last week the company operated cars from 6 a. m. to 8:30 p. m. Over 200 cars were run, employing over 600 men. The company is now carrying over 150,000 passengers a day and it is stated that no difficulty is found in securing non-union men to operate the cars at 25 cents an hour. Three of the strikers have been arrested on the charge of having short-circuited the trolley and feed wires by throwing a chain over them.

The strike situation at Birmingham, Ala., has presented no important developments. The company is operating cars with non-union men on all its lines and there have been no serious disturbances. It was announced at the offices of the Birmingham Railway Light & Power Company recently that 61 of the former employees had returned to work. The strikers have suggested arbitration, but President Jemison of the company refused to arbitrate, stating that the stockholders were supporting him and that he did not care to employ union men. A general sympathetic strike, ordered by the Birmingham Trades Council for June 3, failed to meet with a very ready response.

The car men employed by the Shamokin & Mt. Carmel Transit Company, operating about 19 miles of track between Shamokin and Ashland, Pa., went on a strike on May 30. The service was completely tied up. The reason given by the men is that the management refused to allow the motormen to sit down while at work.

Indianapolis Meeting of the American Society of Mechanical Engineers.

The American Society of Mechanical Engineers held its spring meeting in Indianapolis, May 29, 30 and 31, in the palm room of the Claypool hotel. The attendance was the largest in the history of the association. Several sessions were held each day and abstracts of a number of papers on technical subjects were read and discussed. The subjects of the papers were: "Ball Bearings," by Henry Hess; "Air Cooling of Automobile Engines," by John Wilkinson; "Automobile Material," by Elwood Haines of Kokomo; "Railway Motor Cars," by E. D. Gray of the American Locomotive Company of Providence, R. I. At the concluding session, which was held at Purdue University, whence the members had been taken on an excursion by the Indianapolis & Northwestern Traction Company, papers were read on "Superheated Steam, or, in Other Words, the Economy of Steam Power," by S. L. Kneass of Philadelphia, H. H. Vaughn of Montreal and Professor Goss of Purdue University. These papers were generally discussed and proved of great interest to the managers of power houses. The members of the association visited the large industrial plants in Indianapolis and expressed themselves as highly pleased with the manufacturing enterprise of the middle west. Prof. F. R. Hutton, dean of Columbia University of New York, is president of the society. A commendable feature of the association meeting was that all papers presented before the convention were read by abstract and the general discussions which followed were made up of illustrations and points in the papers selected by the members about which to interrogate the writers.

Pittsburg & Butler to Handle Express.—It is reported that the Pittsburg & Butler Street Railway will soon establish an express package service to all points on its new line between Pittsburg and Butler, Pa.

American Society for Testing Materials.—The tenth annual meeting of the American Society for Testing Materials will be held at the Hotel Chelton, Atlantic City, N. J., on Thursday, Friday and Saturday, June 20, 21 and 22.

New York Public Utilities Bill Passed.—The New York senate concurred with the house on June 5 in passing the public utilities bill over the veto of Mayor McClellan of New York City, and Governor Hughes signed it on June 6. An abstract of the bill appears on another page of this issue.

Five-Dollar Bill for Carfare Unreasonable.—Justice Ott of Detroit, Mich., has given a decision that a rule of the Detroit United Railway that a conductor is not required to change a piece of money larger than \$2.00, when tendered by a passenger for carfare, is reasonable. The judge based his decision on a ruling of the New York supreme court, which held that the tender of a \$5.00 bill in payment for carfare was not reasonable.

Indiana Lines Must Install Interlocking Switches.—The Indiana railroad commissioners have decided that the half interlocking switches now used by the Indiana interurban lines at crossings with the steam lines are not a sufficient compliance with the law. The commission has notified the interurban companies that complete interlocking switches must be put in, towers erected and a man put in charge. This decision will necessitate the expenditure on the part of the interurban lines of many thousands of dollars.

Spokane & Inland Extends Service.—General Manager J. B. Ingersoll of the Spokane & Inland Railway, Spokane, Wash., has announced the extension of service south from Oakesdale to Garfield and Palouse, about 25 miles. Trains have been operating for some time from Spokane to Oakesdale, and on the branch from Spring Valley Junction to Rosalia. For the present, until the overhead work is completed, trains will run from Garfield to Palouse by steam power, although it is probable that this will be only for about 30 days. The distance from Spokane to Palouse is 76 miles and the

branch to Rosalia is five miles long. Three trains a day will be run from Spokane to Palouse, without stops between Spokane and Spring Valley Junction, the running time being three hours. The 40 stations between Spokane and Rosalia will be served by four trains a day in each direction. A handsome new station, similar to the one at Oakesdale, has been opened at Garfield, and a temporary station has been erected at Palouse.

Air Line Gives Bond.—President A. C. Miller of the Chicago-New York Electric Air Line Railroad on June 5 filed a bond for \$5,000 before Judge Windes to indemnify Theodore Nemoyer and other stockholders who have brought suits to annul a contract between the Air Line company and the Co-operative Construction Company which had agreed to build the road for the stock issue of the former. The court denied the motion of the plaintiffs for the appointment of a receiver and the issuing of a restraining order and ordered the defendant to answer the bill of complaint within 20 days.

United States Express Company to Operate over Detroit United Railway.—It is reported that the United States Express Company has signed contracts whereby it will handle all the express package business over the lines of the Detroit United Railway, the Detroit Monroe & Toledo Short Line Railway and the Toledo & Western Railway. It is also stated that the company has purchased the Electric Package Express Company, operating between Toledo and Cleveland over the Lake Shore Electric Railway, and that it will operate a through express service between Detroit, Cleveland and Toledo. The new deal becomes effective on July 1.

Oconomowoc Line Opened.—The new line of the Milwaukee Electric Railway & Light Company from Milwaukee to Oconomowoc, Wis., was opened for traffic on Monday of this week. Owing to a strike at the works of the St. Louis Car Company only one of the 10 new cars ordered for the line was put into service. This car will for the present be operated as a shuttle car between Waukesha Beach and Oconomowoc, connecting with cars from the city every hour. When the new cars arrive they will be put in service between the Public Service building and Oconomowoc, and will make the distance of 38 miles in 1 hour and 45 minutes, leaving each terminal every hour during the summer. The fare is 50 cents one way and \$1.25 round trip.

Power Plant Wrecked by Bursting Flywheel.—The power house of the Allegheny Valley Street Railway Company at Creighton, Pa., was badly wrecked on June 1 by a bursting flywheel of an engine. Early in the morning some of the employes noticed that the governor belt had slipped and that the engine was running wild. They notified Engineer Geiger, who hastened to the engine room to shut off the steam. As he was within a few feet of the engine the flywheel burst and he was struck by a section weighing several tons and crushed to death. One section of the wheel crashed through the brick wall of the building. The sides and roof of the building were damaged by other pieces of the wheel, which also broke pipe connections. Service on the lines to Tarentum was not resumed until 7 o'clock that night.

Governor Signs Pennsylvania Electric Railway Bills.—Governor Stuart of Pennsylvania on June 1 signed the so-called Homsher bill, which gives to electric railway companies the right of eminent domain, provided they first secure the consent of owners of 51 per cent of the property along the proposed route. The bill was opposed by the steam railroads and by many property owners. It is expected that the new law will give a strong impetus to the building of electric railroads throughout the state. The governor has also signed the Fahey bill, amending the street railway act of 1895. It provides that the consent of the local authorities of all cities, boroughs and townships of the first class and of the boards of road supervisors of townships of the second class be obtained before charters for new roads or extensions may be secured.

Coronado Tent City.—The Coronado Railroad of Coronado, Cal., has issued an attractive folder describing Coronado Tent City, which is owned by the company. The Tent City, as its name implies, is a resort for campers, fronting on both the Pacific ocean and San Diego bay. It is provided with furnished tents and palm cottages, which are rented to guests at a reasonable rate, and covers over two miles of ground, laid off into streets. Water supply and sewerage systems are provided and the resort contains nearly all of the conveniences of a city, such as restaurants, stores, telephones, etc. Facilities are furnished for nearly every form of summer amusement, including a large dancing pavilion and a concert band. The resort is reached by the electric cars of the Coronado Railroad, which has a line from San Diego, running through Tent City. The season lasts from June 15 to September.

Central Electric Railway Data Blanks.—W. F. Milholland, secretary of the Central Electric Railway Association, Traction Terminal building, Indianapolis, has recently mailed to each railway in the territory included by the association a set of blanks which it is especially desired to have carefully filled out and returned to the association office. One of these blanks is a lightning report that has been formulated by George Whysall, general manager of the Columbus Delaware & Marion Railway, Marion, O., chairman of the lightning arrester committee of the association. The blank calls for a very detailed report of the performance of the lightning protective apparatus used on high-tension and trolley lines in the generating plant or substation. The other blank is designed to furnish the lightning arrester committee with general information regarding the generating station equipment, substations, low-tension arresters, high-tension lines, trolley lines, overhead ground wires, track and rolling stock. It is desired to have these general data blanks filled out and returned immediately to the secretary and it is hoped that each manager will obtain a plentiful supply of the lightning reports, so that the effects of each storm may be reported in full.

Construction News

FRANCHISES.

Anniston, Ala.—L. H. Kaplan and associates have applied for a franchise to build an electric railway in this city.

Cleveland, O.—It is stated that the Everett-Moore interests of this city will ask for a franchise in East Ninth street, from Prospect avenue S. E. to Eagle avenue S. E., where the depot of the Electric Package is located. This will afford track facilities in East Ninth street, which at present, owing to the expiration of the Cleveland Electric Railway franchises, is without such service.

Ft. Worth, Tex.—The Northern Texas Traction Company has been granted a 30-day extension in which to complete laying its track on Houston street, from Tenth to and along Front street. This also applies to the operation of its cars.

Hughestown, Pa.—A franchise for the use of Parsonage street has been granted to the Pittstown & Avoca Street Railway.

Indianapolis, Ind.—The Terre Haute Indianapolis & Eastern Traction Company, which was incorporated last March to take over several interurban companies entering Indianapolis, has made formal application for an individual franchise to operate its lines in this city.

Knoxville, Tenn.—S. D. Divine, promoter of an electric railway in this city, has applied for a franchise to build a line to Chickamauga Park, Sherman Heights, Highland Park and other suburbs. The petition calls for a third track in Market street, the main thoroughfare of Knoxville, which it is said will be contested by the Chatanooga Railways Company. A franchise also was asked for a line in Sixth street to the top of Cameron Hill in Boynton Park.

Laurel, Miss.—The Gulf States Investment Company, which operates the electric lighting plant of this city, has applied for a street railway franchise.

Milwaukee, Wis.—The amended franchise passed last week by the council, giving the Chicago & Milwaukee Electric Railroad the right to operate its cars on Wells street, east to Second street, has been vetoed by Mayor Becker for the reason that it gives the company exclusive rights on Wells street. This is one of the main arteries by which the downtown district is reached with electric cars and the mayor claims that the wording of the franchise as passed, with its exchange privileges with the Milwaukee Electric Railway & Light Company on Grand avenue, whereby a loop would be formed on Sixth, Wells and Second streets and Grand avenue, would admit of a combination between the two companies in an agreement to control the street railway traffic of that section. As this would limit the entrance of other competing lines to this district, and, in the opinion of the mayor, work to the disadvantage of the best interests of the city, he urges such wording of the franchise as to allow of no combination of these interests for the exclusion of outside competing lines. It is stated that in view of the fact that the Chicago & Milwaukee Electric already has secured under its old franchise certain privileges on Sixth street and over the Sixth street viaduct which the mayor would now restrict, and has paid \$50,000 to the city toward the construction of the viaduct, President Frost is unwilling to grant any additional concessions to those already made in the amended franchise.

Montreal, Que.—The Montreal Park & Island Railway has been granted permission by the minister of railways to extend its line from Stony Point to Valois, Que. D. McDonald, manager, Montreal, Que.

Mt. Clemens, Mich.—William T. Cross has asked for a franchise for an electric or steam line on Spruce and Avery streets, which will connect with the new belt line at the Detroit city limits. If built the road will be on private right of way south from Mt. Clemens to the Detroit limits. It is stated that Capt. James Davidson of Mt. Clemens is interested.

San Angelo, Tex.—Col. J. H. Ransome of Hereford, Tex., has applied for a street railway franchise in this city.

San Diego, Cal.—The South Park & East Side Electric Railway Company, of which E. Bartlett Webster is the principal owner, has been granted a franchise and right of way to run its line from the eastern boundary of the city of San Diego, along El Cajon avenue, and through La Mesa Springs and El Cajon.

Sheridan, N. Y.—The Buffalo & Lake Erie Traction Company has applied for permission to run its line east and west through this city between the main road and the Pennsylvania tracks, crossing several north and south highways. A special meeting will be called to act upon the application.

Spokane, Wash.—The Spokane Traction Company has made application for permission to lay a track commencing at Garland avenue and Post street, in Monroe Park addition, connecting at that point with its main tracks, and from thence west on Garland to Madison street and north on Madison to Elgin avenue.

RECENT INCORPORATIONS.

Columbus (Miss.) Light & Railway Company.—Incorporated in Mississippi to build or acquire and operate an electric light and power plant in Columbus. Capital stock, \$300,000. Incorporators: William Baldwin, Walter Weaver and Charles F. Sherrod.

Lake Erie Fremont & Southern Railway.—Incorporated in Ohio to build an interurban electric line through Ottawa, Sandusky and Seneca counties, with a terminal at Tiffin, O., where it will connect with other interurban lines extending into the interior of the state. The line will serve as a feeder to the Toledo Port Clinton & Lakeside Railway and possibly will be merged with the latter road when completed, as the incorporators of the new company are closely identified with the Toledo Port Clinton & Lakeside Company. Franchises have been secured for a belt line at Fremont and about \$75,000 worth of bonds have been subscribed for by the people of that city and Fostoria. Work on the belt line is to be commenced at once and as soon as the financial arrangements have been completed work on the road between Fremont and Oak Harbor, where the new line diverges from the Toledo Port Clinton & Lakeside, will also be started. The building of this line, together with a proposed branch line to the state rifle range, will enable the Toledo Port Clinton & Lakeside to control a considerable amount of the passenger traffic from the southern and central portions of the state. The headquarters will be at Toledo. The incorporators are: H. F. Shunck, A. E. Klausner, Theodore Schmitt, William Miller and George W. Luckey, Toledo, O.

Portland (Ore.) Eastern Railway.—Incorporated in Oregon to build an electric railway from Portland to Mt. Hood, Ore. This is the corporate name for the Mt. Hood Railway & Power Company, which was organized some time ago for this purpose, by interests identical with the new company. Capital stock, \$5,000,000. Incorporators: E. P. Clark, Arthur H. Fleming, Los Angeles; Elmer B. Colwell, Robert T. Linney and C. W. Miller, Portland. A large portion of the surveys for the route already have been made by the former company.

Puget Sound International Railway & Power Company.—Incorporated in Maine to operate railways. Capital stock, \$500,000. Incorporators: John E. Rousmaire, Alvah K. Todd, Phillip L. Warren, Joseph F. Lovering, Benjamin Joy, Boston, Mass.; Charles M. Drummond, president; Gertrude M. Horne, treasurer; Josiah H. Drummond, Wilford G. Chapman, Portland, Me.

Springfield Beardstown & Quincy Railroad, Quincy, Ill.—Incorporated in Illinois to build an interurban line from Springfield to Petersburg, Chandlerville, Beardstown and Quincy, Ill. Capital stock, \$25,000.

TRACK AND ROADWAY.

Alamo, Tenn.—A meeting has been called for June 22 in the interest of a project to build an electric railway from Humboldt to Gadsden, Alamo, Maury City, Friendship, Stokes, Eaton, Brazil, Gibson Wells and to Humboldt again, completing the circuit.

Bahia Tramway Light & Power Company.—It is reported that New York interests, said to be allied with the Havana, Mexico City, Rio de Janeiro and other West Indian, Central and South American electric traction and lighting properties, have completed financial arrangements in Europe for the construction and operation of street railways in Bahia, Brazil. A lighting monopoly has been taken over and extensive water power rights have also been acquired. The development of the Bahia projects will entail an expenditure of nearly \$10,000,000. The company was recently incorporated in Maine, with a capital of \$3,500,000. There are also authorized \$7,500,000 of 5 per cent 50-year first mortgage bonds. An issue of \$3,500,000 of these bonds has just been sold in the London and Brussels markets. The New Yorkers interested in the company include: Percival Farquhar, William Lanman Bull and F. S. Pearson.

Barberton Doylestown & Orrville Railway.—We are advised by the Cleveland Engineering Company that the report that that company has the contract for building this line from Barberton to Orrville, O., is incorrect.

Buffalo Lockport & Rochester Railway.—This company secured the last of its right of way between Rochester and Lockport, N. Y., last week, when the condemnation proceedings for a strip of land in Niagara county were settled.

Burlington, Ia.—A company is being organized to make surveys and do the necessary preliminary work for an electric railway from Burlington to Bonaparte and West Point, Ia.

Calgary, Alberta.—It is announced that bids for the construction of the Calgary Electric Street Railway, to be built by the municipality at a cost of \$250,000, will be received soon after August 1 next. W. F. Thorold, city engineer.

California Street Cable Railroad, San Francisco, Cal.—This company is taking advantage of the strike, which has been in progress for the past month in San Francisco, to make some extensive repairs and improvements to its plant and tracks. The most important undertaking is the elevation of the track on California street, between Market and Sansome streets, about three feet. House-raising jacks have been placed under the steel ribs which form the cable bed, and the whole body has been raised while still embedded in the concrete.

Carlyle & St. Louis Railroad, East St. Louis, Ill.—It is reported that this company will soon let contracts for an extension of the East St. Louis & Suburban Railroad from Carlyle to Lebanon, Ill., 23 miles. Right of way is now being secured and surveys are being made. Thomas E. Ford of Carlyle, president.

Charlotte, N. C.—It is announced that the Charlotte Consolidated Construction Company has begun surveys for the proposed interurban electric line from Mt. Holly to Gastonia in Gaston county, via McOdenville and Lowell. W. L. Law, chief engineer.

Chicago Great Western Railway, St. Paul, Minn.—We are

officially advised by L. S. Cass, third vice-president, that recent reports that this company had decided to electrify its line between Rochester and Winona, Minn., were premature. The company has been making some estimates, but nothing definite has been determined.

Chicago South Bend & Northern Indiana Railway, South Bend, Ind.—Three carloads of rails have been delivered at Michigan City, Ind., for the construction of the double-track line on Franklin street.

Chicago Waukegan & North Shore Railway.—This company has filed a mortgage in favor of the Central Trust Company of Chicago for \$1,500,000, to secure a bond issue for building the line from Waukegan, Ill., to Kenosha, Wis.

Cleveland & Indianapolis Interurban Railway.—It is reported that options have been secured on practically all the right of way for this line from Norwalk, O., to Bluffton, Ind. C. F. Jackson of Norwalk is interested.

Cleveland (O.) Electric Railway.—This company has made an agreement with the Cleveland Painesville & Eastern Railroad whereby it uses about 2½ miles of the latter's shore line tracks, starting at Collinwood and running west.

Columbia & Walla Walla Traction Company.—H. U. Wallace of the Wallace-Coates Engineering Company, Chicago, has been sent to Dayton, Wash., west of Spokane, by an eastern bonding company, which has under consideration the financing of the electric line from Dayton to Wallula, Wash., via Walla Walla and Milton. Mr. Wallace made a trip over the line recently surveyed for an extension to Pennewawa, on the Snake river, and made an inspection of the power facilities on the upper Tucannon, where there is a natural waterfall of 300 feet, capable of developing several thousand horsepower, which can be made available at a small cost. The right of way between Dayton and Wallula has been secured. The survey from Dayton to Pennewawa, 50 miles, is taken to mean that a connection with the Spokane & Inland Empire line from Spokane to that point is contemplated. J. W. Morrow of Waitsburg is general manager.

Covington & Southwestern Traction Company, Covington, Ind.—We are officially advised by William G. Ruhl, president, Chicago, Ill., that this company's proposed line from Covington to Crawfordsville, Ind., 52 miles, will be operated by steam motors. The entire line has been surveyed and grading has been completed from Covington to Coal Creek, 8.8 miles. Contracts are to be let for completing the road to Coal Creek. C. W. Leinbach, chief engineer.

Crawfordsville, Ind.—A new interurban traction line has been projected to connect Linden, New Richmond, Attica and Indiana Mineral Springs with Crawfordsville, Ind. The American Engineering Company of Indianapolis will survey the route and the company now being organized is to be incorporated this week. The new line taps a good farming community and the towns and cities to be connected are thriving and prosperous.

Denver & South Platte Railway.—H. W. Hartman, Denver, Colo., writes that the grading on this company's proposed electric line from Denver to Roxboro Park, 20 miles, was started on May 20 and is now in progress from Englewood to Littleton, Colo. The type of overhead construction has not been decided. Power will be purchased. Joseph Osner of Denver has the grading contract. Other contracts, excepting those for ties and rails, are still to be let. William E. Hughes, president, Continental Trust Company, Denver; T. B. Doan, vice-president; T. J. Milner, chief engineer, Majestic building, Denver. The permanent trustees of the company will be chosen later.

Dunnville Wellandport & Beamsville Railway, St. Catherines, Ont.—This company has been organized to build a line from Lake Erie to Lake Ontario, about 40 miles.

Illinois Traction Company, Champaign, Ill.—The Illinois railroad and warehouse commission has decided that this company must build at its own expense an overhead crossing over the tracks of the Chicago & Alton Railway at Iles Junction, Ill., on the proposed belt line around the city of Springfield. The commission has also decided in favor of a grade crossing at Main street, Jacksonville, Ill., where the electric railway tracks will cross those of the Chicago Burlington & Quincy, Chicago & Alton and Chicago Peoria & St. Louis railroads. The traction company is to bear one-fourth of any extra expense that may accrue.

Indianapolis Newcastle & Toledo Electric Railway, Newcastle, Ind.—This company is reported to be surveying a line from Newcastle to Muncie, Ind.

Inland Power & Electric Company, Spokane, Wash.—It is reported that this company will build a power plant at Albeni Falls on the Pend d'Oreille river, and an electric railway from Spokane to Newport, Wash. Fred Goddard of Spokane is interested.

Jackson (Mich.) Consolidated Traction Company.—B. F. O'Mara, superintendent, is making preparations for several improvements to the lines in Jackson this summer. Rails are being shipped for relaying the tracks on Francis and Ganson streets and Stewart avenue.

Knoxville (Tenn.) Railway & Light Company.—Within a short time this company will double-track the Broadway line from Central street to the city limits. The Clinch street line is being extended and the Fifth avenue line is being double-tracked. J. H. Drake, chief engineer.

Lake Erie & Youngstown Railroad, Youngstown, O.—Engineers are now at work on the surveys of this company's proposed 60-mile line between Youngstown and Conneaut, O. The line will pass

through Andover, Kinsman, Burgh Hill, Canfield and Church Hill. George Todd, Jr., Youngstown, chief engineer.

Lebanon Highland & Mt. Olive Railway, Lebanon, Ill.—This company will build a 40-mile electric line between Lebanon and Mt. Olive, Ill., with a branch from Highland to Maryville. Edward Lentz is interested.

Lebanon Valley Street Railway.—It is stated that this company is planning a 6-mile extension of its line from Avon to Schaeffers-town, Pa. C. H. Smith, superintendent, Lebanon, Pa.

Lewiston Augusta & Waterville Street Railway, Lewiston, Me.—It is reported that this company will in the next few weeks let contracts for 50 miles of 70-pound A. S. C. E. rails, 5,000 ties and 1,000 cedar poles. The Fred S. & A. D. Gore Corporation of Boston, Mass., has the contract for building the company's three proposed lines, from Auburn to Mechanic Falls, Me., nine miles; from Sabattus to Gardiner, 20 miles; and from Augusta to Waterville, 21 miles. John R. Graham of Bangor, Me., is president.

Litchfield (Conn.) & Torrington Street Railway.—Surveys are now being made and financial backing secured for this company's proposed line between Torrington and Litchfield, Conn., via Lake Bantam, about eight miles. W. F. Dowd, president, Litchfield; T. H. McKenzie, secretary and treasurer, Southington, Conn.

Mattoon Shelbyville Pana & Hillsboro Railroad, Charleston, Ill.—Civil Engineer A. N. Fisher and a corps of assistants are making a new survey of this proposed line from Mattoon to Hillsboro, Ill., 60 miles. The new survey parallels the Cleveland Cincinnati Chicago & St. Louis Railway for most of the way. It is announced that financial arrangements have been made for beginning construction. W. R. Patton of Charleston, president.

Minneapolis Rochester & Dubuque Traction Company, Minneapolis, Minn.—The first grading work on this road was started last week about two miles south of Minneapolis. A 35-horsepower traction engine, a grader and a large number of teams are employed. The road is projected to extend from Minneapolis to Dubuque, Ia., and several franchises have been secured. Robert Baldwin, chief engineer.

Monroe, Mich.—H. C. La Flamboy of Detroit is promoting a line from Monroe to Dundee, 15 miles. A franchise in Dundee and seven miles of right of way have been obtained.

Nashville (Tenn.) Interurban Railway.—John A. Pitts, counsel of this company, which is building a line from Nashville to Mt. Pleasant, Tenn., 60 miles, has filed a mortgage to the Trust Company of America of New York, as trustee, to secure an issue of \$1,500,000 first mortgage 30-year 5 per cent gold bonds. Construction work was begun last week at Franklin. The Interurban Company of New York, of which Patrick Hirsch is president, has the general contract for building and equipping the line. A subcontract for grading has been let to James B. Smith. H. H. Mayberry, president, states that contracts for the entire line will be let within two weeks. D. A. Proctor, chief engineer.

New York, N. Y.—Sealed bids will be received until June 13 by the New York rapid transit commission for the construction of the section of Route No. 9, the bridge subway loop in Delancey street, from the Bowery to Norfolk street.

Niagara St. Catharines & Toronto Railway, St. Catharines, Ont.—This company has completed its 7-mile extension between Thorold and Fonthill and is now constructing another 5-mile extension from Fonthill to Welland, Ont. E. F. Seixas, general manager, St. Catharines, Ont.

Northern Electric Railway, Chico, Cal.—This company has commenced laying rails south from Marysville, Cal., on its extension toward Sacramento. A short delay will occur while the bridge across the south channel of the Yuba river is being completed, but it is believed that construction trains may be run to Sacramento by August 1.

Northern Texas Traction Company, Ft. Worth, Tex.—H. T. Edgar, vice-president and general manager, is quoted as follows: "Reports that our company will apply to the city council of Cleburne for a franchise to build an interurban line into that place from Ft. Worth are not correct. No decision has been reached as to final action on the matter of routes between the two places. Four different lines are now under consideration, and not until we make a selection and know where we will want to enter Cleburne, will a franchise be asked for. We do not contemplate placing in operation a city line at Cleburne, and when we ask for permission to use certain streets there, it will be only for an interurban."

Omaha & Council Bluffs Street Railway, Omaha, Neb.—Construction was begun last week on the extension from Thirty-sixth and Ames avenues west to Fortieth streets, and thence north to Grand avenue, three-fourths of a mile.

Ottumwa, Ia.—It is reported that W. W. Cummings of Ottumwa has been awarded a contract for grading an interurban road from Ottumwa to Hockins, Ia.

Owingsville, Ky.—The Kaufman-Shaw Construction Company of Dayton, O., proposes to build an electric line from Salt Lick to Owingsville, Ky., and on to Carlisle and Cincinnati. It is stated that work will begin this month.

Pacific Electric Railway, Los Angeles, Cal.—This company has been granted permission to construct a viaduct across Los Angeles street, connecting with the rear of the Huntington building at Sixth and Main streets, so that the Long Beach and other interurban cars running out East Ninth street may enter the depot from the rear and upon the same floor as at present.

Panhandle Electric Railway & Power Company.—Thomas W. Payne of Detroit, Mich., A. J. Smith of Spokane, Andrew Coolin of Priest River, Harry H. Wallace and John R. Jones of Spokane, have organized a company to build an electric line in the Priest Lake country, northeast of Spokane. The project will be carried out by eastern capital. The power will be generated at a plant to be constructed below the outlet of Priest Lake, in the Priest river valley. A flume is planned from the lake to a point down the valley where the greater power can be obtained. The lake will be turned into a reservoir, so that the flow can be equalized throughout the year. The line will tap timber belts and mining districts, giving heavy tonnage.

Pittsburg & Westmoreland Railway, Pittsburg, Pa.—It is announced that this company is ready to let contracts for the construction of a 6-mile single-track line. James Bryan, chief engineer, Park building, Pittsburg, Pa.

Pittsburg (Pa.) Railways Company.—It is reported that the directors have authorized the construction of a line from Canonsburg to Castle Shannon, Pa., to cost \$750,000.

Portland (Ore.) Railway Light & Power Company.—It is reported that it has been decided to build a spur line from Gladstone Station to Gladstone Park.

Puebla Atlixco & Metepec Electric Railway, Puebla, Mex.—J. A. McNaught, who is promoting this electric line from Zocalo through Puebla, Las Fabricas, Santa Clara, Coyoacan and Atlixco to Metepec, Mex., about 30 miles, is now completing his plans and expects to let contracts in a short time for the construction work. R. Martinez Carillo of Puebla is president and Mr. McNaught is vice-president and general manager.

San Antonio (Tex.) Traction Company.—This company has ordered the rails for its 1½-mile loop line in Alamo Heights and within the next two weeks will let contracts for its construction.

St. Joseph & Nodaway Valley Railway, St. Joseph, Mo.—It is reported that this company has combined with the promoters of the St. Joseph Belt & Interurban Railway and will build an interurban line from the St. Joseph city limits to Graham, 40 miles, while the latter company will build the line inside the city. Surveys have been completed to Graham and practically all the right of way has been secured in Andrew and Nodaway counties. It is not yet announced when construction will begin. The following directors have been elected: I. R. Williams of Savannah, Mo.; D. L. Bartlett, Dr. John S. Logan, John Townsend, David E. Heaton, S. S. Brown, John A. Duncan, Louis Huggins and Lucien J. Eastin of St. Joseph; C. W. Spicer, Jr., Fillmore; and Thomas E. Fleming, Graham. Several of these are directors of the Belt & Interurban Company.

St. Joseph (Mo.) Light Heat & Power Company.—It is reported that E. W. Clark & Co. of Philadelphia, who control this company, propose to organize a new company to build an extension from Lake Conrary to Atchison, 17 miles. The project will require an issue of \$175,000 of bonds.

St. Joseph Savannah & Northern Interurban Railway, St. Joseph, Mo.—An official of this company states that it is proposed to begin construction in about 90 days on the line from St. Joseph to Savannah, Mo., and that financial arrangements have been made. It is proposed to enter St. Joseph over the tracks of the St. Joseph Railway Light Heat & Power Company. E. W. Clark & Co. of Philadelphia, owners of the St. Joseph company, have taken half of the \$300,000 bond issue and local banks the other half.

San Diego (Cal.) Electric Railway.—This company proposes to build about six miles of extensions to its city lines this year, besides some already under construction. The National City & Otay Railway, operated by this company, is being converted from a steam to an electric line and the overhead work is completed between San Diego and Chula Vista, nine miles.

Seattle-Tacoma Interurban Railway.—Merle J. Wightman of Tacoma, who holds franchises in both cities for the line from Tacoma to Seattle, has applied for a permit to begin construction at once in Seattle. Mr. Wightman states that \$2,000,000 of bonds have been disposed of in New York.

Springfield Wilmington & Cincinnati Electric Railway.—This company has acquired the property of the Springfield & Xenia Railway Company. The new company will extend the line now running from Springfield to Xenia, O., to Wilmington and Cincinnati, O., making a total length of 160 miles of road.

Steubenville Mingo & Ohio Valley Traction Company, Steubenville, O.—This company has commenced the work of rebuilding its interurban line through Mingo, O. J. W. Marsh, superintendent.

Texas Traction Company, Dallas, Tex.—An official report from this company states that about 30 miles have been graded on the line from Sherman to Dallas, 63 miles. The route includes Howe, Van Alstyne, Anna, Melissa, McKinney, Albin and Richardson. There are now eight construction camps and grading is in progress over the entire route. At McKinney, where the power house will be located, a siding about half a mile long is being built to facilitate the handling of the electrical machinery. The dam for the power house is being completed and ground has been broken for the building. The overhead construction will be of the catenary type. The Fred A. Jones Company of Dallas has the general contract. The equipment for the power house and five substations will be furnished by the General Electric Company. J. F. Strickland, president; F. A. Jones, chief engineer.

Toledo & Ft. Wayne Electric Railway, Ft. Wayne, Ind.—Engineer David Spindler has started with a corps of surveyors

to locate this company's proposed line from Bryan, O., through Hicksville and Marysville to Ft. Wayne, Ind.

Toronto & York Radial Railway, Toronto, Ont.—The recently completed extension of this company's line from Newmarket to Jackson's Point, Ont., has been formally opened. W. H. Moore, Toronto, general manager.

Toledo Wabash & St. Louis Railroad, Toledo, O.—This company, recently incorporated to build an electric railway from Toledo, O., to St. Louis, Mo., in four sections, via Ft. Wayne, Indianapolis and Terre Haute, has begun grading between Neapolis and Maumee, O., on the first section, which will extend from Toledo to Defiance. The Atlantic Construction Company has the contract and subcontracts have been let to H. E. Roch and George Shoemaker. The company is also considering the advisability of letting another contract for the grading between Neapolis and Liberty Center. A contract for concrete work has been let to C. W. Ryan & Co., including culverts and abutments. C. D. Whitney of Toledo, president.

Tulsa (I. T.) Street Railway.—This company began operating cars over its new 2-mile street railway line in Tulsa on May 27. C. H. Bosler, president.

United Cities Traction Company, Ft. Smith, Ark.—It is announced that all of the right of way for the line from Ft. Smith to Muskogee, I. T., has been secured and that work will begin at once. It is stated that \$100,000 will be expended in Ft. Smith, Ark. A line is to be built for freight transfer traffic from Ft. Smith, Ark., to Ft. Smith, Okla., 4½ miles. Contracts have been let. Ira L. Reeves of Muskogee, president.

Utica Southern Railroad, Utica, N. Y.—The New York railroad commission has consented to an issue of a first mortgage for \$750,000 for the construction of the line from Clinton to Waterville, N. Y., 26 miles. Frank H. Baxter, chief engineer.

Vallejo (Cal.) & Northern Railroad.—Surveys are now being made near Woodland, Cal., for this company's proposed line, which will connect Vallejo with Cement, Suisun, Cordelia, Winters, Woodland and Sacramento.

Washington Railway & Power Company, Vancouver, Wash.—Ground was broken on May 30 for the construction of this company's proposed street railway system in Vancouver. Rails have been received for seven miles of road. Franchises have been secured in the city and county, and it is proposed to build an extensive system of electric railways radiating from Vancouver, including lines to Washougal and Proebstel. Walter H. Moore of Portland is president and Arthur Langguth is secretary and has immediate charge of the construction work.

Western New York & Pennsylvania Traction Company, Olean, N. Y.—Rapid progress is being made on the construction of the line between Olean, N. Y., and Bradford, Pa., via Rock City, and it is expected that cars will be running by June 10. W. R. Page, president, is quoted as saying that the proposed line to connect Bradford, Pa., with Carrollton, N. Y., will be pushed forward to completion as soon as the line now under construction from Olean to Salamanca, N. Y., via Allegany, is completed. Mortimer Silverman, electrical engineer.

Winona Interurban Railway, Winona Lake, Ind.—S. C. Dickey, general manager, announces that the Ft. Wayne extension will be built at once. It was thought after the recent defeat of subsidies at several township elections that the project might be abandoned, but the farmers have subscribed the desired amounts and contracts will be let as soon as specifications are prepared.

Wichita (Kan.) Railroad & Light Company.—This company has just completed an extension to Wonderland Park.

POWER HOUSES AND SUBSTATIONS

Austin (Tex.) Electric Railway Company.—This company has announced that it is in the market for a 300 to 350 kilowatt, 500-550-volt direct-current railway generator, direct-connected to a compound condensing engine.

Detroit Jackson & Chicago Railway, Detroit, Mich.—This company, formerly the Detroit Ypsilanti Ann Arbor & Jackson Railway, has made a contract with the Commonwealth Power Company to furnish the power required for operating its lines west. Substations are now being constructed at Chelsea and Grass Lake, which will be equipped with step-down transformers, converters and necessary switchboard apparatus. These changes will do away with the substations at Lima Center, Michigan Center and Francisco. It is expected that the service will not only be better, but that it will also be more economical. The power will be received at the substations from the Commonwealth's power plant at Lyons, Mich., at which point the company has a dam.

Rockland Thomaston & Camden Street Railway, Rockland, Me.—This company has announced that it will make an addition to its plant by the installation of a 200 or 300 kilowatt, 2,080-volt 125-cycle single-phase generator and engine. The company is in the market for either a direct-connected or belted unit. A switchboard and all the accompanying instruments complete will also be purchased.

Washington Water Power Company, Spokane, Wash.—This company is building a steam turbine generating station in which a 3,000-kilowatt Curtis turbine will be installed. It is said the turbine will be ready for operation by September, 1907. The company is now operating two hydraulic power stations, aggregating 20,000 horsepower.

Personal Mention

Mr. E. F. Davis has resigned as superintendent of the southern division of the Brooklyn Rapid Transit Company, Brooklyn, N. Y.

Mr. Warren S. Hall, heretofore general manager of the Lehigh Valley Transit Company, Allentown, Pa., has been elected vice-president of the company.

Mr. Everett F. Kyle, formerly superintendent of the Norwalk (Conn.) lines of the Consolidated Railway Company, has resigned to engage in other business at Cuylersville, N. Y.

Mr. R. N. Barrows has resigned as purchasing agent for the Washington (D. C.) Railway & Electric Company, to become sales agent at Richmond, Va., for the Atha Steel Casting Company of Newark, N. J.

Mr. William K. Glenn, who resigned recently as master mechanic of the Tacoma (Wash.) Railway & Power Company, has been appointed superintendent of the Portland (Ore.) Railway Light & Power Company.

Mr. H. W. Mann has resigned as electrical engineer of the Pueblo & Suburban Traction & Lighting Company of Pueblo, Colo., to take a similar position with the Northern Colorado Power Company at Lafayette, Colo.

Mr. Robert O'Brien, heretofore superintendent of the Claiborne street line of the New Orleans Railway & Light Company, has been appointed division superintendent of the company, with headquarters in New Orleans, La.

Mr. L. K. Burge, whose appointment as general superintendent of the Lake Shore Electric Railway and all properties controlled by that company was announced on May 23, by letter from General Manager F. J. Stout, while Mr. Burge was attending the meeting of the Central Electric Railway Association at Indianapolis, as reported in the Electric Railway Review of May 25, was born on May 13, 1874, at Lafayette, Ind. He attended the public schools and completed his education at Stockwell College. In 1896 he moved to Toledo, O., and accepted a position as conductor. He worked as conductor and motorman until 1900, when he was appointed assistant dispatcher of the Detroit Monroe & Toledo Short Line Railway, Monroe, Mich. Later in the same year he was made chief dispatcher of the same line and also had charge of the electrical equipment in substations. In May, 1903, he was appointed superintendent of the Sandusky division of the Lake Shore Electric Railway, was later superintendent of the Norwalk-Cleveland division, and superintendent, and now becomes general superintendent of the entire system, with the right to take up direct with heads of departments all transportation matters. Mr. Burge will have his headquarters at Norwalk, O.



L. K. Burge.

Mr. Hugh Cook, formerly assistant engineer of the Youngstown & Ohio River Railroad at Youngstown, O., has been appointed chief engineer and superintendent of construction of the lines on Long Island, which the Stanley interests of Cleveland are building.

Mr. T. F. Grover, heretofore general manager of the Trinidad (Colo.) Electric Railroad, has been appointed manager of the Terre Haute, Ind., properties of the Terre Haute Indianapolis & Eastern Traction Company, succeeding Mr. C. T. Mordock, resigned to accept another position.

Mr. A. W. Q. Birtwell, assistant treasurer of the Houston (Tex.) Electric Company, has resigned to become connected with the treasury department of the Northern Texas Traction Company, Ft. Worth, Tex. He will be succeeded by Mr. H. L. Harding, heretofore chief clerk in the office of the treasurer.

Mr. Edward Gaffney has been appointed superintendent of the eastern division of the Chicago South Bend & Northern Indiana Traction Company, with headquarters at Elkhart, Ind. He will have supervision over the interurban line between Goshen and Mishawaka and over the Goshen and Elkhart city lines.

Mr. J. M. Bramlette, general superintendent of the Michigan United Railways, with headquarters at Kalamazoo, Mich., has been appointed general manager of that company, succeeding Mr. J. R. Elliott, vice-president and general manager. Mr. Elliott will retain the office of vice-president. Mr. Bramlette has been connected with the Michigan United Railways since the spring of 1906, before which date he was general manager of the Philadelphia & Western Railroad, then under construction. Previous to that

time he was for 10 years general manager of the East St. Louis (Ill.) Railway.

Mr. Reese Davis, for the past three years roadmaster of the Mexico City Electric Tramways Company at Mexico City, has accepted a similar position with the Consolidated Railway Company's local and suburban lines in Hartford, Conn. Mr. Davis was formerly roadmaster of the Connecticut Railway & Lighting Company's local lines in Bridgeport, Conn.

Mr. Charles H. Copley, formerly manager of the Bellows Falls & Saxton's River Street Railway at Bellows Falls, Vt., and more recently engaged on the construction work of the new line of the Consolidated Railway between Rockville and Stafford Springs, Conn., has been appointed superintendent of this company's local lines in Norwalk, succeeding Mr. Everett F. Kyle, resigned.

We are officially advised that the report in last week's issue of the Electric Railway Review that Mr. C. E. Flynn had resigned as second vice-president and general manager of the Conneaut & Erie Traction Company, Erie, Pa., to be succeeded by Mr. B. E. Walker, now superintendent, is incorrect. Mr. Flynn, who is a director and large stockholder in the company, is simply giving up the active management.

Mr. W. N. Stevens has resigned his position as mechanical engineer of the southern properties controlled by Ford, Bacon & Davis of New York City, effective on June 1. Mr. Stevens was formerly chief assistant mechanical engineer of the Manhattan Railway and Interborough Rapid Transit companies of New York, and for a number of years has been engaged in the design and construction of power houses and other buildings for electric railway and lighting properties.

Mr. John Powers, who recently resigned as superintendent and electrical engineer of the Sterling Dixon & Eastern Electric Railway, Sterling, Ill., as reported in the Electric Railway Review of May 25, has accepted a position with the Milwaukee Electric Railway & Light Company, instead of going to the Galesburg Railway & Light Company, as previously reported. The Milwaukee and the Sterling companies are both controlled by the same interests. Before leaving Sterling to take up his new duties Mr. Powers' former associates on the Sterling Dixon & Eastern presented him with a handsome Masonic watch charm as a token of their regard.

Mr. W. H. Simms, general superintendent of the Philadelphia & Western Railroad, which was recently opened for traffic from Philadelphia as far as Strafford, Pa., is an experienced steam railroad operating man. He was born near Bath, Somersetshire, England, and attended private and public schools. His railroad experience embraces that of freight brakeman, conductor, fireman, engineer, station master and passenger trainmaster. From 1888 to 1901 he was passenger trainmaster in charge of the Philadelphia division of the Pennsylvania Railroad, and from 1901 to 1906 was head station master at Philadelphia, in charge of the Broad street and West Philadelphia stations of the same road.

Mr. L. F. Loree of New York City, president of the Delaware & Hudson Company, was on June 1 elected president of the United Traction Company of Albany, N. Y., and the Hudson Valley Railway of Glens Falls, N. Y., to succeed the late David Willcox. Both companies are controlled by the Delaware & Hudson Company. Mr. C. S. Sims of Albany, general manager of the Delaware & Hudson, was also elected vice-president of both companies, succeeding Mr. Abel I. Culver, resigned. Mr. Loree was born on April 23, 1853, at Fulton City, Ill., and has had a long experience in the engineering department of several steam railroads. From January 15, 1896, to January 1, 1901, he was general manager of the Pennsylvania Lines West of Pittsburgh, and from January 1 to June 1, 1901, fourth vice-president of the same lines. From June 1, 1901, to January 1, 1904, he was president of the Baltimore & Ohio Railroad, and from January 1 to October 4, 1904, he was president of the Rock Island Company of New Jersey. He was elected to the presidency of the Delaware & Hudson Company following the resignation of David Willcox, in April of this year. Mr. Loree and Mr. Sims have also been elected directors of the Schenectady Railway Company, in place of Mr. Willcox and Mr. Culver.

Mr. R. C. Taylor, superintendent of motive power of the Indiana Union Traction Company, Anderson, Ind., has been appointed chairman of the "Standardization" committee of the Central Electric Railway Association, to succeed Mr. W. H. Evans, who has tendered his resignation because of leaving the central territory to become master mechanic of the International Railway Company of Buffalo, N. Y. Mr. Taylor has been a member of the committee and another member will be appointed in a short time to take his place. Mr. Taylor has been connected with the Indiana Union Traction Company as superintendent of motive power since December 1, 1906, and has since that time been prominently identified with the committee work of the Central Electric Railway Association. He is also chairman of the committee on "Lighter Cars for Interurban Service." He has had a long and varied experience as a mechanical engineer and before taking his present position was for three years mechanical engineer of the Brooklyn Rapid Transit Company at Brooklyn, N. Y., and for four years master mechanic of the Twin City Rapid Transit Company of Minneapolis, Minn. Mr. Taylor has patented or applied for patents on several railway devices, including an electric block signal system, air brake apparatus for multiple-unit trains, brake hanger for railway car trucks, multiple-unit control for surface cars, electric heating system for electric cars and combined electric and hot water heaters for electric cars. A portrait and descriptive sketch of Mr. Taylor were published in the Electric Railway Review of December, 1906, page 1011.

Financial News

Capital Traction Company, Washington, D. C.—This company has authorized the issue of \$6,000,000 of 5 per cent bonds, of which \$4,000,000 will be issued now. Of this amount \$600,000 will be used to pay off floating debt and \$1,080,000 to retire outstanding bonds.

Chicago City Railway.—The directors declared on June 1 a quarterly dividend of 1½ per cent, or a 6 per cent annual basis, comparing with the previous rate of 9 per cent per annum. This is in accordance with the understanding that the company will not be able to pay as much in dividends under the new ordinance. The 9 per cent rate was established in 1901.

Cincinnati Newport & Covington Light & Traction Company, Covington, Ky.—A meeting of stockholders will be held in Jersey City on June 15 to ratify the lease of the property to the Columbia Gas & Electric Company.

Coney Island & Brooklyn Railroad.—Gross earnings for the quarter ended March 31 were \$308,487, as compared with \$322,460 in 1906. Operating expenses were \$287,535, as compared with \$261,533, leaving net earnings of \$20,952, as against \$60,627 in the corresponding quarter of last year. The deficit after the payment of fixed charges was \$57,145, as compared with \$15,914.

Eastern Ohio Traction Company, Cleveland.—Albert E. Aiken, James T. Ross and F. A. Pease have completed their appraisal of the property. They value it, figured in divisions, at \$1,601,800, and state that, operated as an entire system, \$50,000 should be added to the value as figured in divisions.

Gainesville Whitesboro & Sherman Railway, Gainesville, Tex.—Mortimer M. Elkan of Macon, Ga., has instituted proceedings in the United States circuit court at Sherman, Tex., against this company, on the ground that the road is indebted to him for \$7,629.78 for work done in grading.

Ithaca (N. Y.) Street Railway.—It is announced that A. H. Flint & Co. of New York have purchased control of this road.

Jackson Ann Arbor & Detroit Electric Railway Company.—This company, of which control, it is announced, has been purchased by the Detroit United Railway, has arranged to establish an electric road extending from Jackson, Mich., to Detroit, and from Wayne to Northville, and has acquired the Detroit Plymouth & Northville Railway, now in operation from Wayne to Plymouth and Northville, and also the Jackson & Ann Arbor Railway, extending from Grass Lake to Dexter, Mich., a distance of 20 miles. The company has authorized an issue of \$1,500,000 bonds, of which \$1,000,000 will be used to complete the construction into Detroit and for other purposes, and \$500,000 will remain in the treasury. The company has \$1,900,000 capital stock, of which \$400,000 is 6 per cent cumulative preferred.

Louisville & Eastern Railroad Company, Louisville, Ky.—This company has filed a trust deed to secure an issue of \$2,000,000 first mortgage 5 per cent bonds, due in 50 years.

Louisville (Ky.) Railway Company.—This company has authorized an issue of \$500,000 of 6 per cent notes, redeemable at any time from 1905 to 1910. The proceeds will be used in purchasing new equipment and in the construction of an extension to Bardstown. Of the entire issue \$300,000 notes have been placed and the balance will not be sold until the money is needed.

New York New Haven & Hartford Railroad.—Stockholders ratified on May 31 the absorption of the property of the Consolidated Railway Company. Charles S. Mellen, the president, said that from July 1, 1903, to May 21, 1907, there was expended for capital improvements, extensions and investments \$157,000,000. Of this sum \$97,750,000 was invested in securities of other companies and \$37,000,000 was expended for real estate, new equipment, second, third and fourth tracks and the electrification of the New York division.

Ohio Electric Railway, Cincinnati.—The nominal \$100,000 capital of this company will be increased to \$16,000,000, divided into \$8,000,000 of 5 per cent preferred stock and \$8,000,000 common stock. It is now stated that this company will acquire the Schoepf-McGowan properties in Ohio which are not controlled by the Ohio Traction Company.

Pittsfield (Mass.) Electric Street Railway.—This company has filed a trust deed to the Berkshire Loan & Trust Company of Pittsfield, as trustee, to secure an issue of \$100,000 bonds.

Rhode Island Company, Providence.—This holding company, controlling the New York New Haven & Hartford Railroad electric railways in Rhode Island, will absorb the Providence & Burrillville Street Railway, Woonsocket, and the Columbian & Woonsocket Street Railway.

Dividends Declared.

Chicago City Railway, quarterly, 1½ per cent.
Consolidated Traction Company, Newark, N. J., 2 per cent.
Rochester Railway & Light Company, preferred, quarterly, 1¼ per cent.
South Side Elevated Railroad Company, Chicago, quarterly, 1 per cent.
Twin City Rapid Transit Company, Minneapolis, preferred, quarterly, 1¼ per cent.

Manufactures and Supplies

ROLLING STOCK.

Oklahoma City Railway, Oklahoma City, Okla., expects to be in the market in a short time for a number of cars.

Birmingham Railway Light & Power Company, Birmingham, Ala., has ordered four cars from the St. Louis Car Company.

Ogden Rapid Transit Company, Ogden, Utah, placed an order some time ago with the St. Louis Car Company for two cars, delivery on which will be made this month.

Owosso & Corunna Electric Company, Owosso, Mich., we are officially advised, expects to place orders for considerable new equipment during the next 30 to 60 days.

Washington Water Power Company, Spokane, Wash., is reported to have placed an order with The J. G. Brill Company for 17 semi-convertible cars, to have a seating capacity of 48 passengers each.

San Diego Electric Railway, San Diego, Cal., is in the market for one combination parlor and observation car. Wicker chairs are preferred to fixed walkover seats and the car is to be mounted on interurban trucks, equipped with 4-motor G67 equipment and air brakes.

Mexico Santa Fe & Perry Traction Company, which was reported in the Electric Railway Review of June 1 as to be in the market for rolling stock in about 30 days, is asking prices on six passenger cars, one party car, one express car, one work car, one line car and one electric locomotive. The passenger cars will be 52 feet in length over all and weigh from 30 to 32 tons each. S. L. Robison, president and general manager, Mexico, Mex.

Aurora Elgin & Chicago, as reported in the Electric Railway Review of May 25, has placed an order with the Hicks Locomotive & Car Works for two passenger cars. These will have a seating capacity of 58 passengers, will weigh 80,000 pounds and have a wheel base of 6 feet 6 inches. The cars will have a total length of 52 feet 10½ inches, will be 8 feet 8 inches in width and will be 13 feet 8 inches in height from track to trolley base. The body of the cars will be of wood and the underframe of steel. The equipment will include Westinghouse air brakes, electric heating and headlights and Hale & Kilburn seats.

San Diego Electric Railway, San Diego, Cal., as reported in the Electric Railway Review of May 18, expects to build at its shops during the present year 50 cars for interurban service. A number of cars have already been constructed and at the present time material has been ordered for 20 double-truck open-end cars of the California type. The company has practically completed and is now reconstructing for the National City & Otay Railway six large open-end motor cars of the California type, 51 feet long over all; also a number of trailer cars. The company is now contemplating the erection of 10 additional cars somewhat similar in type.

Spokane & Inland Empire Railroad, Spokane, Wash., has just received from The J. G. Brill Company eight cars for use on the Coeur d'Alene & Spokane Railway. Two of the cars are combination smoking and baggage cars, with a seating capacity of 56 passengers and finished in mahogany with rattan seats, two are passenger coaches, with a seating capacity of 66 passengers, finished in mahogany with plush-covered seats, and two are observation cars, with a seating capacity of 75 passengers. The cars are 57 feet in length. These will be put into service as two three-car trains, each equipped with eight 100-horsepower motors, geared to 65 miles an hour.

Northern Electric Company, Chico, Cal., is building six passenger and baggage cars at its own shops and has ordered material for two steel-frame express locomotives. The locomotives will weigh 82,000 pounds each and will be equipped with Baldwin trucks, Miner draft rigging and Westinghouse motors. The specifications for the passenger and baggage cars are as follows:

Weight	80,000 lb.	Height, from rail to roof.....	12 ft. 2 in.
Length, over all.....	56 ft.	From rail to floor.....	4 ft.
Width, over all	9 ft. ¼ in.		
Over steps	9 ft. 3 in.		

Special Equipment.

Trucks	Baldwin	Conplers	Gould radial
Wheels	Schoen	Seat material	Pantasote
Journal boxes	Symington	Seats	Hale & Kilburn
Air brakes	Westinghouse		

SHOPS AND BUILDINGS.

Chicago (Ill.) City Railway.—This company has purchased the southeast corner of Princeton avenue and Seventy-eighth street, 299 by 246 feet, and the southwest corner, 299 by 254 feet, as a site for proposed new car houses, adjacent to the company's present extensive main car storage houses and shops.

Cincinnati (O.) Traction Company.—This company will soon begin the construction of a new car house on Vine street and will enlarge the present Vine street car house.

Evansville Suburban & Newburg Railway, Evansville, Ind.—Plans have been prepared by Harris & Shoppell for a new station to replace the present office and freight depot at Fifth and Main streets, Evansville. The plans call for a 2-story building, to be

of brick and stone construction, with ground dimensions of 50 by 69 feet.

Indianapolis & Western Traction Company, Indianapolis, Ind.—The contractors expect to have the new \$8,000 interurban station at Greencastle, Ind., completed and ready for use by next week. The station is located on the corner of Seminary and Indiana streets, near De Pauw University.

Niagara St. Catharines & Toronto Railway, St. Catharines, Ont.—It is stated that extensions are to be built to this company's car houses at Niagara Falls, Ont., and St. Catharines.

Rhode Island Company, Providence, R. I.—It is reported that this company has prepared plans for a \$325,000 fireproof car house, to be erected on the site of the present South Providence car house, which is to be dismantled. The proposed building is to be 700 feet long on Thurber's avenue, with frontages of 163 feet on both Broad street and Prairie avenue.

San Diego (Cal.) Electric Railway.—This company is now completing an addition to its power house for a paint shop to accommodate six cars.

Southwest Missouri Railroad, Webb City, Mo.—This company has just completed its new car house in East Joplin, Mo. This is a concrete structure, 64 by 225 feet, and is built in the mission style of architecture.

Syracuse (N. Y.) Rapid Transit Company.—General Manager C. Loomis Allen is reported to have staid that work on the extension through Park, Pond and Spring streets will be started by August 1. Other work to be undertaken this year includes the extension of the Stolp avenue line and the double-tracking of the South Salina street and the Solvay lines.

Washington Baltimore & Annapolis Electric Railway, Baltimore, Md.—The contract for the construction of the terminal station at Baltimore has been awarded to J. Henry Miller. The building will front 78 feet on Liberty street, 100 feet on Marion street, and 60 feet on Park avenue, and is estimated to cost about \$49,000. The building will contain two floors, besides a basement, and will be designed for three additional floors if necessary.

Worcester (Mass.) Consolidated Street Railway.—It is stated that work will be started immediately on the new car house near the present car house on Market street, Worcester, to cost \$75,000. Contracts have been let to the Eastern Bridge & Structural Iron Company for the iron and steel construction and to F. W. Mark for the building and equipment. The building will be of brick and steel construction, 97 by 210 feet, and two stories high.

TRADE NOTES.

Gould Coupler Company and Gould Storage Battery Company have moved their general offices from 1 West Thirty-fourth street to 341-347 Fifth avenue, New York.

Blood & Hale, Boston, Mass., have been appointed New England representatives of the Western Electric Company of Chicago. They will handle only generators of large size for use in railway, power and lighting service.

D. J. Carson, who has been with the American Brake Shoe & Foundry Company for the past two years, in charge of the New York office, has been appointed manager of the American Mal-leables Company, effective June 1, 1907.

C. C. Chappelle, who for the last two years has represented the Westinghouse Machine Company in Denver, on May 1 assumed the position of western sales manager, with general charge of the company's business in Chicago and all the territory west.

Dodge & Day, engineers, Philadelphia, Pa., have opened a branch office in the United States Realty building, 111 Broadway, New York, N. Y., in charge of Robert T. Lozier, who has for a number of years been associated with electrical industries.

Wesco Supply Company, St. Louis, Mo., has opened a new branch office at Birmingham, Ala., in charge of W. W. Moore, who is an electrical engineer and has for several years managed the apparatus department of the company, with headquarters in St. Louis.

W. H. Judson Company, Portland, Ore., has been incorporated with a capital stock of \$250,000 for the purpose of manufacturing rolling stock for both steam and electric operation. The officers are: W. H. Judson, president; G. F. Martin, vice-president; M. Wilson, secretary. The company expects to erect its own plant and foundry.

Northern Engineering Works, Detroit, Mich., has recently shipped to the Denver & Rio Grande a second 3-motor electric traveling, 15-ton Northern crane of special construction, for use in the roundhouse of that company. The crane uses alternating-current equipment, and is designed to run on an overhead track having a considerable curve.

Railway Safety Appliance Company has been incorporated in the state of New Jersey with a capital stock of \$150,000 for the purpose of manufacturing a safety appliance to prevent the spreading of rails. The incorporators are: J. F. Rogers and J. R. Streeter of New York City; E. T. Thomas and C. H. Bowne of Brooklyn, and Charles H. Haight of Jersey City, N. J.

H. M. Byllesby & Co. have been retained as consulting engineers for the Sioux Falls Light & Power Company of Sioux Falls, S. D. A water power, with a head of about 80 feet, is to be constructed on the Big Sioux river at this point. They have also been retained as consulting and operating engineers for the

Flathead Valley Water Power Company of Kalispell, Mont. The company's water power is situated at Big Fork, Mont., on the Big Fork river, having a head of about 105 feet. This development is to be added to and the capacity of the plant is to be greatly increased.

Manning, Maxwell & Moore, 85 Liberty street, New York, have prepared plans for the erection of a storage warehouse in Jersey City, N. J., to be two stories in height and to have ground dimensions of 110 by 260 feet. The building will be located opposite the freight office of the Central Railroad of New Jersey and will be of brick and steel construction, with concrete floors. Each floor will contain 40,000 square feet of space. The building will be equipped with a 20-ton electric traveling crane and a hydraulic elevator, designed especially for handling heavy machinery and tools. It is the intention of the company to keep in hand a large amount of its products to meet the demand for prompt shipment.

Western Electric Company announced on April 15 to their southern customers that it had installed at 230 Lee street, Atlanta, Ga., a complete stock of general electrical supplies and had established there a supply organization for taking care of its southeastern trade. The company has contemplated doing this for some time, and the proximity of a complete stock of Western Electric Company supplies will doubtless be gratifying to southern customers. The construction of the new Atlanta plant of this company, located on the Central of Georgia Railroad, close to the city, has only recently been completed. The building has 60,000 square feet of available floor space and with sidetracks and modern interior equipment the plant is peculiarly well adapted for the rapid and economical handling of the company's heavy stock.

Power Specialty Company, New York, reports recent sales of 120 Foster superheaters, aggregating 42,000 horsepower. These superheaters are to be installed in Babcock & Wilcox, Stirling, Edge Moor, Heine, Franklin, Atlas and other boilers, including a number of return tubular boilers. The above include a large number of repeat orders following the successful operation for from one to five years of initial installations. Among many others such successive orders have been received from: Solvay Process Company (three), International Harvester Company (three), James S. Kirk & Co. (two), Stone & Webster Engineering Corporation (six), Hartford Electric Light Company (four), Philadelphia Electric Company (three), Tennessee Copper Company (three), United States Navy Department (nine), Quincy Market Cold Storage Company (three), American Smelters Company (three), Electric Company of America (seven).

H. W. Johns-Manville Company, New York, had a large and interesting exhibit at the convention of the National Electric Light Association, which was held in Washington this week. Probably the most notable feature of its exhibition was the "Victor" combination meter, a variety of forms of which were shown, including switchboard, portable and automobile types. These instruments possess the unique feature of giving a simultaneous reading of volts, amperes, watts and horsepower on one dial. "Victor" meters have been on the market for almost two years and have met with continued success. The instruments are manufactured at the new instrument plant of the company in Brooklyn, N. Y., which is one of the best equipped of its kind in the country. Among other devices exhibited by this company should be mentioned "Noark" subway and service boxes of one, two and three pole construction, and 250, 600 and 2,500 volt capacity. These boxes are absolutely water-tight, being designed and tested to withstand a pressure of 25 pounds per square inch without leaking, and are therefore suitable for the most severe conditions. A complete line of "Noark" national standard fuse blocks and accessories, as well as line material devices, also were shown. The company distributed samples of the well-known "J-M" friction tape. Another feature worthy of mention is "Transite" asbestos fireproof doors for high-tension transformer and switch compartments. These doors are designed for the protection of apparatus from short-circuiting; also to prevent persons from coming in contact with the live parts. They are made of "Transite" asbestos fireproof lumber, a material which is said to possess the unique features of being fireproof and at the same time an excellent insulator.

ADVERTISING LITERATURE.

Templeton, Kenly & Co., Chicago.—Simplex jacks for car and track work are briefly described and illustrated in a pamphlet which also quotes prices.

Electric Service Supplies Company, Philadelphia.—An elaborate pamphlet regarding a telephone apparatus for railway use has just been issued by this company and contains full information with illustrations of the various kinds of telephone apparatus adapted to railroads.

Chase-Shawmut Company, Newburyport, Mass.—This company has just issued circulars and miniature bulletins covering the following of its special lines: Shawmut ground connection clamps, extended terminal fuses, pocket test lamps, Boston cable clips, red E solder paste and porcelain cut-out blocks.

Lee, Higginson & Co., Boston.—In a bulletin dated June 1, 1907, this firm offers for sale bonds of lighting and traction companies as follows: North American Company, Puget Sound Power Company (Wash.), Madison River Power Company (Mont.), Houston Electric Company (Tex.), Butte Electric & Power Company (Mont.), Dallas Electric Corporation (Tex.) and Whatcom County Railway & Light Company (Wash.).

Gunn, Richards & Co., 43 Wall Street, New York.—The underlying principles in determining foundry costs are considered in a

pamphlet just issued by this company, which is prepared to examine establishments of this and other sorts, and arrange a systematic, complete and coherent plan for finding costs.

Newport News & Old Point Railway & Electric Company.—This company has issued a very interesting and attractive folder which contains maps and illustrations that will be found especially useful by those who attend the Jamestown exposition. The company's lines connect Newport News with Old Point Comfort.

Allis-Chalmers Company, Milwaukee, Wis.—Bulletin No. 1058 describes the Winona Interurban Railway, being a reprint from November, 1906, issue of the Electric Railway Review. Bulletin No. 1603 contains the official duty tests of pumping engines Nos. 1, 2 and 3 at Bissell's Point pumping station, St. Louis waterworks, together with illustrations of the various standards of Allis-Chalmers pumping engines. Bulletin No. 1513 is descriptive of the Christensen portable air compressor, manufactured by this company.

Railroad Supply Company, Bedford Building, Chicago, Ill.—Section No. 1 of Catalogue No. 7 has just been issued by the signal department of this company. The catalogue, when its several sections are complete, is expected to show the company's full line, which includes materials and supplies for single or double track steam or electric railway signal systems and devices to provide protection for highway crossings and other points. Section No. 1 is devoted to crossing signal poles, warning signs, vibrating bells, etc.

Shoemaker & Casparis, Newcomerstown, O.—This firm is exclusive sales agent for the Shoemaker automatic elevators for elevating and screening sand and gravel. A special machine for loading run of bank gravel for ballasting without screening, which is made with 3-foot capacity buckets, it is stated, will load 1,500 to 2,000 cubic yards of gravel per day, but five men being required for its operation. The standard 24-inch bucket machine has loaded 10 cars, five with sand and five with gravel, in four hours, employing six men. The construction of the machine and the screening device are described in a pamphlet.

THE NATIONAL CROSSING SIGNAL.

The essential requirements of a good crossing signal are that it shall, without fail, announce the approach of a train under all conditions of service. As the factor of reliability in such apparatus is an important one considerable weight should be given to any crossing signal installation that has the fewest possible parts and these of substantial construction. Such were the fundamental conditions that were observed in the design of a new signal just



National Crossing Signal—Post, Lamps, Bell and Sign as Furnished with Each Installation.

placed on the market by the National Railway Signal & Manufacturing Company of Wheaton, Ill.

The accompanying illustrations will serve to show the general appearance and detail construction of the new signal equipment as it has been installed, and commendably withstood the very severe service on the Aurora Elgin & Chicago Railway. The simplicity of the various parts will be appreciated. The essential elements of an installation comprise a 12-inch gong and a bank of incandescent lights mounted on a crossing signal post, as shown in one of the accompanying illustrations; a contact-making device, also illustrated, and a relay which governs the making and breaking of the various circuits. The contact-making devices for both trolley and third-rail use are illustrated. It should be noted that the making

and breaking of the circuits which operate the signals are performed at the contact device and no arc takes place in the relay under any conditions. This feature makes the National signal particularly well adapted for lines carrying high voltages.

By tracing the circuits shown in the diagram the principle of the signal movements is apparent.

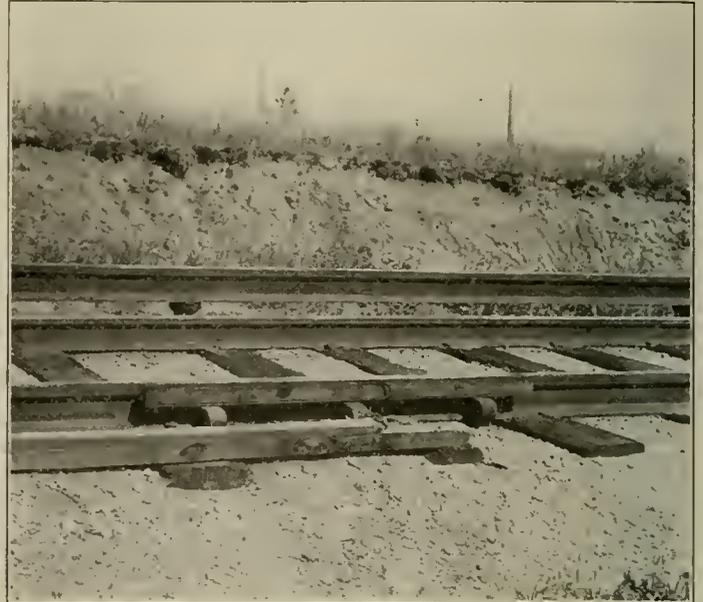
When a train enters a block from either direction, the bell

trolley. This second circuit-closing energizes the coils of the relay, raises a contact-closing armature, and completes a holding circuit from a permanent ground connection through the armature contacts, relay coils, resistance, lights, and bell to the trolley, causing the bell to continue ringing until the trolley wheel passes the next contact at crossing.

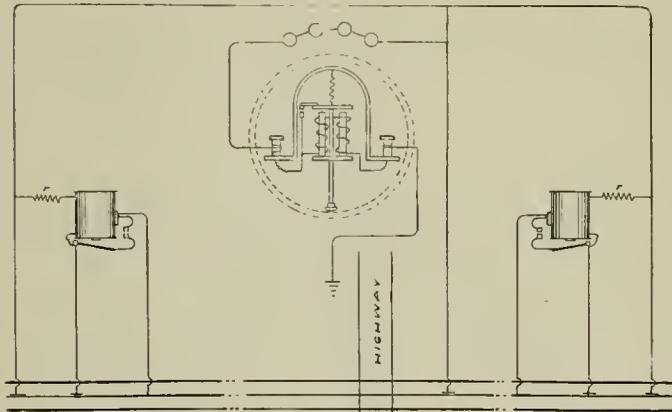
Third—When trolley wheel bridges the contact at crossing, to



National Crossing Signal—Relay and Case as Mounted Near Contact Maker.



National Crossing Signal—Spring-Supported Contact Maker as Installed on the Aurora Elgin & Chicago Railway.

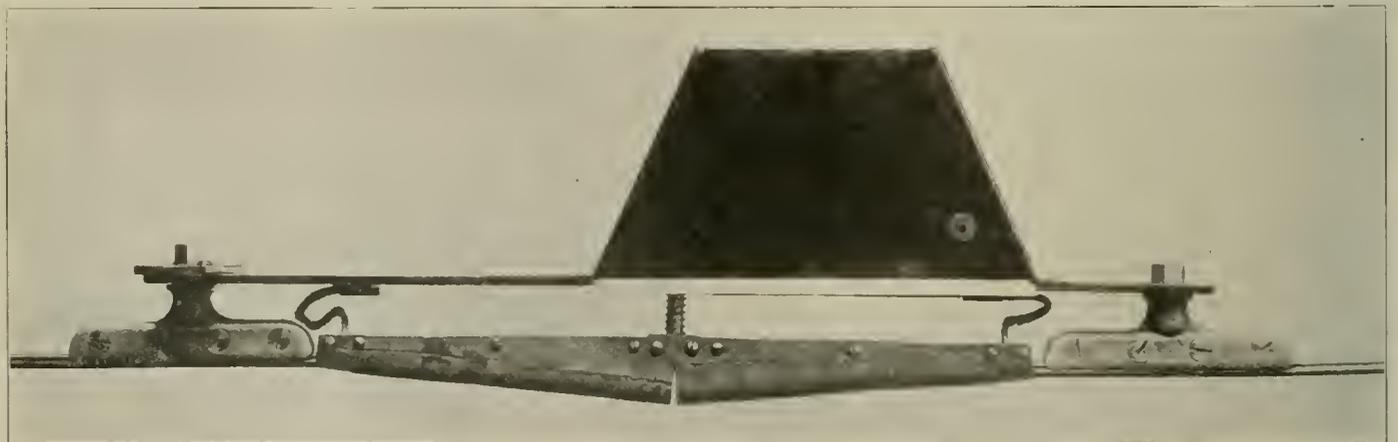


National Crossing Signal—Diagram of Circuits for Single-Track Movement, with Trolley Contacts.

silence the signal, the connection is such as to send an impulse of same polarity as that of grounded circuit at the relay, through a conductor of practically no resistance as compared with the relay coils and relay resistance. This de-energizes the relay coils, breaking the connection to ground at the relay while a current is passing through the low-resistance shunt caused by the car bridging the crossing contact. Thus any arcing at relay contact points is obviated.

Fourth—Leaving the highway crossing, the car makes two final contacts at the remote end of the block. The first (or inner) contact sends an impulse to the contact connected with the armature of the second (right-hand) relay; thence through the winding of the coils, the resistance, the lights, and the bell, to the trolley, energizing the relay coils, raising the armature, and closing the connection to the permanent ground. The second (or outer one) of the final contacts, bridged immediately afterward, de-energizes the second relay just as the first was de-energized, letting the armature drop and breaking the connection to permanent ground without any arcing at the relay contacts.

The trolley contact-maker has proved reliable and efficient, being strongly constructed, durable, placing no obstruction in the



National Crossing Signal—Switching Device Attached to Trolley Wire Without Cutting.

begins ringing, and continues to ring until car passes the highway crossing. This is accomplished as follows (see diagram, tracing diagram from left to right):

First—The trolley wheel throws the contact switch, which bridges an insulated contact at entrance to the block, completing a circuit through the bank of lamps and bell to the trolley.

Second—The wheel immediately throws another contact, completing a circuit through relay coils, resistance, lights and bell to

path of the trolley wheel, and giving sure, positive contact at high speeds. The rail contact-maker, which is used for third-rail lines, is strong and durable, being supported on heavy springs which are clamped to the base of the running rail. The bell, a continuous-current vibrator, is non-arcing and weather-proof. It requires no delicate adjustment, and is of a type that proves efficient on circuits of voltage as high as 500 or 600. The relays, as has been stated, are non-arcing. They are inclosed in wood boxes.

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The street railway manager must take things as he finds them. His best hope of reducing the cost of motive power lies in making the most of the station which he already has. The elimination of some of the uncertain and careless features which induce waste is the duty of the hour, no less than a practical search for new types of machinery. To enumerate the weak spots of power plant operation in detail would transcend the limits of these columns, but a few suggestions may be included as significant. We need to know more definitely how many and what sort of men are required to operate given capacities of generating and auxiliary machinery. There is no lack of judgment on this question obtainable on the basis of personal opinion; but who has attempted to investigate this question by striving to hold the other factors constant which comprise the cost for power, meanwhile varying the labor? "Impracticable," says someone at once. Is it?

The power plant is still in a process of evolution and no man can tell when the development curve of generating machinery will flatten. The selection of equipment appears to require even broader knowledge today than previously. Coming down to specific instances one finds that the range of choice is limited by many uncertainties. The manufacturing companies are putting much of their best thought upon the turbine question, but who is bold enough to say that this interesting prime mover is as yet capable of eventually driving the reciprocating engine from the field in general practice? The gas plant is entering the field, rather slowly in large sizes, but does it not show that these new prime movers have yet to win their place, so to speak, when reciprocating engines continue to be ordered in large plants? Perhaps it is no sign of weakness in our knowledge of power plant economy that we are still somewhat in the dark as to the clearly defined limits of each type of prime mover, but it is certain that the publication of operating results, including the record of shut-

downs, the cost of repairs and the opinions of men in the power house close to the metal, is one of the most enlightening things which could be done in cases where the value of a given equipment is questioned.

Considerable interest has recently been shown in the high-potential line insulator. Several new designs have been proposed, each of which takes into account the desirability of having the smallest possible amount of still air space, combined with the necessary creepage surface. The possible breakdown of insulators from their creepage distance being shortened by an accumulation of dust also is considered and a shape is given the material so that an ample proportion of the surface will be washed clean by rain. These several fundamental requirements in insulator design must be recognized in planning insulators for any high-potential service. There are still other and more severe conditions imposed on the insulating medium of a high-potential line built parallel with or close to a large body of water. Elsewhere in this issue Sidney Sprout, electrical and mechanical engineer of the Ocean Shore Railway, San Francisco, Cal., describes in detail the various severe conditions which an insulator must meet to be satisfactory for use on the proposed transmission line of this railway which parallels the Pacific coast for 80 miles between San Francisco and Santa Cruz, Cal. Some of the severe conditions to be expected on this 33,000-volt line and which warranted very careful tests of insulators under actual operating conditions were as follows: Salt fogs, with trade winds from the ocean during the foggy season; spray; and dry seasons of from four to six months and a proximity to a country road, with the attendant dust. No other transmission line, within the knowledge of the engineers, had been operated under similar conditions at more than 11,000 volts pressure; and, in fact, a line parallel to the proposed route for some miles had experienced a considerable number of burnouts from insulators becoming coated with dust from the highway and salt from spray and fogs. The author of the paper tested under the most severe

conditions many insulators of some eight types of manufacture. His conclusions should be considered as valuable. In summing up the result of his experiments he states that the most satisfactory insulator is one which has few still-air spaces and exposes a large proportion of its surface to the action of the wind and rain. A study of the results also leads to the suggestion that a satisfactory insulator for such severe service could be made of several pieces of porcelain or glass, shaped something like the present insulator tops, and placed one below the other.

SPECIAL SERVICE FOR FACTORIES.

It would seem needless to point out the value of special trolley service in connection with large factories if it were not for the fact that opportunities of this kind are sometimes overlooked by managements which are otherwise progressive. Observation of a recent case in which a double-track trolley line passing a plant employing some four or five thousand persons provides little if any extra service at morning, noon or night, suggests the importance of looking carefully into industrial establishments for possible traffic. In many cities the value of providing extra service for factories is well appreciated, and even in small towns where the schedule calls for a limited number of cars during the greater part of the day, it will often be found that a considerable number of extras are operated for the benefit of shop employes.

One of the advantages of this service from the railway company's standpoint is that the older or off-season cars can often be used to handle the business. The factory employes do not demand the luxuries of equipment so much as the furnishing of transportation. In the winter season, except in very cold weather, open cars can be pressed into service for these factory runs, depending, of course, upon the general distribution of travel required, the location of transfer points and the situation of the industrial plant with respect to main lines of transit. Trailer car service finds a special field of usefulness in such cases. In Schenectady the local railway company has a special terminus at the electrical works, and three times a day the road reaps the benefit of a large amount of extra travel, which would otherwise be lost. Special smoking cars are run for the benefit of shop employes, and, while but a small percentage of the industrial army which daily mobilizes at this immense plant is carried by the local railway company, the business in itself is most impressive in volume.

The provision of special service for factories in very large cities is a much more complicated problem than in a town where one or two great mills provide the bulk of the employment. Just as in the load curve of the large station the influence of the fluctuations of a single line is small in proportion to the total variations, so in the community of many industrial plants it is difficult to observe the traffic influence of any single establishment upon the schedule as a whole. When these large industries are widely scattered, and when there is no strictly defined industrial residential area, about the only thing that can be done is to increase the frequency of service past each plant and fall back upon the transfer points as distributing agencies.

The encouragement of travel to and from factories in smaller cities is a much more definite matter. Here is a good chance for co-operation between the street railway management and the factory executives. There ought not to be much difficulty in the way of ascertaining accurately the residence districts of the bulk of the employes, and planning a car service which will accommodate the maximum number of persons working in a given plant. In these large establishments many workers walk to their homes or use the bicycle at morning and night, but the institution of a frequent trolley service in the rush hours enables many to live in pleasanter districts than would otherwise be the case, and encourages riding in bad weather or in cases of tardiness from those who would ordinarily depend upon their own exertions. Com-

panies will usually go to great lengths to secure baseball traffic twice a week, but in the industrial field is an opening which lasts the year through, and which occurs twice and often thrice daily.

ECONOMIZERS AND STEAM AUXILIARIES.

In the past two or three years a large number of power houses of medium size have not been equipped with economizers. The reasons for this lie partly in the economizer and partly in the fact that some engineers believe nearly the same economy can be obtained in a non-condensing plant, using the exhaust for heating the feedwater, or a condensing plant in which the auxiliary exhaust is used for heating the feedwater, as in one in which condensers and economizers are installed.

These conclusions are, in part, supported by the performance of several English plants having Willans engines which are operated non-condensing. In many stations the condensers and air pumps get very little attention and the economizers are entirely neglected. This neglect is the cause of the poor showing made by so many plants fitted with condensers and economizers and is the basis of the prejudice existing in the minds of so many managers and designing engineers. A further reason why economizers are sometimes omitted is that they necessitate a larger investment in the plant and take up considerable room. The latter can be overcome in most cases by installing the economizers over the boilers if sufficient ground area is not available, and the additional investment required should not be an obstacle to companies which have not reached the limit of their borrowing capacity; for, if money can be borrowed, it is evident that the saving of 10 per cent which economizers will yield on their investment will pay the interest on their cost and leave a good margin for the operating company. To produce a saving of 10 per cent, however, the economizers must be of ample size, properly installed, and receive careful attention, for without careful attention to the scraping mechanism, an economizer is useless.

Most of the failures of economizers and the prejudice against them is due to neglect alone, and such prejudice and opinions based on these failures are unjust, not only to the makers of economizers, but to the designing engineers who advocated their installation. There is an important feature, however, which is sometimes overlooked in the design of condensing plants in which economizers are not fitted, because exhaust steam from auxiliaries is available for heating the feedwater. The arrangement which is generally overlooked is that of passing the exhaust from the auxiliaries into the low-pressure cylinder of a steam engine or one of the later stages of a steam turbine and using an economizer for heating the feedwater. The advantage of such an arrangement is especially commendable in plants equipped with condensing steam turbines. This will be clear when it is remembered that steam will generate as much power in a steam turbine when working between atmospheric pressure and the pressure in the condenser, as it will when working between 150 pounds gauge and atmospheric pressure. The large number of exhaust steam turbine plants which have been so successfully installed in the past two or three years proves the truth of these statements. This arrangement taken in conjunction with economizers will show a positive saving of at least 10 to 20 per cent, depending upon the conditions.

To illustrate this case, assume a power plant of 14,000 kilowatts capacity, fitted with Curtis steam turbines, water tube boilers, dry and wet vacuum pumps, circulating pumps, mechanical stokers and forced draft. All the auxiliaries are assumed to be steam driven.

Assuming a load factor 50 per cent, the output of the station would be about 7,000 kilowatts. The steam consumption under these conditions probably would be about 19.5 pounds

per kilowatt-hour; hence, about 135,000 pounds of water would have to be evaporated for the main engine alone, or say 150,000 pounds including the auxiliaries. In this case the auxiliary exhaust would be just sufficient to heat the feedwater from 80 to 205 degrees F. Now, since a low-pressure turbine can generate a kilowatt-hour on 50 pounds of exhaust steam, the auxiliary exhaust would be sufficient to generate 300 kilowatts in the main units or, in other words, produce a saving of about $4\frac{1}{2}$ per cent in the coal bill. To this must be added the saving due to the economizer alone, which amounts to 8 per cent of the coal used if the temperature of the flue gases is reduced from 550 to 300 degrees F. The combined saving, therefore, would be about 12.5 per cent.

As a matter of fact the actual saving would be somewhat greater than this, as the additional steam in the low-pressure stages of the turbines would materially increase their economy on light loads and thus further reduce the steam consumption. The point which we wish particularly to emphasize is that some engineers probably consider that the saving of 8 per cent effected by the economizers alone is not sufficient to warrant installing them at the present money rates; but, were the plan here suggested followed, the saving of 12.5 per cent might be an inducement to make the extra outlay for the economizers.

CONTRACTS WITH EXPRESS COMPANIES.

In making contracts with express companies electric railways must take into consideration the fact that their own business of handling freight in less than carload lots frequently competes with the facilities afforded by express service. Managers of electric railways are constantly on the lookout for new sources of revenue, but they cannot afford to divide the income from their own business of hauling package or other light freight. So far, therefore, as the express business is valuable, it is of benefit, as it may supplement the freight business which has previously been secured.

Between the express business as it is conducted on contract with steam railways and with electric railways there is a wide difference. It is a difference, however, which the future development of electric railways may affect materially. Either for long or short hauls on a steam railway the delivery of freight requires more time than the delivery of express. The value of the express service on steam railways lies in the saving of delay in delivery, and in the insurance which is assumed where the articles transported are of great value. On electric railways, however, as they are now managed and owned, the difference in time of delivery, owing to the comparatively short mileage of each company, is of hours, not days. On some roads this time advantage is so short that it does not warrant introduction of the express service, which involves terminal expense at points where the express company maintains wagons for delivery of packages. The process of evolution naturally effects an increase in the facilities of individual roads through the construction of extensions, the merger of interests and the formation of traffic alliances. These changes open the way for improved freight service, supplemented by the introduction of express service.

Recollection of the rapid development of freight business on electric roads is an indication of the future possibilities of express service. No long memory is required to recall the early doubts which were expressed regarding the prospects of profitable freight business on electric roads. To doubt its possibilities now would be to deny the facts which have proved the importance of this traffic to many interurban lines. The Inter-Urban Railway, Des Moines, Ia., according to the statement of H. H. Polk, president and general manager, at the last meeting of the Iowa Street and Interurban Railway Association, derives 30 per cent of its gross revenue from freight traffic. The express business will probably eventually reach a growth beyond that which is foreseen at this early day.

For electric railways which conduct a freight business or enter into contracts with express companies it is most important that all of the expenses which properly belong to that branch of the traffic be separated, so far as possible, from those that are chargeable to other departments. The danger of considering revenue from freight or express business as extra profit and the unwisdom of a failure to allocate properly the expenses pertaining to such business was recognized by P. P. Crafts, general manager Iowa & Illinois Railway, in his instructive address before the Iowa Street and Interurban Railway Association, Clinton, Ia., in April, this year. As Mr. Crafts properly stated, the failure to charge the freight revenue with a percentage of such expenses as belong in part to the freight business, and with all other expenses which are caused by this traffic, "deceives the manager as well as his stockholders."

As the motive of both freight and express business is profit, the proof that the business is not transacted at a loss, or at undue expense in proportion to the revenue, is of vital necessity.

SMOKE—PREVENTABLE AND NON-PREVENTABLE.

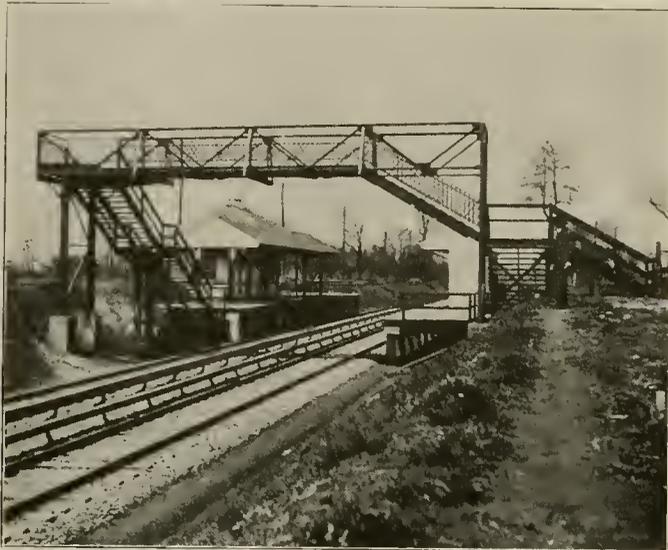
From time to time we have published in these columns discussions and editorial comments on smoke prevention. In such discussions the term smokeless combustion has been used merely in a relative sense, as absolutely smokeless combustion can only be obtained under certain conditions which are hopeless of attainment in railway and lighting plants. In such plants, the load is of a fluctuating character, varying at times from practically no load to full load in very short intervals of time, and with the exception of small plants where it is feasible to carry the peaks by storage batteries, the changes in the demand for power must be met by varying the number of boilers in operation and by checking or forcing the fires. The inevitable result of these conditions is a certain amount of smoke, depending upon the suddenness of the changes of load.

The conditions necessary for smokelessness are that the volatile gases distilled from the coal should be mixed with sufficient air for complete combustion, and when mixed, raised to a sufficiently high temperature to ignite them. This implies the coking method of firing, whether by hand or by mechanical stoking, and it is absolutely impossible to fulfill these conditions where the demand for steam fluctuates rapidly. The reasons are evident, for when the fires have been low, and a sudden demand for steam comes, the only method available to generate steam rapidly is to crowd in a large quantity of green coal and increase the draft. For this purpose a coal containing large quantities of volatile matter which is easily driven off is absolutely necessary, and as under the suddenly changed conditions, it is impossible to burn all the gases completely, some smoke will inevitably result. A similar condition arises when it is necessary to check the fires suddenly, as then the decreased air supply is no longer sufficient to completely burn all the gases given off, and again the result is unpreventable smoke.

It must be remembered that the term unpreventable is applied only in a relative sense. In the large modern stations of today, a sufficiently great storage battery capacity to provide for the peaks of the load would be out of the question, as are likewise large heat storage tanks and flywheels. A certain amount of unpreventable smoke is therefore a necessary evil, though the amount of smoke can be very materially reduced by proper management, and can be entirely eliminated in plants having a constant load. It would therefore be far wiser and more farsighted if municipalities would confine their energy and aggressive legislation to preventing the needless and avoidable smoke made by plants and factories having a uniform load rather than to interfere constantly with and among the electric lighting and railway companies.

THE PHILADELPHIA & WESTERN RAILWAY.

The Philadelphia & Western Railroad Company was incorporated in 1901 with the object of building an electric railway from the western terminus of the Philadelphia Rapid Transit Company at Sixty-third and Market streets, Philadelphia, to Parkesburg, a distance of 44 miles. The eastern



Philadelphia & Western—Typical Station with Overhead Footbridge.

division of the line, 11.8 miles, from Sixty-third and Market streets to Strafford, is now completed and in operation.

Territory Served.

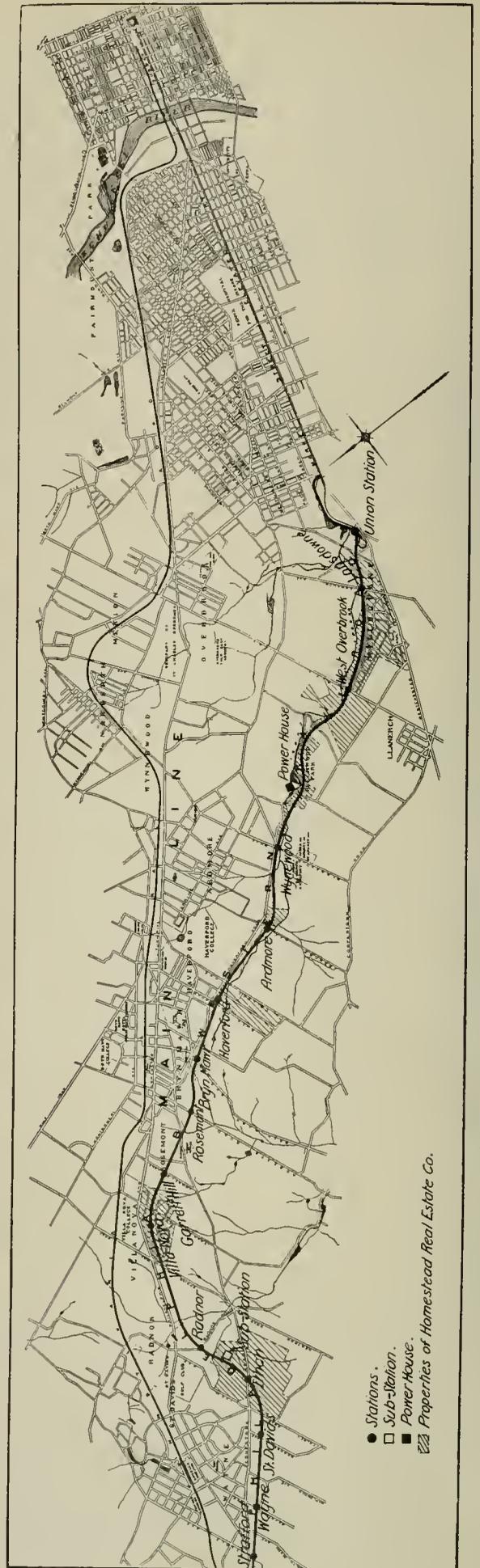
The preliminary work in connection with this involved unusual difficulties in the matter of securing rights of way, and the company was obliged to invest over a million dollars



Philadelphia & Western—Track Layout at Bryn Mawr.

in real estate not required for railroad purposes. All homesteads which will be traversed between Philadelphia and Parkesburg have been acquired and the route located. Between the city terminus and Strafford, which is a station on the main line of the Pennsylvania Railroad, the Philadelphia & Western parallels the Pennsylvania, being from 1/4 of a mile to 1 1/4 miles south of it for a greater part of the distance. This suburban territory heretofore has been served by the Pennsylvania.

Within a few miles of the railroad are located the sum-

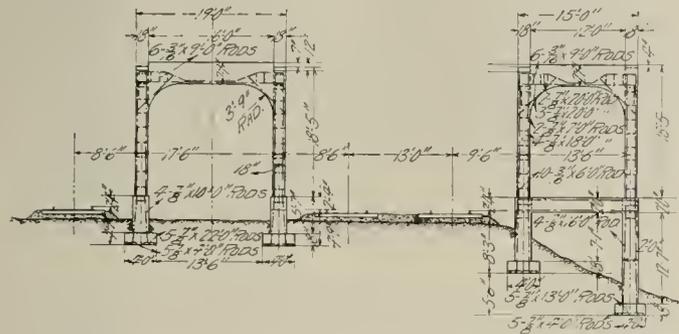


Philadelphia & Western—Map Showing Roadway and Location of Philadelphia Terminal.

mer homes of a great many of the wealthiest families of Philadelphia, and the Philadelphia & Western was obliged to condemn rights of way through a number of these country estates. The total land acquired by the company not needed for strictly railroad purposes is about 800 acres, one of the largest tracts being that of the Joseph H. Childs and Joseph H. Childs, Jr., estates near St. Davids, comprising 150 acres; a tract purchased from the Villa Nova College, 102 acres; and the estate of John Ashhurst. On this last tract is Ellwood Hall, a house built in 1682, at which Washington and La Fayette were frequently entertained.

Personnel.

The real estate interests of the company are handled by the Homestead Real Estate Company, the officers of which are: President, George J. Kobusch; vice-president, L. M. Downs; and secretary and treasurer, Thomas Newhall. The officers of the Philadelphia & Western Railroad Company during construction were:



Philadelphia & Western—Concrete Structures for Overhead Crossings at Beechwood Park Station.

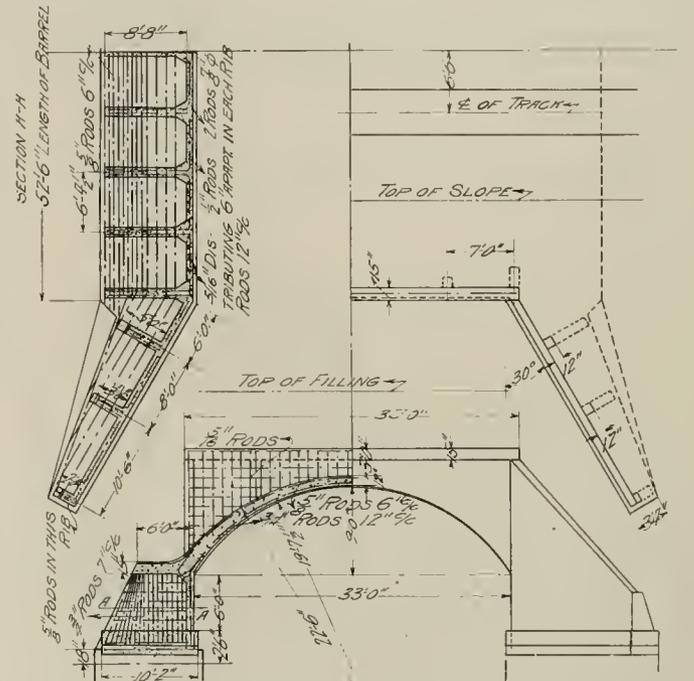
President, George J. Kobusch; vice-president and chief engineer, W. R. Molinard; treasurer, L. M. Downs; secretary, William Darling. The operation is in charge of W. H. Simms, general superintendent.

Track and Roadway.

The eastern division of the road is double-tracked throughout and all extensions will be made double-track when built. It is the intention eventually to have four tracks. Except in a very few instances, constituting not over 1 per cent of the total distance, the right of way is 100 feet wide. The line being design d for high-speed operation, the elimination of all grade crossings was considered essential and bridges or

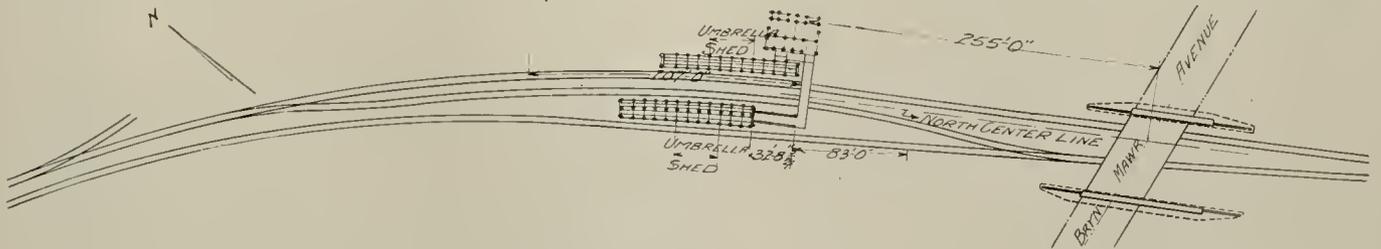
crete. The bridge floors are reinforced with steel rods of 15,000 pounds tensile strength, the rods being of round commercial high-carbon steel, which was considered to give a larger factor of safety than would be the case with other rods.

The maximum grade on the line is 2½ per cent. The sharpest grade is near the Ithan substation. The maximum curvature is 5 degrees. To come within the limit of grade development a number of large cuts and fills were necessary. The largest embankment is 1,850 feet long and 64 feet high



Philadelphia & Western—Reinforced 33-Foot Concrete Arch Through High Embankment.

on a 1½ to 1 slope. On account of the nature of the soil it was necessary to build retaining wing walls at the ends of the embankment for protection from sloughing. At this point also it was necessary to change the location of the highway. There is one rock cut just west of the power house which is 600 feet long and 40 feet in maximum depth, involving the removal of about 20,000 cubic yards. On the whole line there was required the excavation of about one million



Philadelphia & Western—Track Layout at Bryn Mawr Station, Showing Long Cross-Over Between Double Tracks.

viaducts were built at 32 points in the 11.8 miles of the eastern division. One is for a crossing with a trolley line, one for a crossing at the Philadelphia Rapid Transit Company's yards near the terminal station, and the other 30 are mostly at highways, although there are a few of these which are over roads on the private estates which are traversed.

Of the bridges where the railroad is carried over the highway, there are 15 of steel and two of concrete. There are 11 public highway bridges overhead and four overhead bridges for private crossings. The railway bridges conform to Pennsylvania standard for two consolidation locomotives coupled with an additional loading of 5,000 pounds per square foot. All bridges have solid floors, and the abutments are of con-

cubic yards, and the fill practically balances this amount. The principal arch runs through this fill. One of the larger arches is at Cobb's Creek, just west of the power house. These arches are each 30 feet in width. Culverts are very numerous, and these are built entirely of reinforced concrete.

Farnham Third Rail.

The working conductor adopted was the "Farnham" protected third rail. This rail, as shown in one of the accompanying illustrations, is of "U" section, weighing 40 pounds per yard, and is located in the position shown. The center of the bearing surface, which is at the bottom of the third-rail structure, is 3½ inches above the track rail and 27

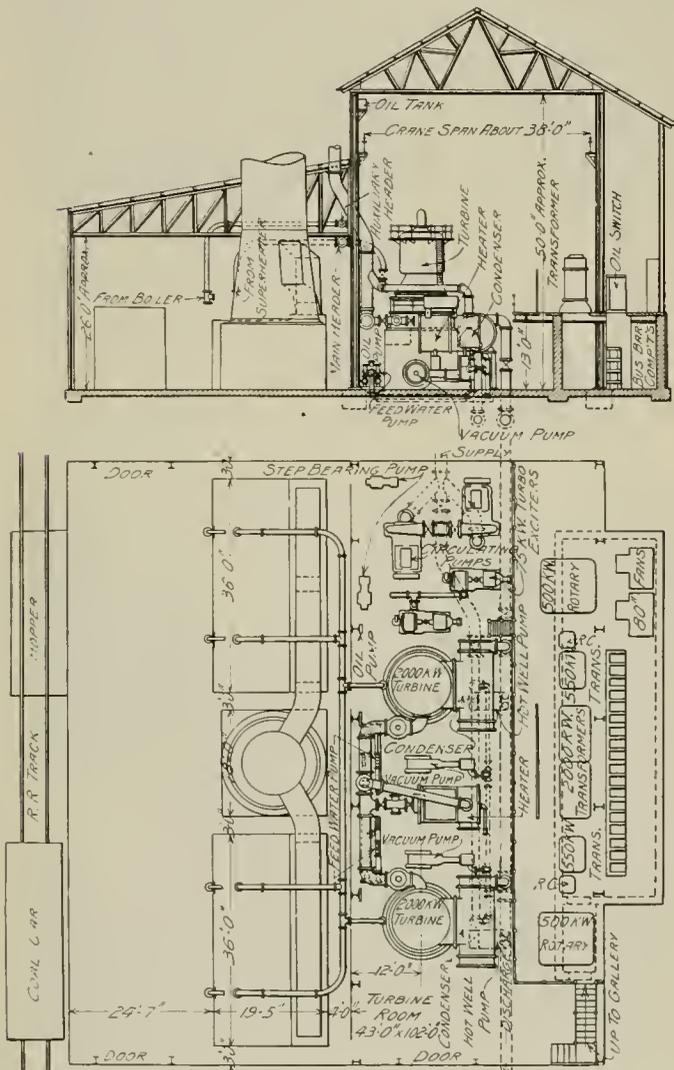
inches outside of the track gauge line. This rail has the same head surface as a 75-pound "T" rail and is low in carbon. It is calculated to have 800,000 circular-mils equivalent copper conductivity, and this is thought to be sufficient for the present traffic. In case it is necessary to increase the conductivity of the third rail the U-shape of the rail provides space for the introduction of a copper conductor which will be thoroughly protected by the steel rail.

The running rails are of 85-pound section and the roadway is entirely ballasted with rock ballast, which the company was able to obtain from a quarry near Ithan. Both rails are bonded with two 400,000-circular-mil protected bonds at each joint. The bonds were furnished by the Mayer & Englund department of the Electric Service Supplies Company.

Stations.

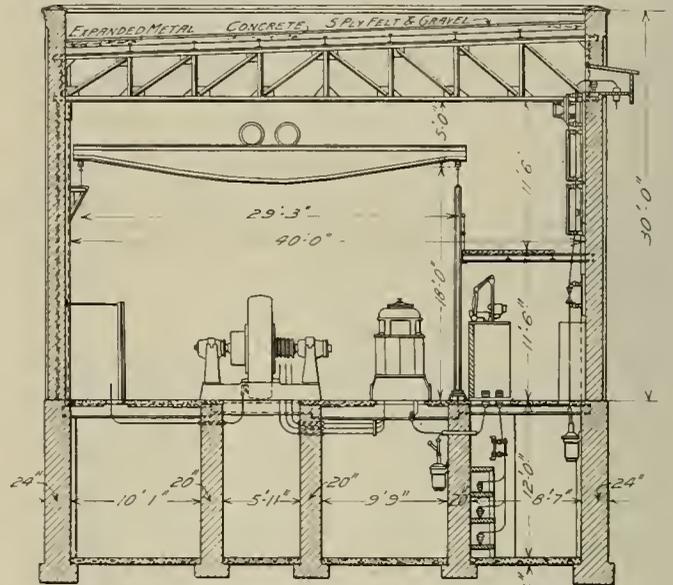
The stations upon the line beginning from the union station which forms a connection with the Market Street Ele-

pany. At several points on the line the capacity of the tracks has been increased by the use of an arrangement shown upon the plans of the station for Bryn Mawr. In this case a third track is interpolated for use as a storage and loading track. The general arrangement of stations is clearly shown in the accompanying views from photographs, and this ar-

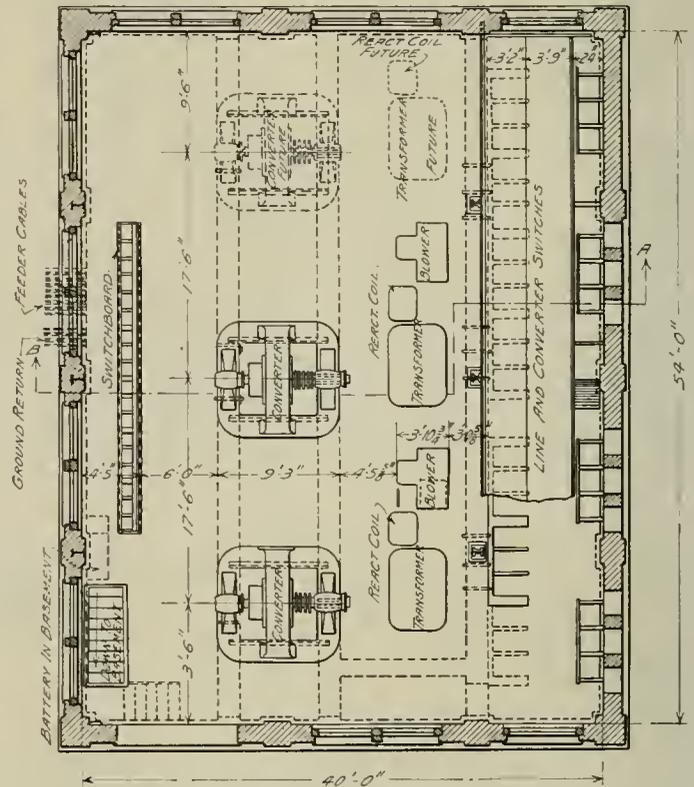


Philadelphia & Western—Sectional Elevation and Plan of Power Station, Showing Disposition of Machinery.

vated Railway, are Beechwood Park, Ardmore Junction, Ardmore, Haverford, Bryn Mawr, Rosemont, Garrett Hill, Villa Nova, Radnor, Ithan, St. Davids, Wayne and Strafford. Of these Bryn Mawr, Villa Nova, Ithan and Wayne are express stations. The power house is located at Beechwood Park, and a substation at Ithan. The schedule contemplated for passenger trains provides for 10-minute intervals during the time of heaviest traffic and for a speed of 23.2 miles per hour. The line will be equipped with a block signal system similar to that adopted for the New York Central electrified zone, which is being installed by the General Railway Signal Com-



SECTION B.A.



Philadelphia & Western—Sectional Elevation and Floor Plan, Showing Disposition of Substation Apparatus.

angement indicates the care which has been taken in the avoidance of grade crossings.

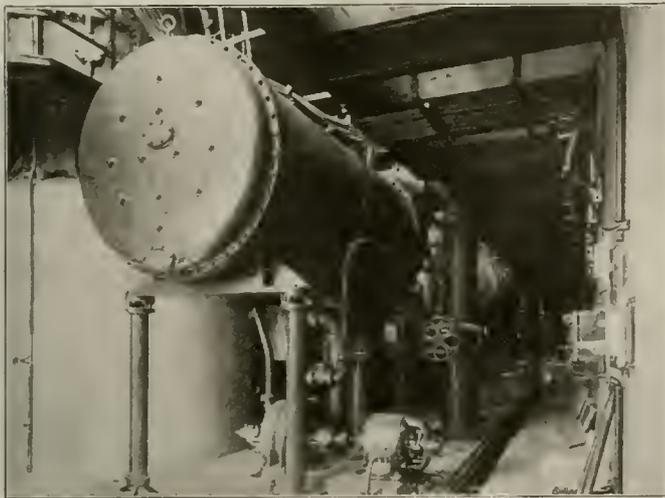
Power House and Substations.

As stated, the power house is located at Beechwood Park, about three miles from the Market street terminns, and the rotary converter substation between Radnor and Ithan is about two miles from the western terminus of the eastern division.

The site of the power house is at a level considerably lower than the level of the tracks and alongside the building

is erected a steel trestle upon concrete columns, upon which cars loaded with coal may be placed for dumping into hoppers which lead directly to the coal supply in the boiler room.

The boiler equipment consists of five 500-horsepower double-drum Heine safety boilers. It is the intention to in-



Philadelphia & Western—Auxiliaries at Base of Turbines in Power House.

crease this number to eight, as the completion of other sections of the road indicates the necessity therefor. Connected with these are Foster superheaters operating at 200 pounds working pressure and designed to afford 150 degrees of superheat. The stack is of steel, 160 feet in height and 13 feet in diameter.

The operating equipment of the power house includes

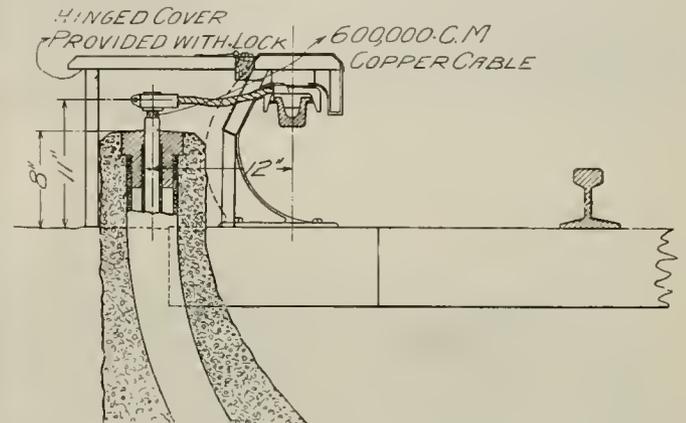


Philadelphia & Western—Exterior of Power House.

two 2,000-kilowatt Curtis turbo-alternator units generating at 2,300 volts. These are of the three-phase 25-cycle type. There is also located at the power house a substation equipped with two 500-kilowatt General Electric rotary converter units. The transformer equipment at the main station provides for stepping down to 435 volts for the rotary converters, and stepping up to 19,000 volts, which is the present transmission potential. It is the ultimate intention to raise this transmission potential to 23,000 volts. The exciters are

General Electric 125-volt machines, direct connected to Curtis turbines. Worthington surface condensers are provided for the main generating units. Cochrane feedwater heaters, Worthington circulating pumps and Buffalo Forge blowers also form a part of the equipment. The accompanying plan and section of the power house indicate clearly the arrangement of the units and their capacity.

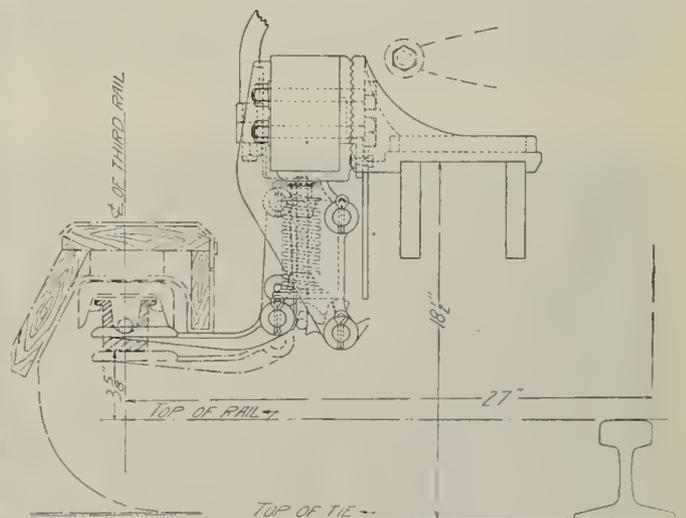
The building is of steel fireproof construction with a concrete roof. It is provided with a 25-ton overhead crane hav-



Philadelphia & Western—Method of Attaching Third-Rail Cables at Highway and Other Crossings.

ing a span of about 38 feet. The accompanying views from photographs will supplement the line drawings as to the general appearance of the power house and its equipment.

The substation at Ithan is equipped with two 500-kilowatt General Electric rotary converters with transformers for reducing the potential from 19,000 to 435 volts. This building, as shown in one of the engravings, is a very neatly designed structure intended to be in keeping with the general high character of the architecture which prevails in the vicinity. It is constructed of buff brick with white enamel wainscoting. In the basement is located a heating plant and



Philadelphia & Western—Sectional View, Showing Third-Rail Detail and Location.

the station is also provided with a 10-ton traveling crane furnished by Maris Brothers, Philadelphia.

Transmission Line.

The transmission line is constructed in an especially substantial manner. The poles are set 7 feet in the ground after being thoroughly tarred for a distance of 8 feet from the lower end, and the hole is then filled with a mass of concrete, which is rounded up at the top around the pole with



Philadelphia & Western—Typical Under Crossing with Highway.



Philadelphia & Western—Substation, Showing High-Tension Wire Entrance and Strain Tower.



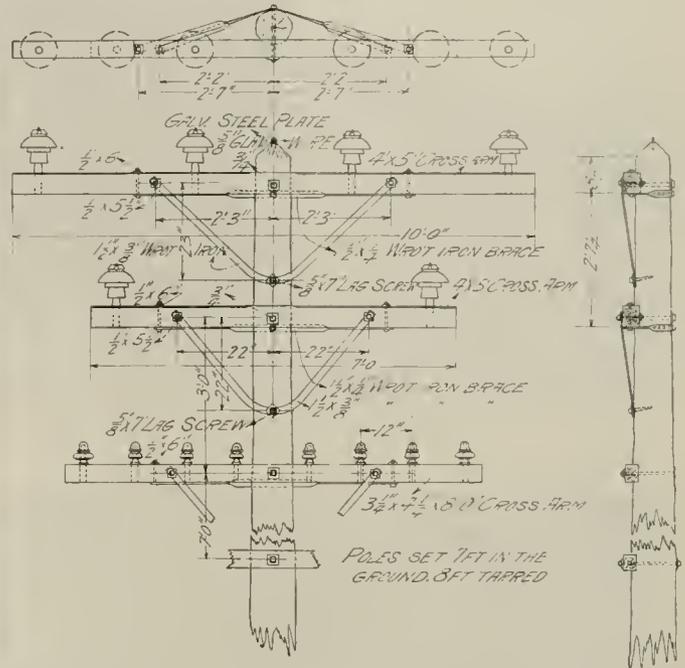
Philadelphia & Western—Interior of Power House, Showing Curtis Turbines, Switchboard and Transformers.

a view to afford drainage away from the pole, and thus materially increase its durability. The crossarms are 4 by 5 inches in section, bolted to the pole with 3/4-inch bolts and braced vertically with 1 1/2 by 3/8 inch wrought-iron braces. The horizontal braces are of 1/2 by 1/4 inch wrought iron, held to the pole by 5/8 by 4 inch lag screws. The upper arms for the transmission line are 10 feet in length and the lower

shop, carpenter shop and various smaller rooms which are used for a blacksmith shop, winding room, storeroom, line tools, mechanics' room, motormen's and conductors' room, and superintendent's office. The building is 330 feet 9 inches from center to center of end walls and each bay is 54 feet



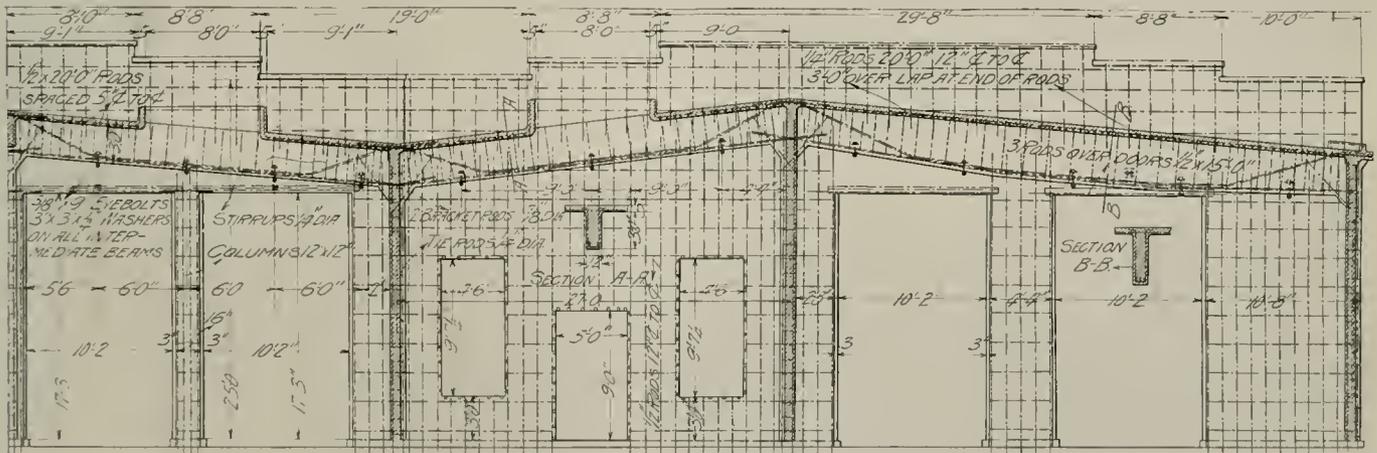
Philadelphia & Western—Interior View of Rotary Converter Substation.



Philadelphia & Western—Detail Dimensions of Pole—Top Construction.

7 feet, while still lower are located arms for telephone and signal wires. An interesting feature is found in connection with the protection afforded highway crossings from possible damage by the high-tension wires. On each side of every highway crossing two poles are set in concrete, as previously described, and the copper wire between these double sets of poles is tied at every 6 feet to a steel wire of high

in width. The bays used for the storage and pit purposes are unobstructed save by a single line of columns down the middle, spaced 15 feet 9 inches apart. The general construction of the pits is shown in one of the accompanying engravings. A passageway affords connection between adjacent pits. The pits are entirely of concrete, the rails being supported on I-beams which are covered with concrete. The



Philadelphia & Western—Details of Reinforcement in Concrete Car House and Shops.

tensile strength. The same construction is employed at other places where it is necessary to carry the high-tension transmission lines over foreign wires.

Car Houses and Shops.

The building devoted to car barns and shops is located a short distance west of the union station. The building is entirely of concrete construction and is subdivided into three bays, two of which afford pit and storage facilities, while the other is subdivided into a machine shop with two pits, paint

capacity of the barn is 24 cars, which embraces the present equipment. All cars are provided with a bow trolley for use when in the barn.

All wires for lighting purposes are carried in pipes with switches at convenient points for turning on the current by sections, and the pits are lighted by incandescent lamps placed 5 feet apart, staggered.

Provision is made for future extension of the building. The reinforcing beams are ended in a projection at the ends of the roof beams. This projection is so built that it



Philadelphia & Western—Concrete Car House and Shops.



Philadelphia & Western—Interior of Car House.



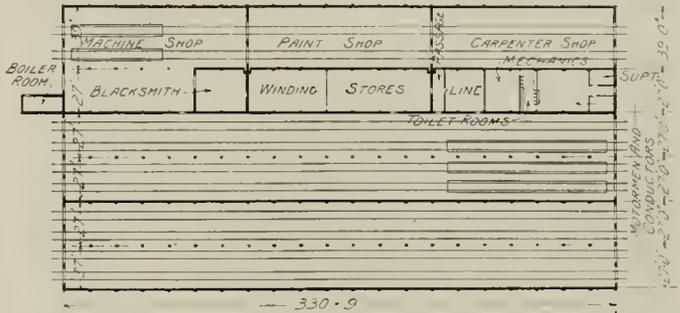
Philadelphia & Western—Multiple-Unit Train of Two Cars as Operated.

can easily be broken to expose the ends of the steel tie rods to enable connection to be made with the rods which will form the reinforcement of the roof of the extension. All partitions in the building are of concrete and the skylights are of wire glass. The building is heated by the "Sturtevant" system, guaranteed to maintain an even temperature of 70 degrees under all circumstances of weather. The building is provided with a traveling crane, which is suspended on concrete beams which have each been tested to 10 tons, and

trict, the company has acquired near the location of the power house a large tract of land which will be used for park purposes and is known as Beechwood Park. This is divided into two sections, one of which will be inclosed and devoted wholly to amusements such as are ordinarily a part of the equipment of pleasure resorts of this nature. The attractions will be grouped around a hollow square, which is outlined by a board walk 32 feet in width and covering an area of 340 feet in length by 200 feet in width. This is fronted toward the railroad station by an administration building, an engraving from a photograph of which is shown herewith. The lighting will be made an important feature, more than 1,500 electric lights being used upon the administration building alone. Within the grounds the buildings are profusely provided with incandescent lamps and general



Philadelphia & Western—Construction Details of Inspection Pit Tracks.



Philadelphia & Western—Floor Plan of Shops and Car House.

thus enables the picking up of an entire car weighing 42 tons.

The machine and repair shops are well equipped with modern tools, and the comfort of employes is sought in modern lavatory arrangements and a locker room containing 60 lockers.

Rolling Stock.

The company has received from the St. Louis Car Company 24 passenger cars which are examples of the best con-

illumination is provided by arc lamps along the various promenades.

The second section of the park will be for the free use of picnic parties, ample tables and seating facilities being provided. This portion of the park is heavily wooded, a grove which occupies it having given its name to the locality. The amusement feature of the enterprise is operated by the Beechwood Park Amusement Company, of which E. E. Downs is president and manager; Frank H. Libbey, treasurer;



Philadelphia & Western—Entrance to Beechwood Park—Amusement Resort.

struction in cars for heavy electric service. These are 51 feet 3 inches long over all and are equipped with four General Electric 75-horsepower motors and type-M multiple unit control. They are thoroughly lighted by 14 incandescent lamps on each side, spaced 2 feet 6 inches apart, and each vestibule also contains two incandescent lamps. Additional lighting is provided by three inclosed arc lamps for each car.

Beechwood Park.

In addition to the fact previously stated that the road is designed to serve a large and well populated suburban dis-

Donald W. Libbey, secretary; and Horace S. Meese, assistant manager. The park was opened to the public on May 30.

The Philadelphia & Western Railroad has recently been reorganized in order to permit the admission of new interests and to plan for expansion. In pursuance of this plan the property was sold under foreclosure on May 20. George J. Kobusch of St. Louis disposed of the principal part of his holdings to a new syndicate, and the Philadelphia & Western Railway was organized to acquire the property. The new officers are: President, George R. Sheldon; vice-president, Thomas Newhall; secretary and treasurer, Davies Murdoch.

THE VALUE OF STRAIGHT AIR BRAKES.

BY INSPECTOR.

In the past 12 or 13 years the air brake has come into almost universal use on electric cars, both interurban and urban. It has practically superseded all other forms of power brake.

The straight air brake system comprises a motor-driven compressor, supplied with current from the trolley circuit, a reservoir, brake cylinder, an automatic governor, which starts and stops the motor-driven compressor at the desired minimum and maximum pressures, the engineer's operating valves, the necessary pressure gauges, switches, fuses, etc.

On double-track cars on city lines when operated by the handbrakes, a schedule of 8 to 8½ miles per hour was once considered about the best speed that could be maintained with safety. Since the advent of air brakes many roads have, after installing them, increased the average speed to from 9½ to 12 miles per hour, with an equal degree of safety, thereby effecting a great saving in operating expense. The increased speed per hour means fewer cars, fewer total car-hours and fewer accidents due to the motormen having more perfect control of the cars or trains they operate. There should be fewer accidents, also, due to the fact that fewer cars now furnish the same service formerly requiring more cars.

Cost of Air Brakes and Maintenance.

Due to keen competition between the several firms now manufacturing air brakes the cost of the apparatus has reached a figure which justifies their use on cars which have been many years in service. In other words, if the car is in a condition to warrant the supposition that it still has three years of service left in it, it would be a good investment to install air brakes on such car, as the increased mileage that could then be made by the car, with safety, would justify the expenditure. The life of the air brake apparatus is as yet an unknown quantity, the writer having in mind several roads on which apparatus has been in service 12 years, and is still giving good service; in fact, to date the writer knows of no air brake apparatus having been discarded due to being worn out.

Regarding the care and maintenance of air brakes the cost for the first three years is purely nominal. The cost for repair parts, during this period, should not exceed 1 per cent of the initial cost per year. During the second period of three years the cost should not exceed 2½ per cent of the initial cost of the apparatus. The cost thereafter should, of course, be somewhat higher on account of wear and tear, and the continually increasing long life of the apparatus. These estimates are based on the supposition that proper care be given the apparatus from its date of installation.

The motor-driven air compressors of the latest design have few oiling places, the bearings being oiled by rings carrying the oil up to the bearing from an oil cellar. The crank-shaft and its bearings are usually lubricated by what is commonly called the "splash system." Therefore the oiling of the compressor is a matter of filling the crank chamber and the oil cellars with oil once in about every 30 days. The compressor should be thoroughly overhauled, cleaned, etc., at least once in each six months.

The engineer's valves also require attention. During the last few years the sliding type of valve has come into quite general use, the advantages of this type being that the wear on the valve tends to improve and perfect its seat. These valves should be lubricated at least every 30 days and should be overhauled at intervals of four months, the working parts cleaned with gasoline and lubricated when reassembled with lubricating oil for bearing parts, except the valve seat, for which tallow from an ordinary tallow candle is, to the mind of the writer, the best and longest wearing lubricant. The automatic governor also should receive some atten-

tion. Where the old type of electric governor is used it should be kept free from dust and dirt, rust, etc., and the contacts kept free from scale. This should be done at intervals of at least every three months.

The tendency of the times, however, seems to be to use a governor of a mechanical type. Its cost of maintenance is said to be lower, and it requires less attention, having no magnet coils to burn out. All its parts are of a size and design affording long life and a surety of action not found in the automatic governors of the electrical type.

The brake cylinders require very little attention, occasionally requiring new leathers and oiling about once a year.

The principle point in the care of air brake apparatus is oiling, overhauling and cleaning at regular intervals. If these things are done properly the cost of keeping up the apparatus will be found to be very low.

On some railway systems a book record is kept of each car, showing the dates on which work is done on trucks, motor equipment, air brakes, etc. By this method the shop superintendent can tell at a glance whether or not the various apparatus are receiving the care and attention they require. Some roads use a card index system; others a large form which usually is kept in a case with a glass front so that it can be referred to at frequent intervals.

Air Brakes on Single-Truck Cars.

Many railway companies are now placing air brakes on cars of the single-truck type. The writer has in the past few years heard many opinions expressed by various street railway officials as to whether or not the move is a wise one. In his judgment, based on 10 years' experience in the operating department of various street railway properties, cars of the single-truck type having a length of body of 20 feet 6 inches over corner posts up to 22 feet over corner posts placed on any type of truck and in a condition to warrant an estimate of five years of service or more, should be equipped with air brakes for various reasons, viz., the average speed can be increased from 1½ to 3 miles per hour, due to quicker stops, and to the fact that brakeshoes can be so adjusted as to permit the shoe to be well away from the wheel when the car is running free. With handbrakes shoes are usually adjusted so neatly that there is more or less friction when the car is running at any speed, either slow or fast. The motorman being enabled to make quick stops will avoid many accidents which, when operating with the handbrake, he would be unable to do.

Another point in favor of the air brake on all types of cars is the fact that a company having its cars so equipped is less liable to have juries give verdicts against it—so-called "sympathy" verdicts. If it can be proved in open court that the company has adopted the most improved type of car-controlling apparatus, which we must admit is a power brake, the juries are more likely to give the company the benefit of any reasonable doubt before assessing damages.

Straight Air Brakes on Trains.

On interurban railways operating trains of not to exceed three cars the straight air system, in the judgment of the writer, is preferable to the automatic system on account of lower initial cost, the greater degree of flexibility and the simplicity of the apparatus as a whole. On trains of two or three cars the response of brakes when application is made is quick enough for all general purposes. There is, however, an element of chance in the operation, as to parting of trains, etc. This can be overcome. A type of emergency valve, similar in design to the plain triple valve, which, when installed in connection with the straight air brake system, takes care of emergency conditions, is now on the market. Should the reservoir line break, hose burst or train part this valve becomes operative and the brakes on each car are set to emergency automatically. This emergency valve can be so installed as to give the conductor on either motor cars or trailer cars a chance to stop the train by installing

vent valves in each car easy of access to the conductor. A vent valve can also be installed in the cab in such a manner that when emergency arises the motorman may open the vent valve and secure a quick or emergency stop instead of the regulation service stop. Therefore for interurban railway operation the straight air brake system with the emergency feature added seems to be the ideal method of control under stated conditions, since it accomplishes requirements under ordinary service, and has at the command of the operator a reserve force or reserve power to be brought into play when the occasion demands.

A TEST OF INSULATORS FOR AN EXCEPTIONAL SERVICE.

BY SIDNEY SPROUT, ELECTRICAL AND MECHANICAL ENGINEER OCEAN SHORE RAILWAY.

The Ocean Shore Railway follows the shore of the Pacific ocean for nearly 80 miles between San Francisco and Santa Cruz, Cal. One of the first problems that presented itself to the engineers making plans for the electrical equipment of this road was that of determining the type of insulator that would give the most satisfactory service on the 33,000-volt transmission line, which it was planned to use for the distribution of power to the various substations from the power house.

Exceptional Conditions.

The problem of selecting an insulator for 33,000-volt operation would not, under ordinary circumstances, be at all difficult, but the conditions in this particular case made the question one to which it was necessary to give a good deal of time and attention before any definite conclusion could be

conditions at over 11,000 volts. (7) An 11,000-volt line which would be paralleled for some 14 miles had had a great deal of trouble from burnouts caused by the insulators becoming covered with a coating of dust and salt.

After consulting the officials of the Big Creek Power Company relative to their experience in operating this latter-mentioned 11,000-volt line, it was decided to establish a testing station at a place called Yellowbank, about 10 miles from Santa Cruz, where they reported that they had had a number



Insulators for Exceptional Service—Near View of Testing Box, Showing Insulator and Dust Bag.

of burnouts caused by the insulators becoming coated with dust from the highway and salt from spray and fogs.

Testing Station.

The station as illustrated was built at this place in the fall of 1905, and samples of different types of insulators were placed on the insulated crossarms on the pole outside of the station. An 11,000 to 440-220-volt transformer was placed on a pole outside of the station, power being supplied from one leg of the three-phase, 11,000-volt, 60-cycle transmission line of the Big Creek Power Company. Eight 2½-kilowatt, 5,700-6,600 to 110-220-volt transformers were placed inside of the station and connected as shown in the diagram, giving a test voltage ranging from 6,600 to 55,000 volts.

Plan of Testing.

When this station was built the plan was to test the insulators on the poles under the natural climatic conditions, but by the time the station was completed the rainy season had commenced, so that the station was closed up and tests suspended until the following summer. Meanwhile the insulators were left on the poles.

When the tests were resumed the following summer it had been decided that instead of allowing the insulators to stand for a long enough time to be coated with dust and salt, under the natural conditions, it would be more advisable to test them under artificial conditions resembling the natural conditions as closely as possible. For this purpose the testing box shown in the illustrations was built just outside of the station. This box was provided with a hinged door in the side. A compressed air sprayer was provided for spraying the insulator with a finely divided salt spray closely resembling the heavy fogs which come from the ocean. A cheese cloth bag of dust from the highway shaken at the windward end of the testing box was found to be a very efficient way of covering the insulators with dust. An electric



Insulators for Exceptional Service—Testing Box and Transformer House.

reached. These conditions are, briefly: (1) Heavy salt fogs from the ocean. (2) Salt spray which is carried by the wind for considerable distances, in certain places where the waves beat upon a rocky coast. (3) Yearly dry seasons of from four to six months, during which time the highways become very dusty and the insulators are not washed off. (4) The proximity of the transmission line to the county road for practically its whole length. (5) The trade winds blowing from the ocean for months during the dry foggy season. (6) The fact that no line had been operated under similar climatic

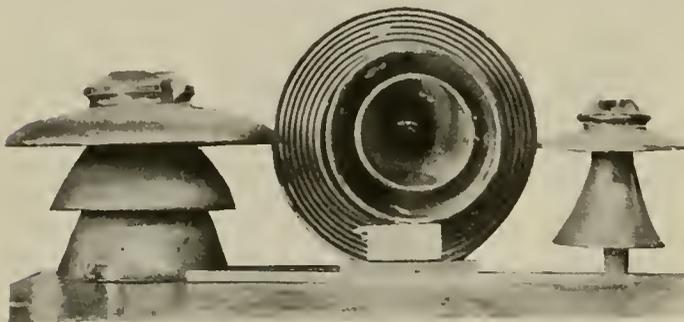
fan was provided for the purpose of blowing the dust and salt spray on the insulators under test, but it was found that the wind, blowing from practically the same direction all of the time, made its use unnecessary.

Results of Tests.

Before beginning the actual tests on the insulators it was necessary to make several changes in the arrangement of the transformer leads in order to prevent cases of sparking and abnormal static discharges. The results of the tests in detail were as follows:

60,000-Volt Porcelain Insulators.

Three on pole for eight months. Well coated with dust and salt on under surfaces and petticoats. Insulators in



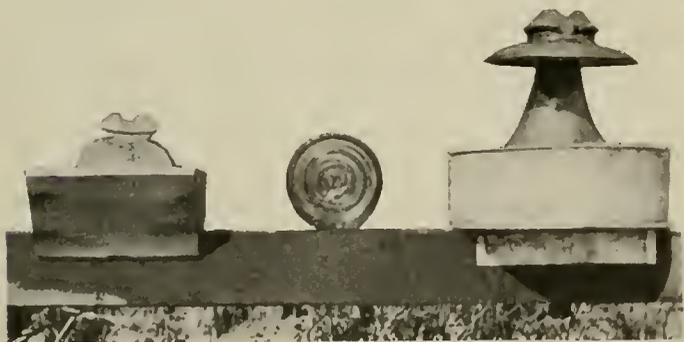
Insulators for Exceptional Service—9 and 16 Inch Porcelain Insulators.

parallel, as shown in diagram. Eight transformers thrown on for 10 minutes. No effect.

Connection to the top of insulator from one side of transformer and around the bottom of second petticoat from other side. Then 56,640 volts was thrown on without results. Wire was then moved from bottom of second petticoat to just under corrugated top. Tested for 10 minutes. No effect.

60,000-Volt, Corrugated Top, 16-Inch Insulator.

Insulator was put in the testing box and 56,600 volts thrown on with no effect. When heavy spray from side of box was turned on, current arced over. Spray was turned on the under sides of the petticoat with transformers off, and



Insulators for Exceptional Service—Glass and Porcelain Insulators with Fog Bowls.

then as fast as they were thrown in, the circuit-breakers came out. Some dust was shaken on the insulator, and after it had dried off the insulator stood the test all right. When covered with dust and subjected to a test voltage of 35,700, duration five minutes, and heavy fog from spray at end of box for five minutes until water was dripping from the petticoats, there was no effect except slight snapping sound. A heavy spray from side of box caused current to arc over immediately.

Insulator manufactured by the Locke Manufacturing Company was cleaned and put in testing box. Test voltage of about 55,000 volts was thrown on; salt spray was turned on insulator from the side of the box but with no effect. After turning spray under the petticoats and getting insulator wet all over the current arced over as soon as thrown on.

Foggy Weather.

Insulator very wet from the fog of the previous night; drops of water were dripping from all petticoats. Eight transformers thrown on and a decided static was both audible

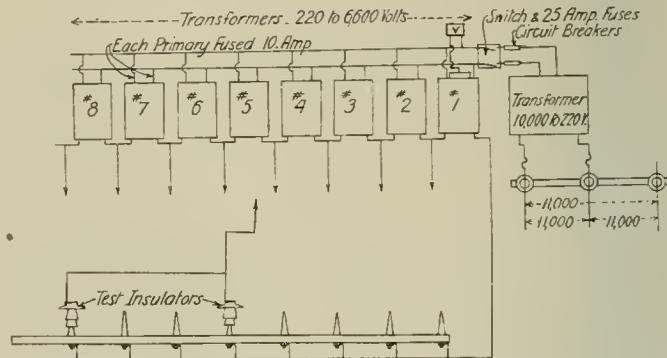
and visible. Dust shaken in the box had no effect on the insulator.

60,000-Volt, Smooth Top, 14-Inch Insulator.

Insulator manufactured by the Thomas Insulator Company. Had been in the station all winter. Well covered with dust and also covered with moisture from fog. Was put in the testing box and tested up to 55,000 volts. No results. A thin wire was then connected to the pin and wrapped around the petticoat No. 2 at point "a" (section) and 55,000 volts thrown on. No results aside from a barely visible static at joints. Wire was then moved up to the point "h" and tested with 55,000 volts without results other than an increase of the static. The end of the wire on the top of the insulator was then brought in contact with the top of the insulator at point "c," two inches from the edge, and the static increased a good deal. It was noted here that visible static discharges jumped from the bottom of petticoat No. 3 to the wire around No. 2, a distance of 1 inch instead of following the 7 inches of dust-covered surface between the two points. The thin wire was next put around petticoat No. 3 at the point "d," about one inch from the bottom, and the wire on top restored to position "e"; 55,000 volts were thrown on. Current arced over the surface between the points "e" and "d," a distance of 14 inches.

Nine-Inch Top, 35,000-Volt, Porcelain Insulators.

Had been on crossarm without disturbing. Coating of dust and salt accumulated by eight months' exposure to the weather. Put on the insulated crossarm in the testing box. Four transformers caused a heavy static discharge over the insulator. Not visible but made evident by a snapping sound. Five transformers increased the snapping. Six transformers,



Insulators for Exceptional Service—Sketch Showing Test Rack and Step-Up Transformer Connections.

test voltage 42,000, 20 minutes. During the first few minutes static flashes were visible on the surface of the under petticoat from the top down, but these gradually disappeared until only the snapping was heard. Seven transformers were tried; test voltage, 48,720; 20 minutes. Decided flashing on under side to top petticoat and on top of bottom one for first few minutes, and then only an occasional flash. Eight transformers; voltage, 55,200; 30 minutes. The current arced over the insulator after a few seconds, throwing the breakers. When thrown on again only occasional flashes were visible for the rest of the time.

Similar insulator had been inside of the station for eight months. Was well covered with dust. Seven transformers; 48,300 volts; 20 minutes. Small bluish flashes near cemented joint for first few minutes. Eight transformers; 55,200 volts; 15 minutes. Slight increase in flashing. At the end of 15 minutes salt spray was turned on insulator and current arced over at once.

Same insulator; test voltage, 56,160; 8 minutes. Insulator well covered with dust before transformers were thrown on. Immediately current arced over the insulator and breakers came out. After putting the breakers in three times they stayed in for the rest of the test, blue flashes around the cemented joint being visible for the first few minutes.

Same insulator; test voltage, 35,700. Salt spray turned on insulator from end of testing box. No effect. Heavy spray turned on insulator from side of box. Current arced over, throwing breakers. Salt spray turned under the petticoat. All of the insulator wet. Breakers would not stay in.

A 9-inch insulator well covered with dust and wet from the fog was tested with 35,000 volts. Arced over immediately, but stood up all right with 27,000 volts.

Similar insulator. Covered alternately with salt spray and dust until muddy all over. Tested with 27,000 volts. Current arced over immediately, standing up all right with 20,000 volts.

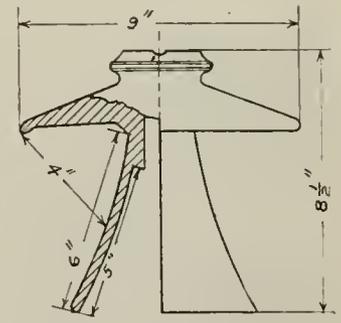
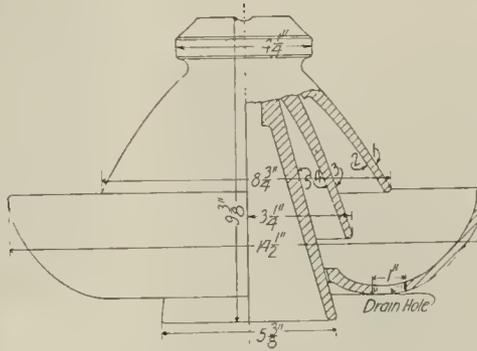
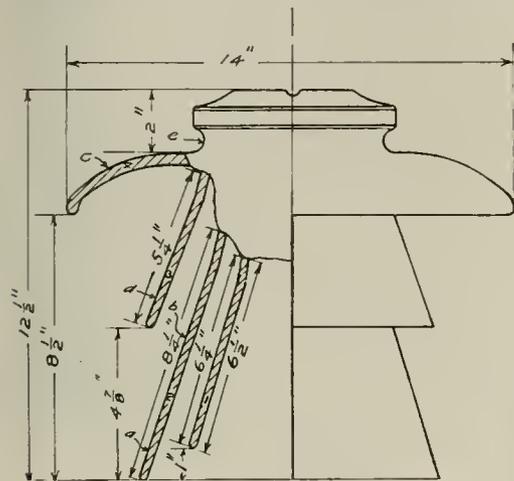
A 9-inch insulator of the Locke No. 409 type was put in the testing box with a special galvanized iron fog box and spray and dust put on it from end of testing box. The under side of the flat top was about as free from dust as the under side of its single petticoat.

Fresh Water Tests.

The 9-inch insulator was wet with the moisture from the fog of the previous night on top and on outside of petticoat. Under side of top was just a little moist and under side of petticoat was covered with a very thin film of moisture, barely noticeable when rubbed off with the finger. Voltage, 35,000. Moisture of the night before on it. No effect beyond a faint static discharge near the cemented joint. A heavy fresh water spray was turned on the insulator from one side and a little above. After a few seconds the current arced over. With transformers on again, the spray was turned on from the end of the box and from above at an angle of about 45 degrees, but the insulator stood up all right, even when the spray was made so heavy that the water ran off of the top in streams almost continuous to the crossarm.

Kern Type Insulator.

An insulator of the Kern type, manufactured by C. S. Knowles, was wiped clean and tested with 55,000 volts, salt spray being turned on it, but it stood up all right until the spray was turned under the petticoats.



Insulators for Exceptional Service—Three Types of Porcelain Insulators Subjected to Various Tests.

Same insulator. Well covered with moisture from fog of night previous. Test voltage, 35,000. Very heavy static flashes on the surface of the insulator. Not heavy enough to throw the circuit-breakers.

Porcelain Fog Bowl Insulator.

This insulator was of special design, the idea being to make use of the advantages obtained from the fog box and at the same time by making the fog box of porcelain and supporting it on the under petticoat instead of the crossarm to reduce the sparking distance required to the fog box. The several parts of this insulator were not cemented together. The insulator was wiped clean and mounted on a piece of 1-inch iron pipe. Test voltage of 35,100 volts thrown on. After five minutes no effect. Salt spray turned on from end of box for five minutes. Water dripped from all of the petticoats. No effect. With the transformers off dust was shaken on the insulator until the moisture was dried off and the outside of the insulator was white with dust. On raising up the top petticoat its under side was found to be practically free from dust. Test voltage, 35,000. No effect.

Insulator again covered with dust. Test voltage, 56,600. After five minutes, no effect. Spray turned on from end of box. Very small amount of spray caused the current to arc over through the drain holes in the porcelain fog bowl.

Salt spray turned on this insulator from the top of the box at an angle of 45 degrees caused the current to arc over at 56,000 and 35,000 volts. Spray was turned on a 60,000-volt insulator, well covered with dust from the top of the box, but to no effect. Fog bowl wet from fog. Water dripping from petticoat. Eight transformers thrown on. No effect. Dust shaken in box. No effect.

Porcelain Fog Bowl and 9-Inch Fog Box Insulators.

The porcelain fog bowl insulator and the 9-inch insulator in its galvanized iron fog box were left in the testing box over night and became well covered with moisture. On the

porcelain fog bowl insulator the moisture was heaviest on surface "3" (see illustration) and light on surfaces "2," "4" and "5." On the 9-inch fog box insulator the under side of the top and petticoat showed very little moisture.

Tested both insulators to 35,000 volts. No result. Middle petticoat then removed from the porcelain fog bowl insulator. No result.

About 55,000 volts were thrown on the 9-inch fog box insulator. No result. Porcelain fog bowl insulator arced over at 55,000 volts when the middle petticoat was removed. With all petticoats on there was no effect.

Nine-inch insulator covered with a thin film of moisture stood about 48,000 volts, but arced over at about 55,000 volts.

Creeping Distance.

On the surface of a clean, dry petticoat 35,000 volts formed an arc at a distance of 3.25 inches; 57,000 volts formed an arc at a distance of 5.50 inches.

Conclusions.

From careful observations of the tests, briefly outlined, the following conclusions were deduced:

First: Under the climatic conditions as defined, any insulator used for 33,000 volts or over, i. e., any insulator used within the limits of size manufactured at present, would have to be cleaned every third or fourth year. It is doubtful if even a very considerable increase in size would be of any advantage.

Second: The use of the so-called "fog boxes" would afford a temporary relief on small insulators and increase the

time between cleanings. On the larger insulators, i. e., insulators for over 20,000 volts, the fog boxes would not be of any advantage owing to the fact that the distance between the boxes and the petticoats of the insulator would have to be so large that it would afford no protection from dust and spray. The expense of fog boxes also would be prohibitive on larger size insulators.

Third: Of the three causes of trouble, namely, salt spray, dust and fog from the ocean, the latter is of minor consequence, and any transmission line away from the combined influences of the first two would meet with comparatively little trouble.

Fourth: The most satisfactory insulator for the conditions stated above is one having as few "still air" spaces as possible, i. e., an insulator exposing a large proportion of its surface to the action of the wind. An insulator having as flat a top as practical to manufacture in the size desired. An insulator having one long petticoat, or, if necessary to get the required surface, two long petticoats, although the latter has the objection of providing a "still air" space between the two petticoats, reached neither by wind nor rain and difficult to clean.

Fifth: The results and conclusions suggest the possibility of an insulator for very high voltages being made up of several pieces of porcelain or glass shaped something like the present insulator tops and placed one below the other.

Acknowledgment is due to W. G. Vincent, Jr., assistant electrical engineer, Ocean Shore Railway, for assistance in performing these tests.

THE NEW STEEL CARS OF THE HUDSON COMPANIES.

BY HUGH HAZELTON.

The plans of the Hudson Companies, which are building a double set of tunnels from Cortlandt street, New York, through Jersey City and Hoboken to Christopher street and thence by Sixth avenue to Thirty-fourth street, New York (The Electric Railway Review, November, 1906, page 893), have been generally discussed in the technical press, but little has been said about the rolling stock to be used. In designing the cars for this service the engineers have had three requirements constantly in mind:

First—The car must be absolutely fireproof.

Second—Doors must be arranged so that passengers may enter and leave with least delay.

Third—The weight must be kept as low as is consistent with safety.

Fireproof Materials.

In order to make the car absolutely fireproof unusual precautions have been taken. The entire car body is made of steel, including doors, roof and headlining. The floor is made of "monolith" cement, laid on steel, with $\frac{1}{4}$ -inch finish of carborundum cement, which is used as a substitute for maple strips. The seat cushions and backs are covered with a metal fabric instead of with rattan. All insulated wires are covered with an asbestos braid and are placed in iron conduit pipes. The magnet coils of the control equipment



Hudson Companies Cars—Interior View, Showing Seats and Stanchions.

are insulated with mica and asbestos, in place of the usual covering of cotton tape.

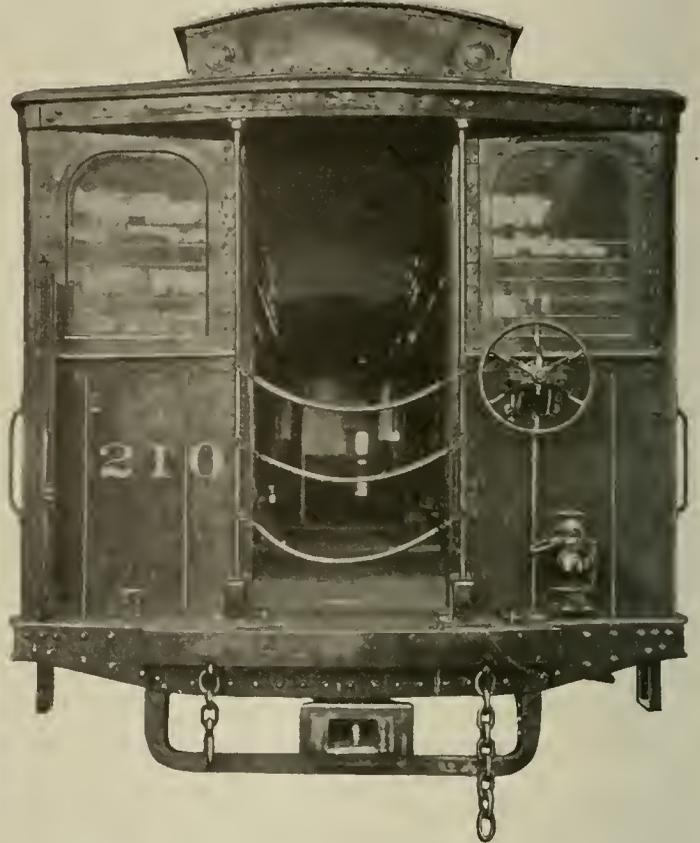
Arrangement of Doors.

In order to facilitate rapid movement of passengers, the car is designed as indicated in the illustration, with wide center doors, side seats, and an unobstructed passageway between the car platforms and the interior of the car. This arrangement minimizes the time of station stops without sacrifice

of carrying capacity. At the terminals the cars will discharge passengers on one side to an incoming platform and will receive passengers on the opposite side from a special outgoing platform. These provisions are particularly necessary owing to the density of traffic and the close headway of trains during the rush hours.

Reduction in Weight.

In a local service like that of the Hudson Companies the stations are from one-third to one-half mile apart, and a large percentage of the power for operating the cars is required for their acceleration. For this kind of service it



Hudson Companies Cars—End View of Completed Car.

is particularly desirable to minimize the weight of the cars as much as considerations of safety will permit. The problem which presented itself to the engineers of the Hudson Companies was to design a steel car with center doors and of the least possible weight.

The type of construction used on Interborough subway steel cars was at first considered, but was not found applicable on account of the decision to use center doors. The unbroken side of the Interborough car below the window sill forms a plate girder about three feet in depth. To introduce a center door in a car of this type would have made it necessary to cut the girder in two, and no satisfactory way was found to frame around the door without adding materially to the weight.

The use of drop frame girders at each side of the car below the floor line was also considered, but as such girders are limited in depth by clearance requirements to 16 inches or 18 inches, it would have been necessary to make them of heavy sections which would have added materially to the weight of the car.

Truss Frame.

The truss frame as illustrated herewith was finally designed as the best solution of the problem. This truss frame is arranged in five panels, the center door occupying the middle panel. As the depth of this truss is about seven

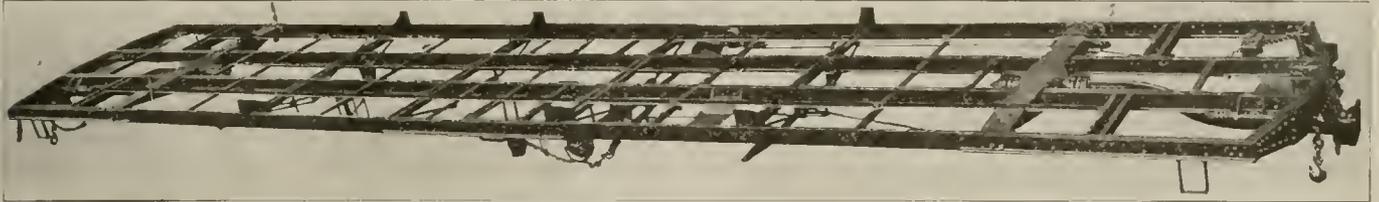
feet, it follows that its weight, for a given strength, is much less than that of any girder or truss construction which can be placed below the car floor. The bottom chord of the truss is a 6-inch channel carried below the door sills and extending from end to end of the car. The top chord is a similar channel placed above the doors and extending the length of the car. The vertical members of the truss frame are 8-inch channel posts spaced at uniform distances, and placed between pairs of windows. Below the window sills these posts are braced by diagonal members to the bottom chord. Above the window sill the posts are reinforced by angle irons and plates, which arch over the pairs of windows and are riveted to the top chord. At the center door the top and bottom

timbers, and if the buffer timber of one car is forced up over that of the adjacent car, it will be stopped by the steel castings before damage is done to the end of the car.

Side Sheathing and Car Roof.

The sheathing of the ends and sides of the car consists of steel plates 1/16 inch thick. These plates are riveted to the truss frame after the latter is in place, and none of the rivets which hold the truss frame together pass through the sheathing. Therefore the plates may be removed for repairs without disturbing the truss frame.

The roof is made of 1/16-inch steel plates, coated on both sides with lead. The roof plates are supported by angle



Hudson Companies Cars—Underframe, Showing Sills, Connections and Reinforcement.

chords are reinforced by bulb angles, and similar bulb angles are riveted to the bottom chord below the end doors to furnish additional support for the car platforms. The truss frame is designed to carry the entire weight of the car with full passenger load with a fiber stress not to exceed 12,000 pounds per square inch in any member.

Underframe.

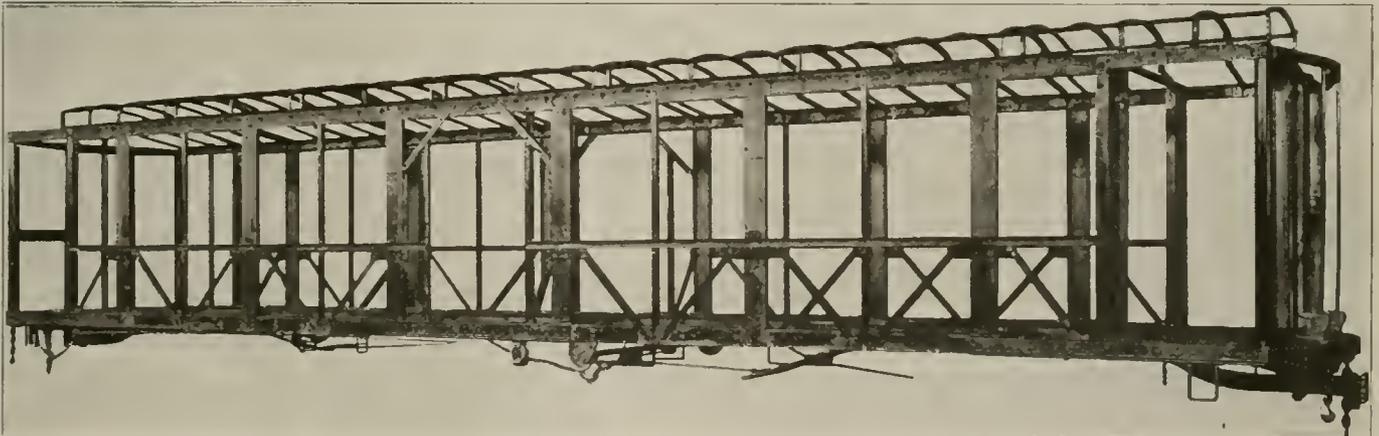
The underframe of the car is shown in an accompanying engraving. The side sills are made of the 6-inch channels already described as a part of the truss frame. The center sills are 6-inch I-beams, which run from end to end of the car. The needle beams are composed of angles with truss rods and turn-buckles. The attachment of the needle beams to the

irons bent to conform to the shape of the roof and spaced about 14 inches apart. The plates are secured in place by 1/4-inch rivets with heads soldered, and all seams between plates are lapped and soldered.

Interior Finish and Monolith Floor.

The headlining and side panels on the interior of the car are of steel 1/32 inch thick, and all window guides and post covers are made of steel plates pressed to the required shapes.

The floor is made of "monolith" cement, laid on galvanized "Keystone" iron, which securely holds the cement down to the metal. The top surface is coated with a layer of cement containing about 30 per cent of carborundum.



Hudson Companies Cars—Body Framing, Showing Holes for Application of Sheathing.

side sills is made by means of bent plates, which serve also to stiffen the posts against side pressure.

End Sills.

The end sills in this design have been made unusually strong in order to distribute the strains due to impact to the center and side sills. Attention is called to the shelf angle which is secured to the end sill for the support of the drawbar. This shelf angle furnishes a stronger support than the sector bar usually employed for the purpose.

To prevent the telescoping of car platforms in the event of a collision, two heavy steel castings, shown in the side view, have been riveted to the ends of the center sills. These castings extend about eight inches above the top of the buffer

This forms a hard wearing surface, and the sharp particles of carborundum prevent slipping.

Seats.

The longitudinal seats are provided with partitions, as illustrated. These partitions consist of steel plates which extend from the seat cushion to a height a little above the shoulder of a seated passenger. The top edge of the partition is finished with a 1-inch pipe bent to a graceful curve. These partitions are high enough to form a support to the passenger and thus obviate the disagreeable effect due to the sudden starting and stopping of trains.

The Hale & Kilburn Manufacturing Company, which is furnishing the seat cushions and backs, has developed for

the Hudson Companies' cars a metal fabric which is to be used as a covering in place of rattan. The frames of the cushions are made of pressed steel, and the seats are, therefore, fireproof throughout.

Vertical Hand Rods.

A vertical hand rod is located at each of the seat partitions; this rod extends from the seat to the ceiling fixture which supports the hand strap rod. The vertical hand rods furnish convenient supports for standing passengers.

Sliding Doors.

Steel sliding doors are provided at the sides of the car and in the vestibuled ends. Each door is supported on a ball-bearing hanger which runs on a track above the door. A piece of rubber hose is attached to the edge of the door to prevent the possibility of pinching the fingers of passengers when the door closes.

The doors are being furnished by Hale & Kilburn Manufacturing Company, and the ball-bearing hangers by the Pitt Car Gate Company.

Door-Operating Mechanism.

The doors are operated by air cylinders controlled by

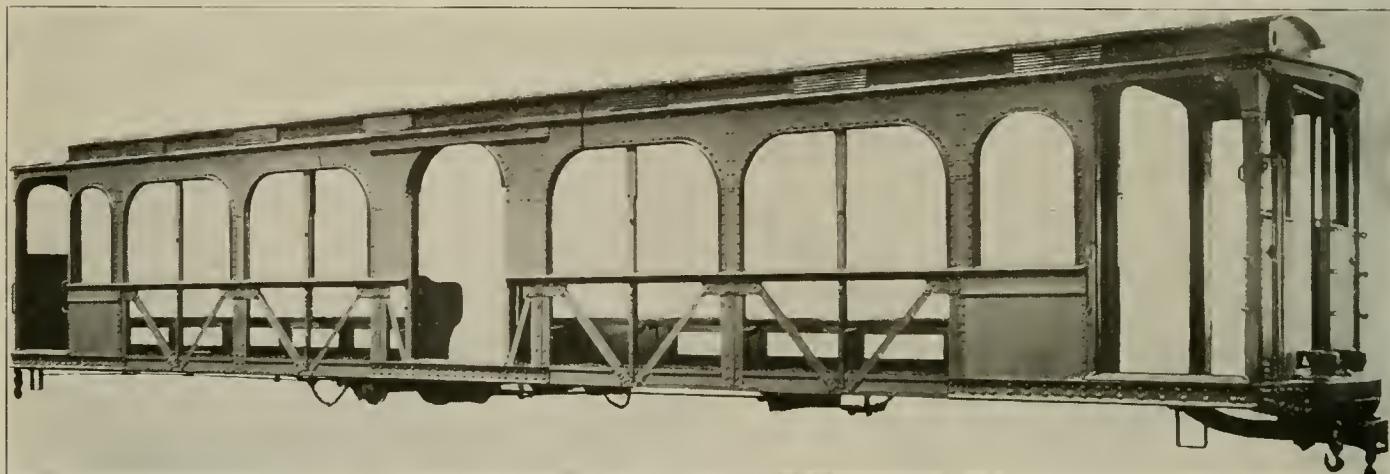
tem, each car is provided with four emergency lamps, which are supplied from a 60-volt storage battery on each car. In case the power goes off the line, the emergency lamps continue to be lighted from the battery.

Storage Battery.

The storage battery consists of 30 cells having a discharge rate of $1\frac{1}{2}$ amperes for eight hours. The battery is placed in series with the six circuits of five lamps each, and the four emergency lamps are connected across the terminals of the battery. The four 60-volt lamps take nearly the same number of amperes as the 30 lamps in the main lighting system, so that the battery normally "floats" on the line. The storage batteries are furnished by the Gould Storage Battery Company.

Destination Signals.

The destination signals are placed above the ceiling of the vestibule at each end of the car. Each signal consists of a stationary lamp surrounded by a cylinder containing four segments of glass of different colors. This cylinder may be turned from the vestibule by the guard or motorman. The lamp is accessible from the vestibule by means of a hinged door at the bottom of the cylinder. A fixed lens is placed



Hudson Companies Cars—View of One Side of Car, Showing How Sheathing is Riveted to Framework.

the guard. The piston has a stroke of about 15 inches, and in order to increase the movement to equal the door travel a rack and pinion is used. The mechanism is so arranged that the door moves up to the end door post, but does not strike against it.

The air cylinders are connected by pipes to air valves, which are located at the ends of the car. The guard opens and closes the doors by operating these air valves. This door-operating mechanism is supplied by the Burdette & Routree Manufacturing Company.

Door Signal.

To prevent the starting of the train before all doors are closed, it is proposed to provide an electrical signal wire throughout the train, with a bell or indicating lamp in the motorman's cab, and with contacts at each door so arranged that every door must be closed before the motorman receives the signal to start.

Car Lighting.

Each car is equipped with thirty 10-candlepower incandescent lamps, two of which are placed above each vestibule. Switches are provided so that the current may be transferred from the two vestibule lamps, in the end occupied by the motorman, to the two lamps in the destination signals. As the cars are to be operated exclusively in tunnel service, the 30 lamps will be lighted continuously.

In addition to the 30 lamps in the regular lighting sys-

tem, each car is provided with four emergency lamps, which are supplied from a 60-volt storage battery on each car. In case the power goes off the line, the emergency lamps continue to be lighted from the battery.

Drawbars and Air Brakes.

The drawbars are of the radial type, designed for clearances with cars on a 90-foot radius curve. The drawbars are made of 85-pound bent rails with Van Dorn couplers.

The cars are equipped with Westinghouse automatic air brakes. The type of brake is designated as Schedule A. M., which includes the following features:

- Quick recharge of auxiliary reservoir.
- Quick service application of brake.
- Graduated release of brake cylinder pressure.
- High-pressure emergency application.
- Electro-pneumatic operation of triple valves.

This air brake equipment is intended especially for the class of service required of Hudson Companies cars, and is of the latest and most improved design.

Each car is supplied with air by a Westinghouse D-2-E.G. motor-driven air compressor, which has a piston displacement of 20 cubic feet of air per minute. In addition to the air brakes, each car has a complete system of independent hand brakes.

Headlights.

Two oil headlights are placed on the front end of the forward car in a train, and two similar lanterns are placed at the

rear end of the rear car, showing red, to serve as "tail" lights. These lanterns are also furnished by the Adams & Westlake Company.

Heaters.

The heaters are of the panel type placed below the seats. The heater coils are arranged in two circuits, which, at 600 volts, take 7 amperes and 14 amperes, respectively. The heaters are furnished by the Consolidated Car Heating Company.

Control Equipment.

The latest type of Sprague-General Electric multiple-unit control has been adopted, and a number of improvements have been made in the materials used for insulation to render them fireproof. For example, in the contactor and reverser coils mica and asbestos have been substituted for cotton tape, and all insulation in molded forms has been made of fireproof material.

The control equipment on each car includes a current limit relay which provides automatic acceleration of the train

Tires, $5\frac{1}{4}$ inches, M. C. B. tread.

Axles, hammered steel, $4\frac{3}{4}$ inches at center, $5\frac{3}{4}$ inches at wheel seat.

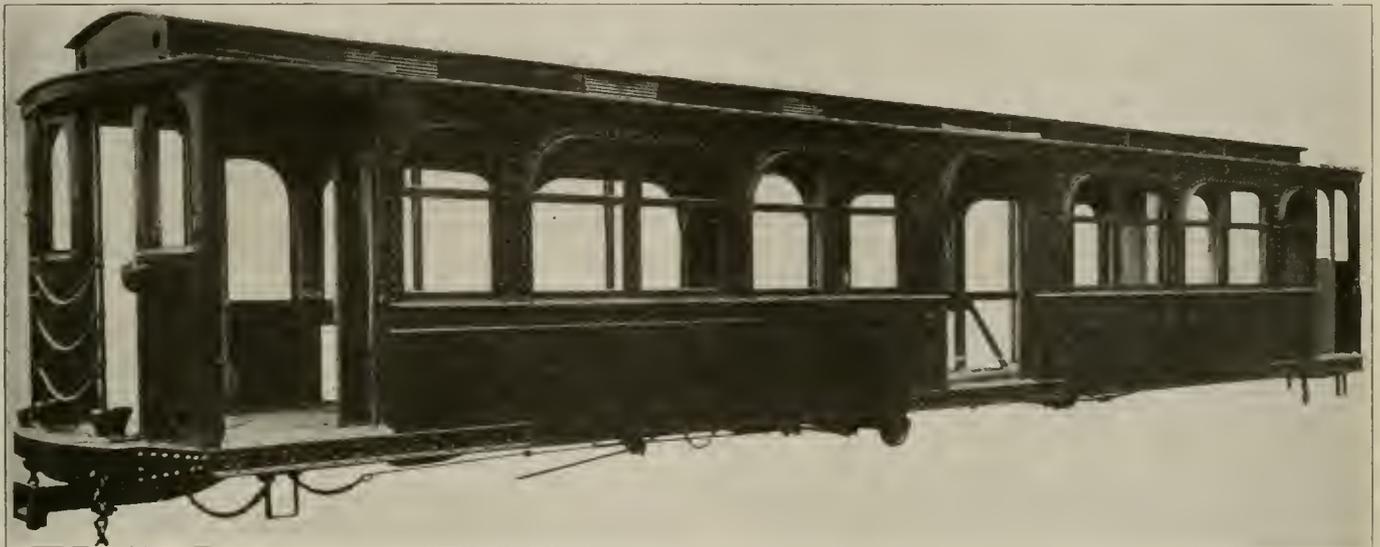
The wheels are of solid steel, forged, and were made by the Standard Steel Wheel Company.

Motors.

Each car is equipped with two 160-horsepower motors furnished by the General Electric Company and of the type known as G. E. No. 76. This motor has been specially designed for the Hudson Companies' service, but follows closely the design of the G. E. 66, a motor which has given such good service on the Manhattan Elevated. In the G. E. 76 motor the armature speed has been reduced and improvements have been made in commutation.

Contact Shoes.

The contact shoes are of the hinged type, similar to those used in the subway cars of the Interborough Rapid Transit Company. The shoe is pressed down on the contact rail by



Hudson Companies Cars—Body with Sheathing in Place.

with predetermined current in the motors. This relay, however, does not prevent manual operation of the master controller at less than the predetermined current if desired.

The motor circuit is protected by a copper ribbon fuse with magnetic blowout, and, in addition, by a circuit-breaker with tripping and resetting coil. The circuit-breakers in all of the cars in the train may be set or tripped by means of a switch located in the motorman's cab of each car.

A bus line cable is installed on each car which will connect the contact shoes of all cars in the train. The bus line cable prevents loss of current when passing through cross-overs.

Trucks.

The motor and trailer trucks are of the M. C. B. type, and were built by the Baldwin Locomotive Works. The motor trucks have the following general dimensions:

Wheel base, 6 feet 6 inches.

Wheel diameter, $34\frac{1}{4}$ inches.

Tires, rolled steel, $5\frac{1}{4}$ inches, M. C. B. tread.

Axles, hammered steel, 6 inches diameter at center, $6\frac{1}{2}$ inches at wheel seat.

The wheels have cast-steel spoked centers and rolled steel tires, held on by double retaining rings. One wheel on each axle has an extended hub, upon which is shrunk the driving gear.

The general dimensions of the trailer truck are:

Wheel base, 5 feet 6 inches.

Wheel diameter, 30 inches.

springs which give a tension of 15 pounds.

Contact-Shoe Fuses.

An inclosed fuse protected by an asbestos lined wooden box is located directly above each contact shoe. The fuse base is mounted on springs in order to reduce the vibration, and thereby prolong the life of the fuse link. Each fuse is designed to carry 650 amperes continuously.

General Dimensions.

Some of the controlling dimensions of the car are:

Length, 38 feet $2\frac{3}{8}$ inches over body posts; 48 feet over buffers.

Width, 8 feet 10 inches over corner posts.

Height, 12 feet rail to roof.

Height of drawbar, $29\frac{3}{8}$ inches.

Truck centers, 33 feet.

Truck wheel base, motor truck, 6 feet 6 inches; trailer truck, 5 feet 6 inches.

Wheel diameter, motor truck, $34\frac{1}{4}$ inches; trailer truck, 30 inches.

The cars above described were designed and built under the direction of L. B. Stillwell, consulting electrical engineer, and F. M. Brinckerhoff, who has followed the details of this work and to whom many of the novel features are due.

Fifty cars have been ordered for the initial operation of the Hudson Companies tunnels. Forty of the car bodies are being built at Berwick by the American Car & Foundry Company and 10 car bodies at McKees Rocks by the Pressed Steel

Car Company. The writer is indebted to the latter company for several of the photographs which illustrate this article.

The first one of these cars is at present being equipped with electrical and air brake apparatus. The 50 cars are to be ready for operation in September, and it is expected that the line between Hoboken and Sixth avenue, New York, will be opened for passengers a few weeks later.

ANNUAL MEETING OF THE NEW YORK STATE ASSOCIATION.

J. H. Pardee, secretary, 611 West One Hundred and Thirty-seventh street, New York City, has announced the program of the twenty-fifth annual convention of the Street Railway Association of the State of New York, which will be held at Hotel Champlain, Lake Champlain, New York, on June 25 and 26.

The first session will be held at 10 a. m. on Tuesday, June 25, and following the address by the president and the reports of the executive committee, secretary, treasurer and committees, the following papers will be read: "Some Phases of Electric Railway Accounting," by J. C. Collins, secretary Rochester Railway Company; and "Existing Shop Practice in Central New York," by W. H. Collins, general superintendent Fonda Johnstown & Gloversville Railroad.

At the Wednesday morning session papers will be read as follows: "Recent Improvements in Motors and Control," by G. H. Hill, railway engineer General Electric Company, and Clarence Renshaw, railway engineer Westinghouse Electric & Manufacturing Company; "Relation Between Maintenance of Way and Equipment," by W. R. W. Griffin, superintendent Rochester & Eastern Rapid Railway Company; "Power," by S. B. Storer, Niagara Lockport & Ontario Power Company.

The afternoon session on Wednesday will be devoted to unfinished business and the election of officers.

The following entertainments have been arranged: Tuesday afternoon, excursion to the far-famed Ausable Chasm. Wednesday afternoon, ball game between railway and supply men. Many short trips can be made to points of interest on Lake Champlain.

Mr. W. Caryl Ely will act as toastmaster at the banquet, which will be held at 7:30 o'clock on Tuesday evening. Banquet tickets will be provided for members, associate members, guests and the ladies. Each allied member will receive one banquet ticket. Extra banquet tickets will be sold at \$5.00 each.

Mr. E. S. Fassett, Albany, N. Y., chairman of the entertainment committee, will arrange for hotel accommodations upon request.

No provisions have been made for a general exhibit of appliances and apparatus by allied members, but any exhibit will be welcomed and arrangements for space can be made directly with Hotel Champlain or Mr. E. L. Brown, manager, 1354 Broadway, New York.

The Empire State Gas and Electric Association has arranged for a meeting at Hotel Champlain on Thursday, June 27, and has extended to this association a cordial invitation to attend.

Arrangements have been made with the Trunk Line Association for a special rate of a fare and one-third on the certificate plan. Hotel Champlain is on the Delaware & Hudson Railroad and can also be reached by Lake Champlain boats.

Further information will be gladly furnished by J. H. Pardee, secretary, 611 West One Hundred and Thirty-seventh street, New York.

An experimental railroad for testing signaling devices, materials used in track construction and different types of motor cars for railroad use, has been built by the railway department of the German government. The road is double-tracked and the line is oval in form, having a length of 5,760 feet.

SCHOOL OF RAILWAY ENGINEERING AND ADMINISTRATION AT THE UNIVERSITY OF ILLINOIS.

The University of Illinois, Urbana, Ill., has established a School of Railway Engineering and Administration which will afford specialized training in all branches of steam and electric railway work. The purposes of the new school and the details of the various courses to be offered are fully described in the University Bulletin, from which the following extracts have been taken:

In the employ of the railroads of the country there are approximately 12,000 persons who are classed as officials. Of this number a considerable proportion occupy positions whose powers and duties require the possession of more than average ability, and such positions must always prove attractive to ambitious men.

Ever since such graduates have been available the railroads have recruited many of the men for their engineering departments among the graduates of technical schools; and the success of these men has amply justified the procedure here as in other fields of industry. The rapid growth of railway organizations, with the attendant increase of responsibility resting upon those in their service, has made more necessary a proper preliminary training for all branches of this work; and each year has seen an increase in the number of men selected for this service from our engineering schools.

Within recent years there has developed a tendency—now quite marked in some railways—occasionally to select men for higher executive positions from the departments of maintenance of way and of motive power instead of taking them, as heretofore, almost exclusively from the traffic and operating departments. This tendency not only renders more urgent the necessity of special training, but, on the other hand, makes more attractive the service in the engineering departments.

There are many reasons why similar specialized preliminary training should prove equally desirable for those who expect to enter the non-technical departments of railways, where, in the administrative positions, responsibilities are frequently greater; and it is probable that here, as in the engineering departments, efficiency and the chances of ultimate success would be furthered by such training. It is only recently, however, that there has been available in this country any except the most elementary and limited education in preparation for commercial work, and where courses of commerce have been established in our universities they have been usually arranged without reference to railway work.

All these considerations point toward the desirability of special recognition of the needs of railways and of prospective railway employes in our educational institutions. Accordingly, there has recently been established at this university a School of Railway Engineering and Administration whose function it is to co-ordinate the various facilities of the university so as to provide specialized training for all branches of railway service and to otherwise further this work. In developing this plan there has been created in the College of Engineering a new department of railway engineering; and the department of economics of the College of Literature and Arts has added to its business courses one in railway administration.

It is the purpose of this school to provide courses of training which shall prepare men to become efficient workers in the financial, traffic and operating departments as well as in the engineering departments of both steam and electric railways.

At present there are offered the four following courses:

1. Course in railway civil engineering.
2. Course in railway electrical engineering.
3. Course in railway mechanical engineering.
4. Course in railway administration.

The main object of these courses is to provide a thorough training in theory and general principles amply illustrated and fixed by practice. It is recognized that this preliminary training can be completed only in actual practice, and that its chief service must be to develop the ability to economically acquire information and to accurately apply it.

The courses in railway civil engineering and railway mechanical engineering are intended primarily for those who expect to enter the service of steam roads in the departments of maintenance of way and of motive power; while the course in railway electrical engineering is arranged for those who will find employment in electric railways or in the service of steam roads with electrified lines. Each course occupies four years.

The course in railway administration aims to prepare men for service in all departments of railway work, other

than the engineering and the legal. For these lines of work, of course, technically trained engineers and lawyers are required. The course is four years in length, and is framed so as to give wide knowledge and training in the specific matters which relate to the organization and operation of all departments of railway administration, while at the same time giving the student a liberal education.

Railway Civil Engineering.

For the work of the course in railway civil engineering there is available all the equipment of the department of civil engineering. This, in addition to the cement and the road materials laboratories, comprises a complete collection of the usual field instruments. The proximity of three steam railways and of one electric road provides opportunities for field work and for demonstrations from practice.

Railway Electrical Engineering.

In addition to the well-equipped electrical engineering department laboratories, in which railway engineering students do their preliminary laboratory work, the railway department owns a 200-horsepower electric test car. This car, of the interurban type, was designed especially for experimental work and was built in 1905. It is equipped with four 50-horsepower direct-current motors and with the Westinghouse multiple control system. The car is supplied with recording voltmeters, ammeters and wattmeters, and with auxiliary measuring and recording devices by means of which there is automatically made a graphical record of voltage, current, power, speed, acceleration, time and curvature. The possession of this car renders possible a great variety of experimental work.

By the courtesy of the Illinois Traction System, whose lines are at present operated between the cities of Danville, Urbana, Champaign, Decatur, Bloomington, Springfield and St. Louis, the department is enabled to operate this car on their lines and obtains by their co-operation in other respects exceptional opportunities for giving instruction, and for investigating the technical problems of electric traction.

Railway Mechanical Engineering.

Three railroads enter Urbana and Champaign, the Illinois Central, the Wabash and the Cleveland Cincinnati Chicago & St. Louis railways; the division shops of the last also being situated here. With the three railroads mentioned the department enjoys most cordial relations, and it can depend upon continuing to receive from them the same assistance and co-operation that have hitherto been extended.

Opportunities for shop and road tests have been freely given and throughout the year numerous locomotive and train resistance tests are made both for instructional purposes and for the information of the railroads. To facilitate this work there was designed and built in 1900 a dynamometer car which is owned jointly by the university and the Illinois Central Railroad. This car is equipped with all the apparatus necessary for carrying on train resistance experiments as well as with auxiliary apparatus used during locomotive tests. During the seven years in which it has been in service this car has been operated over the entire Illinois Central system, in the establishment of tonnage ratings, as well as on the lines of the Central of New Jersey, the Baltimore & Ohio, the Cleveland Cincinnati Chicago & St. Louis and the New York Central railways. On this last road it was used in the preliminary train resistance tests made to provide information for the electrification of the New York City terminal, in which connection it was also used for competitive tests between steam locomotives and electric motor cars at the works of the General Electric Company at Schenectady, N. Y. In all this work the car has been operated by students of the railway engineering department.

The department owns also a complete New York air brake equipment for engine, tender and five cars. In addition to the special apparatus here mentioned, the students of the railway course have open to them the advantages of the mechanical engineering laboratory in which they are given their preliminary instruction in experimental work.

Railway Administration.

For the study of railway administration there is on hand an excellent collection of books and pamphlets on railroad matters, both theoretical and practical. Moreover, the list of railroad journals, technical, legal and administrative, taken by the library is very complete. These are supplemented with the financial and other reports of railroads and government publications relating to railroads.

The department also has at the disposal of students for practice various calculating machines, including one of the electrical tabulating machines used in the preparation of the last census, which are coming more and more into use in handling the freight accounts of great railroad systems.

HOW THE CINCINNATI TRACTION COMPANY AIDS ITS EMPLOYEES.

R. E. Lee, general superintendent of the Cincinnati Traction Company, has furnished us with the details of the system whereby 24 employes of the company who are the most popular, according to the vote of their fellow-employes, will be given a trip to eastern cities. The plan is as follows:

There is an association of the employes, known as the Street Railway Employes' Mutual Protective Association. This association is not connected in any way with labor unions. It is a very strong organization, having about 1,800 members, consisting entirely of employes of the company. Each year the association gives an outing for the purpose of raising funds to be placed in the sick relief fund. The proposed trip is a popularity contest among the employes, the purpose of which is to increase the interest among the members, thereby increasing the sale of tickets. There will be sold this year approximately 90,000 tickets at 10 cents each. The expenses of the outing and the trip to the east for the 24 successful contestants is paid out of the fund derived from the sale of tickets for the outing.

The company is not interested in the matter except to assist in making the outing successful. The company, however, aids the association financially, donating \$700 per month to its sick relief fund.

This association is a splendid organization, managed entirely by employes, no officer of the company being eligible to hold an official position in the association. It pays \$800 death benefit and \$7.50 per week sick benefit.

The income of the association is derived from the payment of \$3.00 per year dues and \$1.00 death assessment from each member. The average expense to each member is about \$9.00 per year. At this low rate it is therefore necessary for the association to obtain funds from other sources to make it self-sustaining, hence the giving of this annual outing, which, as a rule, nets about \$4,000 to \$5,000 per year. That, in addition to the assistance given by the company, has placed the association on a very sound financial footing. At the present time there is about \$26,000 in the treasury.

It is the idea of the company that this association is mutually beneficial to the employes and the company.

The outing given by the association is usually the largest outing held in Cincinnati. It is attended by about 30,000 to 35,000 people each year.

Hyde Park, Muskogee Electric Traction Company.

Hyde Park, the amusement park owned by the Muskogee (I. T.) Electric Traction Company, is situated on a point of land formed by the junction of the Arkansas, Grand and Vertergris rivers, about 5½ miles from Muskogee. This point was chosen for a park site about two years ago on account of its natural advantages for the purpose, and since that time the company has established a modern amusement resort that attracts an average attendance of 3,000 persons a day, from May to November.

The park contains 76 acres of land, much of which is wooded, and the large amount of water frontage offers excellent facilities for boating and bathing. The principal attraction of the park is the casino, which seats 1,600 persons. Here theatrical entertainments are given throughout the season, consisting of vaudeville specialties, alternating each month with a repertoire company. Afternoon and evening performances are held. The other amusements include a skating rink, figure eight, "shoot the chutes," and a pool and billiard hall. Cold drinks and refreshments are served. All of the concessions are leased. Adjacent to the amusement park is a baseball park controlled by the company.

The company operates 12 cars of the Narragansett and California types, on a headway of 15 minutes in summer. A uniform fare of five cents is charged. Excursions are conducted from time to time during the summer and when special attractions are offered.

PIPING AND POWER STATION SYSTEMS—XLIII.

BY W. L. MORRIS, M. E.

City Water to Pressure Oil Tanks—Class K 13.

Water is frequently used to raise cylinder oil from its storage tank through pipe lines into the lubricators. Almost any supply will perform this duty satisfactorily. If engine oil is being put under pressure by means of water it is quite essential that a fairly uniform pressure be maintained. If the station has a gravity water storage tank, then a more uniform pressure is obtainable by connection to the storage tank than can be had by using city water.

City Water for Drinking Purposes—Class K 14.

Drinking water supply is a service that cannot be dispensed with, and though every other service is supplied from the station pumping system it is generally necessary to use the city water for drinking. It may be that the station water is cleaner and, in fact, may "sparkle," but yet it may have properties which affect the employes of the power house, more particularly if they are accustomed to city water. Considerable time would be saved if a drinking place were located near the firemen and another convenient for the engineers.

These pipe lines should be of galvanized iron carried underground and exposed to the heat of the building as little as possible. In all probability this piping connection can be installed without passing the water through the large station meter. This will require paying the regular water rate. By making proper provision in this regard but little time and water are lost when an operator goes for a drink. If a pipe runs 100 feet or more through a hot room the station employes are apt to let the water run for a considerable time until sufficient cold water has been wasted to cool the hot pipes. Drinking water is as important in a power plant as the feedwater for the boilers, and should be given the fullest consideration.

City Water to Other Buildings—Class K 15.

Whether the water for the different shops, barns, etc., is to be taken through the power station meter depends largely upon how complete an accounting system is employed. Ordinarily it is much more satisfactory to have a separate record of the water used in the power station and that used in the shops, and if sprinkling cars are operated possibly a separate record also of the water used for this service. If the city water department will not install so many small meters they can be installed by the consumer and placed in separate buildings. This permits calibrating them and using them as a check on the main meter.

Artesian Water to Pumps and Water Tanks, Class L—1 and 2.

The use of artesian wells is not as general as the advantages accompanying their use warrant. The question of water supply should be the first to receive consideration in deciding upon a site for a power station. The cooling facilities can, as a rule, be more easily provided than a suitable water supply. A surface water supply, such as a creek or stream which gives ample water for 9 or 10 months and runs dry a month or two, is of little use as a source of water, since it is necessary to provide some other source of supply for the remaining portion of the year.

The cost of raising water, say 100 feet, from a driven well is not excessive if the pump is motor-driven. In this case the pump discharges against a 50-pound head. Allowing for friction, each theoretical horsepower costs but approximately one-half cent per hour if the plant is equipped with compound condensing engines. One thousand horsepower of capacity, assuming a steam consumption of 20 pounds of steam per horsepower per hour, would require 20,000 pounds of water per hour, or 333 pounds per minute. If this is raised 100 feet, the theoretical work done is at a rate of approxi-

mately 33,300 foot-pounds per minute, or one horsepower. If the efficiency of the pumping plant is 50 per cent the actual horsepower delivered to the pumps will have to be twice the theoretical, thus making the cost of pumping the water required by 1,000-horsepower plant for one hour about one cent. This is assuming that the water is allowed to discharge into a cooling pond in which the loss by evaporation is equal to the water required for feeding the boiler.

At the cost just estimated for the 1,000-horsepower plant the cost of pumping 1,000 gallons of water would be 4.166 mills, a cost which is much lower than that for which any waterworks system can sell water. The cost of repairs and depreciation must be added to these figures. Regarding the capacity of a deep-well pump, it should be borne in mind that it should be at least twice the normal load capacity; that is, if 333 pounds of water are required per minute, the pumps should not have a capacity of less than 666 pounds per minute. This additional capacity is required to permit the storing of water for emergency purposes or to supply the plant while repairs are being made. Motor-driven pumps can have a stroke of 24 inches, but to have a long life they should not make over 35 strokes per minute, which would require a 5-inch water cylinder to supply the 1,000-horsepower capacity as stated.

In determining the size of the deep-well pumps required, the capacity of the plant upon which the capacity of the pump is based should not be the average horsepower as determined from the horsepower-hours daily output of the plant. For, a plant may have engines of 2,000-horsepower capacity, but develop only 20,000 horsepower-hours in 20 hours; in which case the pump should have an hourly capacity sufficient for 2,000 horsepower, this being twice the average output. Ordinarily the pump should have a capacity equal to the steam machinery installed, and some system of water storage should be provided—one of considerable capacity, so that if the deep-well pump should be out of service for two or three days no shortage of water will be encountered.

If the condensers discharge into a cooling pond this pond would be of ample capacity, since it would ordinarily have 10 square feet of cooling surface for each pound of steam condensed per hour. A drop in the water level of one foot would therefore furnish sufficient water to supply the plant for 62 hours or three days. This does not include seepage losses, a waste which must be considered when determining the capacity of pumping machinery. If the pond is built in clay or lined with clay, the seepage loss will be quite slight. There are many storage ponds constructed on ground 20 feet or more above that surrounding them, which are used to store the rain and melted snow which fills them during the early spring for use during the summer months. Water stands in these ponds with but little drop of level, this drop being caused more by evaporation than by seepage.

It may be desirable to put in an overhead tank to supply the low-pressure mains, but this is of no practical use for a reserve water supply for boiler feeding unless the plant is exceedingly small. For instance, a plant of 1,000 boiler horsepower would require a tank of about 40,000 gallons capacity to run 10 hours. Forty thousand gallons is equivalent to 5,000 cubic feet or a tank would be required 10 by 25 feet, weighing 65 tons when filled with water. If there is no cooling or other pond where water can be stored, then a cistern may be constructed in the ground, the sides and bottom being finished with cement concrete, much the same as a cement floor or sidewalk.

If water from the city waterworks is available a large storage tank is not so essential, but if in any case a storage tank must be provided it should be in connection with the deep-well pump, so that the latter can be discharged continuously for a long period without being compelled to work in unison with the other pumps. The deep well is generally located a considerable distance from the plant and by using storage tanks of five hours' capacity of the deep-well pump, it

will avoid starting or stopping the pump except at long intervals. If an induction motor is used, started by a switch in the engine room, and the storage tank is located where it can be seen from the power house, a telltale must be provided so the operator can ascertain when the reservoir is filled. The device shown in Figure 287 (L 1-1) permits the deep well and storage tank to be located at some distance from power house. The standpipe in the power station has

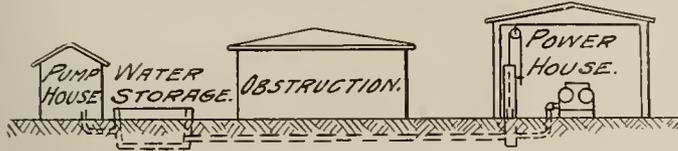


Figure 287 (L 1-1).

a telltale attached, which can, if desired, be fitted with an electric high and low water alarm, brought into contact by the telltale. The automatic high and low water alarm should require little or no attention. This form of telltale is the most approved automatic indicator, since it has no work to do but make and break the bell circuit, which notifies the attendant to open or close the pump motor switch. This requires possibly one-half minute of the attendant's time every five hours or so. The connection from the storage system to the power house should be of ample size, say twice the size of the pump suction, in order to insure the water level in the telltale being approximately the same as that in the cistern. As there would be no appreciable pressure on it, such a line of piping could, in almost every case, be constructed of sewer tile. Tile pipe would not be desirable if the cistern water level were above the ground level.

To insure the telltale showing correctly a small pipe, say one inch, may be laid in the same trench with the pump suction and be used merely to operate the telltale, thus permitting the use of a smaller metal suction pipe. An ideal power station arrangement is secured if the storage cistern or pond is built upon a hill high enough so that the water from the cistern will be under sufficient head to serve the low-pressure water service in the power house, shops, etc. The feed pumps taking this water under pressure would avoid the difficulties caused by air, etc. The pressure corresponding to an elevation of 20 to 25 feet is generally sufficient for any service other than boiler feeding.

It is quite immaterial where the storage tank is located. If the desired head is obtainable by placing the storage tank

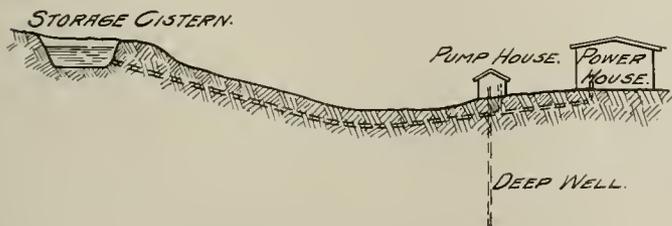


Figure 288 (L 1-2).

500 feet or perhaps more from the power house, it would be better practice than to maintain a pump in operation simply for supplying the low-pressure system. A power station which has its storage cistern located on a hill is shown in Figure 288 (L 1-2).

(To be continued.)

During the present month a hundred miles or more of new Interurban line is expected to be put in operation in Indiana. These lines include a division between Amo and Plainfield by the Indianapolis & Danville Traction Company, a line between Evansville and Rockport by the Evansville & Eastern Traction Company, a line between Crawfordsville and Indianapolis by the Indianapolis Crawfordsville & Western Traction Company, and a line between Henryville and Scottsburg by Louisville & Southern Indiana Traction Company.

RECENT ELECTRIC RAILWAY LEGAL DECISIONS.

BY J. L. ROSENBERGER, LL. B., OF THE CHICAGO BAR.

Rights Acquired with Filing of Instrument of Appropriation.

Ft. Wayne & Southwestern Traction Company v. Ft. Wayne & Wabash Valley Traction Company, 80 Northeastern Reporter, 837.—The supreme court of Indiana holds that the instrument of appropriation filed by the plaintiff with the clerk of the circuit court on March 29, 1901, was a seizure and an appropriation of the land therein described, and that all damages resulting from the taking and construction of the railroad at once accrued and vested in the owner, Aaron Dukes and wife, as a personal claim against the plaintiff, which claim did not pass to the Ft. Wayne & Wabash Valley Traction Company by the deed of Dukes and wife on April 1, 1907. And, the record failing to disclose any assignment of said claim by Dukes to the Ft. Wayne & Wabash Valley Traction Company, said company, for want of interest in the subject matter of the action, had no standing in court, and its exceptions to the report of the appraisers should not have been entertained.

Track Repairers Not Put in Class of Their Own.

Indianapolis Street Railway Company v. Kane, 80 Northeastern Reporter, 841.—The supreme court of Indiana says that it is unacquainted with any rule of negligence that puts track repairers in a class of their own. In this case the trial court gave to the jury an instruction to the effect following: "The complaint charges that the plaintiff was in the employ of the defendant, and when injured was working as a common laborer in and about the work of repairing and constructing the defendant's tracks; that, when a person hires himself to a railroad company to do repair work, such person assumes all those risks as are ordinarily incidental to that kind of work, and he cannot rely wholly upon his employer to make the working place safe." The instruction as given was a modification by the court of one requested by the company, by inserting the word "wholly" in the last clause, so as to make the instruction state that a servant employed to do repair work cannot wholly rely upon his employer to make the place safe. The company insisted that such a servant cannot rely upon his employer at all in this respect. But the supreme court does not think that there was any error in making the modification stated. It says that it is the duty of a servant in any situation or class of employment to observe care, in proportion to the apparent or known dangers of the place, to preserve his own safety; but it is inaccurate to say, as requested by the company, that one employed to do repair work can, under no circumstances, find any measure of excuse in reliance upon the master to keep the working place safe. The servant may certainly rely upon the master not to negligently or maliciously invest the working place with new, unusual and unexpected dangers.

Liability Under Ordinance as to Bridge Building.

North Braddock Borough v. Monongahela Street Railway Company, 66 Atlantic Reporter, 152.—The supreme court of Pennsylvania says that the defendant, by the acceptance of a borough ordinance and in consideration of the privileges granted, engaged to build a new bridge and to reconstruct an old one. The ordinance also stipulated that the defendant should build the approaches to the bridges, but did not specifically state how or in what manner these were to be constructed. Embankments were necessary, and these were constructed of sufficient height, supported laterally by concrete retaining walls, running back an average of some 40 feet from the abutments of the reconstructed bridge, with an average height of about 20 feet. These walls were adequate so far as they extended, but they did not extend along the entire embankment. Beyond where the retaining walls stopped the required support was obtained by enlarging the embank-

ment at the base. This extended it beyond the limits of the street, and was an encroachment upon private property at the side. The defendant left the work in this condition, and, upon its refusal to construct the retaining walls any further, the borough proceeded to finish the work and brought this action to recover therefor.

In affirming a judgment for the plaintiff the court holds that no other conclusion was warranted than that the parties were contracting for the kind of approaches that would be suitable under the improved conditions of the avenue. Adequacy of surface could only be secured in one of two ways, either by extending the base of the embankment beyond the limits of the street, or, if the base was to be restricted to the street limits, by building a retaining wall for lateral support. While it was true that the plaintiff had the right to acquire by condemnation the private property adjoining for purposes of the bridge, it had not acquired it, had taken no steps looking to its acquisition, and nothing in the ordinance gave reason to suppose that such proceeding was contemplated. Under such circumstances it was idle to contend that the embankment, as built, was full compliance with the defendant's obligation. It was not denied that the continuation of the retaining wall was necessary to meet conditions as they existed. It could, therefore, be fairly and legitimately required of the defendant under its contract.

Moreover, the court holds that it was not correct to say as a matter of law that, because at the time the contract was made the avenue had no surface sewerage system, no obligation rested upon the defendant to construct sewer drops. This contract was made in contemplation of certain proposed changes in the street, and it was to be construed accordingly. The obligation of the defendant was to so construct the approaches as to meet the end in view. The only question with respect to the sewer drops was whether they fell within the common intent and understanding. In deciding this, regard was to be paid to the object to be accomplished and the method of construction. In the state of the evidence with respect to the matter it was a question for the jury.

There was no acceptance of the work by the plaintiff; and, if incomplete and unfinished, nothing short of such acceptance would constitute a waiver.

Riding on Inside Running Board Outside of Bar.

Harding v. Philadelphia Rapid Transit Company, 66 Atlantic Reporter, 151.—The supreme court of Pennsylvania says that the witnesses on the plaintiff's side, who saw the accident in which he was injured, said in general terms that when the two cars passed each other the running board of the one on which the plaintiff stood was crowded and several men jumped, fell or were pushed or brushed off. A witness for the defense testified that as the cars passed, a man on the plaintiff's car extended his hand, grasped the other car, and was thrown backwards against the men behind him, including the plaintiff. This was the most plausible account that was given, and apart from it there was nothing to show that the plaintiff on the approach of the car did not lose his nerve and jump or fall from the car.

Under the circumstances there was no presumption of negligence on the part of the defendant, but even if it had been clearly shown, it would have been altogether immaterial. The plaintiff was riding voluntarily in a place of manifest danger, and in so doing he assumed all the risks of the situation. It is settled law that it is contributory negligence which will bar recovery to stand on the platform, or the running board of a car, when a place can be reached inside. And it is equally clear that one who takes a position of manifest and imminent danger assumes the risk of his position, whether he could have got a safer place or not.

It was argued by the plaintiff that he was not warned by the conductor of the danger of his position. But the lowered bar was sufficient warning in itself. It was noticed that the running board on that side was a place of danger, and that

passengers were not expected, nor, so far as the company could control the situation, permitted, to use it, even for the limited purpose of getting on or off the car for which the running board is intended.

The alternative offered by the plaintiff of having to wait for another car, and thus being late in getting home, was no justification.

In any other country than this, the plaintiff would have been forcibly prevented from getting on the car at all, after the number of passengers had reached the limit of safety or even of convenience.

To attempt the enforcement of such a regulation here would certainly lead to continual quarrels and breaches of the peace. A reasonable amount of concession, therefore, to the American's impatience of control and confidence in his own ability to take care of himself should not be visited with punishment by the infliction of penalties on the company for the passenger's own fault.

It must be definitely recognized that one who undertakes to ride on the running board outside of a lowered bar is negligent per se (by the act itself), and cannot recover for injuries incident to his position, whether he could have got a safer position or not.

Open or Defective Car—Floor Trapdoors and Inspection.

Cameron vs. Citizens' Traction Company, 65 Atlantic Reporter, 534.—The trapdoor in the floor of a car, used for access to the machinery beneath, was standing open when a woman boarded the car. It was unobserved by her. She proceeded toward a vacant seat, and, as the car started, stepped into the opening, sustaining injuries which were made the basis of a claim for damages, judgment for which is affirmed by the supreme court of Pennsylvania. The court holds that when the company negligently left the trapdoor open while passengers were entering the car, and after it was in motion, it was answerable for all the consequences that ensued in the natural course of events. An unprotected opening in the floor was dangerous, whether the car was at rest or in motion; and it was no excuse for the company that this danger was increased by its own act in starting the car.

In another case, Jordan vs. St. Louis & Meramec River Railroad Company, 99 Southwestern Reporter, 492, the St. Louis court of appeals holds that the collapse of the floor of a street car beneath a passenger who is simply walking on it, resulting in an injury, is evidence of negligence on the doctrine of *res ipsa loquitur* (the matter speaks for itself). It is a mishap of an extraordinary character, to an appliance within the exclusive control of the railroad company, and one that is not likely to happen in the absence of negligence on the part of the company's employees. This court considers this one of the clearest cases imaginable for the application of the maxim. The giving way of the floor of a car under a passenger's ordinary tread is more cogent evidence of bad management than the collision of two cars, which is held to bespeak negligence.

Complaint was made in this latter case of a refusal to grant an instruction requested by the defendant to this effect: That if the jury believed from the evidence that the car was inspected on the day it was sent out for business, and was found in a safe condition in respect of the cover, then the allegation regarding the negligence of the defendant in maintaining the cover was not sustained by evidence, and the verdict should be for the defendant. But the court says that it would have been error to give that charge. It said nothing about the character of the inspection, but simply stated that, if the car was inspected and found to be in good condition, the plaintiff could not recover. Such a charge would make any inspection, however superficial, conclusive against the defendant's liability. It would seem that an inspection which left the inspector satisfied that the cover was in good order must have been careless, for it was nearly or quite certain that it was not in good order.

News of the Week

Chicago Committee Will Accept Reorganization Plan.

The committee of stockholders of the North Chicago City Railway and the Chicago West Division Railway, underlying companies of the Chicago Union Traction Company, has decided to approve the plan for distribution of the Chicago Railways Company stock which will be decided upon by Judge P. S. Grosscup and Prof. John C. Gray. This approval will remove the obstacle to the acceptance of the new ordinance.

Judge Grosscup expressed his willingness to formulate the final plan of reorganization independent of any suggestions that may be submitted and using the plan which will be submitted by L. C. Krauthoff and George W. Wickersham, representing the New York interests, merely as a guide. John F. Bass, a member of the protective committee, said that the representatives of the underlying stockholders believed that the ordinances should be accepted at once.

Increases of Wages.

The Nashville (Tenn.) Railway & Light Company has announced a new scale of wages for its motormen and conductors of 16 to 20 cents an hour, according to the length of service, in place of the present rate of 15 to 18 cents. The increase affects about 400 men.

The Municipal Traction Company of Cleveland, O., has increased the pay of its motormen and conductors from 24 to 25 cents an hour.

The Worcester Consolidated Street Railway and its employes have reached an agreement on a new wage scale, providing for a minimum rate of 20 cents an hour, with an increase of ½ cent an hour every six months for two years and 1 cent an hour at the end of the third, fourth and fifth years. Service stripes will be given at 5-year intervals, with a bonus of five cents a day for each stripe after the first.

Temporary Receivership for Air Line.

The Chicago-New York Electric Air Line Railroad Company was in the hands of a receiver for about nine hours last Sunday, June 9. Judge Sanborn of the United States district court at Chicago appointed George F. Hull of Indianapolis receiver for the company late on Saturday night on the petition of William E. Webster and Andrew J. Krel of Indianapolis, representing 36 stockholders of the company. The petition set forth that the officers of the company are financially irresponsible for the undertaking and that the company plans to construct an electric railroad between Chicago and New York at a cost of \$250,000,000, whereas, as the complainants assert, such a road would cost \$750,000,000.

The receiver's bond was fixed at \$40,000 and a representative took charge of the company's offices in the Majestic building, Chicago, at 1 o'clock Sunday afternoon. Attorney Wood of the company declared the bond insufficient and appeared before Judge Kohlsaat at 9 o'clock that evening. The judge ordered the receiver to vacate temporarily because of the insufficiency of the bond and ordered a hearing for Monday morning. At the hearing it was decided that the federal courts in Illinois had no jurisdiction in the case and the bill was dismissed.

Report on Municipal Ownership.

The full report of the commission on public ownership and operation of the National Civic Federation, a work upon which for more than 18 months 25 expert accountants, engineers, economists and other specialists have been engaged, is now being sent to press. This report will contain all of the data gathered abroad and in America, and upon which the commission will have based its conclusions.

The investigation embraced the four leading public utilities, gas, water, electric lighting and power and street railways. Examinations were made of 29 private and public plants in America and 24 in Great Britain. Among the American cities visited were Cleveland, Chicago, Philadelphia, Wheeling, Detroit, Indianapolis, Richmond, Atlanta, South Norwalk, Syracuse, Allegheny, New Haven and Norfolk. The inquiry abroad included the leading private and public undertakings of Great Britain and Ireland. Examinations were made in the following cities: Glasgow, Newcastle-on-Tyne, London, Liverpool, Norwich, Manchester, Birmingham, Dublin, Leicester and Sheffield.

The keenly analytical character of the work of this investigation only a study of the full report of the commission can indicate. Some idea of the scientific methods employed may be had from the fact that schedules of questions prepared by noted engineers and economists were followed in the case of each plant and system examined. These schedules disposed of the questions under several general heads, as follows: (a) Historical and general, (b) supervision of municipalities, (c) public supervision of private companies, (d) franchises of private companies, (e) organization, (f) political conditions, (g) labor, (h) character of service and plant, (i) financial matters, (j) capital stock and bonds, (k) assets, (l) liabilities, (m) receipts, (n) expenses, (o) profit and loss.

Several days were personally devoted by the experts upon each plant examined, and in some cases weeks were consumed.

The commission's full report will appear in two main divisions. The first part is intended for popular reading; the second will include the reports of the experts, which will be of especial interest to accountants, engineers, managers of public utility corporations, city officials, members of legislative committees, and all who are interested in municipal ownership and franchise. The second part will also show in the case of each American and foreign plant examined to what extent the experts agreed. Thus will be provided

technical information of the correctness and impartiality of which no question can be raised.

Advance orders may now be sent to E. A. Moffett, secretary, 281 Fourth avenue, New York, N. Y. But a limited edition will be printed, and no copies will be available after the edition is exhausted. The price is: Part 1, Volume I (about 500 pages), paper, \$1.00; cloth, \$2.00. Part 2, Volumes I and II (about 1,000 pages each), \$8.00.

Strike Threatened in Detroit.

Several hundred of the motormen and conductors employed by the Detroit United Railway, at a midnight meeting on Monday of this week decided to refuse the offer of the company for an improvement in working conditions without an increase in wages and declared in favor of a strike within 48 hours unless the company agreed to arbitrate a wage increase, with 25 cents an hour as a minimum and 30 cents as a maximum. They are now receiving 23, 24 and 25 cents an hour.

Since the carmen voted in favor of a strike on May 27 a number of conferences have been held between F. W. Brooks, general manager of the company, and International President W. D. Mahon and other officers of the union in the effort to reach an agreement, and the result of the conferences was submitted to a mass meeting of the men on Monday night. The company refused to grant the demands of the men for a wage scale of 28 cents an hour, with time and a half for overtime, but agreed to a number of improvements in working conditions, especially in regard to the tripper system. The principal concessions offered by the company were: No employe shall be permitted to run a tripper more than one day in seven; no regular employe, compelled to run after midnight, shall be required to report until his regular time on the following day; free transportation on the company's suburban and interurban lines; in cases of men discharged all of the evidence in the case, including the employe's record, shall be submitted to the trial board; on swing runs employes shall receive a full hour's pay for time under an hour and shall be paid for the time spent in waiting at the barns up to 20 minutes.

The declaration to strike was made without a formal vote by the more radical younger men, after a riotous meeting, and is said to be contrary to the wishes of the majority.

Preliminary Report of the United States Geological Survey.

The United States geological survey has just issued a preliminary report on the work being done by the boiler division of the fuel-testing plant at St. Louis, Mo. This department has taken up the scientific study of steam boiler performance and has been conducting tests to verify the theory of steam boilers developed by Mr. John Perry, a distinguished electrical and mechanical engineer of England. As far as the experiments have been carried out by this department the conclusions reached from the study of Mr. Perry's theory have been entirely confirmed. No doubt the work done by this department, and results which have been obtained in the experiments, will in the course of time make astonishing changes in the design of boilers. To quote the report:

"The nature of boiler efficiency has suggested that stationary boilers ought to be made to do from 10 to 20 times as much work per unit of heating surface as they do now. This great increase in capacity is to be attained by subdividing the heating surface and water streams more finely and by allowing less restriction of the water inside the boilers, and by using high forced and induced draft to put a large mass of gases through the boiler at a very high speed.

"Mr. Perry's theory and the survey's verification of it will result in placing the steam boiler on a fairly secure mathematical basis, the same as generators and motors are now on. Thus far the experiments check out the theory excellently. The theory and results will be embodied in a special bulletin to be published in two or three months, to be followed by later bulletins as the work proceeds."

Mr. Walter T. Ray, assistant engineer, acting under the supervision of Prof. L. P. Breckenridge, engineer in charge of the boiler division of the United States geological survey fuel-testing plant, has been studying the mathematical theory of steam boilers and of heating absorption, and has somewhat extended Mr. Perry's theory. This work is of extreme importance to the engineering profession and especially to electric railway and lighting plants which depend for their power primarily upon steam boilers, and it is to be hoped that the fuel-testing department will receive the hearty co-operation and assistance of all engineers and manufacturers who are in a position to render any assistance.

Legislation Affecting Electric Railways.

Connecticut.—Governor Woodruff has sent to the senate a bill providing that before a new electric railway company shall lay any tracks or an existing company additional tracks plans shall be submitted to the state railroad commission with a petition for its approval, which can be given only after a full hearing of the parties concerned. The commission is to have full authority to prescribe the limits within which land shall be acquired by condemnation. In a message accompanying the bill the governor says: "Charters dissimilar in structure have been granted to street railway companies for a number of sessions. In some of them extremely wide powers, and even irrelevant powers, have been granted. It is my opinion that a general law should be passed under which street railway companies can construct and operate with ample powers and not be dependent upon special grants of privilege from the general assembly."

New York.—By refusing to take it from the railroad committee the senate has practically killed the Wagner bill, which provided for a 5-cent fare over lines operated by one company, within the limits of a municipality. The special object of the bill was to prevent the Brooklyn Rapid Transit Company from charging two 5-cent fares to Coney Island. Senator Grady's motion to dis-

charge the committee from further consideration of the bill was lost by a vote of 14 to 31. Some of the adverse votes were based on the idea that the bill would work a hardship on many companies, while others held that the situation should be handled by the public utilities commission, which is to assume its duties on July 1.—The Dowling loop bill, which provided for an elevated loop connecting the Manhattan terminals of the Brooklyn and Williamsburg bridges, was practically defeated on June 5, when the assembly refused to concur in the senate amendments.

Pennsylvania.—Governor Stuart on June 7 signed the Kennedy bill prohibiting street railway companies from charging more than a 5-cent fare within the limits of second-class cities. The law took effect at once and the Pittsburg Railways Company immediately issued an order to its conductors to charge only five cents within the city limits. However, there was no reduction in fares for passengers to the outlying towns, as another fare was charged outside of the city. The principal effect of the new law is to reduce the fare after 12 o'clock at night within the city of Pittsburg from 10 to 5 cents.

Increased Fare in Lorain, O.—The Lorain Street Railroad has announced that it will discontinue its present practice of selling eight tickets for a quarter and will hereafter charge a straight 5-cent fare.

Bion J. Arnold on Chicago Traction.—In an address to the graduates of Armour Institute of Technology, Chicago, on June 13, Bion J. Arnold said that when the reconstruction of the traction properties is completed Chicago will have the best street railway system in existence. Mr. Arnold spoke of this as the electrical age.

Limited Service from Hartford to Springfield Proposed.—It is reported that the Consolidated Railway Company of New Haven, Conn., is considering the feasibility of operating limited express cars between Springfield, Mass., and Hartford, Conn., cutting down the running time from 1 hour and 50 minutes to 1 hour and 20 minutes.

May Contest Public Utilities Law.—New York press dispatches quote a member of the rapid transit commission as authority for the statement that suit will be brought declaring that the public utilities law is unconstitutional, as the city of New York has no voice in the appointment of the commission for the first district, but must bear the expense.

Milwaukee Public Service Building Exempt from Local Taxation.—The Wisconsin state tax commission has given an opinion that the Public Service building of the Milwaukee Electric Railway & Light Company is exempt from local assessment because it is principally devoted to the operation of the street railway and should therefore be taxed by the state.

Evansville & Eastern Line Opened.—The formal opening of the extension of the Evansville & Eastern Electric Railway to Rockport, Ind., was celebrated on June 6, when a party of city officials and leading business men made a trip over the line in special cars. The company's line now extends from Evansville to Rockport, via Newburg, Yankeetown and Hatfield, 21 miles. W. H. McCurdy, president.

Plans for Through Service Between Cleveland and Detroit.—In regard to the reports that the Lake Shore Electric Railway and the Detroit United Railway would soon institute a through limited service from Detroit to Cleveland by way of Toledo, about 180 miles, President E. W. Moore of the Lake Shore Electric Railway writes that this service has not as yet been definitely arranged, although they have the matter seriously in mind.

Opening of Oneida Railway.—C. Loomis Allen, vice-president and general manager of this company, announces the opening of the Oneida Railway between Utica and Syracuse over the electrified West Shore on Saturday, June 15, 1907. Electric trains will leave Utica at 9:30 a. m., and will return in time for lunch, which will be served in Utica upon arrival. A description of this work was published in the Electric Railway Review for November, 1906.

Ft. Dodge Des Moines & Southern Line Opened.—The first passenger car was operated over the new line of the Ft. Dodge Des Moines & Southern Railway from Boone to Des Moines, Ia., on June 8, carrying a party of officials and business men. The construction of the line was described in the Electric Railway Review of May 25, page 672. Regular service was started on Monday, June 10, and a 2-hour service is given between Des Moines and Boone.

Worcester Polytechnic Institute.—The week beginning on Sunday, June 9, was commencement week for the Worcester Polytechnic Institute. The annual commencement lecture was by Prof. A. S. Richey, the subject being "The Electric Railway"; this was delivered on Tuesday evening. On Thursday the commencement address was by Charles F. Scott, consulting engineer Westinghouse Electric & Manufacturing Company, on the subject, "Some Aspects of Electrical Development."

Indiana Decision on Steam Road Crossings.—The Indiana supreme court has decided that the evidence of civil engineers to the effect that it is possible to substitute an overgrade or an undergrade crossing for a grade crossing of an interurban railroad and a steam railroad does not sufficiently establish that it is practicable to make the substitution as provided by Section 5 of the law of 1903, especially where the expenses of such a change would be very great. The case was filed by the Pittsburg Cincinnati Chicago & St. Louis Railway against the Indianapolis Columbus & Southern Traction Company for the purpose of compelling the interurban company to build an overhead crossing where the interurban tracks and

those of the steam line cross just south of Indianapolis. The lower court held that overhead tracks at the point named were impracticable and gave judgment, the supreme court affirming. The decision is of considerable interest to Indiana interurban lines.

Cases Against Milwaukee Company Dismissed.—Two cases against President John I. Beggs of the Milwaukee Electric Railway & Light Company for violation of a city ordinance which prohibits leaving cars standing on the tracks at night have been dismissed on motion of the city attorney. It was stated that since Mr. Beggs was arrested on April 20 the company has made arrangements for storing all of its cars and that there is no object in continuing the cases.

Columbus Council Prohibits T-Rail.—The Columbus (O.) city council on June 10 passed an ordinance prohibiting the use of the T-rail by street or interurban railways on improved streets in the city, and providing for the use of grooved rails of weight and pattern approved by the board of public service. In unimproved streets the T or other form of rail may be used, but grooved must be substituted when the streets are improved. This step follows a long controversy in regard to the comparative merits of the two forms of rail and a vigorous campaign for the T-rail made by the electric railways.

Interurban Railway Mileage in Indiana.—According to reports made to the Indiana state board of tax commissioners the interurban mileage of 1907, as compared with that of 1906, shows a considerable development of the interurbans in the state. Aside from the increase in the first main track mileage from 1,334.49 miles to 1,545.85 miles, and the increase in the sidetrack mileage from 52.84 miles in 1906 to 65.17 miles in 1907, the interest lies in the increase in the mileage of the second main track, which indicates double-tracking. In 1906 there were only 29.94 miles reported to the board for assessment, and this year the mileage so reported is 52.77 miles.

Philadelphia Ordinance Approved.—The joint committee on street railways and finance of the Philadelphia councils has reported favorably the new franchise plan. The principal changes in the ordinance as submitted are: Provision for a proper adjustment of track and equipment around the city hall in case the city or any company shall desire to build a subway under Broad street; the representation of the city in the board of directors has been changed from the president of the board of city trusts and public education to two representatives, to be selected by councils for terms of four years each. It was thought this was a better plan, as citizens who might be in closer touch with the needs of the city could thus be secured.

Joint Through Traffic Agreement.—The Chicago South Bend & Northern Indiana Railway Company, the Southern Michigan Railway Company and the Winona Interurban Railway Company have agreed upon a schedule whereby they will be able jointly to compete successfully for freight between St. Joseph, Mich., and Warsaw, Ind., via South Bend. The agreement provides for a through service between the points named. The plan includes an agreement with the Graham & Morton Transportation Company to handle passengers and freight traffic to and from Chicago across Lake Michigan. It is believed that the arrangement will develop a very popular excursion traffic between the points named and Chicago by the lake route.

Company Responsible for Incivility of Employee.—Justice Gildersleeve of the appellate term of the New York supreme court on June 8 handed down a decision against the Interborough Rapid Transit Company, holding that it is the duty of guards employed on cars operated by common carriers to accord courteous and respectful treatment to passengers and to protect them from insults and assaults. The decision further states that a common carrier is liable for damages to a passenger for injury to his feelings caused by incivility of its employees. The decision upholds a verdict of a municipal court awarding \$750 damages to A. J. Danziger, who sued the company on account of rough treatment and insulting language from a guard on the elevated road.

San Francisco Strike Dying Out.—The strike of the carmen employed by the United Railroads of San Francisco, which has been in progress for several weeks, appears to have almost come to an end. The company is now operating all of its lines and last week 225 cars were running. The company on June 5 discharged a large number of men who have been working under temporary contracts and is replacing them wherever possible with residents of San Francisco. A few acts of vandalism have been reported, but there have been no serious disturbances for two or three weeks. President Calhoun has issued a statement that the company will not recognize the existence of the carmen's union and that it will continue to operate its cars with men who voluntarily seek service with the company. It is stated that many of the strikers have returned to work.

Complaint Against Rate of Fare in Lincoln, Neb.—City Attorney Stewart of Lincoln, Neb., has filed a complaint with the state railroad commission against the four traction companies operating in the city of Lincoln, the Lincoln Traction Company, the Omaha Lincoln & Beatrice Railway, the Citizens' Railway and the Capital Beach & Milford Railway. The bill states that the Citizens' Railway charges five cents cash fare for a ride within the city and sells six tickets for a quarter and 10 tickets for a quarter, good for school children, whereas the other companies charge a straight 5-cent fare, which is declared unjust and unreasonable. The commission is asked to require the other companies to establish the rate of fare now charged by the Citizens' company and also to require each of the companies to issue transfers good on the lines of the other companies within the city.

Construction News

FRANCHISES.

Bay City, Mich.—The Detroit Bay City & Western Railroad, which proposes to build an interurban electric line between Bay City and Caro, has been granted a franchise to operate its line in this city. A franchise also has been granted to the Bay City & Port Huron Railroad to operate its interurban line in Bay City.

Chehalis, Wash.—George W. Gregory, Seattle, Wash., has applied for a 50-year franchise to build an electric railway in this city. The line will commence at the north end of First street and proceeding south on Main street to Market, to West and on West to First street again, will form a loop. It is believed that this may be part of an interurban system which eventually will connect Chehalis with Centralia. In connection with its street railway system the company also will operate an electric light plant and water system.

Chicago.—The local transportation committee of the city council on June 13 approved most of the provisions of an ordinance permitting the Chicago Milwaukee & St. Paul Railway to electrify a line north of Wilson avenue, to be operated in connection with the Northwestern Elevated Railroad. Amendments provide for a station at the city limits and for a 5-cent fare into the city; also that no third rail shall be used except on the elevated structure.

Cloverdale, Cal.—A franchise has been applied for by the Sonoma & Lake County Electric Railway to enter Cloverdale with its interurban road. Construction is to begin at once.

Colorado Springs, Colo.—Eugene B. Sweeney, St. Louis, Mo., is seeking a franchise to build an electric interurban line between Colorado Springs and Denver. Right of way has been secured in Denver to the intersection of Colfax avenue with the Rio Grand tracks. From this point it is stated the line will proceed to the heart of the city, where its depot will be located, over the tracks of another line, possibly the Lakewood & Golden. Mr. Sweeney is quoted as saying that his company will expend about \$2,000,000 on the work, but will not seek an entrance in Colorado Springs until the line has been built to within 25 miles of the city. A fare of \$1.50 is promised by the new company between Denver and Colorado Springs, as against the present rate of \$2.25. It also promises to make the run in 1 hour and 45 minutes, as against the present 2½-hour run.

Corning, N. Y.—The Corning & Painted Post Street Railway has applied for a franchise to double-track its line through Corning. If the franchise is granted the company will slightly change its present route in order to eliminate the curve at the ball grounds.

Crookston, Minn.—It is reported that W. A. Martin is interested in a local street railway system in Crookston and that franchise privileges are now being sought.

Decatur, Ill.—The Decatur Sullivan & Mattoon Transit Company has refused to accept the franchise recently granted by the city because of the requirement that the company shall build an expensive subway under the Illinois Central tracks.

Dubuque, Ia.—A franchise has been granted to the Eastern Iowa Traction Company to enter Dubuque with its interurban line. The terminal will be located on Seventh street.

Fruitvale, Cal.—The Oakland Traction Consolidated Railway has secured a franchise to build and operate an electric railway in this city. W. F. Kelly, general manager, Oakland, Cal.

Ishpeming, Mich.—The Marquette County Gas Light & Traction Company has applied for an extension of its street railway and lighting franchises from July 11, 1921, to July 11, 1936.

Mound City, Ill.—The Southern Illinois Traction Company, Cairo, Ill., has been granted a franchise to enter this city on Fifth street, thence through Walnut to Main and up Main to East First street, where it will turn west toward Mounds. The company proposes to build a line through the Southern Illinois coal belt from Murphysboro to Johnson City by way of Carbondale and Herrin.

Phoenixville, Pa.—A franchise has been granted to the Philadelphia Interurban Electric Railway to construct and operate an interurban line in this city. Right of way has been secured between Pottstown and Phoenixville and work will be started immediately. The line must be in operation inside of two years.

Puyallup, Wash.—An amended franchise granting the Puget Sound Electric Railway permission to build a trestle over the Northern Pacific tracks at Indiana avenue, this city, was passed by the city council on June 5.

Richmond, Ind.—The deadlock between the Terre Haute Indianapolis & Eastern Traction Company and the city authorities at Richmond continues without immediate hope of a settlement. The chief contention is over the question of transfers. The franchise offered by the city provides for a general transfer system between the local and interurban cars within the city limit. It further provides that the interurban cars shall stop within the city limits upon signal at all crossings to receive and discharge passengers. The same provisions are incorporated in a franchise offered to the Dayton & Western Traction Company now being operated by the Terre Haute Indianapolis & Eastern Traction Company. The officials of the traction company state that the

provisions are unreasonable and will never be accepted by the company. They ask that the transfer provision and the stopping of cars at crossings be eliminated.

Syracuse, N. Y.—The Syracuse Rapid Transit Railway has applied for a franchise to double-track its line in Burnet avenue to Eastwood, which is said to represent the first step to reach East Syracuse. It is stated that the company also will ask for permission to build a double-track line through Clark street, to its present tracks in Manlius street, and to double-track Manlius street to the end of the present line. The Syracuse & Chittenango Railway, which proposes to build an electric line from Syracuse through East Syracuse to Chittenango, N. Y., will apply for a franchise to construct its tracks through Second street in East Syracuse.

Terre Haute, Ind.—Hugh J. McGowan of Indianapolis, president of the Terre Haute Indianapolis & Eastern Traction Company, has reached an agreement with the city officials in regard to the terms of a contract by which the company is to be given a new franchise. The company agrees to build a modern and commodious interurban passenger station within three years and to expend not less than \$850,000 during 1907 and not less than \$400,000 during 1908 for permanent improvements and equipment. The city reserves the right to regulate the street car schedule and all interurban cars except limited cars shall stop upon signal at least once in every six blocks within the city. The company is to relay its tracks on Wabash avenue within 15 months. The fare will remain at five cents. This contract must be passed upon by the city council before the franchise becomes valid. The contract is, in effect, a modification of the franchise of the Terre Haute Traction & Light Company, which was leased in March of this year by the Terre Haute Indianapolis & Eastern. The franchise is to expire in 1952.

RECENT INCORPORATIONS.

Akron Canton & Youngstown Railroad, Akron, O.—Incorporated in Ohio to build and operate an electric interurban line in Summit, Stark, Portage and Mahoning counties, with terminals at Akron and Youngstown. Capital stock, \$20,000. Incorporators: Z. W. Davis, Isaac H. Taylor, William Simpson, H. B. Steward and M. L. Rackle.

Centralia & Sandoval Railroad, Centralia, Ill.—Incorporated in Illinois to build an electric railway from Centralia to Sandoval. Capital stock, \$2,500.

Clarksdale Covington & Collierville Interurban Railway, Memphis, Tenn.—The Lake View Traction Company, which recently was incorporated under the laws of the state of Maine to build local street railways in Memphis and Clarksdale with an interurban system between these two points, has been incorporated under the laws of Tennessee with the above title. This was done for the purpose of facilitating the acquiring of right of way, sites for power houses, parks, etc., by condemnation proceedings when they cannot otherwise be obtained, which, under the interurban laws of the state of Tennessee, cannot be done by a company incorporated under the laws of another state. The line will operate in Memphis and Clarksdale and afford connection with the towns named in the title. Capital stock, \$50,000, with the privilege of increasing as necessary. The incorporators are: R. F. Tate, Memphis; W. A. Gage, G. W. Agee, J. S. Robinson, Dudley S. Weaver, H. E. Craft, W. E. Willett, A. Walsh, W. A. Percy, E. Manigan, M. J. Roach, Walter Goodman, I. D. Block, L. Sambucetti, R. B. Nebhut, H. D. Minor, C. F. Farnsworth and W. C. Knight.

Denver & Greeley Railroad, Greeley, Colo.—Incorporated in Colorado to build an interurban electric line from Greeley to Longmont, Loveland, Johnstown, Hillsborough, Ft. Collins, Windsor, Severance and Eaton, with an extension later to Denver. Surveys for the location of the line will be started at once. For a portion of the distance the road will run between the Colorado & Southern on the west and the Union Pacific on the east, traversing the St. Vrain coal fields to Hillsborough, with a branch from Hillsborough to Ft. Collins on the south and west and to Greeley on the north and east. Capital stock, \$50,000. Incorporators: John C. Mosher, president; E. J. Decker, first vice-president; George M. Huston, second vice-president; Mayor Frank J. Green, H. H. Hake, Greeley, Colo.; J. D. Houseman, J. F. Church, John S. Flower, Max Straus, James Williams, H. G. Clark, Denver, Colo. It is announced that J. D. Houseman, who has supervised the building of several interurban lines in St. Louis and the west, will be general manager of the new company and have direct charge of its construction. It is estimated that the road, when completed, will cost about \$1,000,000.

Open River & Navigation Company, Pendleton, Ore.—Incorporated in Oregon to construct and operate steam and electric lines and power plants and operate steam and sailing vessels. It is stated that most of the route for that portion of the road to be built first, from Simmons Landing to Holdman on the Columbia river, 16 miles, has been surveyed and nearly all the right of way secured. The territory to be served is in the great northern wheat belt, and it is estimated that 20,000 tons of wheat will be made tributary to the line by this route. It is thought that eventually the line will be extended to Pendleton, about 35 miles. Capital stock, \$250,000. Incorporators: E. W. McComas, G. A. Hartman and C. E. Curry, the latter manager of the Northwestern Warehouse Company at San Francisco. J. N. Teal, Portland, Ore., is attorney for the company.

Paris & Northern Traction Company, Paris, Ill.—Incorporated in Illinois to build an electric railway in Edgar and Vermillion coun-

ties, from Paris to Ridge Farm and Brocton, Ill. Capital stock, \$5,000. Incorporators: F. L. Kidder, L. L. Caninne, John J. Cummings, J. E. Parrish, Paris, and George E. Fair, Chrisman, Ill.

Quitman Valdosta & Thomasville Electric Railway & Power Company, Quitman, Ga.—This company has applied for a charter to build a 50-mile interurban line from Valdosta to Blue Springs, Quitman and Thomasville, Ga. Capital stock, \$30,000. Incorporators: H. L. Young, J. D. Wilson, J. W. Oglesby, Sr., R. C. McIntosh and others.

Swannanoa Valley Railway, Black Mountain, N. C.—Incorporated in North Carolina to build an electric interurban railway from Asheville to Swannanoa Station, Black Mountain and other points in the Swannanoa valley. Incorporators: F. T. Meriwether, Ed S. Caldwell, P. R. Moale, Hugh L. Barbee, J. M. Chiles and W. R. Whitson.

Wisconsin & Northern Minnesota Railway.—Incorporated in Wisconsin to build an electric line from Superior, Wis., to Duluth, Minn.

Wisconsin Midland Railway.—Incorporated in Wisconsin to build a 2½-mile electric line from Chester to Waupun, Wis. Capital stock, \$30,000. Incorporators: Thomas R. Mercein, Charles Schley, Ralph M. Friend, Earle C. Juneau, Milwaukee, Wis.; De Witt C. West, Beaver Dam.

Yankton Southern Railway, Yankton, S. D.—Incorporated in Oklahoma to build an electric railway from Yankton, S. D., to a gulf port. Incorporators: Fremont Hill, Jesse Lowman, Thomas B. Paxton, Alfred Hill, John W. Warrington, William Cooper Procter, Robert J. Gamble of Cincinnati, and William J. Faulte and Isaac Piles of Yankton.

TRACK AND ROADWAY.

Americus (Ga.) Street Railway.—This company has obtained a franchise in Americus and proposes to build a 4-mile street railway system, to cost about \$150,000.

Anderson (S. C.) Traction Company.—It is announced that the new interurban line from Anderson to Belton, S. C., 10 miles, will be completed and put in operation by July 1. The trestle over Broadaway creek was finished last week and the final work is being done on the construction of the line. J. A. Brock, president.

Auburn & Northern Electric Railroad, Auburn, N. Y.—It is announced that this company has plans about completed for the extension of its line from Auburn westward to Seneca Falls and that work will be started in the near future. Its recently built line to Port Byron will be formally opened at an early date.

Bellingham, Wash.—It is reported that C. D. Wyman of the Stone & Webster Engineering Corporation is in this vicinity to make a final decision on the route of the Seattle-Bellingham interurban line and other lines radiating from Bellingham, which this company proposes to build. Several routes have been surveyed.

Birmingham (Ala.) Railway Light & Power Company.—The stockholders have authorized a bond issue of \$35,000,000, a part of the proceeds of which will be used in making extensions and improvements.

Boston (Mass.) Elevated Railway.—President W. A. Bancroft has announced that plans will be filed in two or three weeks for the company's proposed subway extension to Cambridge. The report of Consulting Engineer William B. Parsons, recommending four stations, has been received.

British Columbia Electric Railway, Vancouver, B. C.—This company expects to build during the next two years about 60 miles of electric railway from Westminster to Chilliwack, B. C. James Milne, general superintendent.

Brooklyn (N. Y.) Rapid Transit Company.—Two tracks of the reconstructed line to Brighton Beach, which was rebuilt to eliminate a number of grade crossings, were opened for traffic on June 10. The work on this line was described in the Electric Railway Review of December, 1906, page 968. The cost of the improvements was about \$2,000,000, of which half was borne by the city. The company also expended about \$500,000 for the erection of 10 new brick stations and other improvements. It was announced that the other two tracks will be in operation in about two weeks. During the progress of the reconstruction the Brighton Beach trains have used the tracks of the Long Island Railroad.

Chester (Pa.) Traction Company.—The contract for the rebuilding of this company's 70-foot span bridge at Waterville has been let to the Belmont Iron Works, Philadelphia, Pa.

Columbus (Ind.) Street Railway & Light Company.—This company has resumed the construction of its extension to East Columbus, Ind., work upon which has been held up by an option on the property. It is expected to complete the extension in about a month.

Consolidated Railway, New Haven, Conn.—It is announced that the proposed extension from Great Barrington to Canaan, Mass., will be built this year and that a number of bad curves between Great Barrington and Pittsfield will be eliminated.

Corning Keuka Lake & Ontario Railroad.—Governor Hughes of New York has signed a bill validating the charter of this company, which was incorporated in 1905 to acquire the property and franchises of the Sodus Bay & Corning Railroad, a steam road, which completed its grade between Savona and Keuka and for several miles toward Lake Ontario.

Cortland & Auburn Railroad.—The New York railroad com-

mission has granted this company permission to issue a first mortgage for \$1,000,000. The company proposes to build from Cortland to Auburn, N. Y. W. L. Weber of Philadelphia, chief engineer.

Cleveland Southwestern & Columbus Railway, Cleveland, O.—Official advice from this company states that the Mansfield division, from Seville, O., on the southern division, to Mansfield, 44.24 miles, has been surveyed for the entire distance. The line will pass through Seville, Le Roy, West Salem, Oak, Nankin, Ashland and Mansfield. Grading is in progress from Mansfield to West Salem and the overhead work from Mansfield to Ashland. The Cleveland Construction Company is the principal contractor. F. T. Pomeroy, president; Roberts & Abbott, chief engineers, Cleveland, O.

Danville, Ind.—It is reported that Philadelphia capitalists are interested in a project to build an electric line from Danville to Rockville, Ind., and that John O. Kain has been engaged in preparing profiles. Incorporation papers are to be filed in a few days.

Enid (Okla.) Street Railway.—This company has opened for traffic a new line between the Rock Island and Frisco depots, about a mile long. Several miles of track has been laid and construction is now in progress on a line to the park northwest of Enid.

Hamstead & Manchester Railroad.—It is stated that an extension to this company's line from Reisertown, Md., to a connection with an extension of the Hanover & McSherrystown Railroad in Pennsylvania is under consideration. If built a through electric line from Hanover to Baltimore will be afforded.

Indiana Columbus & Eastern Traction Company, Columbus, O.—It is reported that the line between Columbus and Springfield, O., is to be rebalasted this year and new ties laid. The work of grading the London cut-off is now almost completed and the placing of rails will begin in a short time. The cut-off will save five miles between Columbus and Springfield, and will leave London off the main line. A car will be run on the spur, however, for the accommodation of passengers. The tracklaying of the cut-off and the ballasting of the road will be done by John T. Adams of Columbus, who is now engaged on a number of contracts for the company.

Indianapolis Newcastle & Toledo Electric Railway, Newcastle, Ind.—It is reported that this line from Indianapolis to Newcastle, Ind., will soon be ready for ballasting. The grade work is rapidly nearing completion, and the heaviest part of the work will be completed within two weeks. The heaviest part is the fill west of Newcastle, across the Blue river valley, and work on this is progressing satisfactorily. Rails and ties have been distributed along the right of way, and as soon as the grade is completed these will be laid. Machinery is being placed in the power house and the prospects are that cars will be running by the first of November.

Interstate Electric Railway.—Ernest D. Martin of Kansas City, Mo., has filed 21 right of way contracts for land south of St. Joseph, Mo., for the proposed line from St. Joseph to Kansas City, via Dearborn and Liberty.

Lake Shore Electric Railway, Cleveland, O.—It is reported that nearly all the bridges on the Sandusky-Fremont branch are completed, and between Erlen and Sandusky there remains but four miles of track to be completed. Grading on the Fremont end of the line is being hurried and it is expected that cars will be running between Fremont and Sandusky by July 4.

Lexington (Ky.) & Interurban Railways.—It is reported that this company has decided to construct its proposed road from Lexington to Nicholasville, Ky., at an early date. J. P. Pope, chief engineer.

Louisville & Northern Railway & Lighting Company, New Albany, Ind.—This company, which recently surveyed a line from New Albany to West Baden and French Lick, via Paoli, again has its engineers in the field to make the final location. As soon as this is finished the company expects to let contracts for the construction of the line. It is the intention of the company to build the line in sections. The first will be from New Albany to Floyd Knobs, five miles north, which will be a junction point for the Paoli line and the proposed line to Corydon, which has also been surveyed, both lines using the same route through the knobs with a grade not to exceed 3 per cent. The Paoli line will use the street railway which is controlled by the Louisville & Southern Indiana Traction Company to reach Louisville, the two companies being closely allied.

Macon Americus & Albany Electric Railway, Macon, Ga.—It is reported that the American Engineering Company of Indianapolis, Ind., has been awarded the contract for the preliminary engineering on this road, which is to connect the cities named in the title. G. H. Binkley, chief engineer.

Mexico Santa Fe & Perry Traction Company, Mexico, Mo.—H. D. Ahlhandt, treasurer, writes that this company will build an electric railway from Mexico to Perry, Mo., 25 miles, via Molino and Santa Fe. Surveys have been completed and matters are being arranged so as to enable contracts for the entire road to be let within 30 days. S. L. Robinson of Mexico, president; C. O. Thon, Belleville, Ill., chief engineer.

New Orleans (La.) Railway & Light Company.—This company is making a number of important improvements and extensions to its city lines. Girder rails are being laid on Carondelet street, the tracks on Broadway are being moved from the side to the center of the street, five blocks of new track are to be built on Villere street, and the rails in Royal street will be replaced by girder rails.

New York Auburn & Lansing Railroad, Auburn, N. Y.—We are

advised that the type of soldered bond to be used on the 36 miles of third rail now being built by this company, from Auburn to Ithaca, N. Y., has not yet been decided.

Northern Texas Traction Company, Ft. Worth, Tex.—It is announced that the work of enlarging and double-tracking the bridge over the Trinity river in Dallas, Tex., will be completed by August 1.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—Vice-President Gurdon W. Wattles and General Manager W. A. Smith have announced to the Commercial Club of Council Bluffs that the extension to the Iowa School for the Deaf will be built this year and that construction will probably begin within a month, or as soon as the company finishes with the work on the city lines that must be done before the streets in question can be paved by the city.

Paris (Ill.) Traction Company.—It is announced that this company will extend its lines to Champaign, Ill., as soon as financial arrangements can be made. The road will pass through Chrisman, about 13 miles north of Paris, Edgar, Brocton, Hume, Metcalf and Ridge Farm. F. L. Kidder is president.

Philadelphia Valley Forge & Suburban Railroad.—This road, recently incorporated in Pennsylvania, is one of several electric lines forming the Valley Forge System of railroads, which, when completed, will be about 30 miles long. The Philadelphia Valley Forge & Suburban division will extend from Philadelphia to Fairview, about six miles. Edward W. Johnson, secretary, writes that this system will be a high-speed third-rail electric line, extending from Philadelphia to the borough of Phoenixville. It will pass through the village of Valley Forge and will be constructed entirely on private right of way, fenced in and without grade crossings. L. Knowles Perot, president; Edward W. Johnson, secretary and treasurer. Principal office, 2129 Land Title building, Philadelphia.

Pentwater, Mich.—A. Gifford of Pentwater is president of a company which proposes to build a line from Ludington to Grand Rapids, by way of Pentwater. The right of way is being cleared preparatory to commencing construction work.

Portland & Northern Railroad, Portland, Me.—William M. Sturges, general manager and chief engineer, Preble house, Portland, Me., writes that surveys for this company's third-rail line, which will extend from Portland to Bridgeton, Me., 40 miles, are completed from Portland to Raymond, 14 miles. The line will start at Morrill's Corners in Portland, and pass through Windham, Raymond, Casco and Naples to Bridgeton. Sturges & Co., Scranton, Pa., have the contracts for grading, etc. Contracts for power houses, cars, steel rails, electrical equipment, etc., are to be let. Howard Winslow, president, Portland; S. O. Hancock, vice-president, Casco; H. L. Forhan, treasurer; L. Barton, secretary; William M. Sturges, chief engineer and general manager, Portland, Me. All communications should be addressed to W. M. Sturges at Portland.

Rainier Electric Company, Portland, Ore.—This company has been organized to build an electric railway from Portland to Rainier, Ore. Capital stock, \$25,000. Alexander Sweet, Carleton Lewis and W. C. Morris are interested.

Rochester Syracuse & Eastern Railroad, Syracuse, N. Y.—The New York railroad commission has authorized an increase of the common stock from \$3,500,000 to \$6,000,000, which will make the total capital stock of the company \$8,500,000. The company proposes to build an electric railway from Rochester to Syracuse, N. Y. The first section, from Rochester to Lyons, 36 miles, has been in operation for several months and construction is now in progress from Rochester to Port Byron, 21 miles.

San Diego (Cal.) Electric Railway.—A franchise has been granted by the city council for the Point Loma line and the company is preparing to begin construction within a few days. The line, which will be owned by the Point Loma Electric Railway Company, but will be built and operated by the San Diego company, extends from Winder and India streets, San Diego, through Roseville, Carlson canyon and Point Loma to Ocean Beach.

San Francisco, Cal.—It is reported that Richard Hotaling, W. M. Rank and their associates have made a deal with a Baltimore syndicate by which an electric railroad system is to be built in Marin, Sonoma, Napa and Lake counties, with ferryboat connection with this city. The deal includes the purchase of the Petaluma & Santa Rosa Railway. The undertaking involves an expenditure of between \$10,000,000 and \$15,000,000. Hotaling, Rank and their associates already have a terminal on Richardson's bay, just across from Sausalito, and they have made surveys from it to San Rafael, thence to Novato and Napa, and thence to Lakeport. The proposed road will embrace an extension of the Petaluma line northward into the Healdsburg & Cloverdale country. Ultimately it will be extended into Lake county.

San Francisco Vallejo & Napa Valley Railway, Napa, Cal.—It is reported that 900 tons of rails and other material have arrived for the construction of the road from Napa to St. Helena, Cal., 11 miles. The present shipment of rails will be used on the section from Napa to Oakville, 12 miles, which has been graded. This company is a subsidiary of the Vallejo Benicia & Napa Valley Railroad, which now has a line in operation from Vallejo to Napa, 17 miles, organized to build the extension to St. Helena. C. H. Wallace, chief engineer.

Sand Mountain Electric Company, Albertville, Ala.—John L. Ray, president of the Albertville Realty Company, writes that this company proposes to build an electric railway from Scottsboro to Gadsden, Ala., 55 miles, via Gadsden, Alabama City, Attalla, Fenton, Boaz, Albertville, Short Creek and Langston. Contracts are

to be let for power plant, dams, flumes and transmission lines. E. O. McCord, president.

Southwest Missouri Railroad, Webb City, Mo.—The contract for the construction of the 650-foot steel-frame viaduct which this company will build over the junction of the Missouri Pacific and the St. Louis & San Francisco railroads for the use of its proposed interurban line, has been let to the Midland Bridge Company, Kansas City, Mo. The structure will be located about 2½ miles from Joplin and will rest upon concrete abutments. A. H. Rogers, president, Webb City, Mo.

St. Helens Public Service Company.—This company has filed suit against the state of Washington to appropriate a right of way for a flume and dam on the Toutle river to supply power for its proposed electric line from Portland through Cowlitz, Clarke and Skamania counties. Dr. H. W. Coe of Portland, Ore., is reported as interested in the company.

St. Louis Terre Haute & Quincy Traction Company.—E. E. Barclay of Springfield, Ill., secretary, and B. F. Darnell of St. Louis, Mo., right of way man, were in Quincy, Ill., recently in the interest of the company and expressed their intention of applying soon for a franchise to enter the city. The company proposes to build from Terre Haute, Ind., to St. Louis and Hannibal, Mo., but the present intention is to build from Terre Haute to Quincy, via Taylorville, and to extend the line later. Surveys are being made. Charles H. Lawrence is chief engineer.

Texas Traction Company, Dallas, Tex.—A contract has been let to the Southwestern Bridge Company for the erection of 12 bridges on the line between Dallas and Sherman, Tex.

Topeka (Kan.) & Southwestern Railway.—This company has purchased all the property of the Topeka Eskridge & Council Grove Railway, which proposed to build from Topeka to Council Grove, Kan., and will build the line. It is proposed to use Strang gasoline-electric motor cars. W. L. Taylor, president.

West Penn Railways, Pittsburg, Pa.—Construction work on this company's proposed extension from Footedale to Brownsville, Pa., 9½ miles, will be started in about two weeks and will be ready for laying the rails about November. The Crossan Construction Company, Philadelphia, has a contract for grading and masonry work.

Western Massachusetts Street Railway, Westfield, Mass.—Surveys have been completed for an extension from Huntington to Lee, Mass., to connect at Lee with the Berkshire Street Railway. H. C. Page, general manager, Springfield, Mass.

Winona Interurban Railway, Winona Lake, Ind.—It is stated that the Warsaw-Peru extension is to be completed by January 1. The route includes Mentone, Chili, Gilead and Akron, and is 44 miles long. The first 10 miles out of Peru has been in operation for some time and work is to begin at once at the Warsaw end on the construction of the remainder. The rails, ties and other material have been contracted for and much of the material is already on the ground. A double-track viaduct 80 feet long is to be built in Warsaw and the Pennsylvania tracks will be crossed overhead and the New York Chicago & St. Louis tracks by a subway. The final survey for the line from Warsaw to Ft. Wayne has been started. S. C. Dickey, general manager.

York County Traction Company, York, Pa.—Dodge & Day, engineers and constructors, Philadelphia, have commenced work on the extension from York to Hanover, Pa., about 20 miles. A large force of men is at work and rapid progress is being made.

POWER HOUSES AND SUBSTATIONS

Birmingham (Ala.) Railway Light & Power Company.—It is announced that this company has authorized a bond issue of \$35,000,000, a part of the proceeds of which will be used to erect a power house at a cost of \$1,500,000. Other extensive improvements will be made to the properties of this company.

British Columbia Electric Railway Company, Vancouver, B. C.—It is stated that this company has recently let contracts for the construction of a tunnel 400 feet long, 14 by 9 feet in area. The tunnel is to be driven through solid granite. A contract was also let for two 64-inch steel pipe lines, 1,200 feet long, and two wooden pipe lines, 800 feet long and 60 inches in diameter. A contract was let to the Pelton Water Wheel Company for a 10,000-horsepower impulse wheel and a contract was awarded to the Canadian General Electric Company for one 5,000-kilowatt generator, three 2,500-kilowatt step-up transformers, 2,000 to 20,000 volts; three 1,000-kilowatt step-down transformers, 20,000 to 2,000 volts. Contracts are to be let in about a week for a 150 by 40 foot granite extension to its power house at Lake Buntzen, also for the erection of a reinforced concrete transformer building, 75 by 35 feet.

Freeport (Ill.) Railway Light & Power Company.—It has been announced that this company will erect a new power house and improve its lighting and street railway service in the near future.

Illinois Traction Company, Champaign, Ill.—It is announced that this company is about to make extensive improvements to its generating plant at Bloomington, Ill., by the addition of a number of boilers and the erection of a new stack. It is stated that Stirling boilers will be installed.

Terre Haute Indianapolis & Eastern Traction Company.—This company is installing a boiler and steam turbine in its power house at Spring Lake, Ind. The latter is located on the old Indianapolis & Eastern line.

Personal Mention

Mr. C. F. Richardson has been appointed superintendent of the Lincoln (Ill.) Railway & Light Company, to succeed Acting Superintendent Thorp.

Mr. Daniel Franciscus has been appointed superintendent of the Carlisle & Mt. Holly Railway at Carlisle, Pa., succeeding Mr. C. Fallor, resigned.

Mr. J. Jordan, heretofore superintendent and park manager of the Cleveland Painesville & Eastern Railroad, Willoughby, O., has been appointed general manager.

Mr. William McGee of Pittsburg, Pa., has been elected president of the Cincinnati Toledo & Detroit Short Line Railway of Toledo, O., to succeed Mr. J. M. Morgan of Toledo, resigned.

Mr. Thomas Lowry, president of the Twin City Rapid Transit Company of Minneapolis, Minn., who has been in the southwest during the winter and spring, has returned to Minneapolis.

Mr. J. M. Bramlette, general superintendent of the Michigan United Railways Company, with headquarters at Lansing, Mich., has been appointed general manager of the company, as announced



J. M. Bramlette.

in last week's issue of the Electric Railway Review, to succeed Mr. James R. Elliott, who will, however, retain his position as vice-president. Mr. Bramlette has had a long experience with electric railway companies in various capacities. He was born in Louisville, Ky., October 24, 1861, and began his railway career in 1890 with the Sprague Electric Company of St. Louis at the time the Lindell Railway was being electrified. In the latter part of 1890 he entered the service of Thomson & Houston, who were engaged in the work of electrifying the lines of the Union Depot Railway Company, where he remained until February, 1891, when he accepted a position with the East St. Louis Railway at East St. Louis. He remained with this company 11 years, serving successively as master mechanic, claim agent and assistant superintendent. In 1902 he was appointed general manager of the St. Louis & Belleville Railway and the St. Louis Belleville & Suburban Railway, which operated two double-track electric lines between St. Louis and Belleville. Early in 1903 these roads, together with the city lines of the East St. Louis Electric Railway, the Mississippi Valley Transit Company and the Collinsville Caseyville & East St. Louis Electric Company were merged, and Mr. Bramlette was appointed general superintendent of the combined properties, now known as the East St. Louis & Suburban Company. In May, 1905, he was appointed general manager of the Philadelphia & Western Railroad at Philadelphia, Pa., where he remained one year, resigning in May, 1906, to become general superintendent of the Michigan United Railways Company's extensive interurban system, with entire charge of its city properties in Kalamazoo, Jackson and Lansing, and its interurban lines operating between Battle Creek and Kalamazoo, Battle Creek and Jackson and between Lansing and St. Johns—comprising in all about 200 miles of track. Mr. Bramlette's present appointment as general manager was effective on June 1.

Mr. Joseph D. Crafton has been appointed superintendent of the United Railways Company of St. Louis, Mo., succeeding Mr. James F. Davidson, resigned. Mr. Crafton has been heretofore chief clerk to Mr. Davidson.

Mr. R. L. Koehler of Wilkesbarre, Pa., has been appointed superintendent of the Northern Electric Street Railway of Scranton, Pa., and Mr. J. C. Meixell of Camden, N. J., has been appointed superintendent of transportation.

Mr. George S. Binkley, formerly chief engineer and construction manager of the Monterey (Mexico) Railway Light & Power Company, has been appointed manager of the Douglas Copper Company's mining properties at Sonora, Mexico.

Mr. Samuel B. McLenegan, heretofore superintendent of the Los Angeles (Cal.) Interurban Railway and the Pacific Electric Railway, has been appointed to a similar position with the Central California Traction Company, Stockton, Cal.

We are officially advised by Mr. A. R. Moore, president and manager of the Escanaba (Mich.) Electric Street Railway, that no successor has been appointed in place of Mr. A. L. Gillette, who recently resigned as superintendent and electrical engineer to accept a similar position with the Sterling Dixon & Eastern Electric Railway, Sterling, Ill. The office of superintendent has been abolished and the office of general inspector and storekeeper has

been created, to which position Mr. D. P. McRae, formerly conductor, has been promoted.

Mr. L. H. Kidder, who has heretofore been connected with the Westinghouse Electric & Manufacturing Company, has been appointed superintendent of motive power of the Pittsburg & Butler Street Railway of Pittsburg, Pa., and the Butler Passenger Railway of Butler, Pa.

Mr. G. J. Anderson, for the past eight years assistant to General Manager P. F. Sullivan of the Massachusetts Electric Companies, has resigned to become associated with the Electric Bond & Share Company, New York City. Mr. Anderson will be secretary to the vice-president of the company.

Mr. F. J. Stout, general manager of the Lake Shore Electric Railway, Norwalk, O., has been appointed a member of the "Standardization" committee of the Central Electric Railway Association, in place of Mr. R. C. Taylor, who has been appointed chairman, to succeed Mr. W. H. Evans, resigned.

Mr. Samuel McRoberts, treasurer of Armour & Co., Chicago, has been elected president of the Illinois Tunnel Company, which operates the Chicago subway, to succeed Mr. Albert G. Wheeler, resigned. Mr. W. J. C. Kenyon, who also represents Armour interests, has been elected general manager of the company.

Mr. George R. Sheldon of New York has been elected president of the Philadelphia & Western Railway Company, which has been formed as a reorganization of the Philadelphia & Western Railroad. The other officers elected are: Vice-president, Thomas Newhall; secretary and treasurer, Davies Murdoch.

Mr. Henry W. Frund, heretofore for many years manager and director of the Vincennes (Ind.) Light & Power Company, has been appointed manager of the Salisbury & Spencer Railway of Salisbury, N. C., in charge of the electric railway between Salisbury and Spencer, and the gas and electric properties in those towns.

Mr. J. H. Brennan, superintendent of the Sidney division of the New South Wales Government Tramways, Sidney, Australia, in company with Mr. John Mitchell of Auckland, New Zealand, is making an exhaustive study of the prominent electric railway systems of the United States, with especial regard to their methods of reinforced concrete construction.

Mr. Wesley Wentworth, for the past year and a half general superintendent of the Houston Electric Company at Houston, Tex., has resigned, effective at once, to devote his attention to business matters in the east. Mr. Uriah Foss, whose title will be superintendent of transportation, has been appointed to succeed Mr. Wentworth. Mr. Foss formerly held a similar position with the Connecticut Railway & Lighting Company at New Britain, Conn.

Mr. L. F. Loree, whose portrait is presented herewith, was on June 1 elected president of the United Traction Company of Albany, N. Y., and the Hudson Valley Railway of Glens Falls, N. Y., to succeed the late David Willcox, as previously reported in the Electric Railway Review. Mr. Loree was born at Fulton City, Ill., on April 23, 1858, and entered railway service in 1877 as assistant in the engineering corps of the Pennsylvania Railroad. He remained with the Pennsylvania for two years and was for a time connected with the engineering departments of the United States army and of the Mexican National Railway. He then returned to the Pennsylvania Railroad and held various positions in the engineering and operating departments. From January 15, 1896, to January 1, 1901, he was general manager of the Pennsylvania Lines West of Pittsburg, and from January 1 to June 1, 1901, fourth vice-president of the same lines. From June 1, 1901, to January 1, 1904, he was president of the Baltimore & Ohio Railroad, and from January 1 to October 4, 1904, he was president of the Rock Island Company of New Jersey. He was elected to the presidency of the Delaware & Hudson Company following the resignation of David Willcox, in April of this year. Mr. Loree's headquarters are in New York City.



L. F. Loree.

Obituary.

Charles K. Stearns, who has been assistant engineer in the electrical department of the Nantasket branch of the New York New Haven & Hartford Railroad, died recently. He was about 44 years of age and was a graduate of the Massachusetts Institute of Technology. He also was a member of the American Institute of Electrical Engineers and of the American Society of Mechanical Engineers and for some time past has acted as consulting engineer for a number of street railways.

Financial News

American Railways Company, Philadelphia.—An issue of \$2,500,000 of 5 per cent bonds has been sold to Bioren & Co., E. C. Miller & Co. and Newburger, Henderson & Loeb of Philadelphia. The bonds are dated April 1, 1907, and will mature on April 1, 1917, but are subject to call at 102 at any interest period. They are secured by a deposit of \$1,475,000 out of a total of \$1,500,000 stock of the Altoona & Logan Valley Electric Railway, Altoona, Pa., and \$1,975,000 out of a total of \$2,000,000 stock of the Scranton (Pa.) Railway.

Birmingham (Ala.) Railway Light & Power Company.—Stockholders authorized on June 8 a bond issue of \$35,000,000. This issue will be used to refund outstanding bonds and to provide for extensions and improvements.

Chicago Electric Traction Company.—A decree of foreclosure and sale was entered in the United States circuit court at Chicago on June 11. The upset price is \$300,000. The road operates 30 miles of track from Sixty-third street and South Park avenue, Chicago, to Morgan Park, Blue Island, West Harvey and Harvey. It has been in the hands of a receiver since June 13, 1900.

Chicago Subway Company.—J. Ogden Armour and interests affiliated with him are now in control of this company. Samuel McRoberts, treasurer of Armour & Co., has been made president of the Illinois Tunnel Company, the operating company, succeeding Albert G. Wheeler. Mr. McRoberts was also elected a director to succeed P. A. Valentine, and Mr. Armour was made a member of the board. W. J. C. Kenyon, vice-president and general manager of the union stockyards, Omaha, was elected general manager of the tunnel company. An active campaign for development of the property will be undertaken.

Metropolitan Street Railway, Kansas City.—Gross earnings for the six months ended May 31 were \$3,943,639.

Northwestern Elevated Railroad, Chicago.—It is expected that a block of first mortgage 4 per cent bonds will be sold in order to complete the payment for construction of the Ravenswood extension.

Oneida (N. Y.) Railway.—Notice is given that stockholders of this company will vote on June 22 on a recommendation to increase the capital stock from \$15,000 to \$2,000,000. The company has electrified and will operate a third-rail line between Syracuse and Utica, N. Y.

Philadelphia & Easton Railway, Doylestown, Pa.—The property of this company was purchased at foreclosure sale at Doylestown on May 31, for \$100,000, by Carroll R. Williams of Philadelphia, on behalf of the bondholders' committee.

Philadelphia & Western Railway.—This company has been organized as successor of the Philadelphia & Western Railroad, which was foreclosed recently. An issue of \$20,000,000 bonds will be authorized, of which \$4,000,000 will be outstanding and \$16,000,000 will be reserved for permanent improvements and extensions. There will be \$600,000 preferred stock and \$3,400,000 common stock. The directors are: George R. Sheldon, Randolph Rodman, James H. Brewster, Jr., Thomas Newhall, William H. Sims, W. Robinson Molinar and Joseph S. Clark. The officers are: President, George R. Sheldon; vice-president, Thomas Newhall; secretary and treasurer, Davies Murdoch.

Sheboygan Heat Light & Traction Company.—The property of this company has been merged with the Milwaukee Northern Railway, which is under construction.

Trenton Lakewood & Atlantic Railway, Trenton, N. J.—John M. Dickinson was appointed receiver of this property at Trenton, N. J., on June 5, in the suit instituted by Peter Schlicher.

Whatcom County Railway & Light Company, Bellingham, Wash.—This company has canceled the \$300,000 authorized issue of preferred stock, of which \$220,000 was outstanding. The \$750,000 outstanding common stock remains unchanged.

York County Traction Company, York, Pa.—This company has acquired \$1,087,000 of its 5 per cent bonds out of a total of \$1,213,000 outstanding. The remaining \$126,000 will be called at 110 and interest. It is reported that the payment of these bonds is preliminary to the organization of a holding company and the creation of a new mortgage.

Dividends Declared.

- Boston Suburban Electric Companies, preferred, quarterly, 75 cents.
- Continental Passenger Railway, Philadelphia, 6 per cent.
- Interborough-Metropolitan Company, preferred, quarterly, 1 1/4 per cent.
- Interborough Rapid Transit Company, quarterly, 2 1/4 per cent.
- Lynchburg (Va.) Traction & Light Company, 1 1/2 per cent.
- Mhattan Railway, New York, quarterly, 1 3/4 per cent.
- Maryland Electric Railways, Baltimore, 2 per cent.
- Portland (Ore.) Railway Light & Power Company, preferred, quarterly, 1 1/4 per cent.
- Puget Sound Electric Railway, Tacoma, Wash., preferred, 3 per cent.
- Roanoke (Va.) Railway & Electric Company, 3 per cent.
- Union Traction Company, Philadelphia, 2 1/2 per cent.
- United Traction & Electric Company, Providence, quarterly, 1 1/4 per cent.

Manufactures and Supplies

ROLLING STOCK.

Interstate Railways Company, Philadelphia, Pa., is reported to be in the market for 25 double-truck cars.

Rio de Janeiro Tramways Company, Rio de Janeiro, Brazil, S. A., has placed an order for one double-truck car.

Wetzel & Tyler Railroad Company, New Martinsville, W. Va., is in the market for two second-hand cars, ready for service.

British Columbia Electric Railway Company, Limited, Vancouver, B. C., expects to build 15 city cars, 6 large interurban cars and 3 shunters.

Toledo Port Clinton & Lakeside Railway, Toledo, O., has ordered five 36-foot flat cars of 50,000 pounds capacity from the Hicks Locomotive & Car Works.

Bayou Teche Railway Company, New Orleans, La., under construction, is in the market for 12 to 14 double-truck cars. F. A. C. Perrine, president, 60 Wall street, New York, N. Y.

Texas Traction Company, Dallas, Tex., has ordered 25 cars from the St. Louis Car Company, in addition to the 15 interurban cars reported in the Electric Railway Review of May 11.

East Shore & Suburban Railway, Richmond, Cal., has ordered two double-truck cars from the St. Louis Car Company, and, it is reported, will be in the market for a few more in the near future.

Cedar Rapids & Iowa City Railway & Light Company, Cedar Rapids, Ia., is figuring on 25 stock cars, 5 box cars and 5 flat cars. These are for steam railway service and will be of 60,000 pounds capacity.

Dimitri Lichatschiff, machinery agent, Odessa, Russia, is asking prices on double-truck cars for electric service. The cars must provide for first and second class below and for third class above and be of the latest type and construction.

Buffalo & Lake Erie Traction Company, Buffalo, N. Y., the operation of which will begin early in the year of 1908, has placed an order with the Cincinnati Car Company for twenty-five 60-foot interurban passenger coaches. Joseph B. Mayer is president and J. C. Calisch is general manager.

Public Service Corporation of New Jersey, Newark, N. J., as reported in the Electric Railway Review of May 18, has placed an order with the Cincinnati Car Company for 200 large semi-convertible double-truck cars. The delivery of these cars is to begin on October 1, 1907, and extend into the first six months of 1908.

Whatcom County Railway & Light Company, Bellingham, Wash., as reported in the Electric Railway Review of June 1, has placed an order with the Jewett Car Company for two single-truck cars for June, 1907, delivery, and with its own shops for one double-truck express car for August delivery, and one locomotive for July delivery. The specifications call for the following details:

Passenger Cars.

Seating capacity...30 passengers	Width, inside .....6 ft. 9 in.
Weight .....16,000 lb.	Over all .....7 ft. 8 in.
Wheel base .....8 ft. 1/2 in.	Height, track to trolley base
Length of body .....19 ft.	.....11 ft. 3 in.
Over vestibule ...31 ft. 1/2 in.	Body .....Wood
Over all .....32 ft. 1/2 in.	Underframe .....Wood

Express Car.

Weight .....34,000 lb.	Width, inside .....7 ft. 8 in.
Wheel base .....4 ft. 6 in.	Over all .....8 ft. 6 in.
Length of body .....40 ft.	Body .....Wood
Over all .....43 ft.	Underframe .....Wood

Locomotive.

Weight .....100,000 lb.	Height, track to trolley base
Wheel base .....4 ft. 6 in.	.....12 ft.
Length, over all.....33 ft.	Body and underframe...Wood

Special Equipment.

Brakes—National Electric and Westinghouse.	Hand brakes...Jewett—St. Louis
Bolsters .....Co. standard	Interior finish, passenger...Cherry
Couplers, express .....Brill	Motors, passenger.....2 GE-67
Locomotive .....Tower	Express .....4 GE-67
Destination signs, passenger..	Locomotive .....4 GE-90
.....Monitor	Paint .....Sherwin-Williams
Fenders .....Co. standard	Sanders .....Air
Gears and pinions.....Falk Co.	Trolley poles and attachments
Headlights, passenger .....	.....United States
.....Crouse-Hinds	Seats, passenger...Longitudinal
Express car .....Syracuse	Trucks .....Brill

Utah Light & Railway Company, Salt Lake City, Utah, is in the market for 62 double-truck cars. In the Electric Railway Review of March 16 this company was reported as contemplating the purchase of 50 double-truck cars for city service.

Mexico Santa Fe & Perry Traction Company, mentioned in the Electric Railway Review of June 8 as being in the market for new cars, should have had Mexico, Mo., for the address of Mr.

S. L. Robison, president and general manager, instead of Mexico, Mex.

Houston Electric Company, Houston, Tex., as reported in the Electric Railway Review of May 18, has ordered 10 semi-convertible passenger cars from the St. Louis Car Company for October delivery. The cars are to measure 28 feet long, 8 feet 9 inches wide, and 9 feet 6 inches high, inside measurements.

SHOPS AND BUILDINGS.

British Columbia Electric Railway, Vancouver, B. C.—This company is building an addition, 68 by 400 feet, to its car house at Vancouver.

Chicago South Bend & Northern Indiana Railway, South Bend, Ind.—It is reported that the board of public works of Michigan City, Ind., has approved the plans for a terminal station.

Evansville (Ind.) & Eastern Electric Railway.—Ground was broken last week for a new car house at Hatfield, Ind.

Grand Rapids Grand Haven & Muskegon Railway, Grand Rapids, Mich.—At a recent meeting of the directors it was decided to rebuild at once the car sheds at Muskegon that were burned last spring.

Indiana Columbus & Eastern Traction Company, Columbus, O.—This company and the Columbus Delaware & Marion Railway of Columbus, O., have leased property in the rear of the present interurban station on West Gay street, Columbus, for erecting additional freight station facilities.

Pacific Electric Railway, Los Angeles, Cal.—It is announced that as soon as the work of double-tracking this company's line from Arcadia to Monrovia is completed, construction work on its proposed new waiting station at Monrovia will be started. The building probably will be ready for occupancy about November 1 next.

Portland (Ore.) Railway Light & Power Company.—Architects and engineers are now engaged in perfecting the plans for the new 7-story central station and office building, to be erected on the block bounded by First, Second, Pine and Ash streets, and it is expected that the work of tearing down the present buildings occupying the site will be started within 90 days.

Scranton (Pa.) Railway.—President J. J. Sullivan has announced that work will begin shortly on the new car house and shops that are to be built on a site that was secured some time ago.

Springfield (Ill.) Consolidated Railway.—Construction has been started on the new car house just south of Iles Park, Springfield, and it is expected to complete it by fall. The building will be of brick and concrete construction and will be 216 by 120 feet, to accommodate 45 cars. The building will be fireproof, and it is estimated will cost about \$45,000.

Warren (Pa.) Street Railway.—This company is reported to have decided to build a new car house at Warren, to replace the one that was destroyed by fire last year.

TRADE NOTES.

Browning Engineering Company, Cleveland, O., has increased its capital stock from \$500,000 to \$850,000.

Allis-Chalmers Company, Milwaukee, Wis., announces the removal of its office in Seattle, Wash., to 115 Jackson street, where G. W. Pulver, district manager, is in charge.

Otto E. Faich, Jr., who has been chief engineer of the Pacific coast department of the Otis Elevator Company, has opened offices at 850-852 Monadnock building, San Francisco, Cal., as consulting, electrical and mechanical engineer.

Carl A. Strom, formerly with the Bucyrus Company, South Milwaukee, Wis., has been appointed mechanical engineer of the steam shovel and dredge department of the American Locomotive Company, with headquarters at Richmond, Va.

W. H. Cowell has been elected secretary and treasurer of the Wellman-Seaver-Morgan Company, Cleveland, succeeding A. D. Hatfield, resigned. Mr. Cowell is from Sault Ste. Marie, where he was formerly associated with W. M. Sawyer, president of the Wellman-Seaver-Morgan Company.

Ridgway Dynamo & Engine Company, Ridgway, Pa., has reorganized its sales department. H. A. Otterson, heretofore assistant superintendent, is now sales manager, with R. C. Eccleston as assistant. This department will control all the agencies and advertising of the company.

Anguera Lumber Company, Chicago, whose business heretofore has been almost exclusively the furnishing of building material to steam railways, is now specializing on lumber for street railways and interurban lines. The company has offices in Seattle, Wash., Hattiesburg, Miss., and Poplar Bluff, Ind.

Joseph Dixon Crucible Company, Jersey City, N. J., on May 31 held a special meeting of its directors to take action on the death of John A. Walker, vice-president and treasurer of the company. George T. Smith was elected vice-president; George E. Long, treasurer; and Harry Dailey a director and secretary.

B. F. Sturtevant Company, Boston, Mass., advises that the Boston Elevated Railway Company, Lincoln power station, Boston, and the Wood Worsted Mills, Lawrence, Mass., have recently placed repeat orders with them for new metal-to-metal fuel

economizers, a special form having been furnished in the case of the Boston Elevated Railway Company to meet that company's particular requirements.

C. C. Chappelle, who for the last two years has represented the Westinghouse Machine Company in Denver, on May 1 assumed the position of western sales manager, with general charge of the company's business in Chicago and all the territory west.

American Car & Foundry Company, St. Louis, Mo., on June 12, it is reported, placed a contract for the construction at Gary, Ind., of the largest plant in the United States devoted to the manufacture of steel passenger and freight cars. It is stated the plant will occupy a site of 170 acres and will have a capacity of 125 to 150 cars a day.

Thomas H. Simpson has been elected president of the Michigan Malleable Iron Company, Detroit, to succeed the late William C. McMillan. Mr. Simpson, who has been treasurer and general manager of the company, still retains the duties of treasurer. Philip H. McMillan continues as vice-president and George M. Black as secretary.

Johnson-Kennedy Electric Company, Cincinnati, O., has been organized by Claude Johnson, who has been connected with the Creaghead Engineering Company for the past 10 years. The new company is capitalized at \$10,000 and has quarters at 244 East Fifth street, where it will conduct a general electric supply business. J. M. Kennedy, president and treasurer; Claude Johnson, vice-president and general manager.

Central Inspection Bureau, New York City, maintains an organization for consultation, tests and inspection in the matter of railway, bridge and builders' equipment, iron, steel and lumber. The general offices are located at 17 State street, New York, and branch offices are maintained at Philadelphia, Detroit, Macon, Ga., and Middletown, Pa. The officers are: H. A. Clark, president; John E. Cobang, vice-president and treasurer; and T. C. Ashenfelter, secretary.

Arnold Company, Chicago, has added to its engineering staff J. E. Moore, who for the past five years has been electrical engineer for the city of Davenport, Ia. After graduating from Purdue University Mr. Moore became connected with the Sprague Electric Company, where he was engaged in electric railway installation and operation. Later he entered Princeton University, doing advanced work in electrical engineering, and in 1899 received the honorary degree of doctor of science.

Conley Frog & Switch Company, Memphis, Tenn., incorporated in March with \$200,000 capital stock, has purchased three acres of land, on which to erect a steel and concrete building, 70 by 200 feet. It will be equipped with pneumatic tools for the manufacture of crosses, switches, switchstands, rail braces, etc. The plant will be operated by electricity and will probably be completed by August 1. J. E. Conley, president; B. S. Randle, vice-president; Frank J. Callahan, secretary-treasurer.

R. E. Coleman has been appointed assistant superintendent of the American Brake Shoe & Foundry Company, with jurisdiction over all its works. His headquarters will be at Mahwah, N. J. Mr. Coleman has been superintendent of the company's East Buffalo (N. Y.) plant. He came to Buffalo from Chicago about 10 years ago to take charge of the Depew works of the Union Car Company and has been with the American Brake Shoe company several years. Nathaniel McAfee succeeds Mr. Coleman as superintendent at East Buffalo.

Arthur O. Einstein, until recently sales manager for the Chicago branch of the Manhattan Electrical Supply Company, has opened an office and storeroom as electrical manufacturers' agent at 103 West Adams street, Chicago, where he will carry in stock the goods of manufacturers represented by him. He at present represents the Trio Manufacturing Company of Rock Island, Ill., which manufactures knife switches and inclosed fuses, and other lines will be added by him as fast as possible. Mr. Einstein has had 12 years' experience as traveling salesman through the central states and has a large circle of acquaintances.

Yale & Towne Manufacturing Company, New York City, exhibited at the conventions of the Master Car Builders' and Master Mechanics' associations, now being held at Atlantic City, the following: Portable electric hoists equipped with graduated speed controllers for careful handling of material and close adjustment of parts, when assembling or placing in machines; 20-ton triplex chain block, enabling one man to lift a 20-ton load; 1-ton triplex, duplex and differential chain block in operation under service conditions; quick speed chain blocks for rapid handling of light loads; overhead I-beam trolleys for use with hand and electric hoists; crane models and photographs of installations. The representatives of the company in attendance at the conventions are: F. A. Hall, E. J. Ford, H. E. Dickerman, William Hazleton, R. T. Hodgkins and C. W. Beaver.

Ohio Brass Company, Mansfield, O., announces that manufacturers of overhead line material have recently made an arrangement with the manufacturers of bare copper wire to adopt a standard cross section for grooved wire, which will be known as the American standard grooved wire. This arrangement is to go into effect in the near future. The advantages of such an arrangement are obvious. Heretofore, wire manufacturers have all held to different shapes of cross section for grooved wires, making it impossible for the manufacturers of line material to design standard types of ears and clamps to exactly fit the various shapes of grooved wire. Under the new regulation it will be possible to standardize these devices to fit accurately the American standard grooved wire. While wire manufacturers will be able to furnish the shapes of wire hitherto made, the American standard

grooved wire will be furnished unless other sections are specifically ordered. The Ohio Brass Company further announces that it will furnish clamps and ears designed for the American standard, unless otherwise specified.

Dodge & Day, engineers, Philadelphia, Pa., have opened a branch office in the United States Realty building, 111 Broadway, New York, N. Y., in charge of Robert T. Lozier, who has for a number of years been associated with electrical industries.

Wesco Supply Company, St. Louis, Mo., has opened a new branch office at Birmingham, Ala., in charge of W. W. Moore, who is an electrical engineer and has for several years managed the apparatus department of the company, with headquarters in St. Louis.

ADVERTISING LITERATURE.

The **Yale & Towne Manufacturing Company**, 9 Murray Street, New York.—A novelette just issued, entitled "The Ghost and the Burglar," emphasizes the efficacy of the renowned Yale lock.

Electric Service Supplies Company, Philadelphia, Pa.—A leaflet describes a specially designed truss pin, made of malleable iron, japanned or galvanized as desired, manufactured by this company for high-tension and feeder work.

Allis-Chalmers Company, Milwaukee, Wis.—Leaflet No. 2031 A contains illustrations of the American Blower Company's self-oiling engine, type E, double cylinder, direct connected to electric generator, built by the Allis-Chalmers Company.

Goldschmidt-Thermit Company, New York.—An interesting pamphlet has just been made public by this company regarding fire brick molds for welding locomotive frames by the Thermit process and contains much valuable data regarding welding, presenting also several excellent illustrations from photographs.

Green Fuel Economizer Company, Matteawan, N. Y.—This company has just issued a 16-page pamphlet discussing the philosophy of artificial drying of brick and tile and other ceramic products, in general and specifically, by means of the Green three-quarter housing bottom horizontal discharge fan. The pamphlet will repay study by those who are interested.

Buckeye Engine Company, Salem, O.—The Buckeye electric blue-printing machine manufactured by this company is the subject of an interesting pamphlet entitled "The A B C of Blue Printing." The pamphlet is gotten up in a manner calculated to hold the reader's attention throughout and contains a long, yet partial, list of users of the Buckeye electric blue-printing machine.

Chicago Pneumatic Tool Company, Chicago, Ill.—A catalogue of Chicago giant rock drills and kindred appliances has just been issued and is now being mailed. The book gives a complete description of the various appliances, which are illustrated by half-tone engravings. A portion of the catalogue is devoted to rock drills and an interesting description of the method of lubrication used in the Chicago giant is also presented. Several pages are devoted to Franklin motor compressors.

Knecht Bros. Company, Cincinnati, O.—A very neat pamphlet has just been received describing the Knecht friction sensitive drill for drilling holes up to 9-16 inch. The machine has a number of unique features and it is claimed that "more holes for less money" are made than by any other similar machine. The pamphlet describes the entire apparatus and equipment in detail, together with specifications. A motor drive manufactured by this company for running the drill, which it is prepared to furnish when required, is also described.

Union Electric Company, Pittsburg Terminal Warehouses, Third and Carson Streets, S. S., Pittsburg, Pa.—Following the merger of this company and the General Railway Supply Company, announcement of which was contained in a previous issue, the first edition of the company's general catalogue, comprising 400 pages, makes its appearance. It is a complete up-to-date reference book of standard electrical supplies for power, lighting, telephone, railway and marine use, confining the selection to the best grades and eliminating duplication wherever possible. The catalogue is copiously illustrated and contains full price lists regarding all of the electrical supplies handled by the company.

Westinghouse Machine Company, East Pittsburg, Pa.—The storage battery department of this company has developed in a vast degree within recent years. From the beginning this company has been an advocate of the pure lead plate formed by the electrolytic or "Planté" process for both positive and negative. The Westinghouse positive plate has shown from the start a remarkably long life. The early Westinghouse negative exhibited the usual tendency toward shrinkage in capacity, but after years of study and experimentation this fault has been overcome and the present negative plate, in addition to indefinitely long life, has the very desirable function of maintaining its initial and rated capacity and is practically indestructible under normal conditions of battery service, and even when in use under the most abusive electrical conditions. The Westinghouse positive and negative plates are made of purest lead, without tin, antimony or other alloy, the grid having the density of rolled lead. The active material is formed from the lead itself by the "Planté" process with sulphuric acid electrolyte. The entire subject of the Westinghouse storage batteries is covered in a most thorough manner in the handsome pamphlet just issued by this company, which contains also illustrations of the various types of storage batteries manufactured by the Westinghouse Machine Company, as also data and illustrations regarding the Westinghouse hoosters, regulators and switchboards and the Westinghouse portable batteries.

PEROLIN—A DUSTLESS SWEEPING COMPOUND.

Announcement has just been made of recently completed arrangements by which the H. W. Johns-Manville Company, the well-known asbestos firm, with branches in all the leading cities, has acquired the exclusive sales agency for Perolin throughout the United States. Perolin is a remarkable product that is said to solve the important problem of preventing the dust and dirt nuisance in public buildings, stores, factories, schools and homes.



Dustless Sweeping Compound.

In the past various indifferent and unsatisfactory methods have been devised for this purpose. The most common method is to use sawdust, sand or salt mixed with crude oil or kerosene. All of these are ineffective, most of them are highly combustible, and, instead of cleaning the floors, leave them in an unsatisfactory condition. Wet sawdust to a certain extent allays the dust, but it leaves the floor muddy. Oily compounds assist in laying dust, but leave the floors, carpets and rugs soiled. Oiled floors are condemned by the Fire Insurance Underwriters' Association because of the added fire hazard.

Perolin is an ideal fireproof floor cleaning compound because, instead of laying the dust, it absorbs it. It draws the dust from cracks and crevices in the floors and from carpets and rugs. It is a powerful disinfectant, destroying the disease germs that are common with dust; leaving the air pure and wholesome, and the floor absolutely clean.

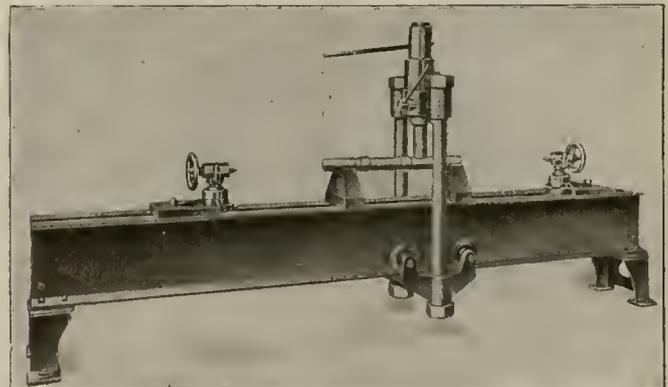
Sixty-five per cent of all diseases are said to be caused by dust infection. A test was recently made in one of the Chicago hospitals, to ascertain the number of living germs floating in the air, before and after ordinary sweeping, and then after sweeping with Perolin. Before sweeping the room it was found that 96 bacteria settled on a plate in four minutes. Immediately after sweeping a similar test showed over 3,000 bacteria. A test was then made by thoroughly sweeping the room with Perolin, and only 45 bacteria were found on the plate.

This compound will not only absorb the dust caused by sweeping, but it will also clean, brighten and preserve carpets, rugs and floorings, and save curtains, tapestries, pictures and furniture from becoming soiled and discolored.

Perolin was invented over 50 years ago by a German chemist. It has long been a standard article throughout Germany, and its success there led to its introduction into the United States. This success is reported to have led to a number of imitations, which, however, lack the peculiar characteristics of the genuine article.

AN IMPROVED AXLE STRAIGHTENER.

Bent car axles and motor axles are frequent causes of annoyance and expense. Bent axles carrying pinions demand immediate attention, as the life of the gears is not only seriously impaired by running for even a few hours with a bent axle, but there is also great danger that the motor shaft will be broken or at least seriously sprung. Considerable expense is involved in renewing or straightening axles by ordinary means. Though they can be



Columbia Axle Straightener.

straightened in an indifferent manner by home-made screw-power presses, the results are in general very unsatisfactory, as it is not easily possible to get a sufficiently great force to take out a short kink in a heavy shaft; and further, in most cases considerable risk of permanent damage is involved in straightening the shaft.

Realizing the large field of usefulness for a simple and efficient axle straightener of moderate cost, the Columbia Machine Works & Malleable Iron Company, Atlantic avenue and Chestnut street, Brooklyn, New York, has introduced the Columbia axle straightener, a general view of which is shown in the accompanying illustration.

This axle straightener has incorporated in it many important improvements over similar devices of the past. Several unique and very desirable features have been used in its construction. As will

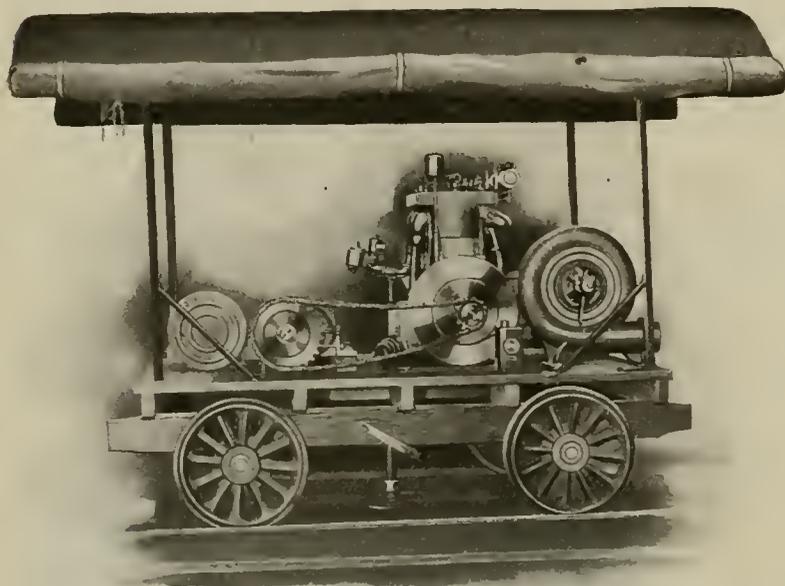
be noted, it consists of a heavy bedplate of double I-beam section, upon which are mounted two center heads for holding and testing the shaft. These center heads are of unique design in that they are provided with springs inside of them, which take up the pressure at the ends of the shaft and thus avoid the necessity of removing them from the shaft centers while the axle is being straightened. This point is of great value, as it often happens that a mechanic operating an ordinary straightener will neglect to remove the heads, which, without this spring arrangement, means that the centers will be bent or broken. The improvement will therefore be appreciated. Two blocks are mounted on top of the bedplate so that they can easily be moved to any desired point and serve as the fulcrums of the shaft when straightening it.

The straightening force is applied by means of a hydraulic plunger controlled by a small hand-operated pump, which gives the operator perfect control over the force applied and the distance through which it is applied, making it possible to perfectly straighten shafts, no matter how badly they may be bent. An improvement which will also be appreciated is the provision which has been made for rapidly moving the plunger back and forth when running free. For this purpose a short lever is provided, which works in a rack on the plunger, permitting the height to be rapidly adjusted with a minimum amount of manual labor. The height can be adjusted for any size axle or gear up to 28 inches in diameter. The straightening plunger and frame, when not in use, are supported on four wheels resting on the lower flanges of the bedplate. This permits the straightening jack to be easily moved from one end of the bedplate to the other.

WELDED RAIL BONDS.

In the construction and maintenance of tracks for electric railways there is hardly any subject of greater importance than that of the joining of rails so that the electric current may have a free and unobstructed return path to the power house. The proper installation of a copper bond, with the necessary cross section to satisfactorily carry the return current is the first step toward the economical transmission of power for the operation of electric cars.

During the past few years many improvements have been made in the types of bonds that are commonly used until now they have reached a stage of perfection which makes them capable of withstanding the strains and vibrations to which they may be subjected. And yet many of the bonds now in use have proved short-lived because of the failure to provide a method for making a proper connection between the heads of the bonds and the steel rails. This connection should be strong mechanically, as well as elec-



Copper Welded Rail Bonds—Power Car.

trically, and if this is accomplished the ideal condition for safe and economical operation of cars will be obtained.

The Electric Railway Improvement Company, 6005 Carnegie avenue, Cleveland, O., claims to have succeeded in bringing about this ideal condition through the use of its electric brazed and its copper welded bonds. When these bonds are installed properly the temperature of both the copper bond and the steel rail are raised to a point where a perfect molecular union, or weld, is made. This is done by electric brazing, whereby an alloy inserted between the copper and the steel is brought up to a requisite heat by the employment of current from the trolley wire, or by the use of molten copper. The latter is known as the "copper welding" process.

The bonds furnished by this company can be made in any desirable size and type for use on the flange, ball or web of a rail.

The apparatus used in installing bonds on railways where current can be supplied consists of a small car with steel wheels, wooden platform and a canopy top. The equipment consists of a 15-kilowatt rotary converter, a step-down transformer, switches,

controller and other essentials for safe and convenient operation. The rotary, provided with a clutch and a chain drive, is used as a motor for the propulsion of the car. Bonding clamps, used in the electric brazing process, are attached to either side of the car in such a way that they may be brought quickly into position for work. A small melting furnace is provided at the rear of the car for use in connecting cross bonds. A screw jack located under the car makes it possible to turn and run the car from the track without delay.

In the copper-welding process two small cars equipped with



Copper Welded Rail Bonds—Furnace Car.

a portable copper-welding plant are provided. These, as shown in the illustrations herewith presented, are known as the power car and the furnace car. The power car carries a gasoline engine, a fan blower, which supplies the forced draft for the furnaces, and a 2-horsepower motor, which supplies current for the rail grinder. The engine is connected to the car axle by a clutch and chain drive and is used in propelling the car. Where electric current is available the gasoline engine can be replaced by a motor.

The furnace car is equipped with six melting furnaces, a sheet steel fuel bin and storage bins for bonds, molds, etc. The molds used in the welding of bonds are of a graphite mixture and vary in size, according to the section of the bond and rail to be used.

The Electric Railway Improvement Company now has a large number of cars in use in applying bonds on new railways and a number in rebonding city and interurban lines that have been in operation for several years. The cost of applying bonds, either by the brazing or the welding process, is said to be cheaper and the bonds more durable than by any other process known. If desired such cars can be leased for a long term of years.

AUTOMATIC TROLLEY GUARD.

One of the most frequent causes for accidents at crowded steam railway crossings is the stopping of a car on the railroad tracks, owing to the trolley wheel having jumped off the wire, while the conductor is ahead giving the signal for the motorman to proceed. Another source of danger, delay and expense is caused by the trolley jumping off when passing through subways, resulting in broken poles and wheels. Various schemes have been devised from time to time to obviate these difficulties. None of these has been entirely successful. Some crude devices consisted of wire nets stretched above the trolley wire and connected to it. These would keep the current on the car when the wheel left the wire, but did not prevent the wheel from striking the guy wires and possibly breaking the pole, or possibly losing the wheel after leaving the guard. Further, these home-made devices as a rule were not entirely reliable, as the wheel often missed

the protective netting and the car consequently would be left helpless.

These difficulties have been carefully considered and eliminated in the automatic trolley guard, manufactured by the Automatic Trolley Guard Company, 391-393 Ellicott square, Buffalo, N. Y. This guard consists of aluminum-coated steel sheets, made in strips eight feet long and bent by machinery into the form shown in the accompanying engraving. The strips are rigidly supported by hangers placed every four feet. These hangers are made of galvanized T-iron, bent to the proper shape. One side of each is cut and turned in to support the metal sides or strips which are riveted to it. The two sheets forming the guard project up to force the wheel on the wire, but leave the top entirely open for locomotive exhaust. The trolley is rigidly centered by special clamps bolting to the top of the T-iron hanger, as shown.

The separate sections of the guard are firmly fixed together by overlapping about 2½ inches and passing rivets through the sides and hanger, thus making the sections substantially one

piece. This construction makes the guard rigid for its entire length and thus obviates any difficulties that might be experienced from more flexible construction. The guard being made of solid metal affords constant contact. This eliminates any objections that might be experienced with lighter construction through the arcing severing the strands so that they would loosen, thus weakening the entire construction, and perhaps becoming entangled with the trolley pole.

The unique and special feature of this guard which, other than its strong construction, commends it to use is the form of the protection. By reference to the illustration it will be noted



Latest Design of Automatic Trolley Guard.

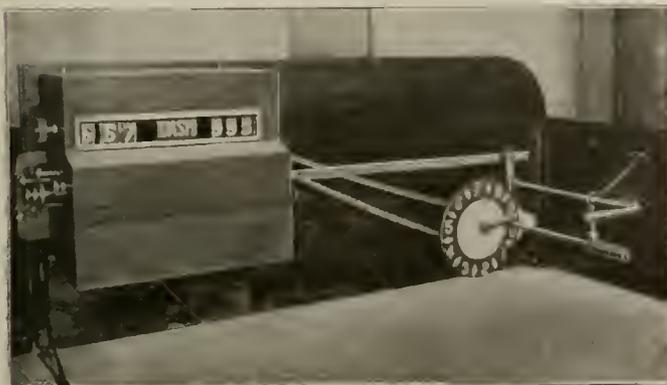
that should the trolley wheel jump the wire it will immediately make contact with the guard sides, and by reason of the form of these immediately be replaced on the wire. Thus the guard not only at all times maintains contact between the overhead wire and wheel, but it also acts as a retriever in reseating the wheel on the wire. There are many locations where these guards are of special advantage, such as railroad crossings, curves and power houses.

MOORE FARE REGISTER.

A fare register embodying in its design entirely new features has recently been patented by Otto N. Moore, 5650 East Washington street, Indianapolis, Ind. Several interesting and advantageous features were sought and are said to have been obtained in this new type of register.

New Principles.

The first and probably most interesting feature is the new mechanical movement with which cash fares up to \$9.95 can be registered on a single line. The mechanical motion for doing this is composed of four parts. As a whole it is very strong and does



Moore Fare Register—General View of Register, Dial and Rods.

not include in its make-up any springs. A movement suitable for a smaller register recording fares up to \$1.00 also has been perfected. This smaller size machine as ready for use is about 10 by 3 3/4 by 12 1/4 inches in dimensions. The larger size of machine is illustrated by the accompanying engraving. It is worthy of note that the inventor of this new design of recording movement has been able to perfect his product so that it will accurately count and add fares of so many denominations. The ordinary single register as now used has a capacity for registering only from 5 to 60 cents, inclusive, or 12 classifications, while the Moore register is designed to register 199 classifications. It should be noted that this machine not only registers through this wide range, but it also totals any number of cash fares between the same limits.

When operating long roads or over complicated track rights it would seem that the feature of providing for the registration of

fare in 199 denominations would be especially valuable, since it would do away with any necessity for the conductor carrying cash fare slips and being called upon to punch and issue them. The use of this register thus eliminating cash fare slips, provides a printed statement of the total amount of cash that a conductor must remit to his company at the end of any one period, and this total is obtained, not by a series of computations, but by only one subtraction.

Method of Operation.

Each conductor and inspector is provided with an individual key, which, when inserted in the register, unlocks the mechanism so that the fares may be rung up. The turning of the key automatically sets the conductor's or inspector's number and the key cannot be withdrawn from the register until the printing mechanism has been operated. Thus it is seen that the proper individual is charged with each operation of the machine. On a dial at the left of the case the train numbers are set, reading from 1 to 999, inclusive.

A very important addition to the recording part of this register is the provision for printing initials, by means of which a code may be utilized so that divisions of fare may be recorded in almost any way desired—either at fare limits, in town or by an arbitrary division of mileage. This valuable feature affords a means for obtaining the correct number of passengers and earnings originating on any definite portion of the run and thus determining the value of the trackage between any stated limits.

Each time that a cash fare or a ticket is rung up the machine registers it in the "total number of fares" column as one fare. Thus it is seen that the total number of passengers carried over the route or any portion thereof can be obtained by a simple subtraction. A column also is provided on the record of the register showing, in a similar way, the number of tickets.

City Fares.

In the design of this register provision has been made to account for city fares on interurban cars without the use of a second register, as is quite commonly required. The city fare recording section works independent of the balance of the register and may, by a simple operation, be interconnected with it so that each time

Conductors No.	Train No.	Division Initial	Total No. of Fares	Total No. of Tickets	Total No. City Fares	Total Cash	
						Dollars	Cents
60	320	AA	672	078	849	413	15
60	320	BB	639	066	838	367	90
60	320	CC	613	050	838	354	60
60	329	CC	613	050	838	354	60
60	329	BB	593	041	838	348	00
60	329	AA	575	034	832	336	40

Moore Fare Register—Portion of Record Sheet.

a fare is registered one city passenger is also registered. As ordinarily used the number of passengers on an inbound car at the time of crossing city limits will be rung up by the conductor on the city fare section. He will then interconnect the city fare section with the balance of the register, so that each time a fare is received while the car is on the city tracks, the register will add the fare collected to the cash column and one passenger will be added to the "total number of city fares." The register can be left thus interconnected until the city limits are reached on the outbound trip. Then, by reversing the simple process, the two parts may be disconnected and the balance of the trip made without interfering with the correct number of city fares.

Cash Column.

An unlimited number of fares can be rung up and totaled in the cash column, the minimum fare being five cents and the maximum \$9.95. In this feature the Moore register becomes especially effective. While the scope of the device is so much broader than the ordinary types of register the clerical work necessary to obtain the value of the cash fares is reduced to a simple subtraction. This eliminates entirely the tedious process encountered with some other types of registers.

Printed Record.

The accompanying illustration shows the operation of the register for one round trip on which it was desired to determine the earnings by divisions. It will be noted that the line of figures opposite AA were obtained at the starting terminal and those at CC at the turning terminal. The readings at the division point between terminals are on the lines opposite BB. In obtaining this record the conductor, before starting, set the letters AA and turned the handle of the printing mechanism, making an impression shown by the bottom line of the table. At the division point he set the letters BB and again turned the printing handle, obtaining the second line from the bottom. Had there been more division points this latter operation would have been repeated at will.

On the return trip the conductor reset his train number and operated the register as he did on the outbound trip, the results being shown in the reproduction.

Inasmuch as this register deals in totals it easily is seen that

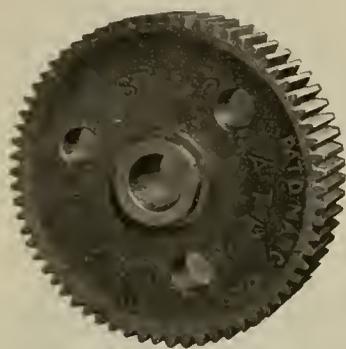
by subtracting the quantities in the line AA from those in the line BB there is obtained a total for each column, including as it does the total number of fares, tickets, city fares and cash. If it is desired to get these totals for any division or for the entire run of the car they easily are obtained by subtracting the readings opposite the key letters of the first terminal from those opposite the key letters for another terminal.

It will be noted that the total performance of the car, as shown in the accompanying record, was as follows: Conductor No. 60; train outgoing No. 329; returning No. 320; total number of fares on round trip 97, outgoing 38, returning 59; total number of tickets, round trip 44, outgoing 16, returning 28; total number of city fares 17, outgoing 6, returning 11; total cash, \$76.75, outgoing \$18.20, returning \$58.55. It should be noted here that if it were not desired to obtain the readings at division and terminal points only two lines of figures would then appear on the printed record and from these, by a simple subtraction, the totals for the round trip would be obtained.

Register Operation.

In operating the register after it has been set to the desired point on the dial, the fare is rung up by moving a handle attached to a rod just over the setting rod. When this handle is pulled down the register rings up a cash fare; when the handle is pushed up a ticket received is recorded. A shield marked "tickets" takes the place of the cash shield. When a ticket is being rung up and while the cash fare is being set by the conductor a "not registered" shield shows to the passengers until after the recording operation is completed.

There are two hands on the setting dials. One hand sets the register from 5 cents to 95 cents, inclusive; the other hand sets the register from \$1.00 to \$9.00. Therefore, in setting the machine



"Titan" Gear Standard for Public Service Corporation of New Jersey.



"Titan" Gear Tested on Public Service Corporation of New Jersey Car No. 1024.



Worn-Out Gear, Ordinary Cut Tooth.

for amounts over \$1.00 it is necessary to set both hands. The setting rod is connected with these hands through the medium of a pin clutch. The setting rod has a longitudinal movement of about one-half inch. When pressed forward it engages the "cents" hand; when pulled backward it engages the "dollars" hand. In the operation of setting the hands to the desired amount it is not necessary to set them in any regular order. The dollars hand may be set first, or vice versa. They also may be turned in either direction while being set.

The accumulators, printing mechanism and setting mechanism are built in units; that is, in a separate frame, and can be removed from the main case, or the frame of the register, be examined and oiled and returned without disturbing any of the mechanism. Also, when a machine once is put together any intelligent workman will be able to keep it in order. If through accident the accumulators, printing mechanism or setting mechanism should become damaged, the damaged parts could be removed and other standard parts inserted, after which the machine would be ready for use.

One of the Moore fare registers has been operated about 12,000 times and is said to have made no false indications or shown appreciable wear. This device herein described is built on thoroughly mechanical principles. The parts are all of standard design and a large per cent of the gear wheels may be bought in the open market, so that the problem of repairs, if necessary, should not be a troublesome one.

United States Express Company Contracts with Electric Lines.

F. W. Brooks, general manager of the Detroit United Railway, has confirmed the report, as published in last week's issue of the Electric Railway Review, that a contract has been entered into with the United States Express Company by the so-called Detroit United Lines, which comprise the interurban lines of the Detroit United Railway, the Rapid Railway system, the Detroit Jackson & Chicago Railway and the Detroit Monroe & Toledo Short Line Railway, whereby the business of the express company will be handled over the lines named. In many features the contract is similar to that generally made between the steam railway and the express company, differing in the fact that the compensation is based, in the main, on tonnage.

The company's view of the matter is that its lines are available for such use as the public may properly make of them, and in entering into the contract above referred to it has been enabled to secure for its patrons a service very much desired.

"TITAN" STEEL MOTOR GEARS.

Some recognition of the principle upon which the deacon built his "One-Hoss Shay" seems to have prevailed in the development of the "Titan" steel motor gear manufactured by the Atha Steel Casting Company, Newark, N. J. While the delay and expense of removing worn-out gears, and consequently wheels which have become well established in their seat upon the axle, is only an incident, it is, nevertheless, an exceedingly important incident in the maintenance of electric railway equipment. The time lost and the expense entailed in pressing off wheels to replace gears and the expense and the labor involved in applying new and removing old gears was evidently an important consideration which led to the introduction of a gear which should wear at least as long as any car wheel is liable to wear. It is claimed that "Titan" gears will outwear from three to five cut gears, that their teeth will not break out in ordinary usage, and that they will not work loose on the axle. One railroad man, whose line is operated under the severest conditions, and whose long experience should make him an authority on such matters, states that "Titan" gears will give from 300,000 to 500,000 miles' service, which is a longer distance than most car wheel manufacturers are willing to guarantee their wheels to run. The economy involved in an operation of this kind is at once apparent. It is not necessary to disturb the fit of wheels upon the axles, as the gear can be removed at a time when it is necessary to apply new wheels or a new axle. The operating department has, in addition to the saving of expense in removing a worn-out or broken gear and applying a new one, the satisfaction of keeping the car in continuous service for a much greater period.

The material of which these gears are made is manganese steel of such a hardness that it is incapable of being worked by

tool steel. All finished surfaces, such as the teeth and hub fit, are accurately ground to templates. Notwithstanding the hardness of the material, it is said that its toughness is so great that test pieces have been bent cold to an angle of 180 degrees without showing a fracture. In the process of manufacture the gear is cast solid, including the teeth, and a special machine grinds the periphery of the teeth to an accurate diameter. Each tooth is then ground at the hub fit and faced both sides. A gray iron or soft steel hub is then inserted under a pressure of from 35 to 45 pounds per square inch. This is then bored out to the proper size for forcing upon the axle. It is unnecessary to use key-ways, as the gears are supposed to be forced on with a pressure of from 30,000 to 35,000 pounds per square inch, and it is stated that none has ever come loose on the axle.

"Titan" gears are standard upon the lines of the Public Service Corporation of New Jersey, where from 400 to 500 of them are in use, and an order for 425 is now being filled for the Boston Elevated. In addition to this the company is doing business with some 40 or 50 roads throughout the country and the records of service obtained indicate that these gears wear five times as long as ordinary gears.

Engineers Report on Safety of Battery Tunnel.

William Barclay Parsons, consulting engineer, and George H. Pegram, chief engineer, of the Rapid Transit Subway Construction Company of New York, have written to President Shonts of the Interborough-Metropolitan Company that the tunnel from the Battery to Joralemon street, Brooklyn, when completed, would be safe and stable. On account of the use of piles under a part of the tunnel near the Brooklyn shore, it has been reported that the tunnel was constructively weak. Mr. Parsons' letter said:

"In reply to your letter of May 29 I beg leave to advise you that, in my judgment, when the tunnels from South Ferry to Brooklyn are completed, they will be entirely safe for the passage of trains." Mr. Pegram wrote: "The anonymous statements that have appeared lately in the daily press questioning the strength and safety of the East river tunnel between the Battery and Brooklyn are calculated to induce an unwarranted distrust. This work has been under the direction and inspection of the engineers of the rapid transit commission from the start, and the answers that have been given to the criticisms would seem adequate. I desire, however, to state that, in my opinion, the work, when completed according to the plans which have been adopted from time to time to meet unexpected contingencies, will be safe and stable beyond question."

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A prominent engineer has suggested the feasibility of improving the load factor of electric railway power plants by the sale of current for use in pumping stations. Inasmuch as some interurban companies during the past two years have derived substantial revenues and bettered their load curves by the sale of 500-volt current to farmers for lighting and power purposes, there would seem to be a possibility in this suggestion worthy of some consideration. If, for example, an interurban line has on its route a number of small towns or villages, each with its own pumping plant and standpipe, the conditions are, indeed, favorable for considering the sale of power. It is suggested that instead of the usual steam pump with its irregularly operated and therefore inefficient boiler plant and steam pump, there could be substituted a pressure pump driven by an electric motor connected through a centrifugal clutch, the clutch to be thrown in during the period of light load at the power station. With a number of such installations taking their current from the railway power feeders and each pumping into an elevated tank or a standpipe as ordinarily used in small city water systems, the load factor could be well regulated. The sale of current generated under such conditions could be made at a comparatively low cost to the consumer, and therefore the advantages would be mutual.

Some two years ago, recognizing the clamor of the popular press, the Union Elevated Railroad, Chicago, removed all advertisements from its loop platforms. These since have been replaced, but it is to be noted that in their replacement care has been taken to provide the mounting of all advertisements with a view to uniformity and also, if it can so be considered, with an artistic effect. This experience and its results were no doubt realized by those who had in hand the designing of station details for the new Ravenswood extension of the Northwestern Elevated Railroad, which now affords a much welcomed express service for residents of the northwestern part of the city of Chicago.

It is remarked that particular attention has been given toward facilitating the placing of advertising posters on station platforms of the new structure without the usual encumbrances, such as loose boards or insecurely fastened pieces of sheet iron. To accomplish this commendable detail and refinement in the construction, the platform railings were built with uniform sheet-iron panels about two and a half by three and a half feet in size. This is a size suitable for receiving standard advertising posters. To stiffen these poster panels an ornamental border of pressed steel surrounds the panel. Such details may seem trifling, but are they not to be considered of value if, as others have shown, they relieve a railroad organization from being held up for public criticism? As one manager has sagely remarked, "It would be nice to refuse advertising in our cars and on our stations, and yet get the money, but we can't get the money without the advertising, and we need it."

Probably no electric railway in this country operating under similar conditions has had more thought given to its detail design as regards operation than has the Philadelphia & Western. The constructional details of this new road were described and illustrated in the issue of the Electric Railway Review for June 15, 1907, page 770. At this time it is desired to call special attention to the arrangement of tracks at waystations. It will be remembered that the Philadelphia & Western is a double-track line from terminal to terminal. To provide for additional track space at waystations the track centers are spread and a third track is interposed between the east and west bound platforms and for a distance of about three hundred feet either way from their mid-point. One end of this third track connects with one of the two main tracks and the other end with the second main track. This arrangement might briefly be described as a long cross-over that passes close by one loading platform. The layout has obvious advantages. A train may come from one terminal, unload its passengers in the usual way, run on to the switch, where the crew could

change ends, then run back on the center track to load for a return trip and pass out to the main track for a return trip to the starting terminal, and by the nature of the track layout perform all these movements with the least possible shunting. In suburban service for a metropolis the third track becomes of especial value, since it is there desired to operate both locals and expresses, turning the locals at various waystations and thus permitting the expresses to handle in a more economical and satisfactory way the traffic of outlying districts. These long cross-overs are also available as passing tracks on which to hold locals for meets with the superior expresses operating in the same direction. When not required for any of these uses the third track is available, and at a comparatively low first cost, for storage purposes. In fact, there are any number of commendable features to substantiate the views of the designers of this roadway, and it is safe to say that no one will realize the desirable features of these long cross-overs more than the superintendent of transportation and his dispatchers.

While the public utility bill which has been passed by the lower house of the Wisconsin legislature has no application to

**Public
Utility Law
in Wisconsin.**

electric railways, it is nevertheless of interest because of the provision that a franchise which is granted hereafter shall have the effect of an indeterminate permit, subject to the provisions of the act. The acceptance of such a permit constitutes an agreement that the municipality in which the major part of the public service property is situated may purchase such property, paying therefor its then value as determined by the state railroad commission and according to the terms and conditions fixed by the commission. The bill applies to corporations as well as to municipalities which own or operate telephone, heat, light, water or power plants for public use. There was no need to mention electric railways on account of the provision in the original railroad commission law giving the commission control over interurban lines, and because there is now a separate bill before the legislature, which, if it becomes a law, will vest power in the commission respecting electric lines which are situated wholly within the limits of municipalities.

The operation of machinery at inefficient loads is a very frequent defect in power plant service. The problem in a railway plant is a matter of striving to attain the ideal—but there is not the least doubt of the importance of knowing that the employes have done their best. Old as the load curve is, it is used far too seldom as a daily method

of analysis in connection with a log of the engine and generator duty, and in relation to the banking of boilers, operation of small feed pumps at times of light output, and the running of large compound duplex outfits when the boilers are forced. The carbon dioxide recorder is not yet appreciated at its full worth, nor is the value of the thermometer in the various piping sections sufficiently recognized. The draft gauge, the revolution counter on the fan engine, and even the pyrometer in the boiler furnace are slow in coming into general use. The saving in operating motor-driven exciters on generator voltage without transformers does not seem to have entered the minds of some designers, nor does the immediate connection between a poorly insulated superheated steam pipe and the coal pile always seem to be realized by operating men. The handling of coal between the barge or the car and the boiler grate is many times carried out in inefficient ways, and the possibilities and advantages of mechanical conveying and stoking systems are none too well recognized. The reduction of maintenance by making repairs at the proper time and by correct operating judgment in routine service is a point of attack in too few installations.

The whole question of power plant economy may well be considered as a specialty to be studied constantly by an expert on a large system, for large expenses offer greater opportunities to make conspicuous savings than do the smaller items of secondary importance.

THE ATLANTIC CITY CONVENTION.

The annual conventions of the Master Car Builders' and American Railway Master Mechanics' associations have been held at Atlantic City during the past two weeks. These conventions have a certain timely interest for readers of the *Electric Railway Review* because of the fact that the convention of the American Street and Interurban Railway Association and the affiliated associations is to be held at the same place and under practically identical conditions in October of this year.

Atlantic City has been chosen as the place for the 1907 convention by a joint committee representing the American association and the Manufacturers' association after a careful investigation. On account of the natural attractiveness of America's premier seaside resort and because of its excellent facilities for convention purposes, Atlantic City has always proved a popular place for conventions. This characteristic and the special arrangements made this year for handling the manufacturers' exhibits—always a most important feature of a convention—should add to the success of the occasion.

In choosing the convention city three points must be considered as of the highest importance: there must be adequate hotel accommodations of the first class, a sufficient space for the manufacturers' exhibits and suitable assembly rooms in which to hold the meetings of the several associations.

Atlantic City is especially suited to fulfill these requirements. In regard to hotel rooms the choice is almost unlimited, and there is no fear of a repetition of the somewhat crowded conditions at Columbus last fall, practically the only cause for criticism at that convention. Atlantic City can easily provide at least 3,000 rooms in the large hotels fronting on the ocean beach, with from 1,200 to 1,500 private baths, besides an almost unlimited number of rooms in first-class hotels not fronting on the beach, many of which are provided with private baths.

Atlantic City is also fortunately situated in regard to exhibit space for members of the Manufacturers' association. The exhibits will be located on the Steel Pier, within a few minutes' walk from the various beach hotels. Reference to the illustrations from photographs of exhibits at the steam railway conventions just concluded, which are presented in another part of this issue, will serve to show the arrangement and general appearance of the exhibits, as it is understood that the same general plan of handling the exhibits will be used for the October conventions. The plan of uniform booths has been employed here for the first time.

A large convention hall with a seating capacity of 800 will be provided on the Steel Pier for the opening meeting of the American association, and smaller meeting rooms will be provided for the various sectional meetings of the allied associations.

The Columbus convention last fall, following the reorganization meeting at Philadelphia in September, 1905, was unanimously considered the most successful in all respects ever held by the street railway association, both from the delegates' and the manufacturers' points of view, and the 1907 convention promises to surpass even that successful meeting. An examination of the attendance figures of the conventions of the American Street Railway Association for the past few years reveals a general increase which augurs well for the coming meetings. The total registration at Columbus was about 2,400, as compared with 1,958 at Philadelphia in 1905, 1,538 at St. Louis in 1904 and 1,584 at Detroit in 1902. The number of delegates from member companies at Columbus

was 666, as compared with 482 at Philadelphia, 456 at Detroit and 498 at New York in 1901. The greater part of the increase, however, was in the number of representatives of manufacturers—1,253 at Columbus, as against 939 at Philadelphia and 796 at Detroit—although the number of exhibitors fell from 243 in 1905 to 195 in 1906. The electric railway business is growing rapidly and the association, guided by some of the strongest men in that business, is growing with it. This general increase in attendance, coupled with the fact that Atlantic City is in itself by far the most attractive of the cities thus far chosen, indicates a most successful convention.

PROFIT IN FREIGHT HANDLING.

In the upbuilding of freight traffic some electric railways which have terminals on the great lakes or other bodies of water which are navigated have found it advantageous to arrange through traffic schedules with steamship lines. Such arrangements have been in force for several years between the Goodrich Transit Company, operating several steamship lines on Lake Michigan, and the Grand Rapids Grand Haven & Muskegon Railway, and between the Graham & Morton Transportation Company and the Grand Rapids Holland & Chicago Railway. These arrangements permit the transportation of freight and passengers between Chicago and Grand Rapids and surrounding points in Michigan on through rates. Attention is called to this subject again by the announcement of traffic agreements between the Graham & Morton company and the Southern Michigan Railway, the Chicago South Bend & Northern Indiana Railway and the Winona Interurban Railway. By this latter arrangement traffic will be carried from Chicago to St. Joseph, Mich., by boat, and will be transferred at that point to the electric line. With the connections named the traffic can be hauled as far as Warsaw, Ind., and also to South Bend and other good traffic centers. The advantage of this route to passengers will lie in an attractive interurban and boat ride, while freight should be delivered with promptness. This, of course, is interstate business and, under the law, the freight and passenger tariffs must be filed with the interstate commerce commission.

The new arrangement which is mentioned in the foregoing derives additional importance from the increasing mileage and future connections of some of the electric railways concerned. The Winona Interurban company will soon have in operation a new division which will connect at Peru with the Indiana Union Traction Company and the Ft. Wayne & Wabash Valley Traction Company. With the Indiana Union a direct route will be afforded from South Bend to Indianapolis, shorter than any steam railway line between those places. The Winona company is also building a direct line from Warsaw to Ft. Wayne. From the latter point the Lima & Toledo Traction Company affords a through route to Lima, and the facilities of the two companies will constitute as direct a line from Warsaw to Lima as obtained by any existing steam railway. The Toledo & Chicago Interurban Railway has under active construction the Ft. Wayne-Kendallville extension, which will connect at Goshen with the Chicago South Bend & Northern Indiana Railway. The completion of these roads will add to the business of the connecting lines.

Contracts for handling freight on traffic agreements with other lines are very inviting to electric railways at this time. Owing to the attacks on their policies and rates, steam railways have been hampered in borrowing money on reasonable interest terms and are therefore not vigorously prosecuting improvements or enlarging facilities. Yet traffic is not diminishing, and there is an abundance of business for all the transportation facilities offered. In view of these traffic conditions and the industrial activity which prevails, the introduction of freight service on electric railways is wise wherever business can be obtained in sufficient volume and

handled on a margin of profit wide enough to leave no room to doubt the essential fact that it affords adequate income.

On this question of determining the profitability of the service rendered each line must make its own decision, but the problem is serious enough to justify reiteration of the truth that only complete analysis of the entire cost of handling freight will determine whether the business is paying its proper return or is conducted at a loss. In order to save possible disappointment in the ultimate results, such an inquiry should be made before a traffic agreement is entered into. If a traffic agreement has been closed, the terms on which it is based should receive the keenest analysis.

To the true cost of freight service all of the expenses which pertain to the operation and maintenance of the property belong in some degree. The actual cost in expenditure of money for the service rendered, the expense of conducting transportation, should first be ascertained. It is not fair to the property to assume a profit because the gross revenue from freight service greatly exceeds the cost of operating the cars from day to day. Other expenses which are ascertainable only by analysis may be either excessive or so large as to destroy the margin of seeming profit. It is necessary to allow for maintenance of equipment and of way and structures. Allowance is essential for all needed repairs, as well as renewals and adequate provisions for depreciation, and, if a limited franchise is held at any point, for amortization of the investment. A fair proportion of general expenses should be charged to the freight business. It may appear to many that stress upon these points is unnecessary, but there is an understanding in some quarters that looseness in accounting for freight operations is more common than is supposed; and therefore attention is directed to the advisability of careful consideration of every detail of expense which in any way, however slight, can add to the cost of freight service. While added labor and responsibility may make some employes more efficient, others may do the extra work only by sacrificing the excellence of that on which they were previously engaged. The item of terminal expense, for instance, is one which may easily grow in undue proportion to the value of the traffic handled.

Evolution in the ways of doing business, combined with the new prosperity of farmers, gives electric railways openings for freight handling which did not exist a few years ago. There is every indication that this freight traffic will grow as it should, provided it is so conducted as to yield a profit, and not to interfere with desirable passenger business.

Blast Furnace Slag in Reinforced Concrete.

Does blast furnace slag used in concrete have an injurious effect on the steel rods used as reinforcement? In answering this question, Sanford E. Thompson says: "The only ingredients in slag which might affect the reinforcing steel in concrete are the compounds of sulphur which may occur in it. The amount of sulphur in slag is variable, but analyses show that ordinarily it contains but a very small percentage, less, in fact, than cinders. Experiments by Professor Norton prove conclusively that sulphur in cinders cannot affect the steel if the concrete is of ordinary richness and laid wet, so that the mortar will coat the steel and produce a dense concrete. We may therefore draw the conclusion that sulphur in ordinary slag will not affect the steel."—Concrete Review.

The Detroit United Railway Company has had a substantial increase in its suburban freight and express business during the past year, as shown in a statement filed with the city treasurer at Detroit. This shows that between May 1, 1906, and April 30, 1907, the company operated 13,872 cars over the different lines as follows: Detroit United Railway, 7,260; Rapid Railway, 2,150; Detroit Ypsilanti Ann Arbor & Jackson Railway, 2,010; and Detroit Monroe & Toledo Short Line Railway, 2,292. The total for the year previous was 11,902 and for the year prior to that 10,282.

CONCRETE SHOPS FOR SEATTLE ELECTRIC RAILWAY.

The Stone & Webster Engineering Corporation, Boston, Mass., has just completed the erection of an interesting group of concrete shop buildings for the Seattle Electric Company. The new shops are at Georgetown, Wash., a

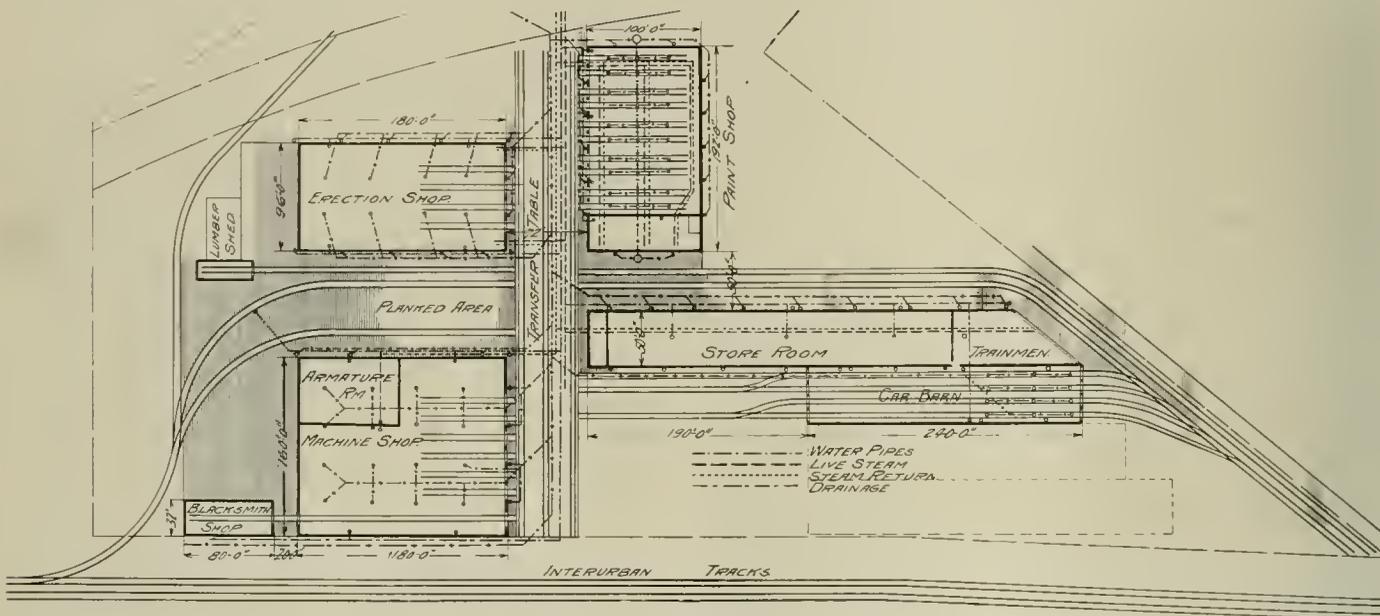
will be noted that the interurban tracks of the Puget Sound Electric Railway, also a Stone & Webster property, as well as the tracks of the Seattle Electric Company, pass the new buildings.

Machine Shop.

The machine shop is 160 by 180 feet in floor area and



New Shops at Seattle—General View of Buildings During Construction—Store Room at the Left, Paint Shop at the Center, Erection Shop at the Right.



New Shops at Seattle—Ground Plan of Shop Yards, Showing Arrangement of Buildings Along Transfer Table.



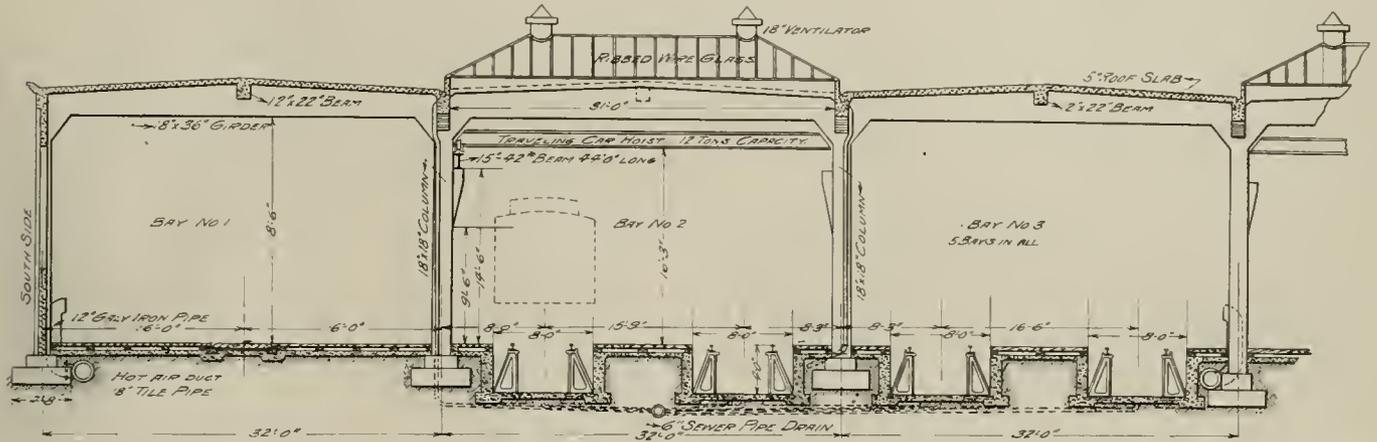
New Shops at Seattle—Exterior of Machine Shop Showing General Type of Buildings.

suburb of Seattle. All of the buildings are of concrete construction throughout. Those now built include a machine shop, erection shop, paint shop, storeroom, trainmen's quarters and a car barn. The arrangement of these buildings with reference to each other and to the transfer table which serves them is shown in an accompanying illustration. It

includes in this space an armature room 80 by 64 feet. The entire building comprises five bays separated by the 18-inch square columns that support the roof. The three center bays are provided for half their distance from the front of the building with repair pits under six tracks. Each pit has a motor-driven screw-operated car hoist. The pits are also pro-

vided with hydraulic motor-jacks mounted on trucks running on a track built in the floor of the pit. The cross-sectional view through the machine shop will serve to outline the general dimensions of the structure. The track in the center of bay No. 1 leads from the transfer table in front, through the

different parts of this building and the near-by erection and blacksmith shops are provided by an overhead Coburn trolley carrier. This economical method of handling materials between shops and between different parts of one building is also to be used elsewhere in this shop layout. The supports



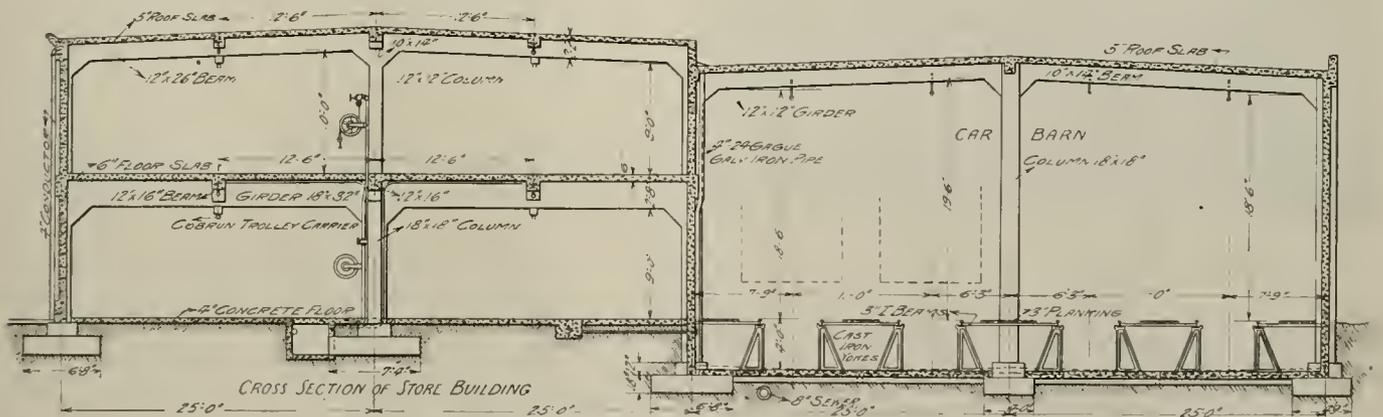
New Shops at Seattle—Cross Section Through Three Bays of Machine Shop, Showing Pit Tracks with Traveling Car Hoist Above.



New Shops at Seattle—Interior of Inspection Shop, Showing Open Pit with Rails Supported on Cast-Iron Yokes.



New Shops at Seattle—Interior of First Floor of Store Room, Showing Massive Concrete Construction.



New Shops at Seattle—Section Through Stores Building and Inspection Shop.

machine shop, to the blacksmith shop in a separate building at the rear.

The armature room is set off from the machine shop proper by concrete partition walls. Separate rooms are also provided in the machine shop building for the heating plant, toolrooms and an office. Facilities for handling work between

for the carriers are shown in the sectional views of the shops.

Erection Shop.

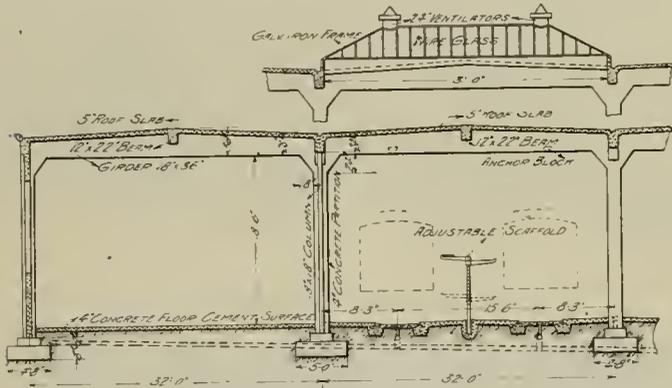
The erection shop is a building 96 feet by 180 feet, having a pattern gallery 20 feet wide across the rear end. Four tracks from the transfer table pit extend 90 feet into the

front of this building. One of these tracks is provided with a repair pit. An office also is provided for the foreman and accommodations are given the workmen in the form of locker and toilet rooms.

The floors in both the machine and erection shops will be of wood supported on stringers resting on a 4-inch concrete subfoundation.

Paint Shop.

The paint shop is a building 100 by 196 feet, into which extend 10 tracks reaching to the rear wall of the building.



New Shops at Seattle—Cross Section Through Finishing Department and One Bay of Paint Shop.

At one end of the building is set off a room 32 feet wide, mainly occupied for finishing work. In one end of this finishing room are found a laboratory, mixing room, paint store-room, locker room and lavatory. A section through two bays of the paint shop shows the arrangement of tracks and adjustable scaffold for painters' use. There also is shown in



New Shops at Seattle—View of Incompleted Interior of Machine Shop, Showing Sunken Floor over Which Will Be Placed Repair Tracks.

this section one of the skylights with which each of the entire group of shop buildings is plentifully supplied.

Store Building, Car Barn and Trainmen's Quarters.

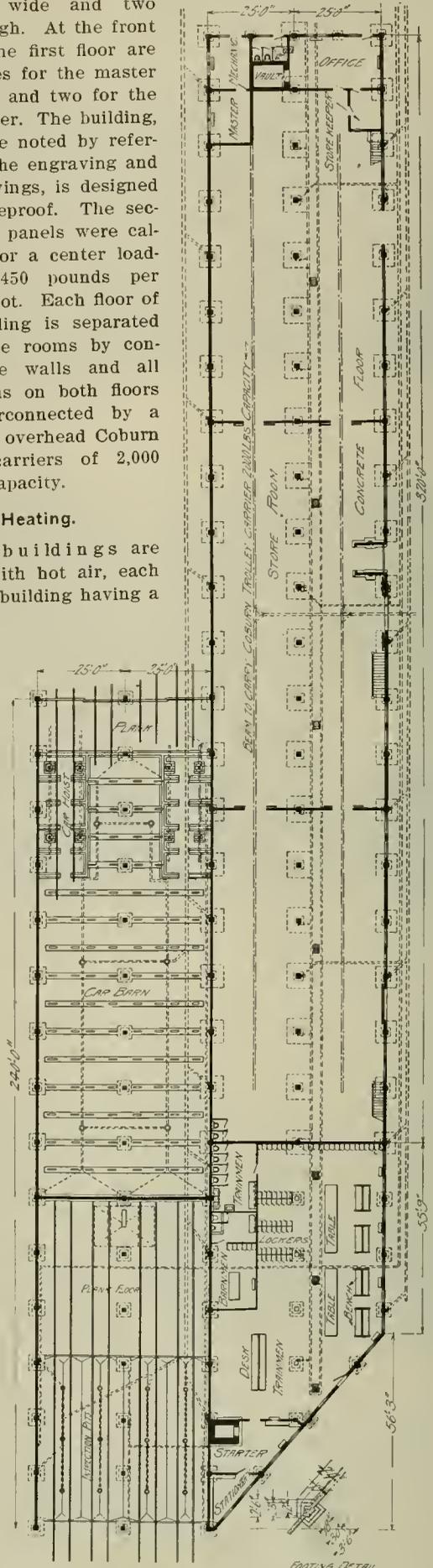
The storehouse, trainmen's quarters and inspection barn are built with division walls in common and arranged as shown in an accompanying illustration. The inspection and car barn is 240 feet long by 50 feet wide and has four tracks extending through it, connecting at one end with the transfer table and at the other with direct leads to the tracks in the streets. The ground adjacent to the present car barn building is sufficient to permit of an addition that will bring the total storage capacity up to 120 cars.

The trainmen's quarters comprise a general room fitted with desk, tables and benches, a locker room, toilet rooms

for barnmen and trainmen, an office for the car starter and a stationery room. The storeroom building is 320 feet long by 50 feet wide and two stories high. At the front end on the first floor are two offices for the master mechanic and two for the storekeeper. The building, as will be noted by reference to the engraving and line drawings, is designed to be fireproof. The second floor panels were calculated for a center loading of 450 pounds per square foot. Each floor of the building is separated into three rooms by concrete fire walls and all the rooms on both floors are interconnected by a system of overhead Coburn trolley carriers of 2,000 pounds capacity.

Heating.

The buildings are heated with hot air, each separate building having a



New Shops at Seattle—Floor Plan of Inspection Barns, Stores Building and Trainmen's Quarters.

motor-driven fan, steam coils and a system of under-the-floor air pipes. The steam for use in heating is obtained from a new 11,000-kilowatt capacity turbine station that has just been erected near the shop buildings.

NEW SUBSTATION FOR THE SCHENECTADY RAILWAY COMPANY.

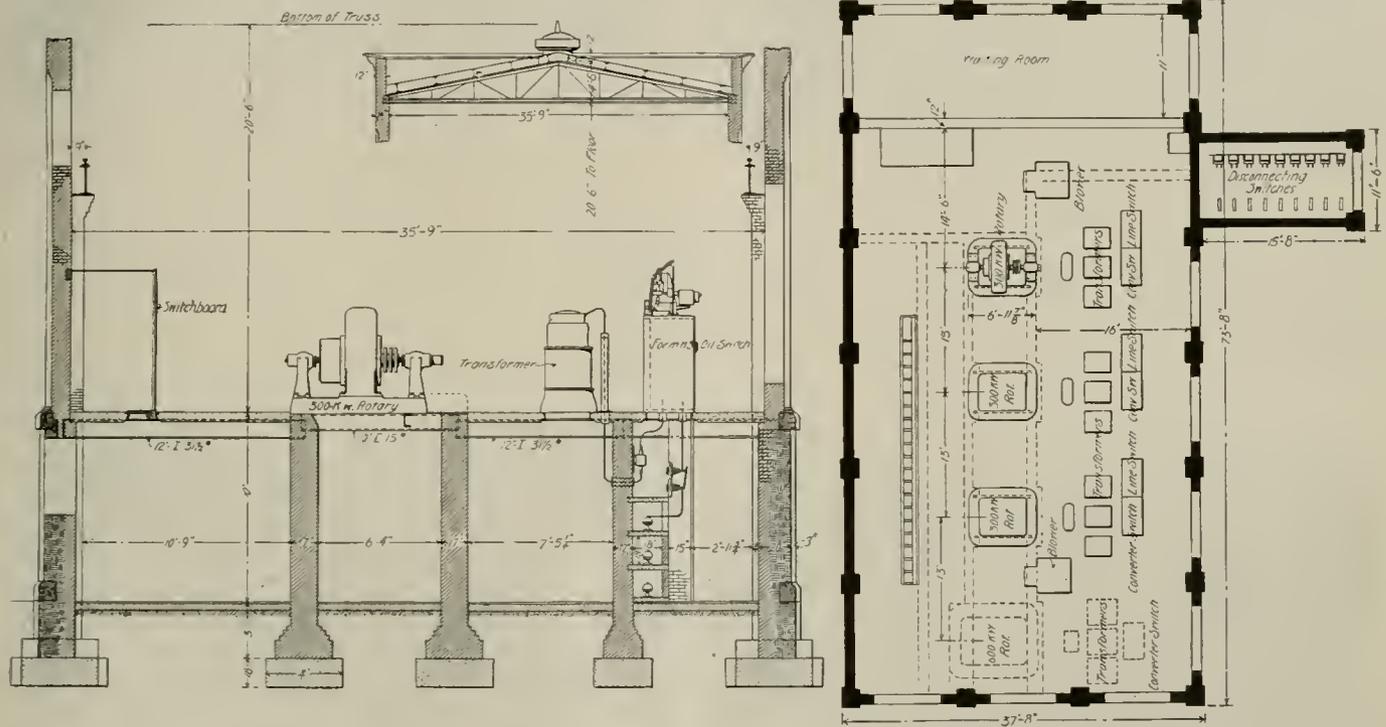
The Schenectady Railway Company is about to replace its frame substation at Karners, between Schenectady and Albany, N. Y., with a new fireproof station of stone, brick and steel construction. The front portion of the new building will be a waiting room.

To provide attractive grounds the company has purchased additional property and now has a lot with a frontage of 225 feet and a depth of 150 feet. The new substation will be placed in the center of this plot and a branch from the

at Karners. To provide power in case of a breakdown on this line a second 10,000-volt line supplies the Karners substation from the substation at Mechanicsville. The 10,000-volt current will be connected with the busbars in the Karners station through form-H oil-break line switches.

The three-phase alternating current delivered to this system has a frequency of 40 cycles. The busbar compartment will be on one side of the building in a brick-enclosed room 53 feet 2 inches long. The lightning arresters and connecting switches will be located in a special tower 11 feet 6 inches wide by 15 feet 8 inches long, separated from the remainder of the building by 20-inch walls. The lightning arresters will be of the General Electric type.

The step-down transformers will supply alternating current at 325 volts to the 300-kilowatt machines, and the rotaries will convert to 650 volts direct current for railway purposes. The switchboard will have 14 panels and will be equipped with



New Schenectady Railway Substation at Karners—Floor Plan and Section.

main line will be built to pass through the waiting room section. The present frame substation building, which is of the Queen Anne style of architecture, will be moved to the back of the new property and will be leased to the employees of the company for a home. It is planned to lay the grounds out in an attractive design and to make the Karners station a feature of interest to passengers.

The new building will be 73 feet 8 inches long and 57 feet 8 inches wide with basement and waiting room floor at ground level. The rotary converters and transformers will therefore be above on the first floor level. The foundation walls of the building will be of stone 20 inches thick to the height of 9 feet above the ground. The pilasters will be of brick spaced 12 feet apart, center to center, and will rest on stone and concrete foundations.

The equipment of the substation will be increased by the addition of three new rotaries and will consist of four 300-kilowatt machines fed from a bank of 10,000-volt air-cooled transformers. The Schenectady Railway Company secures its power from the General Electric Company through one of two duplicate 10,000-volt high-tension lines which enter the Dock street substation at Schenectady through underground ducts. From the Dock street station the 10,000-volt line is continued underground within the city limits and on a high-tension pole line beyond the city limits to the substation

automatic relays for throwing the switches in the 10,000-volt lines and with General Electric circuit-breakers for the direct current.

An accompanying plan shows the arrangement of the rotaries. The station will be provided with air compressors to supply air for cleaning and blowing out the machinery. The station will be equipped with a storage battery to provide lighting in case of a shut-down of the plant and to operate the remote-control switches. The machinery will be served by a hand-operated traveling crane.

In a paper by an English author, on "Notes on the Application of Induced Draft," reference was made to one case in particular of five boilers fitted with steam jets, which resulted in a coal consumption of 27.3 pounds of coal per square foot of grate, the evaporation from and at 212 degrees being 9.8 pounds of water per pound of coal, with a temperature of the economizer water of 166 degrees. With induced draft the results obtained were as follows: Coal consumption per square foot of grate, 25.4 pounds; evaporation of water, 10.2 pounds per pound of coal; and temperature of economizer water, 259 degrees. Taking measurements of the electrical output of the plant, it was found that, using the steam jets, for each unit generated, 3.6 pounds of coal and 30 pounds of water were consumed. With induced draft the results were 3.1 pounds of coal and 28 pounds of water per unit of current. In this case 1,800 gallons of water were simply evaporated for use by the steam jets. The net saving in this case worked out at 14½ per cent.

RAVENSWOOD EXTENSION OF THE NORTHWESTERN ELEVATED RAILROAD.

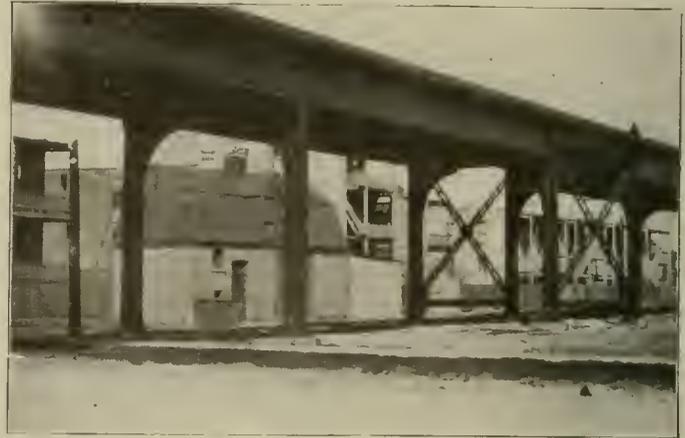
On May 18, 1907, the Northwestern Elevated Railroad Company began operating trains to Ravenswood, one of the northern suburbs of Chicago. This service was made possible by the completion of a new elevated structure connecting

pansion bent is provided between towers. The tracks of the Chicago & Northwestern Railway and also those of the Chicago Milwaukee & St. Paul Railway are crossed on 80-foot through girder spans, supporting the elevated tracks 33 feet above those of the steam roads.

The maximum grade of the tracks is $1\frac{1}{2}$ per cent, which



Ravenswood Extension of the Northwestern Elevated—Plate Girder Through Span over Chicago Milwaukee & St. Paul Railway.



Ravenswood Extension of the Northwestern Elevated—Standard Construction Showing Longitudinal Bracing.

with the original line at Clark and Roscoe streets in Chicago and extending west $3\frac{1}{2}$ miles, to join there a new surface line $1\frac{1}{2}$ miles long terminating in Ravenswood. Both local and express service are given.

Details of Steelwork.

The new structure supports two tracks throughout its

occurs at the crossing over the Chicago & Northwestern tracks.

About 8,800 tons of open-hearth bridge steel were used. It was specified that this material should have an ultimate tensile strength of 28 to 32 tons, and an elastic limit of not less than 16.5 tons per square inch. The steel was first given a shop coat of Lowe Brothers red lead lute paint and then



Ravenswood Extension of the Northwestern Elevated—View of Clark Street Junction.



Ravenswood Extension of the Northwestern Elevated—View Under Structure, Showing Slight Obstruction to Light and Air.

length and is designed to carry a third track, about 1,500 feet long, for storing cars near Western avenue. The spans comprise deck plate girders, 40 feet long, supported on built-up columns, anchored to concrete footings. The structure, averaging 20 feet high to the base of rail, is braced every fourth span by towers having longitudinal cross-ties. An ex-

a field coat of the Northwestern Elevated standard first coat, which is a mixture of Prince's mineral graphite and red lead ground in raw linseed oil, the latter coat having been applied when the work was in position.

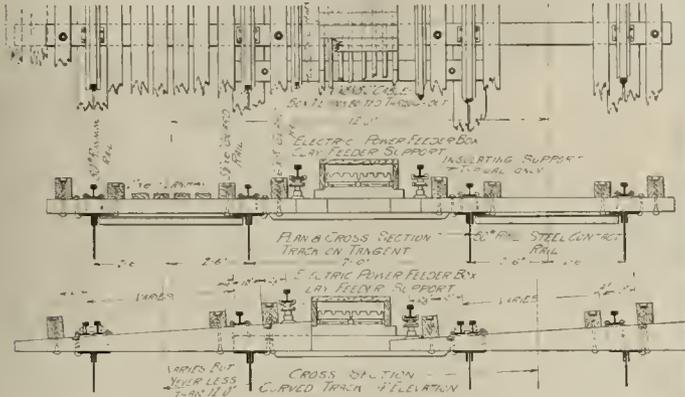
Track Construction.

The rails are laid on ties of long-leaf yellow pine. Both

inner and outer guard rails are provided for each track, being 5½ by 5 inches and 6 by 8 inches in section, respectively. The rails used are of standard 80-pound section, 60 feet long on tangents and 30 feet long on curves. Two 500,000-circular mil bonds are used at each joint. "Continuous" joints are used except on the inner rail of curves, where sheared angle bars and filler blocks support the joints. The rails are

to the ties by bolts passing through the fishplates and tie-plates.

A special detail is exhibited in the construction of the special track work at the Clark street junction. Since the angle of intersection was too small for the usual type of frog,



Ravenswood Extension of the Northwestern Elevated—Plan and Section of Track on Tangent and Curves.



Ravenswood Extension of the Northwestern Elevated—View of Station Platform.

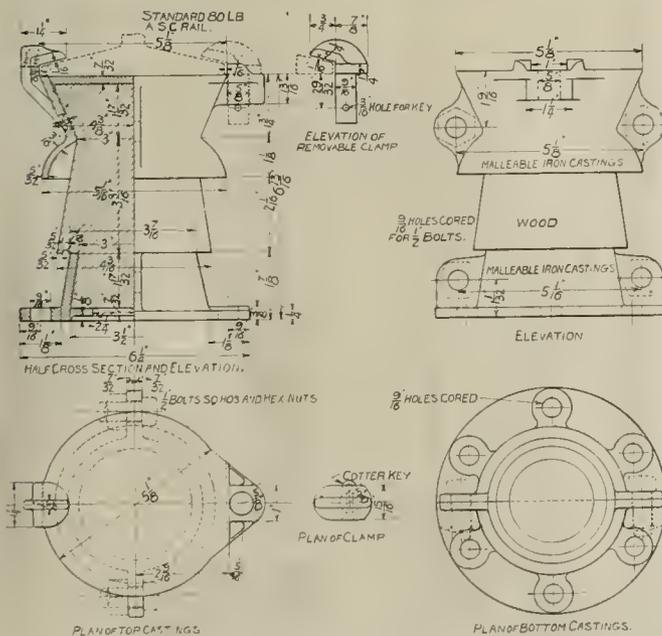
fastened to the ties by specially designed screw spikes with cold-rolled threads. Details of the standard track construction on the tangents and on curves are illustrated herewith. As will be noted, the guard rails are fastened to the ties by screw spikes and the ties are secured to the structure by through hook bolts.

the switches are all provided with movable frogs. All the special track work was furnished by the Morden Frog & Crossing Works, Chicago, Ill., in accordance with designs furnished by the company. The sharpest curves are 400 feet radius and the maximum superelevation of the outer rail is 4 inches.

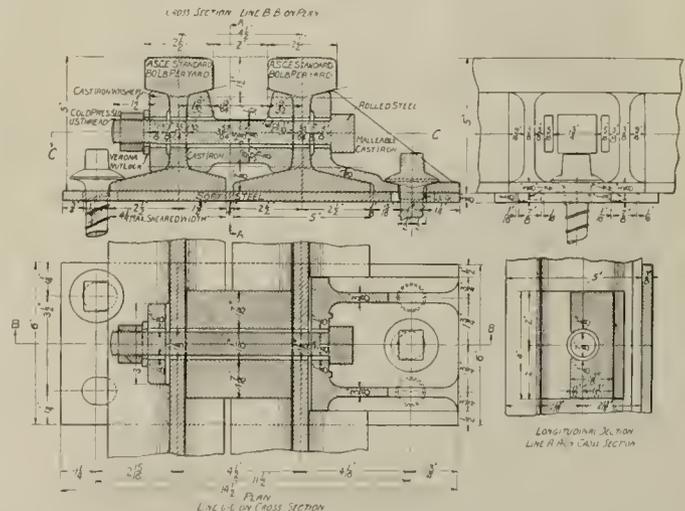
Since much difficulty has been experienced with the stand-

Details of Electrical Work.

An interesting detail which is illustrated in one of the accompanying drawings is the form of insulator employed for the third rail. This insulator, which was designed and patented by F. J. Guernesey of the Northwestern Elevated,



Ravenswood Extension of the Northwestern Elevated—Details of Third-Rail Insulators.



Ravenswood Extension of the Northwestern Elevated—Details of Guard Rail Construction.

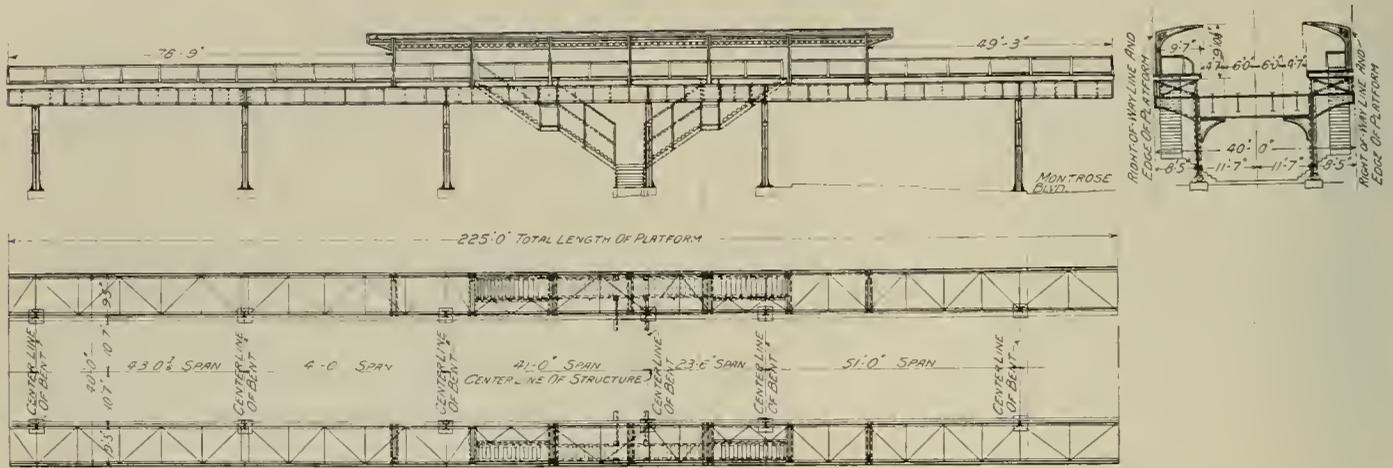
ard form of screw spike with a square head, the engineers of the Northwestern Elevated have adopted a screw spike of their own design. Heretofore the head of a spike would become worn, rendering it difficult to tighten, as the wrench would slip around on the head. To obviate this trouble the head is made oblong in shape, so that the wrench must always be put on in one position. This prevents the head becoming worn.

combines simplicity with a low first cost. The insulator is composed of four malleable iron castings and a hard maple pin thoroughly hoiled in paraffin. The iron castings are bolted together around the insulating pin and the third rail is bolted to the top castings by two hook bolts fitted with split pins. These insulators have been found thoroughly satisfactory and are considerably cheaper and less liable to damage than the earlier types used for this service. In tests made by the engineers of the elevated company, an insulator, after soaking in water for 24 hours, withstood a potential of 5,000 volts.

A feature in the construction of the guard rails on curves, which is worthy of particular note, is the securing of the rail

The third rail supported on these insulators is of standard 80-pound section. There are five supplementary feeders, each of 1,300,000 circular mils, at the beginning of the extension. Their cross section is gradually reduced toward the end of the line to two 1,500,000-circular mil lead-covered cables, which serve the surface portion of the road. The

platforms, which are supported by cantilevers, riveted to the columns supporting the structure, are shown in one of the accompanying illustrations. The cut also shows the construction of the awning roof, which is made entirely of steel. As will be seen, it is of the cantilever type, thus avoiding columns at the front of the platform, which might interfere with

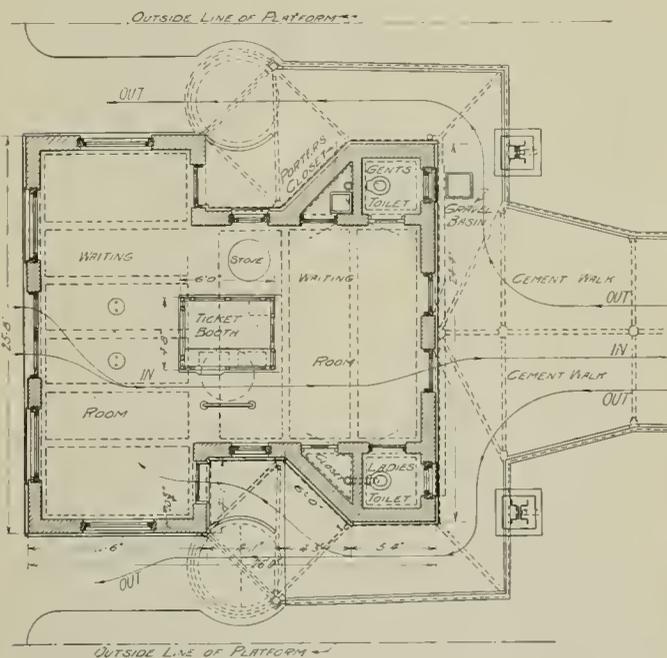


Ravenswood Extension of the Northwestern Elevated—Plan, Elevation and Section of Typical Station.

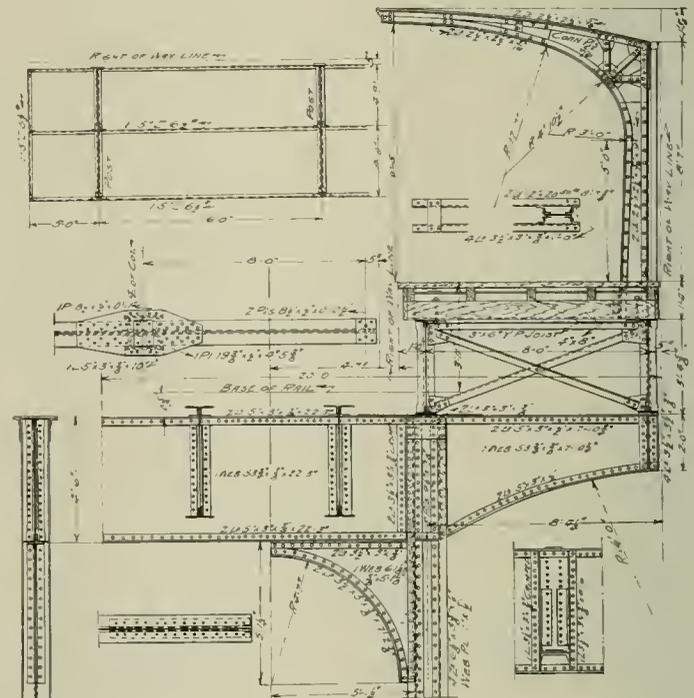
feeders on the elevated portion of the line are bare copper, carried on clay insulators furnished by the Brennan Electric Construction Company of Chicago, which firm furnished all the electrical supplies for the new work. The cables for the surface extension are inclosed in a wooden box, as shown in the drawing of the standard track cross section. All switches are operated by the Union Switch & Signal Company's electropneumatic interlocking system. It is ar-

the loading and unloading of trains. An interesting feature in the design of the awning is the backward slope of the roof and the placing of the gutter at the rear, thus preventing the overflow and drip from the gutters from falling on passengers boarding trains.

Particular attention has been given to facilitating the placing of advertising posters on the stations without encumbering



Ravenswood Extension of the Northwestern Elevated—Plan of Typical Station, Showing Method of Handling Passengers.



Ravenswood Extension of the Northwestern Elevated—Details of Construction of Station Platforms.

ranged so that the brakes will be applied on trains passing a signal set against it.

Elevated Stations.

Special attention has been given to the design of the stations for the new extension and a few of the many interesting details are illustrated herewith. The length of the standard platform is 225 feet, 97 feet of which is covered by an awning roof, as shown. The construction details of the

the station platforms with loose boards of various styles and sizes. The railings of the platforms and stairways have been specially designed with uniform sheet iron panels 2 feet 5/8 inches by 3 feet 7 inches, having an ornamental pressed steel border serving as a frame for a standard size of advertising poster. Between the advertising panels and posts are inserted three cast-iron posts and a small ornamented rosette, as shown in the illustration.

The general arrangement of the stairways is shown in

ELECTRIFICATION OF WEST SHORE RAILROAD BETWEEN UTICA AND SYRACUSE.

The official opening of the electrified section of the West Shore Railroad between Utica and Syracuse, N. Y., took place on June 15. A description of this construction appeared in the Electric Railway Review of November, 1906, page 911.

The work of this installation has been carried out by the Oneida Railway Company, a corporation identified with the so-called Andrews-Stanley syndicate, which syndicate in conjunction with the Vanderbilt-New York Central interests owns several electric traction properties in New York state, including the Utica & Mohawk Valley Railway, the Syracuse Rapid Transit Company, the Rochester Railway & Light Company and the Rochester & Eastern Rapid Railway, and also in conjunction with the Delaware & Hudson Company, the traction systems in the cities of Schenectady and Albany. The Oneida Railway Company entered into a contract with the New York Central under which the former agreed to lease the tracks of the West Shore Railroad between Utica and Syracuse, equip them for electric operation and conduct the passenger business between these two points.

The distance between the two cities is a little over 44 miles. It is proposed to give three classes of service over

The transmission towers used on the Oneida company's transmission line consist essentially of a square latticed structure composed of four angles. The distance between towers is 480 feet.

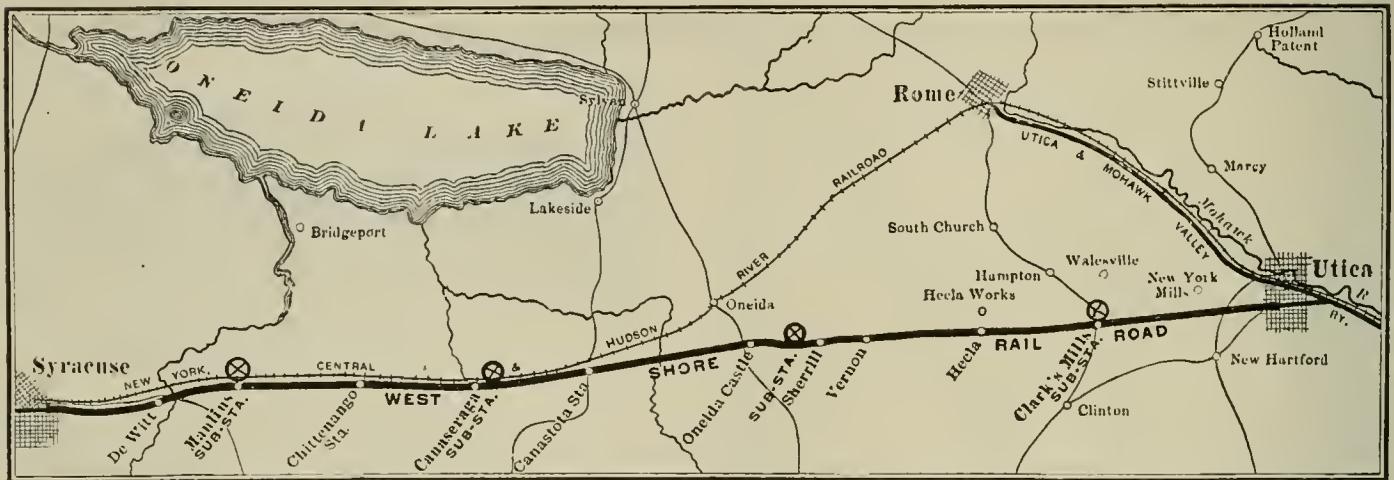
The insulators are of porcelain, were supplied by R. Thomas Sons & Co. of Lisbon, O., and are placed at the corners of a 7-foot triangle. A No. 0 seven-strand, hard-drawn copper cable is used for each conductor. This cable is strung on the towers with a sag of 12 feet for a 480-foot span, at 32 degrees F. This sag corresponds to a normal tension of 300 pounds in the cable. The use of lightning arresters is confined to the substations themselves.

Substations.

The four substations previously mentioned are of similar design. They are of brick with litholite trimmings, concrete roof and concrete floors. They are divided into two main compartments—at the rear the high-tension room and in front the converter room.

This being one of the first 60,000-volt installations in this section of the country, extreme care has been taken to give the necessary clearances on the high-tension side. The arrangement in general is a typical General Electric layout.

In the converter room are two units, consisting of one



West Shore Electrification—Map Showing Routes of New York Central and West Shore Tracks Between Syracuse and Utica.

the West Shore tracks between Syracuse and Utica. First—There will be the fast limited electric cars or trains which will run hourly between the two cities and will make two stops only, completing the run in 1 hour and 28 minutes. Twenty-eight minutes of this time will be taken on the local system at each end and one hour for the run between the two cities. Second—There will be the local trains or cars which are scheduled to make 24 miles per hour, and which will complete the run in 1 hour and 58 minutes. This service will be run hourly and the cars will make frequent stops at every highway if necessary. Third—There will be the steam service.

Power Transmission Lines.

Power for the operation of the line is purchased from the Hudson River Electric Power Company, which owns the hydraulic power plants at Spiers Falls and Mechanisville. This company is now extending its transmission line from its water-power plants to Utica and expects soon to be able to deliver electric power to those points at 60,000 volts.

At Clark's Mills substation current is taken by the Oneida Railway Company and is conducted to the three other substations over its own transmission line. There are four substations. The distance between the substations averages approximately 10.75 miles. The transmission line is carried into each substation and is there tapped to the busbars through disconnecting switches, then passes to the next substation.

330-kilowatt, 60,000-370-volt, oil-cooled transformer, Y-connected on the primary side and delta-connected on the secondary side, and one 300-kilowatt, 370-volt alternating-current and 600-volt direct-current rotary converter. Between the transformer and the rotary stands the reactance which is used for starting the rotary converters. This is the General Electric Company's latest method of starting rotary converters without synchronizing.

The converter room is provided with a heater system which is located in the west end of the building in an entirely separate room along with the toilet, lavatory conveniences and storage room for supplies. The building is of fireproof construction throughout.

Third Rail.

The third rail is of the bull-headed or double-headed type, of the same section as that adopted in the New York City zone of the New York Central Railroad, and is adapted for under-running contact. It was described in detail in the Electric Railway Review of November, 1906, page 911.

The insulators used for holding the third rail in the brackets were supplied by the Ohio Brass Company and are of semi-porcelain. Two sizes are used, one for holding the rail at the inclines where a shallower insulating block is required, the other for supporting the rail at other points. The insulators were required to pass severe tests.

In laying the third rail a space of about one-fourth inch is left at each joint for expansion and contraction. The in-

clines are of gray cast iron of the same quality as that specified for the third-rail brackets and are attached to the third rail by standard two-bolt splice plates. The standard incline used whenever the shoes have to take the incline at high speed is 7 feet in length. The inclines have a pitch of 1 in 44. Two types of protective covering are used, as on the New York Central, viz., a three-part wooden covering which originally was adopted, and a single-piece fiber covering which was manufactured by the Indurated Fiber Company and is

fishplate. There is one of these at each joint, and each bond is of No. 0000 capacity. The track is cross-bonded only at special work. Both rails are available for use for the return circuit.

Connections to Third Rail and Third-Rail Jumpers.

The connection between the direct-current busbars in the various substations and the third-rail system is made through several cables of 1,000,000-circular mil capacity, car-



West Shore Electrification—Passenger Rolling Stock.

considered preferable. Fiber covering is used between New York Mills and Clark's Mills, and would have been employed throughout if a sufficient quantity could have been secured in time for use on the entire installation.

Third-Rail Bonds.

The majority of the bonds on the third rail are the John A. Roebling's Sons Company's ribbon bond. These bonds are 15 inches in length over all and are soldered to the rail, one on each side of the upper head, and have a very large contact

ried in iron ducts 3 inches in diameter. The cable is insulated with 3/32-inch rubber and is lead-encased. The end of this duct at the track is brought up to 2 inches below the top of the track rail or 2.5 inches above the surface of the tie. Great care is taken to insulate and protect the cable at the point at which it emerges from the duct by taping and painting with insulating and waterproof paint.

At the substation end the connections to the east and west bound tracks are carried to separate panels on the switchboard so that electrically the east and west bound



West Shore Electrification—Under-Contact Third Rail as Installed.

surface per terminal. There also have been installed on a portion of this line about 3,000 Ohio Brass Company's ribbon soldered bonds and about 7,000 American Steel & Wire Company's twin terminal bonds. These bonds are of 500,000-circular-mil capacity each and are installed two per joint on the upper head of the third rail. The wood cover is cut away at all joints so as to allow the cover to go over the bond. The fiber cover has an enlarged section at these joints which allows for completely covering the bond.

Running-Rail Bonds.

The running rail is bonded with the Ohio Brass Company's 11-inch compressed terminal bond placed under the

tracks are kept entirely distinct except through the busbars.

Cars.

As the cars are to operate over the city systems in both Utica and Syracuse, a different type was adopted than if they were to use the West Shore tracks exclusively. The main dimensions follow: Length over end panels, 40 feet; over crown pieces and vestibules, 48 feet; width over sills, including sheathing, 8 feet 4 inches by 8¾ inches; end sills, 6 inches by 8 inches; sill plates, ¾ inch by 15 inches; thickness of corner posts, 4½ inches; thickness of side posts, 2¾ inches and 4¾ inches; centers of posts, 2 feet 9 inches.

The bottom framing consists of two intermediate and two

center sills, composed of 6-inch I-beams, extending under the vestibules, with malleable iron caps and supports for main truss rods; the latter are 1½ inches in diameter. The interiors are of inlaid mahogany, which includes the doors; the ceilings are full Empire decorated. The floor is covered with interlocking elastic tile, while a rubber mat is furnished for each vestibule. Storm sashes are furnished for the side windows, which replace window guards in winter. The cars are equipped with 24 reversible and two stationary plush seats



West Shore Electrification—Interior of Standard Passenger Coach.

with high backs and head rolls. Each car is also fitted with a toilet lined with "Mettilite."

The truck used is the Brill No. 27 E-2, with a wheel base of 6 feet 6 inches. The wheel diameter is 37 inches; the axle diameter 5½ inches and 6 inches. The wheel tread is 4 inches wide and the depth of the flange is 1 inch to allow the cars to operate over the city systems in Utica and Syracuse.

Each car is equipped with four G.E. 73 motors with Sprague-General Electric multiple-unit control. Westinghouse



West Shore Electrification—Interior of Rotary Converter Substation.

automatic air brakes with graduated release and Peter Smith hot water heaters are used.

Engineering.

The installation of the electrical equipment of the line has been conducted by the engineering force of the Oneida Railway Company, of which C. Loomis Allen is vice-president and general manager; W. J. Harvie is electrical engineer; and M. J. French, Jr., is engineer of maintenance of way.

Preliminary plans are now being considered by the Northern Texas Traction Company of Ft. Worth, Tex., preparatory to making arrangements for reducing the schedule time of the limited cars from Ft. Worth to Dallas to 1 hour and 15 minutes, 15 minutes less than the present schedule. The line across the Trinity river bottom in Dallas is now being double-tracked and a number of additional switches are to be installed.

LATE INFORMATION ABOUT THE ATLANTIC CITY CONVENTION.

Convention Bulletin No. 2, issued by Secretary Swenson, announces that the plans for the 1907 convention to be held at Atlantic City on October 14 to 18, inclusive, are progressing most satisfactorily. The choice of meeting place has been most favorably commented upon. Elsewhere in this issue is an extended discussion of the convention facilities offered by Atlantic City, N. J. The bulletin contains a detailed schedule of hotel rates for more than 75 of the leading hotels.

Headquarters Hotels.

It has been decided by the official representatives of the various associations that each association shall have its own headquarters hotel. It is the desire that these hotels be used as general meeting places for those interested in specific lines of work.

The Marlborough-Blenheim will in general be considered the headquarters hotel of the American and Manufacturers' associations. The Chalfonte hotel will, in general, be considered the headquarters hotel for the Accountants' association, and the Engineers and Claim Agents will have their headquarters at the Dennis and the St. Charles respectively.

Hotel Reservations.

Arrangements for hotel reservations should be made directly with the hotels. It will aid greatly in avoiding mistakes if the members when writing will indicate that their reservations are made in connection with the convention. In making reservations, explicit statements should be made concerning the kind of room desired and the dates of arrival and departure from the hotel. The special rates are made with the understanding that the charges of the hotel will be for the full time of reservation.

Programme.

The complete programmes of the various associations will be announced in a bulletin which will be issued in July. The morning of Monday, October 14, will be reserved for registration purposes, and the first meetings of the convention will be held on the afternoon of that day. The meetings of the various associations will continue throughout the week, closing on Friday, October 18. Considerable attention has been given to the arrangement of the days upon which the various associations will meet. The following general schedule of meeting days has been decided upon:

Monday, October 14.

9:30 a. m.—Registration and badges.

2:00 p. m.—Meeting of Engineering and Claim Agents' associations.

Tuesday, October 15.

9:30 a. m.—Meeting of Accountants', Engineering and Claim Agents' associations.

2:00 p. m.—Meeting of Accountants', Engineering and Claim Agents' associations.

Wednesday, October 16.

9:30 a. m.—Opening session of American association and joint meeting of affiliated associations.

3:00 p. m.—Meeting of Accountants', Engineering and Claim Agents' associations.

Thursday, October 17.

9:30 a. m.—Meeting of American and Accountants' associations.

Friday, October 18.

9:30 a. m.—Meeting of American association.

The opening session of the American association, which will be a joint meeting with the affiliated associations, will be held in Casino hall.

The usual arrangements are being made with the various passenger traffic associations whereby those attending the convention will be enabled to obtain round trip tickets for one and one-third fare upon the certificate plan.

THE SUPPLY MEN AT ATLANTIC CITY.

The annual conventions of the American Railway Master Mechanics' and the Master Car Builders' associations, two steam railway organizations, have just been concluded at Atlantic City. By reason of the fact that the annual conventions of the American Street and Interurban Railway Association and its allied bodies will be held at that place in October next, the readers of the Electric Railway Review will be especially interested in the arrangements for exhibits at Atlantic City, which will be made on the same Steel Pier and under practically the same conditions as those which prevailed this week during the steam railway meetings.

The interest which the officers of the street railway associations take in the meetings which have just adjourned is indicated by the fact that President John I. Beggs and Secretary B. V. Swenson of the American Street and Interurban

and the American Railway Master Mechanics' associations; to arrange for and have general charge of the exhibits made by its members before said conventions, and to promote friendly relations between its members and the members of said associations.

Art. III.—Membership—Any corporation, co-partnership, or individual engaged in the manufacture or sale of railway material or in the publication of periodicals in the interests of railways and manufacturers of railway materials, may become a member of the association by conforming to the provisions of its by-laws.

Art. IV.—Amendments—Amendments may be made to this constitution at any meeting of the association by a two-thirds vote of the members present and voting.

By-Laws.

Article I.—Qualification of Members.

Section 1.—Payment of the sum of \$25 to the treasurer of the association (or such sum as may be fixed by the executive committee), by those eligible to membership under Article III of the constitution, shall qualify them and their duly



Atlantic City Convention Facilities—Entrance to Steel Pier.

Railway Association visited Atlantic City during the meetings. Mr. George Keegan, the secretary of the Manufacturers' Association, was also an interested observer of the methods employed in handling the exhibits and other things pertaining to the supply interests.

The supply men who attended the Master Mechanics' and Master Car Builders' conventions have had a very excellent organization for a number of years, but the growth of the exhibits and the increase in the importance of the conventions generally, called for a more formal organization. Our readers will, therefore, be interested in the new constitution and by-laws which were adopted at Atlantic City for the Railway Supply Manufacturers' Association. The constitution and by-laws are as follows:

Constitution.

Article 1.—Name—This association shall be called "The Railway Supply Manufacturers' Association."

Art. II.—Objects—Its objects shall be: The advancement of the interests of its members as they are connected with the annual conventions of the Master Car Builders'

designated representatives as members, and entitle them to all the privileges granted by the executive committee as regards exhibit space and entertainment, subject to the limitations hereinafter named.

Sec. 2.—A corporation, firm or individual, upon payment of the fee for membership as prescribed by the executive committee, shall be entitled upon application to receive one badge or other insignia of membership adopted by the executive committee.

Sec. 3.—Any corporation, firm or individual, having paid the membership fee and having need of more than one representatives' badge, may secure additional badges upon payment of \$5.00 for each additional badge, and the application for such badges shall designate the names of their representatives, by whom the badges are to be used; and it is to be expressly understood that no representatives' badges are to be issued to or for any person who is not actually connected with the concern holding the membership, and who is not actually in attendance upon the conventions. The executive committee shall provide for the issuance of guests' badges for ladies, or for other persons, who, in its discretion, may be entitled thereto, by such regulations as it may deem proper.

Sec. 4.—All corporations, co-partnerships or individuals

that shall have paid the assessment of the executive committee of the supply men in connection with the conventions of the Master Car Builders' and the American Railway Master Mechanics' associations for 1907, and all their duly designated representatives who shall have been enrolled and received badges as such, shall, by virtue thereof, be members of this association until May 1, 1908.

Sec. 5.—No application for exhibit space at any convention of the Master Car Builders' or American Railway Master Mechanics' associations shall be accepted by the executive committee unless said application be accompanied by the sum prescribed by the executive committee, thereby renewing the membership of said applicant if he shall be a member or qualifying the applicant as a member under the constitution and by-laws of the association.

Sec. 6.—All membership rights, unless renewed, shall expire on the first day of May subsequent to the conventions preceding or during which the membership fee is paid.

Article II.—Executive Committee.

Section 1.—The government and management of the affairs of the association shall be vested in an executive committee of 12 members, who shall be chosen from among the

Sec. 4.—At the first election to be held after the adoption of these by-laws, eight executive committee members shall be chosen, viz., one from the first district, three from the second, one from the fourth, two from the fifth and one from the seventh, who shall by lot divide themselves into two classes, so that four of them shall serve two years and four three years. The members of the executive committee of the supply men, as constituted at the time of the adoption of these by-laws, who have another year to serve, shall complete the term for which they were chosen. Thereafter, annually, four members shall be elected for terms of three years to fill the places of those whose terms have expired. A member of the executive committee who shall have served three years continuously shall be ineligible for further service until an interim of three years shall have elapsed.

Sec. 5.—Vacancies occurring in any class of the executive committee shall be filled by a majority vote of the remaining members of the executive committee until the next annual meeting of the association, at which time the members of the association from the district where the vacancy shall have occurred shall fill such vacancy for the unexpired term.

Sec. 6.—The executive committee shall hold such meet-



Atlantic City Convention Facilities—Exhibit Booths Along the Steel Pier.

members of the association in the manner following, and no corporation, co-partnership or individual proprietor shall be represented on the committee by more than one member:

Sec. 2.—The United States shall be divided into seven representative districts, comprising territory as follows, with the number of members for each district as designated:

- First District—New England States.....1 member
- Second District—New York and New Jersey.....3 members
- Third District—Pennsylvania, Maryland, Delaware, District of Columbia, West Virginia.....2 members
- Fourth District—Ohio, Indiana, Michigan, Kentucky, Tennessee2 members
- Fifth District—Illinois, Wisconsin, Iowa, Minnesota2 members
- Sixth District—Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi1 member
- Seventh District—States west of Mississippi river, including Louisiana, but excepting Iowa and Minnesota1 member

Sec. 3.—The executive committee members for the several districts shall be chosen by the members of the association residing in such districts, in the manner prescribed in Section 2, Article IV, of the by-laws.

ings as may be necessary to be called by the president or by six members of the committee, at which meeting reasonable notice shall be given to the members. The attendance of four members shall constitute a quorum of the committee at any meeting. Any member of the executive committee unable to attend a meeting of the same may appoint some other member of the association as his proxy, and such proxy shall for such meeting have all the powers of the member whom he represents.

Article III.—Officers.

Section 1.—The officers of the association shall be a president, a vice-president, a secretary and a treasurer, who, with the exception of the secretary, shall be chosen from the members of the executive committee who have served at least one year as members of said committee, at the annual meeting of the association, by a plurality vote of its members. Each officer shall hold office for one year from August 1 after his election, or until his successor shall be elected and qualified, except the secretary, who shall be elected by the executive committee and serve during the pleasure of said committee.

Sec. 2.—No salaries may be paid to any of the officers except the secretary, who may, within the discretion of the executive committee, be paid a salary for his services.

Sec. 3.—It shall be the duty of the president to preside at all meetings of the association and of the executive committee. He shall manage the business of the association and do and perform all such acts in the name of the association as he may thereunto be authorized by the executive committee, subject at all times to the action and control of the executive committee.

Sec. 4.—The vice-president shall, in absence of the president, act in his stead, with the same powers and subject to the same restriction imposed upon the president.

Sec. 5.—The treasurer shall have the care and custody of the funds of the association which may come into his hands, to hold and dispose of same as the executive committee may direct, and give such bond or security as the executive committee may deem proper.

Sec. 6.—The secretary shall keep the minutes of the proceedings of the association and of the executive committee; attend to such correspondence as shall be assigned to him; have charge, under the direction of the president and of the executive committee, of the allotment of exhibit spaces for the conventions, and shall in general, under the direction of the president and of the executive committee,

Sec. 2.—The executive committee shall by proclamation, to be duly published in such daily paper or papers as may be mentioned, and also to be posted conspicuously at least two days prior thereto, name the time and places for holding the meetings of the members of the association residing in the several districts, for the election of members of the executive committee. At each of such meetings a chairman and a secretary shall be chosen, who shall certify to the association the person or persons elected thereat as members of the executive committee, and such certificate shall contain the names of the members attending the meeting. The executive committee shall be the final arbiter of any contests affecting the election of members of the executive committee.

Sec. 3.—In case the members of the association residing in any district shall fail to elect a member or members of the executive committee, then and in that event the executive committee shall fill the vacancy as provided for in Section 3, Article II, of the by-laws.

Article V.—Order of Business.

Section 1.—The order of business at the annual meeting shall be:



Atlantic City Convention Facilities—Arcade on the Steel Pier.

tee, perform all duties incident to the office of secretary.

Article IV.—Meetings.

Section 1.—The annual meeting of the association shall be held on the Saturday intervening between the annual meetings of the Master Car Builders' and the American Railway Master Mechanics' associations, in the same city or village where said associations meet, at such time and place as the executive committee may appoint, and of which the members shall have due notice. If the dates of the conventions of the Master Car Builders' and the American Railway Master Mechanics' associations should be changed so as to make it impracticable to hold the annual meeting of this association on Saturday as above prescribed, then a time three days after the beginning of said conventions shall be appointed by the executive committee for such meeting. Special meetings may be called by the executive committee upon the petition of 25 or more members, representing at least 25 separate and distinct corporations, co-partnerships or individual proprietors. If such special meetings are called for any other time than during the conventions above named, at least 30 days' notice shall be given to all members. Twenty-five members, representing 25 different concerns, shall constitute a quorum for the transaction of business at any meeting of the association.

1. Reading of minutes of preceding meeting.
2. Report of executive committee.
3. General business.
4. Reports from district meetings of election of members of executive committee.
5. Election of officers.

Article VI.—Amendments.

These by-laws may be amended at any meeting of the association by the affirmative vote of two-thirds of the members present and voting.

The New Executive Committee and Officers.

In conformity with the provisions of its new organic law the Railway Manufacturers' Association elected officers as follows:

- President—R. T. Walbank, Glidden Varnish Company.
- Vice-President—F. L. DeArmond, Protectus Company.
- Treasurer—George N. Riley, National Tube Company.

These gentlemen are all members of the executive committee, which is made up as follows:

- First District (New England States)—Frank A. Morrison of the Mason Regulator Company.
- Second District (New York and New Jersey)—Alexander

Turner of the Galena-Signal Oil Company; A. L. Whipple of the Curtain Supply Company; and Thomas Aldcorn of the Chicago Pneumatic Tool Company.

Third District (Pennsylvania, Maryland, District of Columbia, West Virginia)—George N. Riley of the National Tube Company and F. L. DeArmond of the Protectus Company.

Fourth District (Ohio, Indiana, Michigan, Kentucky, Tennessee)—George A. Cooper of the Frost Railway Supply Company and A. G. Hollingshead of the Ralston Steel Car Company.

Fifth District (Illinois, Wisconsin, Iowa, Minnesota)—R. T. Walbank of the Glidden Varnish Company and W. H. Miner of the W. H. Miner Company.

Sixth District (Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi)—L. O. Cameron of the Pressed Steel Car Company.

Seventh District (states west of Mississippi river, including Louisiana, but excepting Iowa and Minnesota)—R. H. Weatherly of the Scullin-Gallagher Iron & Steel Company.

The secretary is chosen by vote of the executive committee, and Mr. Bruce V. Crandall, president of the Bruce V. Crandall Company, Chicago, which publishes the American Railway Master Mechanic, has been elected to that office.

The exhibits were made on a more comprehensive scale than ever before and well-nigh taxed the facilities of the Steel Pier. There was some space, however, which was not filled, and the results of the experience of the last two weeks at Atlantic City indicate that the exhibits of October next will be well provided for. A scheme of uniform booths, which contributed much to the attractiveness of the exhibits, was employed for the first time, and these same booths and the same general plan of handling the exhibits are, we understand, to be used for the October conventions. The views which we reproduce herewith from photographs taken for the Electric Railway Review will give a very good general idea of the appearance of the exhibits. Owing to the fact that the awnings which are attached to each booth were up when these pictures were taken, they do not show clearly the details of the exhibits. They will, however, serve the purpose of giving a good idea of the booth scheme which was described in our issue of April 13, 1907.

Following is a complete list of the concerns which made displays at Atlantic City, together with an enumeration of what their exhibits contained and the names of their representatives:

List of Exhibitors.

Acme Ball-Bearing Company, New York City.—Acme ball-bearing jacks. Represented by George F. Wasson, Charles C. Sturtz and E. T. Sawyer.

Acme Supply Company, Chicago, Ill.—Acme vestibule curtain, Acme vestibule roller, Acme vestibule curtain shield, Acme car shade roller, Acme metallic weather strip, Acme vestibule diaphragm. Represented by W. H. Schrover, R. E. Slagle.

Adams & Westlake Company, Chicago, Ill.—Adlake-Newbold car lighting system, lighting fixtures, car trimmings, signal lamps. Represented by F. B. Jones, E. L. Langworthy, A. S. Anderson, R. M. Newbold, F. N. Grigg.

Addressograph Company, Chicago, Ill.—Card index addressograph, a combined addressing machine and card index system. Represented by E. D. Dorsey.

Aikman & Co., C. M., New York.—Samples of car plush at the Hotel Dennis. Represented by Richard Harris.

American Balance Valve Company, Jersey Shore, Pa.—American semi-plug piston valves after two years' (night and day) service over ports without bridges, semi-plug valves for simple and compound engines, Jack Wilson high-pressure slide valves for standard and for low-clearance cylinders, model of Walschaert valve gear with piston valves, model of modified Stevens valve gear with Jack Wilson internal-admission, low-clearance, separately-actuated valves, giving extremely close distribution of steam. Represented by J. T. Wilson and Frank Trump.

American Blower Company, Detroit, Mich.—Blower, exhaust fan, generator set, pressure blower, heating coils, model of a moist air dry kiln, volume blower and motor, also a 5 by 5 inch engine. Represented by C. W. Old and R. B. Bedford.

American Brake Company, Pittsburg, Pa.—Locomotive driver and truck brakes and slack adjusters. Represented by E. L. Adreon, C. C. Higham and F. E. Schwentler.

American Brake Shoe & Foundry Company, Mahwah, N. J.—

Steel back locomotive driver brakeshoes, steel back flanged coach shoes, steel back unflanged car shoes, steel back electric railway brakeshoes. Represented by W. S. McGowan, F. L. Gordon, F. W. Sargent, J. S. Thompson, H. S. Bradfield, E. L. Janes, E. J. Searles, C. C. Higgins, L. R. Dewey, E. B. Smith, L. J. Hibbard, Charles Herron, F. H. Coolidge, B. H. Grundy, J. D. Gallagher and J. B. Terbell.

American Car & Foundry Company, St. Louis, Mo.—One New York Central steel passenger coach designed for suburban service. On exhibit track. Represented by Scott H. Blewett and Messrs. Sturtevant and Duvall.

American File Sharpener Company, New York, N. Y.—File sharpening machine, carbolynt for sharpening files. Represented by A. H. Radell and M. G. Grubb.

American Locomotive Company, New York.—Booth on the pier. Represented by W. H. Marshall, H. F. Ball, G. M. Basford, J. D. Sawyer and F. J. Cole.

American Mason Safety Tread Company, Boston, Mass.—Mason safety tread, steel base and brass or delta metal base, lead filled, carborundum filled, karbolith filled, both flat and with nosings, repair tread and method, running board of cars and method of preventing slipping, combination of Mason safety tread and cork composition for passageways, vestibules, etc., worn safety treads, safety tread as installed on wood and in concrete, anchors used for holding tread in granolithic work, karbolith flooring for car and other floors set on wood, concrete or steel. Represented by Henry C. King and L. H. Myrick.

American Steel Foundries, Chicago, Ill.—Steel truck on turntable equipped with Simplex bolster, Susemihl side bearings, four Davis wheels and Andrews cast-steel side frames. Simplex brakebeams and springs, T-shaped cast-steel truck bolster, I-shaped bolster, U-shaped bolster and box-shaped bolster, swayback body bolster for furniture cars, body bolster for low-hung sills, steel cross-heads, driving wheel centers, Andrews side frame, Janney freight and tender couplers, Kelmont passenger coupler. Represented by W. V. Kelley, R. P. Lamont, W. W. Butler, G. E. Slaughter, D. T. Harris, J. V. Bell, T. D. Kelley, G. E. Murray, T. E. Cook, W. F. Shults, J. Stewart Andrews, D. W. Coll, P. J. Kalman, J. Soule Smith, H. P. Shaw, J. R. Stuart, E. H. Bauer, W. E. Fowler, Jr., R. H. Ripley, W. Ross Gravenor, F. B. Ernst and G. G. Floyd.

American Steam Gauge & Valve Manufacturing Company, Boston, Mass.—American Thompson improved indicator, American muffled pop safety valve, American locomotive steam gauge, American locomotive duplex gauge, American dead-weight gauge tester, American locomotive chime whistle and several other locomotive appliances. Represented by R. B. Phillips, Gardner Cornett, C. A. Allen and Horace Parker.

American Water Softener Company, Philadelphia, Pa.—Model of railway water softening plant in operation. Represented by A. S. Garrett, G. S. Garrett, W. H. P. Fisher, A. C. Tomlinson, George Bacon and A. C. Emlen.

American Track Barrow, Lowell, Mass.—One-rail track tools, devices for carrying railway material on one rail. Represented by E. D. Peirce.

Anglo-American Varnish Company, The, Newark, N. J.—Samples and advertising matter. Represented by William Marshall and Franklin W. Fort.

Armstrong Bros. Tool Company, Chicago, Ill.—A full line of Armstrong lathe and planer tool holders, Universal ratchet drills, improved tool posts for lathes, boring bars, bolt drivers for lathe and planer jacks. Represented by Paul Armstrong and John McBride.

Atha Steel Casting Company, The, Newark, N. J.—One B. R. & P. cast-steel truck bolster, one D. & H. cast-steel truck bolster, one Maine Central cast-steel truck bolster and cast-steel body bolster, two "Titan" steel motor gears. Represented by R. N. Barrows, G. T. Paraschos, C. W. Gennet, C. W. Owston and L. A. Shepard.

Baeder, Adamson & Co., Philadelphia, Pa.—Model of a refrigerator car, showing the application of insulating material. Represented by H. J. Bellman and M. J. Murphy.

Bald Manufacturing Company, Pittsburg, Pa.—The Miller quick-acting monkey wrench. Represented by William Bald.

Baldwin Steel Company, New York.—Full line of Hudson high-speed tools, twist drills, reamers, milling cutters, etc., Hudson high-speed steels, crucible tool steel, lathe tools. Represented by C. F. Simmons, J. A. Collom, Edward Milnor, W. L. Stone.

Barnett Equipment Company, New York and Newark, N. J.—The Barnett connector, automatically coupling signal, air and steam lines and safety chains between cars, exhibited under service conditions, the Barnett universal steam hose coupler, couples with all sizes and makes. Represented

- by Stephen D. Barnett, E. W. Hine, E. E. Silk, Robert A. Wolff.
- Besly & Co., Chicago, Ill.—Besly spiral disc grinders, spiral grooves, shear-cut, Helmet spiral paper and cloth circles, Helmet temper taps, Helmet oil, Helmet babbitt, Helmet iron oil cups, bonanza oil cups, Helmet bronze, spring, sheet and wire. Represented by Edward P. Welles and Charles A. Knill.
- Best American Calorific Company, W. N., New York.—Oil burners and oil-burning furnaces. Represented by R. G. Wells, W. N. Best and L. D. Douglas.
- Bethlehem Steel Company, South Bethlehem, Pa.—Staybolt irons, high-speed steel, special alloy steels, drop forgings and heavy machinery. Represented by W. C. Cutler, J. C. Halliday, G. J. Costello, R. D. Chapman, J. S. Hageman and O. H. Reynolds.
- Bettendorf Axle Company, Davenport, Ia.—Bettendorf I-beam bolster, Bettendorf all cast-steel truck, Bettendorf structural steel underframe with cast-steel and center sill ends. Represented by W. P. Bettendorf, J. W. Bettendorf, G. N. Caleb, J. H. Bendixen and S. S. Shields.
- Bickford Drill & Tool Company, Cincinnati, O.—No. 1 stand-
- also storage tanks and oil cabinets. Represented by C. A. Dunkelberg, W. T. Simpson and W. A. Pitcher.
- Bradford Car & Manufacturing Company, Chicago, Ill.—Bradford draft gear, steel underframes, rocker bottom cars and steam and air connectors. Represented by H. C. Priebe.
- Brady Brass Company, Jersey City, N. J.—Cypress bronze in casting and ingot form, phosphor bronze in casting and ingot form, engine castings, brass castings, motor bearings, babbitt metals, trolley wheels, journal bearings and solder. Represented by Daniel M. Brady, Amos J. Passino, Henry J. Lahay, Clarence M. Mendenhall and George C. Morse.
- Bridgeport Safety Emery Wheel Company, The, Bridgeport, Conn.—Eighty-inch guide bar grinder, motor-driven; tool grinder, motor-driven; emery, corundum and carborundum alumina wheels. Represented by D. T. Homan.
- Buchs & Son, A., Elizabethtown, Pa.—A gravity molding machine. Represented by A. Buchs, C. A. West.
- Buckeye Steel Castings Company, Columbus, O.—Major steel freight car coupler, Buckeye cast-steel coupler, yoke and Buckeye cast-steel truck bolster. Represented by S. P.



Atlantic City Convention Facilities—Exhibit Booths Along the Steel Pier.

- ard plain radial drill fitted with variable speed motor in operation. Represented by H. M. Norris and Fred H. Holz, Jr.
- Birdsboro Steel Foundry & Machine Company, Birdsboro, Pa.—Jackson belt lacing, Wagner universal cold saw. Represented by W. C. Johnson.
- Bliss Electric Car Lighting Company, Milwaukee, Wis.—Three types of axle lighting equipments, one with Bliss constant potential bucker regulation, one with Bliss New York Central constant potential booster regulation, one with Bliss Santa Fe constant current regulation. Various parts which go to make up the apparatus, disassembled. Types of standard car lighting batteries. Represented by W. L. Bliss, John T. Dickinson, F. Urban, W. M. Labor, Robert C. Shaal, L. Mau, John Bliss and Edwin H. Tower.
- Boker & Co., Hermann, New York.—Intra-steel—a new semi-high-speed steel, to be used as a substitute for regular carbon steel, also "Novo" steel. patent sections. Represented by Ellsworth Haring.
- Bordo Company, L. J., Philadelphia, Pa.—Locomotive blow-off valves, locomotive gauge cocks and locomotive swing joints. Represented by L. J. Bordo, Edwin A. Knowlton, Edward W. Hodgkins, C. R. Weaver and C. W. Allen.
- Bowser & Co., Inc., S. F., Ft. Wayne, Ind.—Self-measuring hand and power pumps for handling all kinds of oils.
- Bush, J. C. Whitridge, A. H. Thomas, George Broobey, G. T. Johnson and H. L. Winslow.
- Buda Foundry & Manufacturing Company, Chicago, Ill.—Hand-car wheels, Paulus track drills with high-speed Rich bits, Buda grinders and attachments for grinding Rich and twist bits, ball-bearing jacks up to 60 tons, one 25-ton locomotive jack on traversing base, ratchet track jacks, car jacks, track lining-up jacks, Buda replacers, Buda pressed steel hand-car wheels. Represented by W. R. Burrows, R. D. Bates, R. H. Hyland, R. M. Smith, T. J. Stocks.
- Buffalo Brake Beam Company, New York, N. Y.—Solid brake-beams for all classes of equipment, forged steel brake-heads, forged steel fulcrums, forged steel wheel guards, forged steel chain clips and steel backs for brakeshoes. Represented by S. A. Crone, R. C. Fraser, E. Strassburger, C. E. Barrett and E. C. Farlow.
- Bullard Machine Tool Company, The, Bridgeport, Conn.—The 36-inch vertical turret lathe in operation. Represented by S. H. Bullard, J. W. Bray, Allen W. Ransom, H. C. Elliott, G. J. Stansbury, G. E. Merryweather, Charles G. Smith and W. J. Alles.
- Cambria Steel Company, Johnstown, Pa.—One low side gondola car and one 100,000-pound capacity, Pennsylvania

- standard, hopper car on exhibit track. Represented by Mr. Sage.
- Camel Company, Chicago, Ill.—Refrigerator car on tracks. Represented by J. M. Hopkins and P. M. Elliott.
- Carborundum Company, The, Niagara Falls, N. Y.—Carborundum products. Represented by E. J. Eames, W. W. Sanderson, R. B. Fuller, C. C. Schumaker, Charles Nicholson and C. O. Taylor.
- Cardwell Manufacturing Company, Chicago, Ill.—Cardwell friction draft gear, Cardwell rocker side bearings. Represented by W. G. Krauser, C. H. Tobias and J. R. Cardwell.
- Carey Manufacturing Company, The Philip, Cincinnati, O.—Carey's 85 per cent magnesia locomotive lagging, Carey's standard flexible cement roofing, Carey's 85 per cent magnesia sectional steam pipe covering, Carey's all-asbestos train pipe covering, asbestos paper, millboard and packings, asbestos-metallic packing and gaskets, standard asbestos-molded covering, nonpareil cork covering and lagging, 85 per cent magnesia cement, asbestos cement, asbestos fibers, asbestos cold water paints, magnesia roofing paint, etc. Represented by George D. Crabbs, Steve J. Bowling, N. S. Kenney, John G. Howley and W. I. Kelly.
- Castle & Co., A. M., Chicago, Ill.—Corrugated side sheets for locomotive fireboxes. Represented by W. A. Roomse, C. M. Chamberlin.
- Celfor Tool Company, Successor to George R. Rich, Chicago, Ill.—High-speed twist and flat drills in operation. Represented by Russell Dale, W. F. Heacock, William Brewster.
- Chase & Co., L. C., Boston, Mass.—Chase's "Goat Brand" mohair car plushes for car seats and upholstering purposes, in plain and frieze effects. Represented by R. R. Bishop, Jr.
- Chicago Car Heating Company, Chicago, Ill.—Vapor system of car heating, pressure system of car heating, steam hose couplers, vertical steam traps, horizontal steam traps, automatic train pipe valves and special devices for Baker heater. Represented by Egbert H. Gold, E. A. Schreiber, B. A. Keeler and F. F. Coggin.
- Chicago Railway Equipment Company, Chicago, Ill.—Creco, National Hollow, Diamond, Kewanee, Reliance, Monarch, Sterlingworth and 96 types of brakebeams, Monitor bolsters, Creco roller side bearings for steam and street railways and Creco slack adjusters. Represented by E. B. Leigh, F. T. De Long, A. J. Farley, E. G. Buchanan, Fred G. Ely, Harry W. Frost, C. H. Williams, Jr., E. F. Leigh, B. F. Pilson, Raymond H. Pilson, H. W. Fennell, C. P. Williams and George A. Cooper.
- Clark & Co., A. C., Grand Crossing, Ill.—Mechanical boiler cleaner. Represented by J. C. Mohr and W. C. Smith.
- Cleveland Car Specialty Company, Cleveland, O.—Pressed steel carlines for passenger and freight equipment. Represented by George L. Weiss, W. S. Bidle, B. Haskell, J. A. Costello and George B. Maltby.
- Chicago Pneumatic Tool Company, Chicago, Ill.—Franklin air compressor, Boyer and Keller riveting and chipping hammers, Little Giant piston air drills in several sizes with plain and Corliss valves, turbine air drills, Duntley electric drills, grinders, blowers, hoists, compression riveter, magnetic oldman, drilling stands, etc. Represented by W. O. Duntley, Thomas Aldcorn, W. P. Pressinger, C. B. Coates, F. C. Severin, G. A. Barden, C. E. Walker, B. H. Tripp, Charles Booth and Howard Small.
- Cleveland Pneumatic Tool Company, The, Cleveland, O.—Pneumatic riveting hammers, chipping and calking hammers, stone and scaling hammers, valve grinder, drills, reversible and non-reversible, breast drills, Bowes' automatic air hose couplings, hose and holders-on. Represented by H. S. Covey, W. J. Greer, C. R. Ely, C. A. McInturff, Charles F. Palmer and Arthur Scott.
- Cling-Surface Company, Buffalo, N. Y.—Cling-Surface for belts. Represented by William D. Young and Charles F. Chase.
- Coale Muffled Safety Valve Company, Baltimore, Md.—Standard muffled safety valves in the exhibit of the Nathan Manufacturing Company. Represented by H. C. McCarty.
- Coe Brass Manufacturing Company, The, Ansonia, Conn.—Extruded metals in great variety of intricate designs, especially adapted to car and railway construction and ornamentation; also for use in electrical and other apparatus. Represented by James A. Doughty, E. J. Steele, William W. Cotter and William H. Rippere.
- Coe Manufacturing Company, W. H., Providence, R. I.—Coe's gilding wheels and ribbon leaf, Coe's Hibernish bronze powders, Coe's Hibernish bronzing liquid. Represented by Charles H. Bowers.
- Columbia Nut & Bolt Company, Bridgeport, Conn.—Samples of the Columbia lock nuts. Represented by Fred Atwater.
- Commercial Acetylene Company, The, New York, N. Y.—Acetylene safety storage system as applied to car and signal lighting, locomotive headlight, etc., car lamps and brackets, signal lamps, locomotive headlights, tank cut open showing asbestos packing, tanks which went through fire on the Delaware Lackawanna & Western, railway appliances. Represented by W. P. Hix, Roger J. Faure, Oscar F. Ostby and C. N. Neilson.
- Commonwealth Steel Company, St. Louis, Mo.—Models of transom draft gear for steel cars, transom draft gear for wooden cars, Davis counterbalanced locomotive driving wheel, tiregraph machine, separable body bolster for wooden cars, separable body bolster for steel cars and engine and tender trucks. Represented by Clarence H. Howard, H. M. Pflager, George H. Howard and A. R. Thomas.
- Consolidated Car Heating Company, New York, N. Y.—Direct-steam hot-water and low-pressure car heating systems, steam couplers, steam traps, steam valves, McElroy automatic electric car lighting system and electric heaters and switches. Represented by Francis C. Green, Cornell S. Hawley, James F. McElroy, William H. Fulton, W. S. Hammond, Jr., S. B. Keys, C. C. Nuckols and T. M. May.
- Consolidated Railway Electric Lighting & Equipment Company, New York, N. Y.—Showing standard D-type generator and Kennedy regulator and type F generator and A regulator, in operation, and several types of storage battery, Kennedy system of axle lights. Represented by Patrick Kennedy, J. L. Watson, Thomas L. Maunt, Chester Terry and Barton H. Grundy.
- Crocker-Wheeler Company, Ampere, N. J.—Form I-F field-weakening motor in operation; a large number of photographs of various lines of motors and generators, both alternating and direct current. Represented by H. de C. Hamilton, Rodman Gilder, F. B. De Gress, H. J. Sage, L. S. Horner, A. L. Doremus, H. L. Patteson, R. J. Randolph, Jr.
- Crucible Steel Company of America, Pittsburg, Pa.—All kinds of tool steel forgings, Rex "A" twist drills and bar steel, cold drawn drill rods, wire and strips. Represented by I. Baskerfield, M. R. Ferguson, W. A. Gowing and B. V. Maxwell.
- Curtain Supply Company, Chicago, Ill.—Forsyth roller tip No. 86 fixtures, No. 88 ring fixtures, No. 89 ring fixtures with projecting pins, Keeler eccentric fixtures, Burrowes No. 83 fixtures, Pantasote curtain material, Crown curtain material and Oakette curtain material. Represented by W. H. Forsyth, A. L. Whipple and R. F. Hayes.
- Dahlstrom Metallic Door Company, Jamestown, N. Y.—All-steel door, interior steel car trim. Represented by O. C. Reinecke, Charles Dahlstrom, W. H. E. Reinecke.
- Damascus Brake Beam Company, The, Cleveland, O.—Damascus beams in both 5 and 6 inch sections of various weights, forged fulcrums for Damascus beams, Waycott trussed beams of various weights for freight and passenger equipment and adjustable heads for Waycott passenger beams. Represented by Albert Waycott and Philip T. Handiges.
- Davis Company, The John, Chicago, Ill.—Reducing valves, back-pressure valves, pump regulators, air regulators and armored hose. Represented by George F. Hughson.
- Davis Expansion Boring Tool Company, St. Louis, Mo.—Expansion boring tools. Represented by Mr. Moberly.
- Davis Solid Truss Brake Beam Company, Wilmington, Del.—Brakebeams and brakebeam testing machine. Represented by Nathan H. Davis, Thomas C. Davis, W. C. DuComb, Jr., and H. Dohl.
- Dearborn Drug & Chemical Works, Chicago, Ill.—Water purifying reagents and exhibit of the action of different kinds of boiler waters on locomotive boiler tubes. Represented by Robert F. Carr, George R. Carr, D. E. Cain, J. D. Purcell and H. G. McConnaughy.
- Detroit Hoist & Machine Company, Detroit, Mich.—See Pilling Air Engine Company.
- Detroit Lubricator Company, Detroit, Mich.—Three-feed sectional lubricator, three-feed No. 21 lubricator, with new type gauge glasses, a seven-feed No. 61 lubricator for superheated steam locomotives. Represented by A. B. Wetmore, H. J. Lord, John Arnold, A. D. Homard.
- Detroit Seamless Steel Tubes Company, Detroit, Mich.—Detroit locomotive flues and Detroit safe ends. Represented by T. H. Simpson, T. N. Motley, Frank H. Clark and R. B. Owen.
- Dickinson, Paul, Incorporated, Chicago, Ill.—Photographs and full-sized models of Dickinson cast-iron smokejacks, ventilators and chimneys. Represented by A. J. Filkins, E. W. Hodgkins, W. A. Bither and J. A. Meaden.
- Dill Machine Company, T. C., Philadelphia, Pa.—One 15-inch Dill rapid-production slotter in operation. Represented by T. C. Dill, Harry Taylor and Robert Russell.
- Dixon Crucible Company, Joseph, Jersey City, N. J.—Dixon's silica-graphite paint, American graphite pencils, Ticonderoga flake graphite lubricants, plumbago crucibles, pipe-

- joint compound, graphite air-brake and triple valve grease, and graphite greases and other graphite products for railroad use. Represented by C. H. Spotts, L. H. Snyder, J. J. Tucker, H. A. Nealley, W. A. Houston, A. C. Bowles and R. A. Brown.
- Dressel Railway Lamp Works, The, New York, N. Y.—Locomotive headlights, engine signal lamps and train marker lamps. Represented by F. W. Dressel, Robert Black, F. W. Edmunds, H. S. Hoskinson, J. M. Brown, E. W. Hodgkins.
- Drouvé Company, The-G., Bridgeton, Conn.—Anti-Pluvius skylight and Lovell window-operating device. Represented by A. C. Bradley.
- Dudgeon, Richard, New York, N. Y.—Thirty-ton Universal jacks of the railroad type, plain type and claw type; 30-ton Universal railroad jack of the independent claw type, 40-ton Universal railroad jack, 60-ton independent pump Universal jack and test pump. Represented by James W. Nelson, W. H. Mathers and Frederick Tenney.
- Duff Manufacturing Company, The, Pittsburg, Pa.—Barrett track and car jacks, Duff ball-bearing screw jacks in all sizes and capacities up to 75 tons, Duff roller-bearing and cone-bearing screw jacks, Barrett and Duff journal jacks and traversing jacks. Represented by T. A. McGinley, George A. Edgin and P. F. Kobbe, Jr.
- Edwards Company, O. M., The, Syracuse, N. Y.—Models illustrating 30 designs of Edwards' window fixtures and 4 de-
- water, and many other interesting tests. Represented by Thomas H. Downward and S. F. Osbourn.
- Farlow Draft Gear Company, Baltimore, Md.—Models of the Farlow twin-spring draft gear as applied to cars of the Great Northern Railway and Seaboard Air Line, showing the malleable iron draft sill; twin spring applied to channel draft sills for wooden underframe construction, Farlow attachments in combination with the Westinghouse friction barrel, twin-spring gear applied to cast-steel end sills, Farlow attachments in combination with the Sessions friction barrel, twin-spring gear applied to channel sills cut off from a wrecked car. Represented by I. O. Wright, Dwight F. Mallory, Bradley S. Johnson, John H. Farlow, M. A. Garrett and C. M. Garrett.
- Fibrous Paint Company, Inc., Philadelphia, Pa.—Adhesive, waterproof and flexible paint. Represented by Frank Davis, H. S. McCartney, W. L. Corson, Alfred Voelker, B. F. Davis.
- Flannery Bolt Company, Pittsburg, Pa.—Several sizes of Tate flexible staybolts and tools for applying them to locomotive boilers. Represented by B. E. D. Stafford, J. Rogers Flannery, Harry A. Pike, W. M. Wilson and Tom R. Davis.
- Forsyth Brothers Company, Chicago, Ill.—Forsyth buffing mechanism for passenger equipment, metallic sash, draft rigging and truck-actuated drawbar controlling devices, Chaffee drawbar centering devices, Stucki radial drawbar centering devices, safety deck sash ratchets, all metallic



Atlantic City Convention Facilities—Exhibit Booths Along the Steel Pier.

- signs of Edwards' extension platform trap-door fixtures, samples showing metal windows and window sash, Edwards' tin barrel-spring rollers, both pawl designs and the Edwards special ratchet design, with roller brackets, both plain and worm gear, and samples of hardware showing special finishes in brass and bronze. Represented by Oliver M. Edward, Edward F. Chaffee, Franklin M. Nicholl, C. H. Rockwell, C. L. Eddy and George G. Norris.
- Ehret Magnesia Manufacturing Company, Philadelphia, Pa.—Samples of 85 per cent magnesia locomotive laggings. Represented by W. A. Macan.
- Electric Storage Battery Company, Philadelphia, Pa.—Car lighting cells, all kinds of single cells, types D, E and F, in glass jars, New York Central type, for electrified steam roads. Represented by E. L. Reynolds, Charles Blizzard, E. H. Hunt, A. Taylor and Robert Hull.
- Falls Hollow Staybolt Company, Cuyahoga Falls, O.—Samples of hollow and solid staybolt iron, manufactured of a blend of imported Swedish and native high-grade charcoal iron stock, samples of staybolt iron nicked in various ways, and broken to indicate the superior quality and fibrous texture of Falls hollow and solid staybolt iron, and samples threaded and bent double flat without fracture. Represented by C. M. Walsh, John Livingstone, F. C. Lippert and W. H. Dangel.
- Flexible Compound Company, Inc., The, Philadelphia, Pa.—Flexible compound, flexible black enamel No. 75 iron destroyed in any kind of acid asked for, without destroying paint or film, all kinds of acids put in tissue paper napkins, water boiled in tissue paper napkins and china silk bags, water in muslin bags, hundred pounds to square foot, hardwood finishing, flexible paints and varnishes on silks and muslin, silk transparent signs, painting under weather stripping and Forsyth patent car seat beaters. Represented by George H. Forsyth and Louis A. Gray.
- Foster Company, The, Walter H., New York, N. Y.—Landis universal and piston rod grinders and bolt cutters, Lassiter staybolt threading machine and chaser grinder, and taper bolt cutter heads. Represented by Walter H. Foster, Frank H. Robinson, B. D. Jackson and George R. Willis.
- Fox Machine Company, Grand Rapids, Mich.—Fox heavy pipe or flue cutter, Thomes core box machine, Fox mitering machine, Fox milling machine, Fox universal wood trimmers, Fox bench type trimmers, patternmakers' bench with patent vise, and Fox adjustable saw dado or gaining heads. Represented by George Schow and S. O. Livingston.
- France Packing Company, Inc., Philadelphia, Pa.—Metallic packing, grease cup, fibrous packing, sheet packing. Represented by A. W. France, L. T. Safford, J. K. Rutherford.
- Franklin Manufacturing Company, Franklin, Pa.—Reinforced corrugated asbestos roofing or sheathing asbestos shingles in assorted colors, asbestos building lumber, K. & M. 85 per cent magnesia locomotive lagging, magnesia pipe coverings, asbestos pipe coverings, asbestos boards, papers, packings and textile goods, Ambler asbestos ring air pump and throttle packings, asbestos lumber smoke jacks, and asbestos roofings, 2 and 3 ply. Represented by R. J. Evans, Wallace W. Johnson, George S. Stuart, Frederick Alford, L. B. Melville, C. E. Wade, Charles H. Stringer and W. C. Walsh.
- Franklin Railway Supply Company, Franklin, Pa.—Franklin automatic locomotive fire door and fire door opener, Franklin driving box lubricator, Franklin flexible ball joint for steam, air and oil connections, McLaughlin flex-

- ible joint, McLaughlin lock nut and Franklin journal-bearing replacement jack. Represented by J. S. Coffin, A. G. Allen, B. H. Haskell, A. G. Elvin, H. S. Hayward, Jr., B. A. Krenz, J. Sinkler and Paul Weiler.
- Frost Railway Supply Company, Detroit.—Harvey friction draft spring gear, Harvey permanent stake pocket. Represented by Harry W. Frost, George L. Harvey, George A. Cooper.
- Galena-Signal Oil Company, Franklin, Pa.—Booth on the pier. Represented by J. S. Coffin, E. V. Sedgwick, Harry Hillyer, J. A. Roosevelt, William Walsh, William Holmes, E. W. Grieves, W. O. Taylor, E. G. Johnson, J. S. Patterson, J. S. Seeley and Alexander Turner.
- Garlock Packing Company, The, Palmyra, N. Y.—Fibrous, metal and asbestos packing, hose, pump valves and all other mechanical rubber goods for railroad service. Represented by O. J. Garlock, F. W. Griffith, L. E. Adam, W. R. Haggart, George L. McCabe, F. A. Ebert, E. H. Morrison, A. J. Bolting, G. A. Wismer, J. N. Todd, E. C. Adams, J. F. Edmonds, D. Newhall and J. E. Johnson.
- Garvin Machine Company, The, New York, N. Y.—No. 2 Garvin universal milling machine with new design dividing head, No. 22 vertical milling machine with rotary table, No. 14 vertical spindle milling machine, Garvin's latest pattern with adjustable rail, Garvin die slotter, four sizes of Garvin straight-line milling machine vises, No. 2 Garvin automatic tapping machine, No. 14 Garvin plain milling machine in operation, motor driven, column type millers to be provided with the Garvin solid top and extended knee. Represented by George J. Thompson and Roy Garvin.
- General Electric Company, Schenectady, N. Y.—Booth on pier. Represented by F. H. Gale, W. J. Clark, J. G. Barry, L. R. Pomeroy, R. E. Moore, C. C. Peirce, J. J. Mahoney, E. D. Priest, A. W. Jones.
- Gisholt Machine Company, Madison, Wis.—Photographs of standard Gisholt "Big Bore" lathe, Gisholt combination lathe, a chucking and bar machine with spindle capacity up to 7½ inches, Gisholt boring mills and universal tool grinder. Represented by Stanley G. Hanks, C. W. Johnson, Ellis F. Muther, J. E. Brandt.
- Gold Car Heating & Lighting Company, New York, N. Y.—Improved Gold systems of car heating by means of direct steam apparatus, as well as hot-water circulating systems, and a very simple and commendable car-lighting system using acetylene gas, improved steam couplers, automatic steam traps, temperature regulators, end train pipe valves, locomotive reducing valve, electric heaters, and refrigerator car-heating apparatus. Represented by Edward E. Gold, John E. Ward, William E. Banks, W. H. Stocks, Thomas Fildes, J. M. Stayman, J. O. Brombaugh, A. E. Robbins, Richard Voges, E. B. Wilson, George F. Ivers, F. E. Weir and F. A. Purdy.
- Goldschmidt Thermit Company, New York, N. Y.—Thermit for welding, repairing and reheating molten iron; welded sections of locomotive frames, trolley rails, wrought-iron pipes, steel castings, etc.; firebrick molds for welding locomotive frames, and samples of nickel thermit, manganese, chromium, molybdenum, manganese-copper, manganese-tin, manganese-zinc, ferro-vanadium and ferro-titanium. Represented by A. M. Guenther and W. R. Hulbert.
- Gould Coupler Company, New York, N. Y.—Freight couplers, tender couplers, tender buffers, steel platforms, Crown truck bolsters, Crown body bolsters, Gould bolsters, friction draft gear, buffers for stub-end cars, vestibules, tandem draft gear and journal boxes. Represented by F. P. Huntley, S. R. Fuller, Jr., C. W. Gould, H. N. Loomis, T. L. McKeen and W. F. Richards.
- Greene, Tweed & Co., New York, N. Y.—Palmetto air pump and throttle valve packings, Favorite reversible ratchet wrench and Exacto packing gauge and cutter. Represented by H. S. Demarest, F. E. Ransley and B. M. Bulkley.
- Grip Nut Company, Chicago, Ill.—A full line of square and hexagon shaped grip nuts, U. S. standard threads, from ¾ inch to 1¼ inches, and a line of semi-finished hexagon nuts for locomotive use. Represented by E. R. Hibbard, J. W. Hibbard, R. S. Wickersham and T. F. DeGarmo.
- Hale & Kilburn Manufacturing Company, The, Philadelphia, Pa.—Car seats of all kinds, for steam railways and heavy electric railway cars, "Neverbreak" pressed steel "Walk-over" seats, all-steel and fireproof upholstered seats as adopted for about 400 steel coaches under construction at the present time, and reclining and revolving parlor car chairs. Represented by H. T. Bigelow, A. F. Old, B. F. Pilson and S. A. Walker.
- Hammond Typewriter Company, The, New York.—Large machines for payrolls and close space machines for special tabulated work. Represented by A. G. Kupetz, Miss L. Wright, Miss Stephenson.
- Hammett, H. G., Troy, N. Y.—Trojan metallic packing for piston rods and valve stems, triple valve business roller and Sansom bell-ringers. Represented by H. G. Hammett and J. J. Leighton.
- Hanlon Locomotive Sander Company, The, Winchester, Mass.—Locomotive sandbox with Hanlon sander attached. Represented by J. H. Hanlon, W. J. Hanlon and J. W. Russell, Jr.
- Hanna Engineering Works, Chicago, Ill.—Represented on pier by Thomas W. Pangborn Company of New York, showing a pneumatic compression riveter in operation, electric and air driven screening machines, a No. 2 sand blast machine. Represented by John C. Pangborn.
- Harrington Son & Co., Edwin, Philadelphia, Pa.—Peerless spur gear hoists, screw hoists, plain and geared travelers, stay-bolt threading machine. Represented by W. J. Somerset, E. Van Note and J. A. Slaughter.
- Harrison Dust Guard Company, Toledo, O.—Harrison dust guard in various sizes, Harrison driving box lubricators, cellar lubricators, Harrison car journal lubricators, Harrison driving box cellars and Williams-Harrison journal boxes in various sizes. Represented by Lacey Y. Williams and Frank B. Harrison.
- Heath & Milligan Manufacturing Company, Chicago, Ill.—Reception booth on the pier. Represented by E. T. Trigg, H. O. Quest, W. R. Parker.
- Helwig Manufacturing Company, St. Paul, Minn.—Helwig pneumatic staybolt clippers, Helwig reversible pneumatic motors (end spindle drills), Helwig portable pneumatic grinders, Helwig improved self-feeding flue expanders and Helwig pneumatic hammers, for chipping, calking and riveting. Represented by J. Helwig and A. Helwig.
- Hess-Bright Manufacturing Company, The, Philadelphia, Pa.—Complete axle and wheels mounted on ball-bearings as used on European railways. Represented by Henry Hess.
- Hewitt Electric Company, Cooper, New York.—Lamps for shop lighting. Represented by M. B. Buckman.
- Hicks Locomotive & Car Works, Chicago, Ill.—Photographs and woods, one passenger coach. Represented by George A. Berry, Elliott C. Smith and George E. Pratt.
- Hicks Improved Engine Brake Company, Atlanta, Ga.—Two engine equipments of air brakes. Represented by James A. Hicks and J. H. Bouchard.
- Hitner's Sons Company, Henry, Philadelphia, Pa.—Showing the product of the Kensington Plate-Washer Company. Represented by L. Lewis.
- Home Rubber Company, The, Trenton, N. J.—N. B. O. sheet packings, steam hose, air pump packings, pump valves. Represented by A. R. Foley, H. M. Royal, C. E. Stokes.
- Homestead Valve Manufacturing Company, Pittsburg, Pa.—Homestead valve, locomotive blow-off valve, straightway valve, 3-way valve and 4-way valve. Represented by P. L. Rhodes and W. R. Schuchman.
- Houghton & Co., E. F., Philadelphia, Pa.—Hydro-carbonated bone-black for case-hardening, cutting oils, cutting compound, Vim cylinder oils, cosmolubric engine oils, cosmic counter-corroder, tempering oils, lubricating greases, Marck railway steam trap, Marck steam trap, Vim air brake leathers, Vim hydraulic leathers and Houghton oil filter. Represented by Fred C. Wilson, A. Everly Carpenter, 2d, and A. C. Bass.
- Hunt-Spiller Manufacturing Corporation, South Boston, Mass.—Cylinder bushings, cylinder packing, pistons, piston valve cages, piston valve packing, eccentrics, eccentric straps, driving boxes, shoes and wedges, crosshead shoes and superheater headers. Represented by Walter B. Leach and John G. Platt.
- Independent Pneumatic Tool Company, Chicago, Ill.—Thor pneumatic reversible and non-reversible piston air drills, reaming, tapping, flue-rolling, and wood-boring machines, pneumatic one-piece long-stroke riveting hammers, pneumatic chipping, calking and beading hammers, cose-quarter piston air drills, pneumatic turbine wood saw and pneumatic hose couplings in operation. Represented by James B. Brady, W. O. Jacquette, R. S. Cooper, J. A. Porter, J. P. Bourke, Charles Parsons, R. D. Hurley, R. T. Scott, J. H. Davis, J. D. Hurley, A. B. Holmes, George A. Gallinger and Campbell Mathie.
- Indestructible Fibre Company, The, New York, N. Y.—Decorated panels, car headlinings and ferryboat partitions, samples showing methods of applying decoration and section of wainscoting in imitation tile. Represented by John Jolly, R. L. McDuffie, Jacob Wendell, Jr., H. E. Osterreich, F. C. Field, O. Ferans.
- Invisible Roll Screen Company, Brooklyn, N. Y.—Invisible roll screens for railway coaches, dining cars, private cars, etc., to screen against dust and smoke, invisible roll screens for railway offices, station buildings, dining-rooms, etc., to screen against flies and mosquitos; exhibit in Hotel Islesworth. Represented by R. A. Bagnell.
- Jenkins Bros., New York, N. Y.—A full line of Jenkins Bros."

- radiator valves, automatic non-return valve, regular and extra heavy brass and iron body globe and angle valves, sheet packing, pump valves and gasket tubing, car heating and air brake discs and Jenkins Bros.' extra heavy gate valves. Represented by Arthur C. Langston, Joseph J. Williams, Charles J. Jackson and Charles W. Martin, Jr.
- Johns-Manville Company, H. W., New York, N. Y.—Asbestos-sponge felted sectional pipe covering, fire felt, fire felt train pipe covering, 80 per cent magnesia pipe covering, vitribestos pipe covering, vitribestos smokejacks, asbestos fire felt and 85 per cent magnesia locomotive lagging, asbestos cement felting, 85 per cent magnesia cement, high and low pressure, hot and cold water pipe covering, J-M asbestos roofings, air pump packings, asbestos steam packings, asbestos sheet packings, vulcabeston packings, asbesto-metallic flange gaskets, all kinds of fire-resisting cements, electrical insulating materials, Noark fuses, fire extinguishers, refrigerator and produce car insulating material. Represented by H. O. Fettinger, E. C. Sawyer, John H. Trent, W. F. Taylor, E. M. Gilmore, J. C. Younglove, C. E. Murphy, J. W. Allan, F. G. Corbin and J. E. Meek.
- Justice & Co., Philip S., Philadelphia, Pa.—Forty-ton Reliance hydraulic jacks, 20-ton Reliance hydraulic jacks, 15-ton Reliance hydraulic car box jack, all lowered by thumb-key, and Justice spike puller. Represented by Philip Justice Mitchell and O. L. Wright.
- Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Root Koppel Company, Arthur, New York.—Industrial railway track material. Represented by Henry Robiczek.
- Kinnear Manufacturing Company, The, Columbus, O.—Wood slat rolling door for roundhouses, steel slat rolling door for shops, power houses and freight houses. Represented by F. B. Billheimer and F. C. Schmidt.
- Landis Machine Company, Waynesboro, Pa.—One 2-inch double-head bolt-cutting machine and staybolt cutter, showing staybolt machine without using the lead screw, different styles of dies for cutting special threads. Specimen of staybolt cut without using a lead screw, showing accurate pitch. Numerous samples of work showing special threads and many operations of interest, capable only of being done on the Landis die. Represented by J. G. Benedict and H. L. Fisher.
- Landis Tool Company, Waynesboro, Pa.—No. 16 gap grinder and No. 1½ universal grinder. Represented by T. H. King.
- Lang Company, G. R., Meadville, Pa.—T-bolt heads for planers and boring mills. Represented by George R. Lang.
- Latrobe Steel & Coupler Company, Philadelphia, Pa.—Latrobe freight coupler, Melrose freight coupler, Chicago freight coupler, Latrobe Lewis-Seley engine coupler, Goodman wrecking hook and cast-steel drawbar yoke. Represented by W. L. Jacoby, Jay G. Robinson, W. N. McMunn and E. O. Warner.
- Lawrence Manufacturing Company, Philadelphia, Pa.—Anti-



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- locomotive spring snow scraper, Moore track drills, bonding drills, with new chuck, flat drills, Kalamazoo velocipede and hand-car wheels in three sizes. Represented by F. N. Root.
- Kansas City Railway Foundry Company, Kansas City, Kan.—Rogers journal box, open end box, wastebox and engine cellars, Fisher grain door. Represented by A. F. Reitz, J. A. Kennedy.
- Kelly-Arnold Manufacturing Company, Wilkesbarre, Pa.—Automatic air and steam connector for use on passenger cars, automatic air connector for freight service, automatic device for detaching connector from draft coupler, flexible metal conduits, auxiliary connections for gum hose. Represented by George F. Royer, George E. Kelly and John J. O'Donnell.
- Kent & Co., Edwin R., Chicago, Ill.—Tool steel, high-speed twist drills, high-speed improved milling cutters, high-speed improved flat drill chucks. Represented by Edwin R. Kent, J. T. Stafford, W. E. Nagle.
- Keystone Lubricating Company, Philadelphia, Pa.—Keystone lubricating grease in its various densities and forms of application for various purposes, such as engine lubrication, for shafting purposes and general machine lubrication. Represented by H. A. Buzby, Charles A. Hopper and H. L. Carpenter.
- Keystone Drop Forge Works, Chester, Pa.—Keystone connecting link, Keystone safety shackle hook, boiler jaws, tank lugs, driving spring links and keys and other special locomotive and car forgings. Represented by George H. Berlin.
- Keystone Nut Lock Manufacturing Company, Pittsburg, Pa.—Smith nut locks. Represented by William M. Smith, W. M. Simmons.
- waste grabber Filion folding vestibule trap. Represented by V. O. Lawrence and Nat P. Lane.
- Lawrenceville Bronze Company, Pittsburg, Pa.—Malleable bronze castings, phosphor bronze ingots, journal bearings, driving boxes, and side rod brasses. Represented by Edward Kerr, C. B. Ault.
- Livezey, John R., Philadelphia, Pa.—Sheet and granulated cork for cold storage work and refrigerators, cork pipe covering for cold pipes, asbestos, air-cell coverings, etc., for steam and exhaust pipes, hard pressed cork for electrical insulation and flooring, models of cold-storage construction. Represented by John R. Livezey and Harry E. Souder.
- Locomotive Stoker Company, Chicago, Ill.—Strouse locomotive stokers. Represented by C. A. Street, James Elder.
- Lodge & Shipley Machine Tool Company, The, Cincinnati, O.—24-inch by 12-foot patent head standard screw-cutting engine lathe, driven by 10-horsepower General Electric 2 to 1 variable speed motor, 450 to 900 R. P. M. Represented by R. G. English and R. D. Betts.
- Lord Company, George W., Philadelphia, Pa.—Boiler compounds. Represented by V. O. Lawrence, J. E. Doughty and Nat P. Lane.
- Love Brake Shoe Company, Chicago, Ill.—Armbrust car and driver brakeshoes and driver brakeheads. Represented by C. W. Armbrust, H. G. Fuchs, W. H. Colebrook.
- Lucas & Co., John, Philadelphia, Pa.—Comical mirrors, coach colors. Represented by William C. McMullin, E. W. Storey and H. A. Clark.
- Mason Regulator Company, The, Boston, Mass.—Mason locomotive reducing valves, Mason air pump governors, Mason pump pressure regulators, Mason elevator pump pressure regulators, Mason damper regulators, Mason belt

- shitters, Mason steam pump speed governors, Mason steam pump gravity tank regulators, Mason by-pass or water relief valves for power and electric pumps and Mason steam pump. Represented by William B. Mason and F. A. Morrison.
- Massachusetts Mohair Plush Company, Boston, Mass.—Car seats covered with mohair plush in various colors and figures, articles showing various stages of manufacture of plush, samples of different kinds and qualities of plush, photographs of plush mill in operation. Represented by J. S. Seabury and W. D. Sawyer.
- McConway & Torley Company, The, Pittsburg, Pa.—Janney "X," Kelso and Pitt freight couplers, various designs of passenger car and tender couplers, Buhoup 3-stem passenger equipment applied to standard steel platform, and samples of miscellaneous steel castings for railroad work. Represented by E. M. Grove, William McConway, Jr., H. C. Buhoup, I. H. Milliken, Stephen C. Mason and G. W. McCandless.
- Metal Plated Car & Lumber Company, New York City.—Brown metallic window strip. Represented by Garrett Burgert.
- McCord & Co., Chicago, Ill.—McCord journal box, McCord draft gear, McCord spring dampener, McKim gasket, force feed locomotive lubricator. Represented by J. A. Lamon, W. J. Schlacks, Clive Rummells, J. W. Cain, H. H. Newsom, D. J. McOsker, W. G. Dunham, Morrill Dunn, I. A. Randel.
- McIlvain & Co., J. Gibson, Philadelphia, Pa.—Samples of white metal, phosphor bronze and German silver. Represented by T. A. Dalton, J. Gibson McIlvain, Jr.
- Merchant & Evans Company, Philadelphia, Pa.—Star ventilators, habbit metal. Represented by W. C. Thomas.
- Michigan Lubricator Company, Detroit, Mich.—One 5-feed bullseye locomotive nickel lubricator and trimmings for same, one 4-feed quadruple nickel by-pass, one triple-feed nickel lubricator, sectionized parts of the bullseye and by-pass bullseye lubricators, one by-pass triple lubricator, new type with stand, one 1½-pint double bullseye nickel with round observation glass, one quart double bullseye nickel lubricator with oblong observation glass, one 1-pint duke nickel with gauge glass two stationary lubricators, one applied with the automatic valve, automatic valves, locomotive automatic valves, new automatic drain stems, nickel, one angle nut steam chest plug, one nickel-plated wrench for same. Represented by John B. Corliss and W. E. Bryant.
- Modoc Soap Company, Philadelphia, Pa.—Soaps for cleaning cars, demonstration daily on the exhibit tracks. Represented by Henry Roever, J. D. Holtzinger.
- Morgan & Wright, Detroit Rubber Works, Detroit, Mich.—White steel sheet packing, Morganite throttle stem packing, triangle piston rod packing, air-brake steam hose and car-heating hose, engine and tender hose, matting. Represented by Hudson Dickerman.
- Moran Flexible Steam Joint Company, Louisville, Ky.—Moran flexible joints for steam, air, gas and liquid, trolley controller. Represented by C. H. Jenkins.
- Nathan Manufacturing Company, New York.—Injectors, lubricators, boiled checks, oil cups, steam fire extinguishers, boiler tester and washer, feedwater strainers, locomotive whistles and boiler fittings, Coale muffler and safety valves. Represented by E. S. Toothe, J. C. Currie, J. E. Miner, Charles Kearns, Sanford Keeler and L. Minetree.
- National Brake & Electric Company, Milwaukee, Wis.—Motor-driven portable air compressor outfit mounted on steel frame truck—in operation; also latest oil pneumatic governor, sectional motor-driven compressors, engineer's valve and emergency valve for air-brake equipment. Represented by J. T. Cunningham, W. H. Goble, F. E. Huntress, W. M. Bisel, C. N. Leet, R. P. Tell, S. I. Wailes and Bert Aikman.
- National Lock Washer Company, The, Newark, N. J.—Car curtains, curtain fixtures, sash locks, sash balances and window fixtures operating on full size models; also samples of nut locks for all sizes of bolts. Represented by F. B. Archibald, W. C. Dodd, Daniel Hoyt and John B. Seymour.
- National Malleable Castings Company, The, Cleveland, O.—Tower and Climax couplers for freight, passenger and locomotive equipment, special exhibit of coupler repair parts, special exhibit of coupler pivot pins, National safety car door fasteners. Represented by S. L. Smith, J. V. Davison, F. R. Angell, J. H. Jaschka, J. A. Slater, K. R. Johnston, L. S. Wright, George V. Martin, H. D. Hammond, C. L. Johnston, M. C. Pilson and R. T. Hatch.
- National Patent Holding Company, Chicago, Ill.—White boltless sectional piston head, Atlas side bearing, Atlas center bearing, National boiler washing system, National case-hardening compound. Represented by W. White and Frederick A. Lester.
- National Roofing Company, Tonawanda, N. Y.—National asphalt roofing. Represented by F. A. Fuller, Morris Ayrault.
- National Tube Company, Pittsburg, Pa.—Carload of 6-inch pipe loaded on a gondola car to show the method of service of the tubular telescopic side stakes. Represented by George N. Riley, L. R. Phillips, E. D. Giberson, J. F. Townsend, J. G. Bateman.
- Nernst Lamp Company, Pittsburg, Pa.—Display of Nernst lamps. Represented by John Sorber.
- Newman Clock Company, Chicago, Ill.—Watchman's portable clocks. Represented by A. A. Newman and August Nanz, Jr.
- New York Air Brake Company, New York.—Automatic air and steam connector (Forsyth patent). Represented by W. T. Henry, J. E. Forsyth, C. P. Lovell, H. F. Bickel, W. N. Campbell, E. F. Wentworth and William Owens.
- Norton, A. O., Inc., Boston, Mass.—Genuine Norton bridge, journal and car jacks. Represented by Harry A. Norton, Joseph O. St. Pierre, B. B. Terrill, F. L. Gormley, F. M. Twombly, A. O. Norton and Charles G. Erickson.
- Norton Company, Worcester, Mass.—Alundum grinding wheels and specialties, India oilstones, alundum grain for polishing. Represented by George C. Montague, Arthur C. Scott and George A. Stone.
- Norton Grinding Company, Worcester, Mass.—One electrically driven "gap table" grinding machine, for railway work, in operation, pair of steel car wheels revolving on their journals, to show the accuracy with which these are ground by Norton wheel-grinding machine. Represented by Hiram Cushworth and Hans Wickstrom.
- Norvell-Shapleigh Hardware Company, St. Louis, Mo.—Display of the company's special brand Diamond Edge tools of all kinds, including axes, hatchets, saws, ship augers, files, also a line of shovels and scoops, showing evolution of 1-piece Conqueror shovel. Represented by Joe C. Reed.
- Ohio Brass Company, The, Mansfield, O.—Tomlinson automatic radial car coupler, Nichols-Lintern pneumatic track sander, Lintern electric car signal system. Represented by J. S. Hamlin, F. A. Strail, N. Shute, R. M. Campbell.
- Oil Well Supply Company, Pittsburg, Pa.—Railroad special globe and angle valves. Represented by Joseph C. Bruff.
- Ostermann Manufacturing Company, Chicago Ill.—The Ostermann grain door. Represented by R. B. Kadish.
- Otis Company, Spencer, Chicago, Ill.—Tubes made by the Tyler Tube & Pipe Company, Hutchins Car Roofing Company's roofs, Solid Steel Tool Company's forgings. Represented by Spencer Otis, William Baker, H. H. Hart, William Latta, Jr.
- Pantasote Company, The, New York.—Samples of Pantasote in car seats and curtains. Represented by John M. High, D. E. Bonner.
- Parker Car Heating Company, Ltd., The, London, Ont., Canada.—Parker anti-freezing and hot water system for railway cars. Represented by Thomas Parker, J. M. McEvoy, J. C. Duffield and C. S. Parker, Jr.
- Pels & Co., Henry, 68 Broad Street, New York City.—Johns' patent beam shears, Johns' patent plate shears, Werner's hand power punch, Werner's hand power bar cutter, roller trestles. Represented by Ingo Maddaus and W. L. Kerlin.
- Penn Steel Casting & Machine Company, Chester, Pa.—Locomotive cast-steel cylinder, high-pressure steam valves. Represented by W. S. Bickley and T. Burd Zell.
- Perry Side Bearing Company, Chicago, Ill.—Side bearings after three years' use under 237,000 pounds, industrial cranes on Pennsylvania Railroad, passenger hearings after 130,000 miles on 104,000-pound body observation car, C. & N. W., also full set of all styles and types Perry bearings. Represented by H. M. Perry, E. A. Laughlin and J. H. Sewall.
- Phillips Laffitte Company, The, Philadelphia, Pa.—The Laffitte welding plates, welding, tempering and brazing powders. Represented by J. J. H. Phillips.
- Phillips Sons & Co., F. R., Philadelphia, Pa.—Velos high-speed steel and twist drill made by the Walter Spencer Company, Sheffield, England. Represented by F. Rees Phillips and E. D. Manley.
- Pilling Air Engine Company, Detroit, Mich.—Locomotive turntable mule, pneumatic geared hoists. Represented by J. C. Pilling.
- Pittsburg Automatic Vise & Tool Company, The, Pittsburg, Pa.—The Pittsburg double swivel machinists' vises, the Pittsburg single swivel machinists' vises, the Pittsburg double swivel pipe vises, the Pittsburg portable pipe vises, the Pittsburg double swivel woodworkers' vises, the Pittsburg Ysiad woodworkers' vises, the Pittsburg automobile and motor boat vises, the Pittsburg jewelers' vises, the Pittsburg single swivel pipe attachments, one very large vise weighing 695 pounds and having a jaw opening of 15 inches. Represented by G. P. Blackiston.
- Pittsburg Equipment Company, Pittsburg, Pa.—One cast-steel

side frame, one cast-steel column casting, one built-up bolster with cast-steel hook ends, models of cast-steel draft carrier, three-piece side frame truck bolster, roller center plates and side bearings. Represented by O. S. Pulliam and H. V. Seth.

Pyle-National Electric Headlight Company, Chicago, Ill.—Ladies' rest room in handsome booth on the Steel pier. Represented by Mark A. Ross, J. W. Johnson and H. W. Withington.

Ralston Steel Car Company, The, Columbus, O.—Ralston gondola dump car, Ralston steel underframe. Represented by J. S. Ralston, J. D. Ellison, A. G. Hollingshead, L. C. Brown, J. L. Connors, J. E. Tesseyman and C. W. Martin.

Refined Iron & Steel Company, Pittsburg, Pa.—Staybolt, engine bolt, muck bar and other irons. Represented by J. C. Denoon, H. F. Gilg, W. A. Stubblebine.

Republic Railway Appliance Company, St. Louis.—Republic friction draft gear. Represented by C. S. Shallenberger, H. T. Curd.

Restein Company, Clement, Philadelphia, Pa.—All kinds of steam and hydraulic packings for locomotive and general shop use. Represented by Norman Miller.

Riverside Metal Company, Riverside, N. J.—Cold rolled sheets of white metal, phosphor-bronze and German silver, German silver and phosphor-bronze wire and coil stock, phosphor-bronze rope, phosphor-bronze and nickel castings, phosphor-bronze tubes. Represented by W. P. McGlynn, H. W. Berroth, L. J. Kane, W. K. McGlynn.

Rockwell Engineering Company, New York.—Oil furnaces for

frame punch, motor driven with 36-inch throat and capacity to punch 3/4-inch hole in 3/4-inch material, working model of Ryerson flue cleaning machine, capacity to clean 500 boiler tubes up to 24 feet long at one time, working model of Continental boiler with Morison corrugated furnaces. Represented by Gilbert H. Pearsall, Edward T. Hendee and Austin M. Mueller.

Safety Car Heating & Lighting Company, New York, N. Y.—Improved mantle lamps, flat flame lamps and single mantle lamp of 100 candlepower, models showing straight steam and hot water heating systems, steam couplers, traps and valves, buoy lantern. Represented by R. M. Dixon, D. W. Pye, E. F. Slocum, J. S. Henry, W. H. Hosper, William St. John, George E. Hulse, W. L. Garland, C. B. Adams, M. T. Elliot, H. J. McMinn, Lewis Judge, W. I. Thompson, A. Sebald, George H. Chadwell.

Schoen Steel Wheel Company, Pittsburg, Pa.—Method of making the Schoen wheel, showing steel slab, first and second forging and finished rolled wheel, steam and electric wheel unmounted, also mounted wheels on axle that have been in service. Represented by Charles T. Schoen, M. R. Jackson and N. B. Trist.

Schutte & Koerting Company, Philadelphia, Pa.—Injectors and injector regulating attachment (also sectional injector), check valve, steam stop valve, gate valve, globe valves and check valves, sectional stop check valve, balanced lever valve, hand test pump, syphons, automatic eductor, trip valve. Represented by S. C. Smith.

Scullin-Gallagher Iron & Steel Company, St. Louis, Mo.—Booth



Atlantic City Convention Facilities—Exhibit Booths Along the Steel Pier.

brass melting, flue welding, rivet heating, bolt heating, case-hardening, forging, etc. Represented by F. S. Garrett and W. S. Quigley.

Roadhouse Steam Coupler Company, Detroit, Mich.—Coupler for steam hose. Represented by W. L. Kelley, A. L. Sellers, N. F. Roadhouse.

Robinson Company, The, Boston, Mass.—Robinson exhaust nozzle, device for protecting air strainers, wrecking anchor. Represented by Charles L. Snow, Frank Robinson and Frederic Parker.

Rostand Manufacturing Company, Milford, Conn.—Baggage racks. Represented by Frank Barbey, P. N. Landine, George H. Bryant, W. B. McCarthy.

Rutherford Automatic Connector Company, Chicago, Ill.—Automatic connector for air, steam and signal hose on cars and engines. Represented by F. H. Rutherford and C. H. Carman.

Rubberset Brush Company, The, Newark, N. J.—"Ruhberset" paint and varnish brushes. Represented by A. L. Holtzman and T. B. Denton.

Russell, Burdsall & Ward Bolt & Nut Company, Port Chester, N. Y.—Steel nuts and bolts, special nuts for locomotives, all finished screw products. Represented by John Abel, W. S. Comly, Robert Cook, R. J. Snyder, C. B. James.

Ruud Manufacturing Company, Pittsburg, Pa.—Automatic gas water heaters. Represented by Charles F. Bartlett.

Ryerson & Son, Joseph T., Chicago, Ill.—Lennox rotary bevel shear in operation, beveling steel plates, angles, etc., up to 3/4 inch in thickness, motor-driven, Ryerson portable automatic key seating machine in operation, cutting key-ways in nickel steel locomotive axles, Cleveland vertical solid

nicely fitted up as rest room, with chairs, etc., for the convenience of visitors. Represented by S. M. Dolan, Thomas M. Gallagher, P. J. Howard, B. V. H. Johnson, G. B. Longstreth, J. V. McAdam, F. L. Norton and R. H. Weatherly.

Sectional Grain Door Company, Indianapolis, Ind.—Grain door. Represented by A. E. Dennison.

Sellers & Co., William, Inc., Philadelphia, Pa.—Non-lifting injector and attachments operating under steam, lifting injectors, boiler checks, locomotive feedwater strainer. Represented by Strickland L. Kneass, John D. McClintock and Franklin Martin.

Shelby Steel Tube Company, Pittsburg, Pa.—Seamless link bushing material, seamless locomotive flues, welding demonstrations, Shelby seamless steel locomotive bells, 17 in number, representing each note in musical scale, suspended from Shelby seamless tube tree, each bell being electrically connected with keyboard so that musical selections can be produced. Represented by H. S. White, H. A. Flagg, J. E. Minetree and C. H. Wood.

Sherwin-Williams Company, The, Cleveland, O.—Locomotive finishes, car body system, steel coach finishes and enamels, varnishes and dry colors, railway specialties, rattan seat enamel, handcraft stains, metal paints. Represented by W. B. Albright, E. M. Richardson, Thomas Madill, J. H. Eames, F. A. Elmquist and E. M. Williams.

Simplex Railway Appliance Company, Chicago, Ill.—(See American Steel Foundries.)

Societe Generale des Freins Lipkowski, Paris, France.—Chapsal-Saillet's long freight train brake. The same brake is used on the Western Railway of France, and to be tried

- on the Northeastern of England. Represented by A. Sallot.
- Sprague Electric Company, New York City.—Air brake hose, signal line hose, car heating hose, pneumatic tool hose; all these covered with Sprague Electric Company's flexible steel armor. Represented by Allan C. Bakewell, E. E. Ruete and W. A. Treat.
- Standard Coupler Company, New York City.—Standard steel platform. Sessions standard friction draft gear. Represented by George A. Post, A. P. Dennis, R. D. Gallagher, Jr., E. H. Walker, George A. Post, Jr.
- Standard Metal Manufacturing Company, Chicago, Ill.—Anti-friction S. T. B. car journal bearings, anti-friction metal. Represented by Donald C. Barbee and Carl E. Tandy.
- Standard Paint Company, The, New York, N. Y.—Ruberoid roofing for buildings, Ruberoid cab roofing, Ruberoid car roofing, Ruberoid colored roofings, red, green and brown, Giant, Hercules and P. & B. insulating papers, P. & B. preservative paints, Flexite metal preservative paints, Ruberine, varnishes, clear baking, black baking, black air drying, black finishing, core plate air drying, core plate baking, P. & B. insulating tapes. Represented by J. N. Richards, J. H. Thomas, Charles Earnshaw, B. C. Beckman, J. G. Satterthwait, George Wilms and E. F. Van de Water.
- St. Louis Car Company, St. Louis, Mo.—Sleeping car "Beulah," built for the American Palace Car Company. On exhibit track.
- Standard Steel Works, The, Philadelphia, Pa.—Forged and steam and electric service. Represented by T. H. Symington, E. H. Symington, J. F. Symington, C. J. Symington, D. Symington, W. W. Rosser, Carl Tucker, T. C. de Rosset, A. H. Weston and H. W. Baldwin.
- Tate, Jones & Co., Inc., Pittsburg, Pa.—Oil burners and oil-burning appliances for railroad shops, portable oil rivet furnaces, oil pumping systems, furnaces for all purposes. Represented by J. M. Tate, Jr., and R. G. Kirkwood.
- Timms, James & J. O., Columbus, O.—The "Excel" automatic car coupler. Represented by James Timms and J. O. Timms.
- Toomey, John A., Chicago, Ill.—Folding car stake for flat cars. Represented by John A. Toomey.
- Trojan Car Coupler Company, The, New York, N. Y.—Junior M. C. B. car coupler. Represented by Charles Chew Mickle, Harry D. Dumont and Henry W. Wasserbach.
- U. S. Metal & Manufacturing Company, New York City.—Perfect pressed steel car replacers, Nos. 1 and 2, Victor cast-steel car replacers, Nos. 1, 2, 3 and 4, Columbia lock nuts, "Ideal" drawbar centering device, Western malleable iron brake jaws, "Almetl" lumber stake, Cliff and Guibert automatic fire hose reel, "Hoyt" push car door. Exhibition car on exhibition track equipped with Dunham hopper door device, Columbia lock nuts, "Ideal" drawbar centering device, Feasible drop brake staff, "Almetl" lumber stake. Represented by B. A. Hegeman, Jr., F. C. Dunham, M. Jackson Crispin, E. D. Hillman, Thomas Beaghen, Jr., Fred Atwater and John Varian.
- Universal Railway Equipment Company, Jackson, Mich.—



Atlantic City Convention Facilities—Exhibit Booths Along the Steel Pier.

- rolled steel wheels and steel-tired wheels. Represented by E. S. Lewis, H. DeH. Bright, Frank Carpenter, Charles Riddell, Oliver J. Bamford, Edward B. Halsey, George F. Jones, Harry W. Sheldon, William Penn Evans.
- Star Brass Manufacturing Company, Boston, Mass.—Samples of safety valves, whistles, gauge testers, steam gauges and indicators, in the St. Charles hotel. Represented by G. H. Musgrave, J. A. Edgar.
- Stoeber Foundry & Manufacturing Company, The, Myerstown, Pa.—One-half-inch automatic pipe threading and cutting off machine, capacity $\frac{1}{4}$ inch to 2 inches, automatic power pipe bending machine, capacity 1 inch to 2 $\frac{1}{2}$ inches. Represented by Ralph McCarty, Ed. R. Euston, A. A. Schaefer.
- Storrs Mica Company, Owego, N. Y.—Copies of Storrs' calendar of railroad club and association meetings and conventions, advertising their mica headlight and caboose lamp chimneys; register for mailing list for quarterly numbers of this calendar. Represented by A. P. Storrs and Charles P. Storrs.
- Stowell Manufacturing & Foundry Company, South Milwaukee, Wis.—Model of baggage car door fitted with adjustable hangers, Wilbern adjustable warehouse door hangers. Represented by D. J. Dalton, R. A. Nourse.
- Summers, H. J., Chicago, Ill.—Automatic releasing vestibule curtain hook. Represented by Harry J. Summers.
- Symington Company, T. H., Baltimore, Md.—Symington journal boxes of various designs for standard archbar trucks, special steel trucks, M. C. B. passenger trucks, M. C. B. electric trucks and special electric trucks, Baltimore ball-bearing center and side bearings of various designs for "Easy Lift" grain door. Represented by H. E. Edwards, S. F. Randolph.
- Union Spring & Manufacturing Company, Pittsburg, Pa.—Locomotive and car springs, pressed steel spring plates and journal box lids. Represented by A. M. McCrea, L. G. Woods, C. S. Foller and T. B. Arnold.
- Underwood & Co., H. B., Philadelphia, Pa.—Portable boring bar outfit for cylinders 12-inch to 26-inch diameter, 2-cylinder steam or air motor for driving the above, portable rotary planing machine for flat valve seats on locomotives. Represented by A. D. Pedrick, C. O. Ralph, F. E. Emery.
- Wagenhorst & Co., J. H., Youngstown, O.—Electric blue-printing machine. Represented by Donald Parson.
- Walworth Manufacturing Company, Boston, Mass.—Stillson wrench, Smith track drill, "Neverstick" blow-off cock, Walworth pipe stock and die, Smith friction tool, also general line of small tools. Represented by W. P. F. Ayer.
- Washburn Steel Castings & Coupler Company, The, Minneapolis, Minn.—Car couplers, boilers, car replacers, steel buffer beams, friction draft rigging. Represented by E. C. Washburn, A. Munch.
- Watson-Stillman Company, The, New York.—Hydraulic jacks, hydraulic rail benders, hydraulic crankpin presses, hydraulic bar straighteners, hydraulic wheel presses. Represented by George L. Gillon and Edward A. Johnson.
- Watters, J. H., Augusta, Ga.—Pneumatic track sander, working model in a glass case. Represented by J. H. Watters.
- Wells Light Manufacturing Company, The, New York.—The Wells light in three sizes, the Wells standard oil gas lamp,

- Wallwork's patent universal electric lamp brackets. Represented by George H. E. Robinson and Howard Manahan.
- Wendell & McDuffie, New York.—The Gutelius ventilating smoke jacket; made of asbestos board. Represented by D. H. Ferguson.
- West Disinfecting Company, New York.—Disinfecting appliances, chloro-naphtholeum, disinfectant, liquid soap dispensers and liquid soap, Taussig fumigating lamps, carbiform fumigators, CN soap for the skin. Represented by E. Taussig and C. A. Ekstromer.
- Western Railway Equipment Company, St. Louis, Mo.—Acme brake slack adjusters, Western sill and carline pockets, Western brake jaws, Acme pipe clamps, Hoerr tandem draft gear, Linstrom eccentrics, Linstrom syphon pipes, interchangeable car doors, Hoerr car doors, Western truck end castings, St. Louis flush car door, Missouri car door, Downing card holders, Economy slack adjuster, Western bell ringer, car door fastenings, fishhook tie-plates, brake jaws, tie dating nails. Represented by Louis A. Hoerr and S. H. Campbell.
- Western Tool & Manufacturing Company, Springfield, O.—Expanding mandrels, adjustable reamers, portable vice stands and tool stands, vises, tool holders, abrasive polishing wheels, scrapers. Represented by E. V. Galen and Henry Morris.
- Western Tube Company, Kewanee, Ill.—Kewanee unions, Kewanee union specialties, high duty metal valves, malleable, cast iron and brass fittings, iron body valves and cocks. Represented by N. J. Higinbotham.
- Westinghouse Air Brake Company, Pittsburg, Pa.—Cross-compound steam-driven air compressor, self-locking angle cock, friction draft gear. Represented by John F. Miller, W. S. Batholomew, E. A. Craig, W. V. Turner, R. H. Blackall, A. L. Humphrey, Joseph R. Ellicott, A. Johnson, F. T. Reese, I. H. Brown, T. L. Burton, H. S. Clark, C. C. Farmer, F. V. Green, J. P. Kelly, C. J. Olmstead, H. S. Kolseth, C. P. Cass, W. G. Clark, S. D. Hutchins, F. M. Nellis, George Westinghouse, Jr.
- Westinghouse Automatic Air & Steam Coupler Company, St. Louis, Mo.—Automatic air and steam coupler. Represented by N. F. Niederlander and R. E. Adreon.
- Westinghouse Electric & Manufacturing Company, Pittsburg, Pa.—Motors, controllers, switchboards, current measuring instruments. Represented by A. T. Chamberlain, J. R. Gordon, J. H. Klinek, R. F. Moon, D. D. Pendleton, Charles Robbins, F. H. Shepard, C. F. Street, Charles Stuart, Charles Talbot.
- Westinghouse Machine Company, The, Pittsburg, Pa.—Automatic truck, storage batteries. Represented by E. H. Sniffen, L. L. Brinsmade, L. H. Flanders, Samuel Hazlett, Edgar Lewis, D. C. Arlington, D. G. Davis, H. M. Hampton.
- Westmoreland Coal Company, Philadelphia, Pa.—Full-sized reproduction of a room in a mine, with electric coal cutter actually in operation. Represented by H. C. Adams and G. B. Wood.
- Wheel Truing Brake Shoe Company, Detroit, Mich.—Abrasive brakeshoes. Represented by J. M. Griffin.
- White Enamel Refrigerator Company, St. Paul, Minn.—Bohn syphon refrigerators. Represented by H. S. Parks.
- Wilmarth, Morman & Co., Grand Rapids, Mich.—New Yankee drill grinders, one electrical machine ready to operate. Represented by Charles E. Meech.
- Yale & Towne Manufacturing Company, The, New York.—Portable electric hoists, equipped with graduated speed controllers for careful handling of material and close adjustment of parts when assembling or placing in machines, 20-ton triplex chain block, enabling one man to lift a 20-ton load, 1-ton triplex, duplex and differential chain blocks in operation under service conditions. Quick speed chain blocks for rapid handling of light loads, overhead I-beam trolleys for use with hand and electric hoists, crane models and photographs of installations. Blount door checks, builders' hardware, Yale cabinet locks, Yale padlocks. Represented by F. A. Hall, E. J. Ford, H. E. Dickerman, William Hazeltin, R. T. Hodgkins, C. W. Beaver, W. C. Bigelow.

The Kern River Power Station No. 1, of the Los Angeles Edison Electric Company, has recently been put in operation. It is located near the headwaters of the Kern river, in the Sierra Nevada range. The plant is claimed by the builders to be the largest hydro-electric system west of Niagara Falls. The water is brought some 12 miles by flume to a penstock having a static head of 874 feet. Four Allis-Chalmers impulse wheels of 10,750 horsepower operate under an effective head of 865 feet at 250 revolutions per minute. Current is transmitted to Los Angeles, Cal., 117 miles, at 75,000 volts. The transmission cables are supported by galvanized iron towers.

NEW YORK CITY RAILWAY'S EIGHTY-SIXTH STREET CAR BARN BURNED.

The New York City Railway, which lost by fire on April 8 its car barn at One Hundred and Forty-sixth street, suffered a similar misfortune on June 16, when the car barn at Madison avenue and Eighty-sixth street was burned. The building was a three-story brick structure of semi-mill construction with substantial brick walls, and was built about thirty years ago.

The first floor was used as a car barn by the company and the second and third floors were leased by the New York Transportation Company, which lost fifty or more automobiles. Ordinarily the New York City Railway Company has about sixty-five cars in this barn, but the demand for rolling stock was so great on Sunday, the day of the fire, that only four cars were destroyed.

The origin of the fire is not known. An examination of the burned structure shows that the wooden timbers were



Ruins of New York City Railway Car Barns.

heavy, but the floors were not self-releasing and when they collapsed the side walls fell with them. The offices of the company were located in a partitioned space at the left of the car entrance. From this section a passenger elevator led to the floors above, while the automobiles of the Transportation company were hoisted by means of an elevator shaft about half way between the office and the rear of the building. It is stated that the building will be rebuilt in the near future.

An Improvement in Commutating Poles.

A. E. L. Chorlton and H. Smith, Manchester, Eng., have recently been granted a patent on an improved method of constructing commutating poles for motors and generators. The invention consists of separating the commutating poles from the main yoke, thus establishing an independent magnetic circuit. This construction has a number of advantages; the commutating poles can be more easily designed to give the desired effect, can be more easily controlled, and magnetically have the advantage of not being affected by changes of the magnetic flux in the main pole pieces.

Another important advantage secured by this invention is that the commutating poles can be added to motors and generators already in service, the commutating poles and yoke being entirely independent of the generator or motor proper. The yoke for the commutating poles is made in sections so that it can be easily installed in motors or generators which are in service without dismantling them. The commutating pole yokes are bolted to the pole pieces of the main field magnets.

News of the Week

Traction Affairs in Chicago.

Judge P. S. Grosscup declares that he has a satisfactory plan for settlement of the differences between the New York interests in the Chicago Union Traction Company and the protective committee representing the stockholders of the Chicago West Division Railway and the North Chicago City Railway, underlying companies. The continued failure of these interests to agree to a plan for leaving the distribution of the stock of the new Chicago Railways Company to the arbitrators named in the ordinance postpones the acceptance of the ordinance.

The Chicago City Railway Company has taken out a permit for the beginning of reconstruction work under the ordinance. Work has been begun on the track in Root street, between State and Wallace streets.

To avoid congestion, the Union Traction Company has abolished the terminus of the Twelfth street line at State and Van Buren streets, and hereafter the cars will run over a loop terminal on Dearborn street, Adams street, Fifth avenue and Twelfth street.

Michigan United Railways to Handle United States Express Company Business.

The United States Express Company is rapidly extending its service over the electric railway lines and is still seeking to make new contracts. In the Electric Railway Review of June 8 was published the announcement of a contract between the express company and the Detroit United Railway. We are now advised by J. M. Bramlette, general manager of the Michigan United Railways Company, which operates the city systems of Lansing, Kalamazoo and Battle Creek, and interurban lines between Lansing and St. John's and Jackson and Kalamazoo, that this company has also entered into a contract with the United States Express Company whereby the latter will operate over the Michigan United lines. Operation will be started between Jackson and Kalamazoo on July 1. The company will run three express trains a day over this 75-mile line, instead of two, as at present. Mr. Bramlette says: "I feel that this arrangement is one of great importance to our company. It is certainly a step in the right direction and indicates that interurban properties are daily becoming more serviceable to the communities through which they operate."

A general agent of the express company has been seeking during the past week to make a similar contract with the Winona Interurban Railway for the express business between Warsaw and Goshen, Ind. The matter will be submitted to the directors on June 20. It is reported that the company is seeking to make contracts with other northern Indiana roads.

Advertising Literature of the Boston & Northern and Old Colony Street Railways.

The passenger department of the Boston & Northern and Old Colony Street Railway companies has issued some new literature this year which is very attractive and convenient. The feature of the publications this year is a large four-colored map of eastern Massachusetts, east of Worcester, southern New Hampshire and northern Rhode Island, showing not only all the trolley lines of these companies, but all trolley lines in the district, as well as all the parks, groves and other inland and shore pleasure resorts. The map is a very artistic bit of work and is one of the most complete ever issued covering this district. This map forms the inside of both the Boston & Northern and the Old Colony Street Railway's folders, while the rest of the space is devoted to schedules showing the routes, distances, fares and mileage on these systems. Everything is arranged in as condensed a form as possible, tending to put as much helpful information for the passengers in as little space as is required. The covers of the two folders are in colors and are excellent examples of the printer's art. The Boston & Northern folder, entitled "Trolley Trips," shows a cool, attractive view of a rocky shore and a bay with an island in the background, all on a background of striking red. The Old Colony folder cover is a delightfully typical little country scene framed in an attractive arrangement of greenery. A glance at the covers creates a desire to seek the shore and country. Copies will be sent free upon application to the passenger department, 309 Washington street, Boston.

Legislation in Michigan.

An amendment to the law permitting the consolidation of electric light and street railway companies was passed in the house on June 17. At present the law provides that unanimous consent of all the stockholders must be obtained, and the amendment, which applies only to the upper peninsula, provides that the consents of only three-fourths of the stockholders be required.

The Seidmore railroad commission bill, which the house on June 12 substituted for the bill passed by the senate, provides for an interchange of freight between steam and electric railways, and in certain cases for the running of freight cars through city streets. The bill provides: "That in cases where shippers or consignees of freight in carload lots whose places of business are not provided with adequate steam railway facilities, but may be reached by means of interurban, suburban or urban railroad of suitable gauge, they shall have the right to be supplied by any steam railroad which has a physical connection with said interurban, suburban or urban railway with steam railway freight cars for the shipment of their freight and similarly shall have the right to receive their freight in steam railway cars. Such cars shall be turned over by said steam railroad to said interurban or street railway at the point of junction for the use of said shipper exclusively and shall be hauled between said point of junction and said place

of business of the shipper by said interurban or street railway under the same general conditions as cars of the foreign roads are now, or may be after handled upon so-called belt lines, or terminal railroads." This provision does not apply to purely city lines and the commission has no power to interfere with any franchise or contract with the city.

Progress of New York Subway Plans.

The New York rapid transit commission on June 13 decided to authorize the construction of a fourth track on the Broadway subway, between Ninety-sixth and One Hundred and Third streets. The cost of the improvement, which will permit uninterrupted traffic above Ninety-sixth street on the easterly and westerly branches of the subway, will be about \$850,000, and it is estimated that 16 months will be required for the work. The Interborough-Metropolitan Company has already stated its willingness to do the work, provided the expense shall be borne by the city under the heading of "extra work." The amount is to be added to the general construction account which the company must pay back to the city in the next 50 years. On the recommendation of Chief Engineer Rice it was also resolved to install the ventilating system on the stations of the Broadway route north of Fifty-seventh street. Only on the stations south of this point have the plants been established, and Mr. Rice explained that the result in cooling the tunnel had been so successful that it would be advisable similarly to equip the northern part of the Broadway subway. He estimated the cost at \$250,000. The cost of the downtown plants was \$390,000, so that the city will have to spend a total of \$670,000 on another extra.

Bids were also opened by the commission for the construction of the three sections of the subway connecting the terminals of the Brooklyn and Williamsburg bridges in Manhattan for which contracts had not yet been let. The Bradley Contracting Company was the lowest bidder for all the three sections. For that on Center street, between Pearl and Park Row, the bid for tunnel construction and pipe galleries was \$1,003,828; for the section on Delancey street, between Center and the Bowery, the bid was \$1,547,342, and for the third stretch, also on Delancey street, running from the Bowery to Norfolk street, the Bradley offer was \$1,298,436. The contracts were awarded to that company.

Comptroller Metz and Commissioner Hurlley were able to advance their demands for the Fourth avenue (Brooklyn) subway another step. George L. Rives, counsel to the board, was directed to draw up the form of contract and to present it for adoption to the next meeting of the commission. In order to lessen the cost of construction of the new route it was decided by the board that the open excavation method could be adopted except in the parts of the route where the traffic was heavy, and that on a portion of the route south of Flatbush avenue the contractor should be relieved of property damage responsibilities. The commission also practically determined that there would be no need for pipe galleries in the subway, but ordered Mr. Rives so to frame the contract as to provide for bids for and without the galleries. The cost of the subway has been estimated at \$31,000,000, but by leaving out the pipe galleries there would be a saving of about \$2,000,000.

Philadelphia Ordinance Passed by Councils.—The Philadelphia Rapid Transit Company ordinance was passed by councils on June 20, after an 8-hour session. The ordinance will restore the ability of the company to make improvements in its property through the use of the improved credit which it will now have.

Decatur-Champaign Line of the Illinois Traction System Opened.—The new line of the Illinois Traction Company from Decatur to Champaign, Ill., has been recently opened for operation. For the present the running time for the 50 miles will be three hours, as the track is still rather rough in places. Cars have been running between Champaign and Monticello for several months. This completes the line from Danville, near the Illinois-Indiana state line, to St. Louis.

Pittsburg & Butler Street Railway.—The Pittsburg Trust Company, financial agent of the Pittsburg & Butler Street Railway Company, has issued a most attractive booklet describing and illustrating the company's new single-phase line from Pittsburg to Butler, Pa., 38 miles, which has been recently opened for traffic. The booklet, which is an especially fine example of the printer's art, completely describes the new road and contains a large number of excellent halftone illustrations of views along the line and of the company's rolling stock and power house equipment.

Street Railway Association of the State of New York.—J. H. Pardee, secretary, is sending out, together with the programme of the annual meeting of the association, which was published in last week's issue of the Electric Railway Review, a pamphlet issued by the management of Hotel Champlain, Bluff Point, N. Y., where the meeting will be held on June 25 and 26. The pamphlet describes and illustrates with several good halftones the natural attractions and points of interest of Bluff Point and vicinity, and indicates that an especially favorable place has been chosen for the convention. A timetable of the trains running to Bluff Point and a circular in regard to the special railroad rates for the convention are also inclosed.

Brooklyn Bridge Improvements.—Two important contracts for work designed to increase the transit facilities of the Brooklyn bridge will be awarded within the next few weeks. Bridge Commissioner Stevenson has already started advertising one of these contracts, which provides for the widening of the roadways on the Manhattan approach to the bridge structure. This improvement is part of the plans which the department has made to establish the immense loop terminal station on the site of the Staats Zeitung building, which is to be used for trolley cars and elevated trains alike. According to the plans it is proposed to run the trolley cars from the roadways of the bridge into a subway to reach the system of loops in the new terminal station. In order to do this

and avoid cutting the masonry arches, the roadways must be widened to the full extent of the city's property, and the tracks carried on the outside of the roadways instead of on the inside, as at present. The terms of the contract require that the entire improvement must be completed by October 1.

Columbus Speeches and Municipal Ownership Report.—The office of the secretary of the American Street and Interurban Railway Association has just issued two pamphlets, one containing the addresses of the presidents of the various associations as presented at Columbus and the other containing the report of the committee on "Municipal Ownership," also presented at the 1906 convention.

Brooklyn Strike Ended.—The strike of the firemen and other power house employes of the Brooklyn Rapid Transit Company was settled on June 14, when an agreement in regard to wages was reached. The old men are to be taken back and the union is to be recognized. The wages of the firemen are increased from \$2.25 to \$2.40 per day and the water tenders are to get \$2.65 instead of \$2.50. Both classes of employes demanded an increase of 25 cents per day. The boiler men and coal handlers are to get \$2.00 a day, an increase of 25 cents.

Spokane's Lake Region.—The Spokane & Inland Empire Railroad of Spokane, Wash., has issued an attractive pamphlet with the above title, describing the many inland lake resorts reached by the lines of the Coeur d'Alene and Spokane division from Spokane. These resorts, of which several excellent halftone views are presented, include Newman Lake and Liberty Lake, Washington and Spirit Lake, Fish Lake, Hayden Lake and Lake Coeur d'Alene, Idaho. These lakes, which are all within a short distance from the city, are excellent places for summer cottages, camping, fishing, hunting, boating, etc.

Through Billing, Chicago to Warsaw.—H. S. Dickey, general superintendent of the Winona Interurban Railway, Winona Lake, Ind., writes that this company now has a through billing arrangement between Chicago, Ill., and Warsaw, Ind., in connection with the Graham & Morton Transportation Company, the Southern Michigan Railway Company and the Chicago South Bend & Northern Indiana Railway, and is also perfecting arrangements to sell through tickets between these points and all intermediate points. Although this arrangement has only been in effect for a short time, the business so far has been very encouraging.

Express Service from Boston to Springfield, Mass.—Plans for the through trolley express service from Springfield to Boston by way of Worcester are being gradually developed, and announcement is made that it will be in operation about October 1. The express cars will run over the Springfield & Eastern Street Railway, over the Brimfield extension and the Worcester & Southbridge Street Railway into Worcester, whence they will run over the Boston & Worcester lines. The last-named road has had some difficulty in securing rights to run the cars into Boston, but it is said that what franchises have hitherto been refused will be granted soon. The necessary equipment has been ordered. It is planned, if the necessary Boston franchises cannot be obtained, to run a line of automobile trucks from the Boston & Worcester line's terminal in Chestnut hill, Brookline, into Boston's business section.

Electric Railway Express Company to be Reorganized.—Following the action of Circuit Judge Reynolds of St. Louis, Mo., on June 14, denying to the minority stockholders of the Electric Railway Express Company of East St. Louis, Ill., an injunction restraining the East St. Louis & Suburban Railway from letting to the Illinois Traction Company the express privileges over the Suburban system between East St. Louis and Belleville, Ill., and other points, the announcement was made that a new company would be formed to conduct the express business. The plaintiffs claimed that the Electric Railway Express Company had the exclusive right to do an express business over the Suburban system. The contract was declared forfeited by the Suburban company for failure of the express company to comply with the terms of the contract. The company was recently placed in the hands of receivers and has ceased operating.

Detroit Strike Avoided.—The trainmen employed by the Detroit United Railway, who about two weeks ago voted to strike unless the company granted their demands for 28 cents an hour and improvement of working conditions, especially in the tripper service, on Monday of this week practically voted to accept the company's offer. This offer, as reported in last week's issue of the Electric Railway Review, includes the concessions demanded by the men as to working conditions without increasing the wages. The vote on Monday was as to whether the entire contract between the company and its employes should be submitted to arbitration and the proposition was defeated by a large vote. The men are now working under an agreement by which the question of wages is not to be reopened except by the consent of both parties. The vote not to arbitrate therefore practically means an acceptance of the company's offer.

Chicago-New York Air Line.—The Chicago-New York Electric Air Line Railroad, the company which has attracted so much attention through advertisements of its proposed 10-hour 10-dollar air line from Chicago to New York, on Saturday, June 15, formally opened a 5-mile spur line from Laporte, Ind., to its grading camp on the main line at South Laporte. Speeches were made by officers of the company, Mayor Becker of Milwaukee, Mayor Darrow of Laporte, and others. Special trains at the expense of the company were run from New England and from Minneapolis, carrying parties of stockholders to inspect the work. Grading is now nearly completed over about 20 miles of the main line from South Laporte toward Chicago. It is reported that the company has made an agreement with the Chicago South Bend & Northern Indiana Railway for joint use of the latter's tracks in South Bend and of the Air Line company's tracks in Laporte.

Construction News

FRANCHISES.

Augusta, Ga.—The Augusta & Columbia Railway Company, which proposes to build a 59-mile interurban line from Aiken, Ga., to Columbia, S. C., has petitioned for permission to lay a single-track passenger and freight line in Augusta, from Thirteenth street to the city wharf. Terminal facilities already have been purchased and it is stated that work will be started at once if the petition is acted upon favorably. It is estimated that the improvements will cost \$250,000. James U. Jackson, vice-president, Augusta, Ga.

Carthage, Mo.—A franchise in this city has been granted to the Kansas City Springfield & Southern Railway for its line from Springfield to Nevada, Mo.

Morris, Ill.—The Chicago Ottawa & Peoria Railway, recently incorporated to connect the Peoria lines of the Illinois Traction System with those of the Illinois Valley, has been granted a franchise to operate its line on Benton street in Morris. The line must be completed by January 1, 1909. H. E. Chubbuck, general manager, Ottawa, Ill.

Peoria, Ill.—The Peoria Railway Company, through S. L. Nelson, vice-president, has submitted to the council a proposition to build a double-track interurban railway on Washington street, from Chestnut street to Western avenue, the city of Peoria, after its completion, to have absolute ownership, the railway company retaining the perpetual right to occupy and use same. By this arrangement the city is to maintain the tracks and may, at its discretion, lease them to other interurban electric railways on such terms as it may deem advantageous to the city, the revenue accruing therefrom to go to the city of Peoria. This improvement would require about four miles of additional track and an expenditure of \$100,000, as estimated by the company.

Point Loma, Cal.—The Point Loma Electric Railway Company has applied for an additional franchise to construct a loop line in Point Loma, which privilege was not embodied in the franchise previously obtained. The San Diego Electric Railway Company will build and operate this new line.

Terre Haute, Ind.—The city council has refused to ratify the action of the board of public works in accepting the contract or new franchise submitted by the Terre Haute Indianapolis & Eastern Traction Company. The reasons given by the council are three in number, viz., the failure to provide for universal transfers from interurban lines to the city lines, and vice versa; the refusal to stop interurban cars upon signal except once in every six squares, and the failure to provide for a reasonable remuneration to the city for such a valuable franchise. The traction company is experiencing a similar trouble in the securing of a franchise in Richmond, and the business men of both cities are urging that some settlement be made, because the delay occasions them considerable inconvenience and is detrimental to business.

West Newton, Pa.—The Pittsburg McKeesport & Westmoreland Street Railway, which proposes to build an interurban electric line from Herminie to West Newton, with a branch to Suterville, has secured a franchise to operate its line in West Newton.

RECENT INCORPORATIONS.

Bellebridge Street Railway, Elizabeth, Pa.—Incorporated in Pennsylvania to build a 4-mile electric line from Glassport to Elizabeth, Pa. Capital stock, \$24,000. D. B. Neagley, president, Pittsburg, Pa. Other incorporators: E. L. Kern, J. K. Neagley, George McKain and N. F. Bicking, all of Pittsburg.

Centralia & Sandoval Railway, Centralia, Ill.—Incorporated in Illinois to build an electric railway from Centralia to Sandoval, parallel to the Illinois Central Railroad. Incorporators: W. M. Warnock, George D. Burroughs of Edwardsville, and others.

Crucible Street Railway, West Elizabeth, Pa.—Incorporated in Pennsylvania to build an electric railway 2½ miles long, from State street in Clairton to First street in West Elizabeth and the Allegheny county boundary line. Capital stock, \$15,000. Incorporators: D. B. Neagley, president; E. L. Kern, J. K. Neagley, George McKain and N. F. Bicking, all of Pittsburg, Pa.

Electric & Hydraulic Company, Grand Junction, Colo.—Incorporated in Colorado to promote power developments and electric railways. Capital stock, \$100,000. Incorporators: John Hays Hammond, John S. Bartlett, Irving W. Bonbright, Henry Hine, Leonard E. Curtis and others of Colorado Springs.

Idaho & Northwestern Railway, Coeur d'Alene, Idaho.—Incorporated in Idaho to build an 80-mile standard-gauge interurban line with four branches, to be operated by either steam or electricity or both. The line will start from Coeur d'Alene and end at Clarkia, Wash., by way of Chatelet. Capital stock, \$3,000,000. Incorporators: A. E. Gallagher, W. J. Taylor, Moscow, Idaho; Earl M. Rogers, Coeur d'Alene; E. R. Lewis, Fred B. Morrill, Spokane, Wash.

Ithaca-Owego Traction Company, Owego, N. Y.—Incorporated in New York to build an electric railway from Ithaca to Owego, 50 miles. Officers: President, Sherman Collins; vice-president, Charles D. Nixon; secretary and treasurer, George R. Peck.

Joplin & Pittsburg Railway, Joplin, Mo.—Incorporated in Kansas and Missouri to build an 80-mile interurban electric railway

between Joplin, Mo., and Pittsburg, Kan. Capital stock, \$5,000,000. Incorporators: H. W. Noble, Detroit, Mich.; F. H. Fitch, Pittsburg, Kan.; D. L. Robinson, Buffalo, N. Y.; C. G. Hutchinson, T. K. Irwin, Joseph I. Heim and others. The charter of the company, notice for application of which was noted in our issue of June 1, empowers the company to take over the street railway now under construction in Joplin, and the Pittsburg Railway & Light Company, operating from Columbus to Pittsburg, Kan.

Ohio & Southern Michigan Interurban Railway, Kalamazoo, Mich.—Incorporated in Michigan to build an interurban line from a point in Ohio through Coldwater, Hillsdale, Union City and Athens, Mich., to Kalamazoo. Capital stock, \$150,000. The line will be financed by Toledo and Pittsburg capitalists.

Penn Eastern Railroad.—Incorporated in Pennsylvania to build a 14-mile electric line in Pike county. Capital stock, \$150,000. William V. Hilliard, Milford, Pa., is president.

Rockwood & Bakersville Railway.—Incorporated in Pennsylvania to construct and operate an interurban line between Rockwood and Bakersville, Somerset county. Charles F. Hood, Connelville, Pa., is interested.

TRACK AND ROADWAY.

Ashland, Ky.—Thomas Boggess, Jr., is vice-president of a company that proposes to build an electric railway connecting Ashland, South Ashland, Oakview, Pollards, Russell and Greenup, Ky., about 20 miles.

Aurora Elgin & Chicago Railway, Wheaton, Ill.—Chief Engineer Charles Jones has announced that the first section of the line to Pigeon Hill, Aurora, Ill., will be opened for traffic on July 4, and that the entire line will be operating by August 1.

Bartlesville (I. T.) Interurban Railway.—This company, it is reported, will soon begin construction work on its proposed line from Bartlesville to Dewey, I. T. At a recent meeting it was decided to purchase track material immediately. The following officers have been elected: President, Joseph J. Carl; vice-president, George B. Keeler; treasurer, W. A. Smith.

Burlington-Bonaparte Interurban Railway, Burlington, Ia.—The promoters of this proposed line to connect Burlington and Bonaparte, Ia., via West Point, have organized by electing the following officers: President, J. A. Johnson, Bonaparte; first vice-president, John Blual, Burlington; second vice-president, T. L. Lampe, West Point; treasurer, H. H. Meeke, Bonaparte; secretary, Edward E. Egan, Burlington. It is stated that capital has been secured and that construction will begin without delay.

Canandaigua Southern Electric Railroad, Canandaigua, N. Y.—This company, which proposes to build an electric railway from Canandaigua to Atlanta, N. Y., has obtained permission from the state board of railroad commissioners to issue a \$2,000,000 mortgage. A 6½-mile extension from Atlanta to Wayland, one 2½ miles long from Atlanta to Lake Salubria, near Bath, N. Y., and a branch from Canandaigua to Palmyra, about 14 miles, also will be built after permission has been obtained from the commissioners.

Capital Circuit Traction Company, Indianapolis, Ind.—Charles E. Worth, secretary of this company, which proposes to build a belt line around Indianapolis, states that he has completed the work of securing the right of way. He states that the company is considering operating the road when completed with gasoline motors.

Cassville, Mo.—S. M. Mitchell of Cassville is reported to be seeking a charter for an electric railway from the Arkansas-Missouri state line to Eureka Springs, Ark.

Central Texas Traction Company, Corsicana, Tex.—Plans and specifications for this company's proposed interurban line, which will connect Corsicana and Palestine, Tex., are now completed and it is announced that work on the construction of the road and power plants will be started as soon as some of the minor details have been arranged.

Chatham Wallaceburg & Lake Erie Electric Railway, Chatham, Ont.—It is reported that \$40,000 of bonds for the construction of this road from Chatham to Lake Erie, via Wallaceburg, Blenheim and Dresden, Ont., have been subscribed locally, and that this sum is sufficient to insure the construction of the road by a party of American capitalists. George W. Kipp of Towanda, Pa., is president.

Chattanooga (Tenn.) Railways Company.—It is announced that this company will build a new railroad from Chattanooga, up Look-out mountain and to Lula lake and Minnehaha falls, on the mountain. It is also proposed to establish a 140-acre park on the mountain, near these lakes. A new line is also to be built to Chickamauga park, which will be much shorter than the present one.

Chicago & Western Indiana Traction Company, Indianapolis, Ind.—The preliminary survey for the line between Lafayette and Greencastle, Ind., 57 miles, has been completed. This line, known as the Educational Route, was originally intended to connect Chicago and Louisville, passing through the four college towns of Lafayette, Crawfordsville, Greencastle and Bloomington, but present plans contemplate only the construction of the section which has just been surveyed. W. L. Eckhouse of the American Engineering Company, Indianapolis, is chief engineer.

Chicago (Ill.) City Railway.—On June 17 about 200 men started the work of reconstructing this company's tracks in accordance with the provisions of the general settlement ordinance. The first work to be undertaken is on Root street, between Wallace and

State streets, where the tracks are being relaid with 129-pound grooved rails of a standard section approved by the board of supervising engineers, as described and illustrated in the Electric Railway Review of April 6, 1907, page 457. The directors have authorized a bond issue of \$10,000,000, the proceeds of which are to be used for the reconstruction work. Of this \$3,000,000 is to be available at once, \$3,000,000 on call, and \$4,000,000 when the work requires it.

Columbus Urbana & Western Traction Company, Columbus, O.—Right of way along the Scioto river is now being secured for this company's proposed extension through Dublin.

Columbia & Walla Walla Traction Company, Walla Walla, Wash.—It is reported that the officers of this company have under consideration the plan of extending the proposed line to Pasco. If this is done the line will run from Pasco to Wallula, thence to Walla Walla, to Dayton and up the Snake river to Lewiston or Charleston, with probably a branch line to the Palouse country to connect with the Spokane & Inland Empire system. J. W. Morrow of Waitsburg, Wash., is general manager.

Consolidated Railway, Bridgeport, Conn.—It is announced that this company will make extensive improvements to its lines on the Bridgeport division, including the construction of a large machine and repair shop, the enlargement of its rolling stock equipment by the purchase of a number of up-to-date cars, the extension of its freight and passenger system and other improvements, involving an expenditure of \$75,000.

Corry & Columbus Street Railway, Corry, Pa.—C. P. Northrup, president, is quoted as saying that as soon as the construction of the line from Corry to Columbus, Pa., five miles, is completed, it will be extended to Clymer, N. Y., and thence to Cutting, French Creek, Findley's Lake and northeast. Right of way is now being secured for a new line from Columbus to Ashville, via Bear Lake, Panama and Blockville. It is expected that the line to Columbus will be completed by July 4. The new line will connect at Ashville with the line of the Chautauqua Traction Company to Chautauqua lake.

Denver Interurban Railway, Ft. Collins, Colo.—T. S. McMurray, vice-president of this company, is quoted as saying that work on the local street railway lines in Ft. Collins would be started this week.

Des Moines Winterset & Creston Electric Railway, Des Moines, Ia.—B. Schreiner, chief engineer, writes that surveys, estimates, plans and specifications have been completed for this proposed line from Des Moines to Winterset and Creston, Ia., and that the proposition has been submitted to a bonding company. Construction is to begin at once, as soon as capital is secured.

Elkins (W. Va.) Electric Railway.—This company, recently incorporated to build an electric line in Elkins, and from Elkins to Belington, has elected the following officers: President, J. C. McShadden, Rockwood, Pa.; vice-president and general manager, J. E. Morgan of Elkins; secretary and treasurer, W. K. Taylor of Pittsburg. Construction is to begin as soon as material is shipped.

Evansville Suburban & Newburg Railway, Evansville, Ind.—It is reported that it has been decided to extend the line from Booneville to Chrisney, Ind., and that construction will begin immediately upon the completion of the surveys. It is also proposed to extend later to Cannelton, via Tell City and Troy.

Fresno (Cal.) Traction Company.—This company is preparing to build a new line on M street, from Inyo to Pollasky street. The Recreation Park line is also being double-tracked and work is progressing rapidly. C. A. Jenkins, superintendent.

Geary Street Park & Ocean Railroad, San Francisco, Cal.—It is reported that the board of supervisors has decided to proceed with the reconstruction of this road and has appropriated \$720,000 to be expended in converting the cable system to an underground conduit electric system.

Indianapolis Traction & Terminal Company, Indianapolis, Ind.—In accordance with an agreement reached between Hugh J. McGowan and the city, this company will begin at once the work of double-tracking its line in West Michigan street, from Blake street to the White river bridge.

Indianapolis & Cincinnati Traction Company, Indianapolis, Ind.—Charles L. Henry, president, has offered to build an extension from Greensburg to Madison, Ind., 52.4 miles, provided the residents along the line will subscribe \$300,000 of the estimated cost, \$1,321,967. The citizens are organizing to raise the money.

Indianapolis & Western Traction Company, Indianapolis, Ind.—be started by July 1. The road will be extended to Brazil to connect with a line from Terre Haute.

Iola Electric Railroad, Iola, Kan.—It is stated that this company is planning an extension of its line to Wheeler Heights, Kan.

Iowa-Missouri Traction & Power Company, Fairfield, Ia.—It is reported that this company, which proposes to build an extensive system of electric railways through eastern Iowa, has now completed surveys from Cedar Rapids to Oskaloosa, via Marengo, Genoa Bluff, Millersburg, Deep River and Montezuma, with a maximum grade of 2 per cent. Also a large per cent of the right of way has been acquired. J. W. Andrews, chief engineer.

Joplin & Pittsburg Street Railroad, Joplin, Mo.—Work on the electric railway in Joplin is progressing rapidly. Track is now being laid on Joplin street, between Fifth and Tenth streets, and material is arriving for the work on South Joplin street. Surveys have been completed for 48 miles of lines, running from Joplin

to Webb City, Carthage and Galena, and it is proposed to build about 15 miles this summer. W. O. Hands, manager and engineer.

Kansas City St. Joseph & Excelsior Springs Electric Railway, Kansas City, Mo.—It is reported that arrangements have been made for underwriting the bonds required for building the proposed line from Kansas City to St. Joseph and Excelsior Springs, Mo., 50 miles, and a bridge across the Missouri river at Kansas City, for which a franchise was recently secured.

Kansas City & Olathe Electric Railroad, Rosedale, Kan.—F. P. Dickson, president of this company, which proposes to build an interurban line from Kansas City, Mo., to Olathe, Kan., passing through Rosedale, Bryn Mawr, Rosedale View, South Park, Merriam, Shawnee, Lenexa and Lackmans, writes that the line has been surveyed from Rosedale to Olathe, Kan., its entire distance of 20 miles. Grading is completed from Rosedale to Lenexa, 11 miles, and 3 miles of track has been laid from Rosedale to South Park since the first of the year. Work on the overhead construction, which is of the bracket type, is now in progress from Rosedale to Merriam, a distance of 5 miles. The equipment for the power house will consist of two 150-horsepower gas engines and one 500-volt 90-kilowatt compound-wound multipolar direct-current generator, with switchboard apparatus, etc. F. P. Dickson, 408 Gumbel building, Kansas City, Mo., is president; D. B. Johnson, vice-president; R. W. Hoeker, secretary and treasurer. The Palmer Company, Dwight building, Kansas City, has charge of the engineering work.

Kansas City-Western Railway, Leavenworth, Kan.—The first car was operated last week over the Welborn cut-off, which will save about 15 minutes in the running time between Kansas City and Leavenworth.

Lafayette & Logansport Traction Company, Ft. Wayne, Ind.—It is announced that the line from Lafayette to Logansport, Ind., which was described in the Electric Railway Review of May 18, page 653, will be opened for traffic about July 15. A car will be operated over the line on June 23, when a party of officials will make an inspection trip, but the ballasting has not yet been completed.

Lake View Traction Company, Clarksdale, Miss.—It is announced that construction work on this company's line to Lake View will begin about September 1. Its capital stock has been increased to \$1,000,000 of preferred and \$1,500,000 of common stock and the company since its organization has been steadily at work acquiring right of way, real estate, franchises, etc., preparatory to beginning construction work in the fall. R. F. Tate, Memphis, is president.

Marlboro, Mass.—It is stated that a 17-mile interurban railway from Marlboro to Waltham is being promoted by C. E. Stevens of Sudbury, Mass.

Meridian (Miss.) Light & Railway Company.—It is announced that the Twenty-fourth avenue line in Meridian is to be extended at once to Poplar Springs, three miles, and that \$263,500 is to be expended in improvements.

Metropolitan Street Railway, Kansas City, Mo.—C. N. Black, general manager, has announced that the material for the extension of the Prospect avenue extension is expected to arrive the latter part of this month and that construction will begin about July 1. It is expected that 45 days will be required to build the extension.

Milford & Uxbridge Street Railway, Milford, Mass.—This company is reported to be contemplating the construction of an electric road connecting Whitinsville, East Douglas and Manchaug, Mass.

Milwaukee Northern Railway, Port Washington, Wis.—W. A. Comstock, president, writes in regard to the reports of a consolidation of this company with the Sheboygan (Wis.) Light Power & Railway Company that there has been no actual financial consolidation of the two companies, but consolidated management has been agreed upon between them, for mutual advantages in economy of operating charges, and for mutual protection. Ernest Gonzenbach, at present vice-president, treasurer and general manager of the Sheboygan Light Power & Railway Company, becomes general manager also of the Milwaukee Northern Railway. E. G. Broad, at present auditor of the Comstock-Haigh-Walker Company, which is building the Milwaukee Northern, becomes auditor of the two railway companies jointly. F. W. Walker of the Comstock-Haigh-Walker Company becomes operating engineer for the two railway companies. As far as the general officers are concerned the two companies will keep their identity as at present. The agreement goes into effect on July 1, 1907. The construction of the Milwaukee Northern is being pushed with all possible dispatch. There have been delays in construction, due to very bad weather, in the last two months, and there have been some delays in receiving material on account of strikes. It is expected, however, to be in operation to Port Washington, Wis., from Milwaukee about August 1. At the same time the work is being pushed along between Port Washington and Sheboygan, and with no untoward delays the line should be in operation into the last-named city from Milwaukee by November 15.

Mineola Roslyn & Port Washington Railroad.—It is announced that this company, which proposes to build an electric line from Oyster Bay to Flushing, L. I., via the points named in its title, has made application to increase its capital stock from \$150,000 to \$1,250,000, and to change its name to the New York & North Shore Traction Company.

Minneapolis Kansas City & Gulf Electric Railway, Minneapolis, Minn.—The Northwestern Securities Company has issued a prospectus for this company's proposed electric line from Minneapolis,

Minn., through Des Moines, Ia., Omaha, Neb., Kansas City, Mo., Wichita, Kan., Oklahoma City, Okla., Dallas, Waco, Houston and Galveston, Tex. The road is to be double-tracked and to handle both passengers and freight.

Montgomery Traction Company, West Point, Pa.—This company, which now operates an electric line from Lansdale to Norristown, Pa., announces that it will build an extension from Norristown to Ambler, with a possible continuation to Willow Grove.

New Orleans (La.) Railway & Light Company.—President E. C. Foster has announced that the company proposes to expend from \$700,000 to \$1,000,000 this year in track construction and roadbed improvements. At present the company is reconstructing its tracks on Broadway, from St. Charles avenue to Walnut street, and removing them from the side to the center of the street. As soon as this work is completed, or in about 30 days, the Villere street line is to be extended about five blocks. It is also proposed to make an experiment with wooden blocks for paving between the tracks and for one foot on each side.

Northern Cambria Street Railway, Patton, Pa.—Work is to be started in a few days on an extension from Barnesboro to Garman's Mills, Pa., three miles. Surveys have been completed. W. H. Denlinger, president.

Oregon Water Power & Railway Company, Portland, Ore.—Work will be started in a short time in replacing the present 40-pound rails between Oregon City and the Clakamas river with 70-pound rails. This division includes about two miles of track. Other portions of the track will be rebuilt this summer.

Paris (Ill.) Traction Company.—F. L. Kidder, president, writes that 3½ miles of track has been laid this year and put in operation, from the south city limits of Paris to Reservoir Park. The Paris & Northern Traction Company, which has the same officers, has been incorporated to build from Paris to Ridge Farm, Ill., 20 miles, from Horace to Brockton, 12 miles, and from Garland to Metcalf, 6 miles. Surveys have been completed from Paris to Chrisman, 14 miles, and surveying is in progress on the remainder of the distance to Ridge Farm. Grading is to begin in July. I. N. Doughty of Paris is chief engineer.

Public Service Corporation of New Jersey, Newark, N. J.—The new extension to Clementon, N. J., was opened for traffic on June 15.

Puget Sound International Railway & Power Company.—C. D. Wyman of Boston, Mass., vice-president of the Seattle Electric Company and the Puget Sound Electric Railway, who is also connected with other properties of the Stone & Webster Engineering Corporation in the northwest, has announced that this company has been organized and incorporated in Maine for the purpose of building and operating an extensive system of interurban electric lines in the state of Washington and to extend and improve the lines in the northwest already controlled by Stone & Webster. The cities which will be served by this system and their approximate distances from Seattle are as follows: Aberdeen, 133 miles; Blaine, 138 miles; Bellingham, 97 miles; Chehalis, 94 miles; Centralia, 94 miles; Puyallup, 32 miles; Everett, 46 miles. Negotiations for the controlling interest in the street railway properties of Everett, Wash., by Stone & Webster are now under way and as soon as these have been completed actual work will be begun on the construction of the first division, whose objective will be Bellingham. Between 30 and 40 miles have been surveyed south of the latter city. It is stated that power for the northern portion of the system will be obtained from the Noosack power plant, whose capacity will soon be increased to care for the additional load.

Pullman La Crosse & Columbia River Railroad.—J. O. Staats of La Crosse, Wash., has submitted a proposition to the people of Whitman county, Washington, south of Spokane, to organize a railroad company and build an electric line from Pullman to La Crosse and Hooper, 42 miles. It is to connect at Pullman with the Oregon Railroad & Navigation Company and at Hooper with the new Portland-Seattle branch of the Northern Pacific. The route will be from Pullman to Union Flat, via Wilbur gulch, thence crossing the flat to Little Pennewawa creek, thence down that creek and across the divide to Alkali Flat, thence to La Crosse, via Willow creek. Power will be generated at Falouse Falls, near Washuena, if sufficient force can be obtained. If not, steam will be used. The proposed line will occupy almost the route selected by the Northern Pacific several years ago when it was proposed to build a cut-off to connect with the main line near Pasco, thus saving a long haul to Marshall Junction and back to Pasco. The line will be 130 miles shorter than the road now running from Pullman to Pasco via Marshall Junction.

San Diego (Cal.) Electric Railway.—This company is under contract with the Columbian Realty Company to build and operate a car line from University boulevard, out University avenue, through City heights, to Fairmont avenue, and the construction of this line will be commenced and rushed to completion and operation as soon as the grading of the street has been completed. The line will be completed within six weeks after construction has begun, as most of the material is now in the city and the remainder will have arrived before the grading has been finished.

Sand Point, Idaho.—Announcement is made by A. McDonnell that plans for an electric railway to facilitate the transporting of ore from the Weber mine to Lakeview are under consideration. The line will be nine miles long.

Seattle-Everett Interurban Railway, Seattle, Wash.—Harry C. Todd, secretary, writes that this company has laid 2½ miles of track this year from Lake Ballinger to Hall's Lake, Wash., and is operating four 41-foot passenger coaches, one electric locomotive and 25 freight cars. An extension from Hall's Lake to Everett, 18

miles, is expected to be in operation by January 1. G. W. Chapman, chief engineer.

Southern Illinois Transit Company.—McCann Brothers of Herrin, Ill., who have the contract for grading this line from Murphysboro, through Carbondale, Herrin and Johnson City, Ill., were expected to begin work this week between Carbondale and Carterville. Another force of men is to be put at work soon between Carbondale and Murphysboro. The work of securing a private right of way is being pushed. The company is to be reorganized under the name of the St. Louis & Big Muddy Coal Belt Railway, with a capital stock of \$600,000.

Springfield (Ill.) Consolidated Railway.—Mullville Brothers of Alton, Ill., have been awarded the contract for the construction of this company's proposed extension to the Zoo park.

Springfield, Md.—The Springfield State Hospital for the Insane has let a contract to David E. Evans of Baltimore for building an electric railway line from Springfield to Sykesville.

Terre Haute Indianapolis & Eastern Traction Company, Indianapolis, Ind.—This company will replace half a mile of track in Newcastle, Ind., with new 6-inch girder rails.

Texas Traction Company, Dallas, Tex.—The grading forces for the line from Sherman to Dallas, Tex., have begun work in the city of Sherman and will complete the work from the city to the next camp in the vicinity of Choctaw Bayou.

Toledo (O.) Railways & Light Company.—This company is relaying five miles of its tracks in Toledo with 90-pound rails, in place of the old 45-pound rails. The work on the Broadway line is completed and work is now in progress on South and Adams streets. The Monroe and Western avenue lines will be rebuilt next and also the Lower Summit line, when that street is repaved this summer. This line may also be double-tracked. L. E. Beilstein, general manager.

Union Traction Company of Kansas, Independence, Kan.—Tracklaying has been completed on the line from Coffeyville to Independence, Kan., and President D. H. Siggins is quoted as saying that cars will be operating over the line by June 30. Work on the park line in Coffeyville is expected to be completed by July 15. The company also proposes to build from Coffeyville to Parsons and from Coffeyville to Cherryvale.

United Railways, Portland, Ore.—E. E. Little, president of the Pacific Railway & Navigation Company, has acquired control and been elected president of this company, which is now building a street railway system in Portland and proposes to build to Hillsboro and Forest Grove. Work has been started on Flanders street, from Front to Twelfth street.

Washington & Martinsville Traction Company.—Thomas De Noon of Chicago and Chief Engineer E. J. Wilson announced recently that construction on the line from Washington to Martinsville, Ind., via Bloomfield, will begin in 30 days. Surveys are being completed and grading is to begin at the Washington end.

Western New York & Pennsylvania Traction Company, Olean, N. Y.—The New York railroad commissioners have granted this company permission to issue \$300,000 of bonds for improvements.

Williamsport (Pa.) Passenger Railway.—E. H. Davis, general manager, writes that this company expects to complete this summer an extension of about 1½ miles.

Winnipeg (Man.) Electric Railway.—This company has written to the board of control of Winnipeg that it proposes to double-track its Portage avenue line from Nella street west; also the Belt line and the William avenue line.

Wyalusing Valley (Pa.) Railway.—W. D. B. Ainey, T. J. Davis, M. S. Allen and J. S. Courtright have applied for a charter to build an electric railway from Wyalusing to Montrose, Pa.

POWER HOUSES AND SUBSTATIONS.

Buffalo & Lake Erie Traction Company, Buffalo, N. Y.—This company has closed a contract with the General Electric Company for a new converter substation, which will be built near Athol Springs, N. Y. It is expected that the station will be ready for operation by August 15. The cost of the new substation will be about \$60,000. This station is being erected as a result of a contract just entered into with the Ontario Power Company for electric power for the main line between Buffalo and Erie. It is stated that within a year power will be available for manufacturing purposes and it is predicted by President Joseph B. Mayer that this will do much to increase the development of towns along this line. The power house at Fredonia will be abandoned except for the manufacture of gas.

Chippewa Valley Electric Railway, Eau Claire, Wis.—It is announced that this company has decided not to renew its contract with the Chippewa Falls Power & Lighting Company for power to operate its cars. The company has decided to operate its plant at Menomonie, and expects to have sufficient power available to sell for power and lighting purposes.

Keokuk (Ia.) Electric Railway & Power Company.—It is announced that this company will spend about \$10,000 on improvements on its local property this fall and winter. A new 400-horsepower generator will be installed in its power house.

Memphis (Tenn.) Street Railway Company.—It is announced that this company will install two new units in an addition to its power house. The addition will be of brick of sufficient size to accommodate the new units. Work will be started in about a month.

Personal Mention

Mr. E. S. Fassett, general manager of the United Traction Company of Albany, N. Y., has been elected a director and a member of the executive committee, succeeding Mr. W. J. Mullen.

Mr. E. J. Bechtel, heretofore chief electrician of the Toledo Railways & Light Company, Toledo, O., has resigned, effective on July 1, to become consulting engineer for Hodenpyl, Walbridge & Co., New York City.

Mr. Leonard A. Jansen, superintendent of underground construction of the Milwaukee Electric Railway & Light Company, has been appointed south side commissioner of public works of the city of Milwaukee, Wis.

Mr. Charles R. McKay has been appointed chief electrician of the Toledo Railways & Light Company, Toledo, O., succeeding Mr. E. J. Bechtel, resigned. Mr. McKay formerly was with the General Electric Company at Cincinnati.

It is officially announced that Mr. Frank R. Henry, auditor of the United Railways Company of St. Louis, St. Louis, Mo., has been elected second vice-president of the American Street and Interurban Railway Accountants' Association, vice Mr. C. F. Bryant, resigned.

Mr. Hugh J. McGowan of Indianapolis, Ind., president of the Terre Haute Indianapolis & Eastern Traction Company and of the Indianapolis Traction Terminal Company, has sailed for Europe to spend at least three months, accompanied by his wife and daughter.

Mr. Ernest Gonzenbach, vice-president, treasurer and general manager of the Sheboygan (Wis.) Light Power & Railway Company, has been appointed general manager also of the Milwaukee Northern Railway of Port Washington, Wis., which is building a line from Milwaukee to Port Washington and Sheboygan, Wis.

Mr. S. N. Ford of Mansfield, O., has been elected president of the Mansfield Railway Light & Power Company, in place of Mr. Leopold Kleybolte of Cincinnati. Mr. C. F. Ackerman of Mansfield has been elected vice-president, succeeding Mr. A. S. Huey of Chicago, and Mr. S. A. Foltz of Mansfield, general manager, has also been elected secretary, to succeed Mr. George H. Koehler of Chicago.

Mr. M. Kuroki, a professor in the University of Japan, who has been sent to this country and also to Germany to study the electric traction systems, is spending a few weeks in inspecting the Indiana lines and especially the alternating-current system and power house of the Indianapolis & Cincinnati Traction Company at Rushville. Mr. Kuroki is accompanied by Mr. J. W. Meares, electrical adviser for the English government in India, who is likewise making an inspection of the interurban lines in Indiana.

It is officially announced that the new officers of the Connecticut Company, formerly the Thomaston Tramway Company, which will have charge of operation of the Connecticut electric lines of the New York New Haven & Hartford Railroad Company, are as follows: President, C. S. Mellen; vice-presidents, Calvert Townley, H. M. Kochersperger and E. H. McHenry; assistant to the president, H. A. Fabian; general traffic manager, A. B. Smith; general manager, John K. Punderford, all of New Haven, Conn.

The Michigan United Railways Company, Lansing, Mich., has issued the following notice: "The appointment of Mr. J. M. Bramlette as general manager of the Michigan United Railways Company has been announced, to take immediate effect. Mr. Bramlette has held the position of general superintendent for the company for more than a year past and the appointment is a well-merited recognition of his efficient services. His headquarters will continue to be in the city of Kalamazoo, the western terminus of the system. The office of general superintendent has been abolished." A portrait and biographical sketch of Mr. Bramlette were published in last week's issue of the Electric Railway Review.

The office of Mr. T. P. Shonts, president of the Interborough-Metropolitan Company of New York, has been moved from the Park Row building to the United States Realty building, 115 Broadway, seventeenth floor. Mr. H. M. Fisher, secretary, will also have his office there. A reorganization of the legal department of the companies embraced in the Interborough-Metropolitan Company system in New York has been announced as having taken effect on June 1. The department is now organized as follows: Mr. Paul D. Cravath, general counsel New York City Railway and subsidiary companies. Mr. George W. Wickersham, general counsel Interborough Rapid Transit Company and subsidiary companies. Mr. James L. Quackenbush, general attorney for all companies. Mr. A. A. Gardner, general solicitor for all companies. Mr. Charles A. Gardiner, solicitor for Manhattan Railway. Mr. Henry A. Robinson, solicitor for the New York City Railway and solicitor in charge of the bureau of real estate and taxes for the various companies in the system. Mr. Van Vechten Veeder, attorney and solicitor for the borough of Queens and Nassau county. Mr. Ambrose F. McCabe, attorney and solicitor for Westchester county. Mr. Quackenbush formerly had jurisdiction over the surface lines only. Under his new assignment he is general attorney for all the lines. The jurisdiction of Mr. Gardner extended formerly over the Interborough Rapid Transit Company only. His new duties entail much more work. Mr. Gardiner has been relieved of the legal work of the subway and will now confine his attention to the Manhattan company.

Financial News

Boston Elevated Railway.—The Massachusetts railroad commissioners have approved the issue of \$5,800,000 of 30-year 5 per cent bonds by this company, to supply funds needed in new construction and equipment, and the purchase of real estate.

Boston Suburban Electric Companies.—The shareholders voted on May 27 to amend the trust agreement with the object of enabling the company to consolidate three companies west of Newton, Mass. A. D. Clafin, the president, is quoted as saying that in acquiring these roads the Boston Suburban Electric Companies received about \$100,000 bonds, of which, together with some real estate, it will dispose. The three companies are the Westboro & Hopkinton Street Railway, Hopkinton, Mass.; the South Middlesex Street Railway, Framingham, Mass., and the Natick & Cochituate Street Railway, Natick, Mass., which will give a through line from the end of the Worcester Consolidated Street Railway tracks in Westboro to Newton, from whence the Boston Suburban Companies' cars may be run directly by the Boston Elevated Railway into the Park street station of the Boston subway.

Chicago City Railway Company.—An issue of \$10,000,000 of first mortgage 5 per cent 20-year bonds has been authorized, and \$6,000,000 of the bonds have been sold to the Harris Trust & Savings bank and the First Trust & Savings bank. Of this \$6,000,000 it is announced that \$4,000,000 will be issued on July 1, another \$1,000,000 on August 1, and the remaining \$1,000,000 on September 1. The proceeds of the issue will be used in rebuilding tracks, providing new equipment and for the purchase of additional real estate and the erection of buildings.

Consolidated Railway, New Haven, Conn.—Earnings of this company and controlled lines for the 10 months ended April 30, 1907, were as follows: Total gross earnings from operation, \$4,989,607; less operating expenses, \$3,181,448; net earnings, \$1,808,159; add income from other sources, \$851,647; total income, \$2,659,806; deductions from income, \$2,516,578; net income, \$143,228. Against net income there was charged: Six months' dividend paid on December 31, 1906, \$200,000; accrued dividend for January to April, 1907, \$100,000; total, \$300,000.

Electric Properties Company.—This company has issued a report for the 11 months ended April 30, 1907, as follows:

Earnings	\$388,248
Organization, legal and general expenses	104,744
Net	\$283,504
Preferred dividend	128,057
Common dividend	120,000
Surplus	\$ 35,447

At the annual meeting of stockholders the following directors, whose terms expired, were re-elected: H. Starr Giddings, George C. Smith, New York; E. G. Tillotson, Cleveland; John F. Wallace, New York; Theodore Vorhees, Philadelphia; F. Q. Brown, New York. The other members of the board are: Paul D. Cravath, New York; John A. Spoor, Chicago; Moses Taylor, New York; F. D. Underwood, New York; J. R. McGinley, Pittsburg; E. H. Jennings, Pittsburg; Charles H. Allen, N. W. Halsey, Robert B. Van Cortlandt, New York; George Westinghouse, Pittsburg; C. Sidney Shepard, New Haven, and W. H. Bixby, St. Louis, Mo. Immediately after the adjournment of the stockholders' meeting the board of directors organized and elected the following officers: John F. Wallace, president; George C. Smith, vice-president; P. F. Thompson, vice-president; John Seager, secretary; R. E. Keating, assistant secretary, and W. A. Esselstyn, treasurer.

Henderson (Ky.) Traction Company.—This company, which has acquired the property of the Henderson City Railway, recently foreclosed, has filed a trust deed to the Ohio Valley Banking & Trust Company of Henderson, Ky., as trustee, to secure an issue of \$150,000 of 5 per cent 20-year gold bonds. The authorized capital stock is \$150,000. Henry P. Barret is president, J. Henry Lyne vice-president, and Charles F. Dallam is secretary and treasurer. These three, together with B. G. Witt of Henderson, C. C. Tennis of Pittsburg, and Charles A. Hinsch and W. F. Boyd of Cincinnati, comprise the board of directors. For each \$1,000 bond of the old company \$500 in stock and \$500 in new bonds have been given.

Illinois Traction Company.—Gross earnings for the four months ended April 30 were \$1,195,324, an increase of \$212,939, or 23.72 per cent over the corresponding period of last year. The increase in net earnings was \$92,969, an increase of 24.29 per cent.

Indianapolis Traction & Terminal Company.—At the annual meeting of stockholders on June 12 the directors were re-elected as follows: Hugh J. McGowan, H. P. Wasson, John J. Appel of Indianapolis; Arthur W. Brady of Anderson, and W. Kelsey Schoepf of Cincinnati. The directors re-elected the following officers: President, Hugh J. McGowan; secretary-treasurer, W. F. Milholland; vice-presidents, H. P. Wasson, John J. Appel, Robert I. Todd, E. B. Peck of Indianapolis, and E. G. Edwards of Cincinnati. Mr. Todd also is general manager.

Mansfield (O.) Railway Light & Power Company.—At the annual meeting of stockholders in Mansfield on June 10 the following directors were elected: S. N. Ford, C. F. Ackerman and Reid Carpenter of Mansfield, F. L. Fuller, C. L. Southerden and Thomas W. Latham of Cleveland, and George Kohler of Cincinnati. The directors organized by electing the following officers: S. N. Ford,

president; C. F. Ackerman, vice-president; Reid Carpenter, treasurer, and S. A. Foltz, secretary.

Manila Electric Railroad & Lighting Corporation.—This company has issued its annual report for the year 1906. The income account, with a comparison, is as follows:

	1906.	1905.	Increase.
Gross earnings—			
Light and power	\$381,120	\$328,417	\$ 52,703
Railway	513,840	347,316	166,524
Trucking	15,514	47,793	* 32,279
Total	\$910,474	\$723,526	\$186,948
Operating expenses—			
Light and power	\$184,321	\$168,458	\$ 15,863
Railway	269,361	165,234	104,127
Trucking	14,167	36,286	* 22,119
Total	\$467,849	\$369,978	\$ 97,871
Net earnings	442,625	353,548	89,077
Other income		1,122	* 1,122
Total net	\$442,625	\$354,670	\$ 87,955
Interest on bonds	233,208	193,109	38,099
Surplus for year	\$209,417	\$159,561	\$ 49,856

*Decrease.

The operation of the railroad department was inaugurated on April 10, 1905, so that the figures for 1905 cover operations of the railroad department for less than nine months.

Maryland Electric Railways, Baltimore.—The declaration of a semi-annual dividend of 2 per cent increases the annual rate to 4 per cent. The first dividend, which was paid in January, was only 1½ per cent.

Meridian (Miss.) Light & Railway Company.—Shareholders have approved an amendment to the charter authorizing an increase in the capital stock from \$1,000,000 to \$2,000,000, in order to provide for additions and extensions.

Rio de Janeiro Tramway Light & Power Company.—The annual report for 1906 shows gross earnings of \$5,575,000 and operating expenses of \$4,010,000, leaving net earnings of \$1,565,000.

Rome (N. Y.) City Street Railway Company.—A meeting of stockholders will be held on June 22 to vote on a proposition to increase the capital stock from \$150,000 to \$500,000. The proceeds will be used for extensions.

Toledo Ann Arbor & Detroit Railway, Toledo.—Judge Lockwood of the circuit court at Toledo has taken under advisement the motion to sell the property. John O. Zabel of Toledo presented the motion for the sale and argued the case before the court. Other interests opposed the sale on the ground that their claims were not sufficiently protected.

Toledo (O.) Railways & Light Company.—The purchase of the property of the Toledo Gas Electric & Heating Company and the increase in the capital stock from \$12,000,000 to \$15,000,000 have been authorized by shareholders. The Toledo Railways & Light Company guarantees the \$2,200,000 outstanding bonds of the gas company.

United Railways Investment Company.—The directors have decided that it would be inadvisable to take any action on the semi-annual dividend on the preferred stock, which is ordinarily payable in July. This decision was taken on account of the existing labor situation in San Francisco, and in order that the investment company might be in a position to give the United Railroads of San Francisco the fullest measure of support.

United Traction Company, Albany, N. Y.—The directors have authorized the issue of \$859,000 additional first consolidated mortgage 4½ per cent bonds, making a total outstanding of \$2,588,000. The remainder of the authorized issue of \$6,500,000 is reserved to retire prior liens.

Uxbridge & Blackstone Street Railway, Uxbridge, Mass.—It is announced that the \$80,900 capital stock of this company will be acquired by the New England Investment & Security Company, which holds the New York New Haven & Hartford Railroad street railway properties in Massachusetts. The Uxbridge & Blackstone company has \$80,000 first mortgage 5 per cent bonds outstanding. It operates 10 miles of road, connecting Woonsocket, Whitins, Whitinsville, Millville and Uxbridge.

Western New York & Pennsylvania Traction Company, Olean, N. Y.—Approval has been given by the New York railroad commission to the issue by this company of \$300,000 additional first and refunding mortgage bonds, making a total outstanding of \$2,474,000.

Dividends Declared.

American Cities Railway & Light Company, preferred, quarterly, 1½ per cent.
Bangor (Me.) Railway & Electric Company, quarterly, 1¼ per cent.
Cincinnati Street Railway, quarterly, 1¼ per cent.
Indianapolis Street Railway, 3 per cent.
Louisville (Ky.) Traction Company, common, quarterly, 1 per cent.
Manila Electric Railroad & Lighting Corporation, 1 per cent.
Reading (Pa.) Traction Company, 1½ per cent.
St. Joseph Railway Light Heat & Power Company, preferred, 1¼ per cent.
Union Passenger Railway, Philadelphia, 9½ per cent.
West Philadelphia Passenger Railway, 10 per cent.

Manufactures and Supplies

ROLLING STOCK.

San Jose & Santa Clara Railway, San Jose, Cal., has placed an order for 12 double-truck cars.

Camden & Suburban Railway, Camden, N. J., it is reported, is in the market for 41 motor cars.

Maryland Electric Railways, Annapolis, Md., has placed an order for eight new passenger cars.

Elkins Electric Railway, Elkins, W. Va., is in the market for a number of electric motor passenger cars.

Mt. Hood Railway & Power Company, Portland, Ore., under construction, will be in the market for cars about September 1.

Spokane & Inland Empire Railroad, Spokane, Wash., has ordered one locomotive from the Baldwin Locomotive Works.

Scioto Valley Traction Company, Columbus, O., has recently purchased and is now equipping for service four express trail cars.

Sandusky Norwalk & Mansfield Electric Railway, Norwalk, O., it is reported, has purchased a number of new 53-foot cars.

Pittsburg Harmony Butler & New Castle Railway, Grafton, Pa., placed an order with the St. Louis Car Company some time ago for 12 new cars.

Whatcom County Railway & Light Company, Bellingham, Wash., it is reported, expects to buy eight motor cars and a few trailers in the near future.

Williamsport Passenger Railway, Williamsport, Pa., as reported in the Electric Railway Review of April 6, has ordered four cars from The J. G. Brill Company.

Philadelphia & Western Railway, Philadelphia, Pa., it is reported, has drawn up specifications for 50 new cars and will be ready to award the contract in the near future.

Worcester Consolidated Street Railway, Worcester, Mass., has placed an order with The J. G. Brill Company for 15 closed cars for city service and 5 closed cars for suburban use.

Kansas City St. Joseph & Excelsior Springs Railway, we are officially advised, has not yet placed its order for equipment, but will be in the market for new cars later in the season. Ira G. Hedrick, consulting engineer, Keith & Perry building, Kansas City, Mo.

Washington Railway & Electric Company, Washington, D. C., has ordered 25 closed cars, 28 feet 3 inches long, from the St. Louis Car Company. These cars are to be mounted on maximum traction trucks, with steel-tired wheels and equipped with Westinghouse 93-A motors.

Waterloo Cedar Falls & Northern Railway, Waterloo, Ia., has placed a contract with the McGuire-Cummings Manufacturing Company for seven 10-bench open cars and seven closed cars. The closed cars will be 20 feet long over body, 31 feet 1 inch over all and will have 5-foot platforms.

United Traction Company, Albany, N. Y., has ordered 25 double-truck cars from J. M. Jones' Sons. These cars will have 28-foot bodies, longitudinal seats, pneumatically operated doors and six-foot vestibules. They will be equipped with 27-G Brill trucks, GE-80 motors and K-28F controllers.

Ferrocarril Electrico de Lerdo a Torreón, Gomez Palacio, Mex., it is reported, has placed an order with The J. G. Brill Company for six large double-truck cars. This is the second order for equipment that this road has placed in the United States. The first, given about a month ago, calls for 10 large cars.

Newton & Northwestern Railroad, Boone, Ia., has received from the Niles Car & Manufacturing Company 10 passenger interurban cars. These cars are 53 feet long and 8 feet 9 inches wide, inside measurement, and have three compartments—baggage and express, smoking and passenger. The company has also purchased an express car of the same length and width from the Niles Car & Manufacturing Company.

SHOPS AND BUILDINGS.

Chippewa Valley Electric Railway, Eau Claire, Wis.—Plans have been prepared for a new waiting station at Eau Claire, which will be 17 by 30 feet, with cement floor, iron columns and metal roof. H. G. Lawrence, superintendent.

Indiana Union Traction Company, Anderson, Ind.—It is announced that this company will expend \$15,000 additional on the large car shops now under construction at Anderson, bringing the total cost up to \$140,000.

Louisville & Southern Indiana Traction Company, New Albany, Ind.—It is reported that this company has taken an option on land near Midland, Ind., on which to erect a car house, gas house and a substation.

United Railways & Electric Company, Baltimore, Md.—The Maryland Electric Railways Company, acting for the United Company, has let a contract to J. Henry Miller for the erection of a large reinforced concrete car house on the block bounded by Pratt, Lombard, Seventh and Eighth streets, Highlandtown, Md. The

plans were prepared by Simonson & Pietsch, architects, and the estimated cost is \$140,000. Work is to be started immediately, with the intention of completing the building by fall.

New York (N. Y.) City Railway.—The car barns on Madison avenue, between Eighty-fifth and Eighty-sixth streets, New York City, were destroyed by fire on June 16. The loss is estimated at \$200,000.

Petaluma & Santa Rosa Railway, Petaluma, Cal.—It is reported that this company contemplates the erection of a new passenger station and other improvements, including the enlargement of the switching yards.

Spokane & Inland Empire Railroad, Spokane, Wash.—Three new passenger stations are now being erected at Liberty Lake, Liberty Lake Junction and Dalton Gardens, Idaho, on the Coeur d'Alene and Spokane division. The type of structure is similar to that used in the new station at Hayden Lake, of the Swiss chalet style, with long umbrella sheds.

TRADE NOTES.

General Electric Company, Schenectady, N. Y., has declared its regular quarterly dividend of 2 per cent, payable on July 15.

Beaumont Iron Works, Inc., Beaumont, Tex., will erect a building there, 50 by 150 feet, equipped for building and rebuilding cars.

J. G. White & Co., New York, have declared their regular quarterly dividend of 1½ per cent on the preferred stock, payable on July 1.

American Nut & Bolt Fastener Company, Allegheny, Pa., has declared its regular quarterly dividend of 5 per cent and 5 per cent extra, both payable on June 20.

Standard Coupler Company, Chicago, has declared a semi-annual dividend of 2½ per cent on the common stock and 4 per cent on the preferred stock, payable on June 29.

D. T. Williams Valve Company, Cincinnati, O., has opened an eastern branch office at 26 Cortlandt street, New York, in charge of Charles K. Thomas as eastern sales agent.

Union Switch & Signal Company, Swissvale, Pa., has declared the regular quarterly dividends of 3 per cent on its preferred and 3 per cent on its common stock, payable on July 10.

Northern Engineering Works, Detroit, Mich., has installed two 5-ton 3-motor electric traveling Northern cranes in the new plant of the Michigan Copper & Brass Rolling Mills, Detroit.

Virginia Passenger & Power Company, Richmond, Va., has recently placed an order for Allis-Chalmers turbines and Babcock & Wilcox boilers, equipped with Foster superheaters for 175 degrees.

Pittsburg Screw & Bolt Company, Pittsburg, Pa., has had plans prepared for a 4-story factory and office building, 72 by 100 feet. It will be located at Twenty-fifth street and Liberty avenue, Pittsburg.

H. M. Bylesby & Co., Chicago, have been retained as consulting and supervising engineers by the Mobile & Ohio for the rehabilitation and electrification of its general repair shops at Whistler, Ala.

Electric Storage Battery Company, Philadelphia, Pa., has declared the regular quarterly dividend of 1½ per cent on its preferred and common stocks, payable on July 1, to stockholders of record on June 25.

Evens & Howard Fire Brick Company, St. Louis, Mo., emphatically denies the rumors which associate this company with others in the so-called merger of St. Louis fire clay interests. The company advises it is not and will not be a party to the merger.

American Car & Foundry Company, St. Louis, Mo., has declared a regular quarterly dividend of 1 per cent on the common stock and 1½ per cent on the preferred stock, both payable on July 1. This increases the dividend on the common stock from 2 to 4 per cent yearly.

Federal Railway Signal Company, 42 Broadway, New York, will soon begin the construction of a factory building on upper Broadway, Albany, N. Y. The building will be 350 feet long and 100 feet wide, two stories high and of fireproof steel construction and will cost about \$50,000.

E. H. Symington, western sales manager of the T. H. Symington Company, who was seriously injured while riding in Lincoln park on May 18, is now rapidly regaining his health. He has recovered consciousness and his strength to such an extent that he is able to take some recreation.

R. L. Ginsburg & Sons, dealers in iron, steel and metals, announce that on July 1 this firm will be succeeded by a corporation known as the R. L. Ginsburg Sons' Company, with offices located both at Detroit, Mich., and Buffalo, N. Y., as heretofore. The new corporation will take over all the assets and assume all the liabilities of the present firm.

Goldschmidt-Thermit Company, 90 West street, New York, exhibited at the Master Mechanics' and Master Car Builders' conventions at Atlantic City three sizes of its new fire brick molds for welding locomotive frames. These molds represent a great advance in the process, as they entirely do away with the services of molders and pattern makers, allowing the repairs to be made in the roundhouse or repair shop. Daily demonstrations of the welding of locomotive frames were given in connection with the exhibit

and formed a most important feature. Other exhibits of the company were its new wax patterns, interesting samples of repair work and specimens of the rare metals free from carbon, such as chromium, manganese, manganese-copper, molybdenum, etc., produced by the Thermit process and supplied by the company.

Heywood Brothers & Wakefield Company, Wakefield, Mass., will construct a \$300,000 factory at Gardner, Mass. The plant will consist of a main building, 75 by 425 feet, and an office building, 60 by 60 feet, each building to be four stories high and basement. A contract has just been awarded the American Bridge Company for 1,500 tons of structural steel.

Acme Road Machinery Company, Frankfort, N. Y., manufacturer of contracting machinery and road building supplies, has prepared plans for a number of buildings to replace those recently destroyed by fire. These will include a main erecting and machine shop, 74 by 304 feet; woodworking shop, 50 by 100 feet; foundry, 60 by 80 feet; storage shed, 34 by 200 feet, and another storage shed, 20 by 200 feet.

General Fireproofing Company, Youngstown, O., announces that H. A. McMore, engineer, formerly with the Harlem Contracting Company of New York City, has been engaged by it. Mr. McMore is at present located at the home office and works in Youngstown. He will be connected with the reinforced concrete department and will be particularly concerned in designing and estimating work in which this company's system is to be installed.

Electric Controller & Supply Company, Cleveland, O., has moved into a plant of its own at 2698 East Seventy-ninth street. The company has been occupying leased quarters in the plant of the Wellman-Seaver-Morgan Company, but for some time both companies have been cramped for room and the change will greatly facilitate their work. The new plant of the Electric Controller Company is a 3-story building, 50 by 200 feet, with a T, 50 by 100 feet, and will enable it to double its output.

Southwestern Portland Cement Company, El Paso, Tex., has been incorporated with \$1,100,000 capital stock, to establish a Portland cement plant. Plans are now being prepared and the plant is expected to have a monthly capacity of 1,400 barrels. C. Leonard, Los Angeles, Cal., president; Charles Boyetcher, Denver, Colo., vice-president; A. Courchesne, vice-president and general manager; Felix Martinez, vice-president; J. E. Williams, treasurer; all of El Paso, Tex.; O. J. Binford, Los Angeles, Cal., secretary.

Stone & Webster Engineering Corporation, Boston, Mass., has recently placed contract for new equipment for the Pawtucket Electric Company, including four 520-horsepower Babcock & Wilcox boilers, equipped with Foster superheaters for 150 degrees superheat. This boiler room equipment is practically a duplicate of that recently ordered by the Texas Traction Company, of which the Fred A. Jones Company of Houston is consulting engineer, for operating the Curtis turbines in the new power station at McKinney, Tex.

Allis-Chalmers Company, Milwaukee, Wis., advises that its business continues to show a steady gain. During the month of May this company shipped from its works 552 cars of machinery, which was a gain of 20 cars over the record established for April. In April the aggregate weight of shipments was 21,680,847 pounds, while for the month of May the figure had risen to 23,772,242 pounds, making a total weight for the two months of 45,463,089 pounds. Cars bearing this enormous quantity of machinery, if coupled in one train, would have covered a distance of about eight miles.

Allis-Chalmers Company, Milwaukee, during the past two years has equipped six complete electric traction systems, aggregating a total of 218 miles of trackage, of which 150 miles are already completed and in daily operation. These include the Toledo Port Clinton & Lakeside, Cincinnati Milford & Loveland, Winona Interurban, Indianapolis Newcastle & Toledo, Indianapolis Crawfordsville & Western, and the Milwaukee Northern. The equipment for the latter road will constitute the installation of the largest gas engine driven electrical units for traction purposes in America.

Cutler-Hammer Manufacturing Company, Milwaukee, Wis., manufacturer of electric motor controlling devices, announces the purchase of the Wirt Electric Company of Philadelphia, Pa. The manufacture of the Wirt apparatus will be continued, and pending the inclusion in the Cutler-Hammer catalogue of the Wirt apparatus, the current Wirt catalogue will be used, which may be obtained from either the Wirt Electric Company, Philadelphia, or the Cutler-Hammer Manufacturing Company, or any of its district offices. The purchase of the Wirt company will enable the Cutler-Hammer company to meet more fully than ever before the requirements of the trade. For many years certain types of Wirt apparatus have enjoyed an enviable reputation. Particular attention is called to the very complete line of Wirt battery charging rheostats and field rheostats, which in 1902 were awarded the John Scott medal on recommendation of the Franklin Institute of Pennsylvania. Bulletins covering these and other lines of Wirt apparatus will be furnished on application.

ADVERTISING LITERATURE.

American Engineering Company, Traction Building, Indianapolis, Ind.—A novel piece of advertising literature is the pamphlet just issued by this company on the subject of the "Evolution of Transportation" from the steam locomotive to the electric locomotive. The pamphlet contains pithy paragraphs, emphasizing the advisability of the use of an expert and scientific agency in the construction of traction properties. The company makes examinations, reports, valuations and surveys and designs and supervises the construction of railroads, bridges, grain elevators and

industrial and manufacturing plants, and acts as consulting engineer. Contracts for construction are made only on the basis of cost-plus-a-fixed-sum.

General Electric Company, Schenectady, N. Y.—The electrification of the West Jersey & Seashore Railroad is covered at full length in this company's pamphlet just received.

Lunkenheimer Company, Cincinnati, O.—"Generator Valves" is the title of a new booklet issued by this company, which contains detailed information regarding the various types of Lunkenheimer generator valves and accessories, and is replete with splendid illustrations.

Lumen Bearing Company, Buffalo, N. Y.—The June issue of The Lumenary, the monthly publication devoted to the interests of this company, contains as usual several pages of readable prose and poetry. The metal report for May, as well as information regarding the metal situation and data regarding babbit metals, are also fully mentioned.

General Fireproofing Company, Youngstown, O.—A handsome 32-page work, covering this company's system of reinforced concrete construction, is a valuable addition to literature on this subject. The entire matter is covered most exhaustively, supplemented by excellent illustrations from photographs of construction work at various stages by the reinforced concrete system of this company.

Electric Service Supplies Company, Philadelphia, Pa.—A folder with return postal card attached is being sent to the trade regarding the National trolley guard, for which this company is the selling agent. The folder mentions the merits of the National trolley guard and describes briefly the method of construction. This guard is now being used by many of the largest and most prominent railways in the country.

Buda Foundry & Manufacturing Company, Chicago.—Bulletin No. 111 describes in detail the various railroad track, coal mine, depot and warehouse, wagon, elevator, portable and other scales manufactured by this company, as also its recording beams and quick weighing devices. The pamphlet is amply illustrated and contains full price lists of both scales and repair parts. There is also mention of the large line of other track appliances manufactured by the company.

American Spiral Pipe Works, Chicago.—The company's 1907 catalogue, comprising 100 pages, is the most complete work of this character published regarding all kinds of forged and rolled steel pipe flanges. It is of great interest to the engineering profession, as it contains general and detailed information covering flanges for power work. The catalogue is replete with splendid illustrations from photographs and drawings and contains full prices. The company also manufactures hydraulic supplies.

The J. G. Brill Company, Philadelphia, Pa.—The June issue of Brill's Magazine describes the additional equipment furnished by The J. G. Brill Company to the Inland Empire System at Spokane, Wash., also additional grooveless post semi-convertible cars for the United Railways & Electric Company of Baltimore, and a second lot of semi-convertibles for the San Antonio (Tex.) Traction Company, accompanied by splendid illustrations of the Brill types of cars furnished. An interesting article describing the manufacture of Brill truck frames is also contained therein.

General Electric Company, Schenectady, N. Y.—Bulletins Nos. 4493, 4498, 4502 and 4511, issued by the supply department of this company, describe respectively the parts of R controllers, Thomson single-phase high-torque induction wattmeters, G. E. knife-blade lever switches, type L form D-12, and lightning arresters, 1907 types. Bulletin No. 4503, issued by the lighting department, describes CQ generators and balancer sets, and Bulletin No. 4508, issued by the railway department, describes commutating pole railway motors. All of the bulletins contain excellent half-tone engravings from photographs.

Standard Varnish Works, 29 Broadway, New York.—A new catalogue has just been issued by this company in which the various insulating specialties manufactured by it are described. A novel and convenient improvement in catalogue work introduced by the Standard Varnish Works is the insulator's index, by reference to which it will be found that the varnish or compound best suited for various classes of work is indicated under the particular part of electrical apparatus it is designed to insulate. There are also several pages devoted to the latest method of insulation, viz., by means of drying and impregnating in vacuum. The vacuum system is being rapidly introduced into the shops of the large electrical manufacturers and operators of electric street railways in this company and its success has been so pronounced that indications are that the majority of the large electric railways throughout the country will adopt the method. The company will be pleased to forward a copy of this catalogue to anyone interested upon receipt of application.

American Sheet & Tin Plate Company, Frick Building, Pittsburgh, Pa.—"From Underfoot to Overhead" is the title of the beautifully illustrated brochure regarding tin for roofing purposes manufactured by this company. The booklet describes the experience of a piece of iron ore from its home in mother earth to its place on the home of man and is designed to give the architect, the builder, the roofer and the property owner an idea of the many processes through which a piece of ore must pass before it becomes the base of this company's MF Terne plate. Statistics have been carefully omitted from the book, because of the desire of the company to make its reading a pastime and not a study. However, the terms used and the descriptions given are accurate to the letter and beautiful half-tone engravings are shown, so that a clearer understanding of every process can be had. Suggestions

regarding the construction of a tin roof are made, accompanied by interesting tables for flat seam tin roofing, standing seam tin roofing, wind pressures on roofs, approximate weight of materials for roofs, snow and wind load and safe bearing loads. Tables are also shown of standard gauge and weights for all uncoated sheets and plates of iron. The company's other products are Terne plates, galvanized sheets, formed roofing materials, metal siding, metal lath and black sheets. The reading of the pamphlet will prove of educational value to anyone interested in the roofing subject.

Garden City Sand Company, Security Building, Chicago.—The subject of fire brick is treated exhaustively in this company's pamphlet, which contains illustrations and data regarding the standard shapes and sizes manufactured by it, as also valuable suggestions on furnace construction and general fire brick requirements and specifications for water tube and return tubular boilers. The company is a large manufacturer of special shapes of fire brick and its high perfection in this regard has merited the recommendations of the prominent manufacturers of smokeless furnace and chain grate stokers of the middle west. It is now filling a 40-car order of special shapes for one furnace manufacturer alone, and its locomotive arch business has been constantly on the increase. Suggestions are also made regarding the care of fire brick. The company's Rosedale fire clay meets the demand of the trade for a selected, high-class refractory clay. It also handles furnace sand, mined from the well-known Utica banks, and gannister, being a material made from silica rock, to which a sufficient quantity of plastic clay is added, together with a little water, to bond it. When a furnace wall or roof burns out in spots, by applying gannister to the burned-out portion, the lining is renewed and will last indefinitely. The company also carries in stock as nearly as possible all special tile used in baffling the numerous boilers which are on the market. This company is an extensive manufacturer of and dealer in building material and foundry supplies, and carries a very complete line of tile and cupola blocks; and also handles the famous Toch Brothers cement filler and floor paint, which is oil and water proof, and when applied to cement floors in power houses it prevents dusting and disintegration.

INSULATING MATERIAL.

From the time Faraday built his first coil the use of insulating material has steadily increased and it is natural that the conditions to be fulfilled by insulating materials vary so widely that no one material can be expected to serve the requirements of all classes of service. Faraday's first coils were constructed of bare copper wire coated with shellac. This served his purposes quite well, as the voltages he employed were low. The wires were next coated with silk or cotton thread in one or more layers and the coils made of this wire proved to have ample insulation for fairly high voltages, as long as the temperature was not allowed to rise too high and it was not subjected to undue mechanical strains, such as are inevitable in motor and generator work, and especially in the armatures and field coils of modern railway motors.

With the introduction of induction coils, in which very high voltages were generated, Ruhmkorff experienced considerable difficulty with his coils and it was not until Poggendorff suggested dipping the coils in melted paraffine that coils were obtained which would resist high voltages without a breakdown. These coils were probably the first to be insulated by the dipping process, which is now considered the most satisfactory method of insulating armature, field, transformer coils, etc., since it fills all the interstices of the coil, not only insulating the individual turns from each other, but mechanically separating them, holding them in a fixed position and thus protecting them from injury. Shellac, though it proved itself to be an efficient insulator for the conditions existing in the pioneer work in electrical engineering, is now superseded by insulating compounds having a superior dielectric strength, more elastic and more suitable in many ways for the conditions of service to be fulfilled in modern electrical machinery.

The Standard Varnish Works, 29 Broadway, New York City, manufactures insulating compounds of superior quality in such a wide variety that a material exactly suited for any set of conditions can be obtained. The advantage of having such a large variety of insulating materials available is that the engineer and master mechanic can select a compound which exactly meets their requirements, rather than select one of three or four insulating compounds intended to meet the full range of conditions covered by the 25 different insulating materials manufactured and regularly carried in stock by this company.

In addition to the 25 stock insulating materials, this company is prepared to manufacture special insulating materials to meet conditions which may not be covered by its regular products. It would be difficult to conceive of any condition which could not be met perfectly by one or more of them. Besides a line of clear insulating varnishes which can either be air dried or baked, the company manufactures standard oil and waterproof varnish for core plate insulation, a flexible mica sticking varnish, coil sticking varnish, light and black finishing varnishes and a splicing and filling-in compound. This company also manufactures a complete line of impregnating compounds which can be used for insulating armature and field coils, transfer coils, and for the impregnation of wood.

The Standard Varnish Works advocates the vacuum drying system of impregnating coils. With this process it is unnecessary to subject the coils to very high temperatures. By removing the moisture from the cotton at a low temperature and also removing the air from the interstices of the coils, it is possible to completely fill the latter and thus secure the high insulating qualities and mechanical strength desired. For small companies not having sufficient work of this class to do, the Standard Varnish Works will dip the coils for them, having at its plant the latest and most improved type of Passburg vacuum drying, impregnating and insulating apparatus.

THE GILCHRIST IMPROVED RAIL CHAIR.

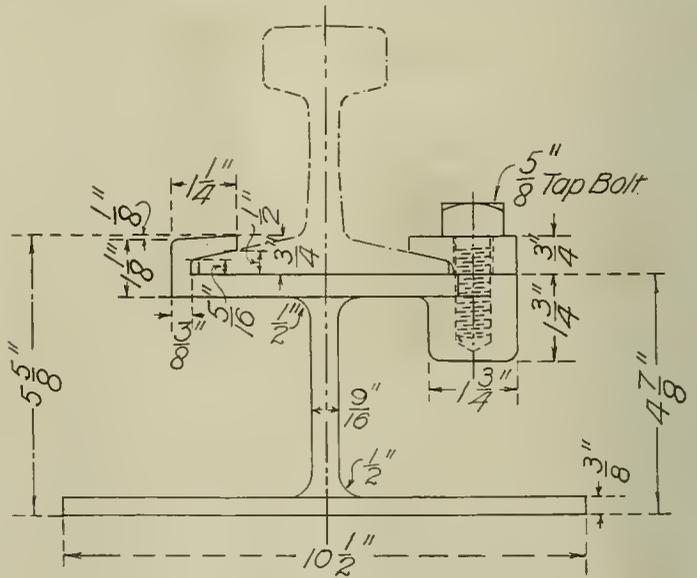
The steadily increasing traffic in cities has shown that the old forms of track construction are not adequate to stand up properly under the traffic of the present time. More substantial forms of track construction have therefore been introduced, many of which substitute concrete girders under the rails for the cross ties formerly used. In most cases where concrete track construction has been properly installed it has proved itself far superior to the



Gilchrist Rail Chair—Showing Method of Holding Rail.

old cross tie construction, but in many cases difficulty has been experienced in attaching the rails to the concrete in such a manner that they might easily be removed and new ones inserted without also removing the concrete from around the rails.

The need for an efficient, simple and economical method of attaching the rails to the supporting concrete girder is therefore evident, and to meet this Edward A. Gilchrist, McKeesport, Pa.,



Gilchrist Rail Chair—Detail Dimension of Parts.

has invented the rail chair illustrated herewith. These rail chairs are now being manufactured by the T. H. Symington Company, Baltimore, Md., and it is stated that they have been examined by a large number of prominent railway engineers, who have reported favorably upon them. A number of engineers have recently prepared track specifications in which they have recommended the use of Gilchrist rail chairs. An examination of the illustrations will show that the rail chair consists of an I-shaped casting, having a base 10 1/2 inches wide and 5 inches long. The upper head of the I has a hook-shaped projection on one side and a lug on its other side. One side of the rail base is held down by the hook-shaped projection, and a cast-iron clamping block screwed down by a

5/8-inch tap bolt, which screws into the lug previously mentioned, holds the other side of the base of the rail securely in position. These rail chairs are embedded permanently in the concrete and it is only necessary to loosen the tap bolts in order to remove or replace rails.

OHIO BRASS COMPANY'S NEW CATALOGUE.

The seventh edition of the Ohio Brass Company's catalogue of electric railway and mine haulage material and supplies has just made its appearance. The catalogue is 9 1/4 by 6 1/2 inches in size, is bound in cloth, and comprises 582 pages. It is profusely illustrated and covers all of the products handled by this company, showing also complete price lists. The volume is divided into 10 sections, as follows: Section 1, rigid and flexible pole brackets; Section 2, catenary construction; Section 3, trolley wire hangers, pull-overs, guard-wire insulators, etc.; Section 4, trolley ears, clamps, splicers, section insulators, cross-overs, etc.; Section 5, rail bonds, bonding tools, bonding caps and sleeves, channel pins, etc.; Section 6, materials for third-rail installations; Section 7, car equipment specialties and supplies; Section 8, construction material and supplies; Section 9, construction, track and line men's tools; and Section 10 contains some very useful tables, giving the comparison of aluminum and copper conductors, weights of stranded copper and aluminum cables, weights of solid copper and aluminum wires, properties of bare and insulated stranded copper cable and solid copper wire, tensile strength of copper wire, properties of galvanized wire strand, power required for electric traction, tables regarding structural steel tubing, standard iron pipe, standard and extra heavy pipe, copper equivalent of steel rails, sag in spans, following which are indices to trade numbers, code words and materials listed. The Ohio Brass Company is designer, dealer in and manufacturer of a complete and perfected line of appliances used in the construction and operation of electric railways, mine haulage systems, lighting and power plants. The main office and works are located at Mansfield, O.



Ohio Brass Company's New Catalogue.

and solid copper wire, tensile strength of copper wire, properties of galvanized wire strand, power required for electric traction, tables regarding structural steel tubing, standard iron pipe, standard and extra heavy pipe, copper equivalent of steel rails, sag in spans, following which are indices to trade numbers, code words and materials listed. The Ohio Brass Company is designer, dealer in and manufacturer of a complete and perfected line of appliances used in the construction and operation of electric railways, mine haulage systems, lighting and power plants. The main office and works are located at Mansfield, O.

GASOLINE MOTOR CARS FOR PASSENGER SERVICE.

BY A. L. ABBOTT.

The first gasoline motor car to be put into practical service by the railroads was a small velocipede type of car for inspection work. This was brought out a number of years ago by Fairbanks, Morse & Co., Chicago, Ill. It was so successful that the company continued experiments with new types of cars for various other purposes. A few years later this company had perfected and put into successful operation a number of types of cars to be used



Gasoline Motor Car.

for section gang work, replacing the hand car, for signal service, bridge inspection, track inspection, transferring switchmen in the yard, trolley repair work, and for moving light construction material. The latest product is the present light passenger car.

The engine used in all of this company's cars is of the highest grade, with individual cylinder, liberal crank case, nickel-steel crankshaft and special nickel-steel valves. They are of the high-compression type, four-cycle and are water jacketed. The cooler is made up of fine copper pipes with sufficient radiating surface to cool the engines under all conditions. In fact, the entire power equipment of these cars has been especially designed for the hard service it is to meet and is as near "fool proof" as can be built.

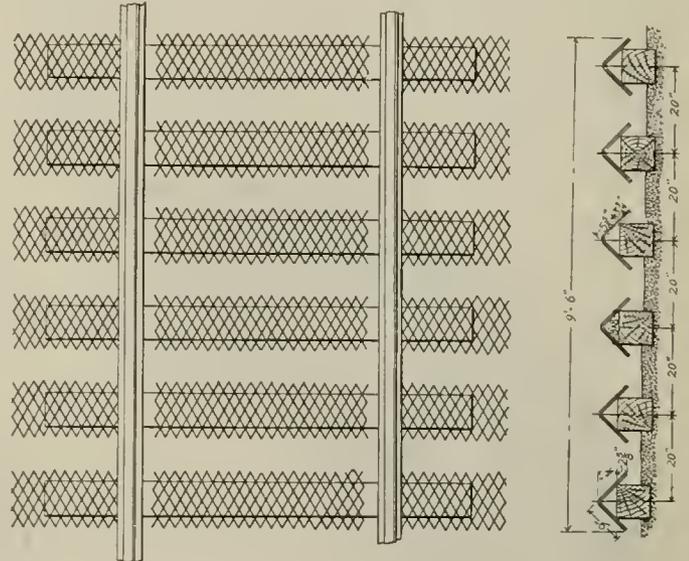
At Houston, Tex., between the terminals of the Houston electric lines and with a suburban extension, laid out by Brook Smith, a prominent banker at Houston, we find being used for passenger service a Fairbanks-Morse standard No. 16 motor car. This car is designed to be operated at any speed up to 35 or 40 miles per hour. The frame is of steel and securely riveted. The power is supplied by a two-cylinder 12-horsepower gasoline engine. Recent records tend to show that service derived at this point from this car is very satisfactory.

Another location where a similar car is being used is at Walnut Ridge, Ark. This car runs between Hoxie and Walnut Ridge, a distance of about two miles. The track over which this car is run was originally operated with one bob-tail street car drawn by a mule. The present owner of the road purchased a No. 16 motor car to operate over the lines of the Cache Valley Railroad, for carrying mail, and incidentally handling any passengers that might be picked up. This is a logging road, built through the swamps, and high water caused a suspension of operation. Since that time, to keep the line in operation, the motor car has been used. It is stated that the motor car, while in service in March, on the line between Hoxie and Walnut Ridge, has carried 600 passengers in one day, and that the average has been 300 passengers per day since the car was put in service on that road. The line over which this car operates parallels the St. Louis Iron Mountain & Southern Railroad.

Another point where a motor car is doing good service is at Mineral Wells, Tex. Here they are using a No. 16 Fairbanks-Morse special type C motor car between Mineral Wells and Lake-Wood Park. The company is known as Mineral Wells & Lake Wood Park Street Railway Company. The track is laid with 40-pound steel; the grades are light and the expense of construction was low. A few days ago the secretary of the road stated that one day they collected \$78.80 in cash fares at a rate of 15 cents a round trip. This company has since ordered a third car. The length of the track is 1.5 miles, but it is the intention to build a scenic railway around an artificial lake to which the road runs.

EXPANDED METAL CATTLE GUARDS.

A light and durable stock guard, which, it is stated, is practically impassable by stock has recently been patented by F. W. Stewart of the Climax Stock Guard Company. The new guard, as illustrated herewith, is made of expanded metal sheets, 18 inches wide and 2 feet long. These sheets are bent lengthwise into a



New Type of Expanded Metal Cattle Guard.

trough-shaped form, thus making each side 9 inches wide and 24 inches long.

These metal strips are set over the ties and extend 4 inches above and 2 3/4 inches below the tops. The ballast between the ties is removed to a depth of about 6 inches, which, with the triangle over the ties, makes the guard practically impassable. The ties may be set any distance apart that is desired, though a spacing of 20 inches center to center is recommended.

Should cattle try to cross these guards, their legs would go into the pit between the ties and upon trying to remove them the downward projecting portion of the guard would strike the animal's legs in a tender part, which would make it too painful for the animal to proceed. There is, however, no chance of an animal getting caught, as there is nothing to prevent it from withdrawing its foot. Small stock would certainly have serious trouble crossing over this form of guard, as the mesh may be made any size desired in order to prevent their hoofs from going through and still not give them any place for a foothold.

The expanded metal sections, each two feet long, are attached to the ties by means of from 8 to 15 staples, which hold them securely in position. It will be evident that little labor is required to install these guards. They leave the track free for inspection and repair without necessitating their removal. They also have the advantage that should a heavy object hanging under a train strike them they would only be bent and can easily be straightened and replaced. They are not easily torn out, as the mesh would tear before a sufficient force could be applied to pull out such a large number of staples. Another good point in their favor is that they can be packed in a relatively small space and consequently occupy little floor space in the storeroom and are easy to ship. If made of galvanized metal or if they are given a good coat of asphaltum paint these guards will last indefinitely and make one of the cheapest metal guards yet devised.

ENGINE-TYPE GENERATORS FOR DIRECT CURRENT.

In spite of the increasing use of turbo-generators for electric railway work, there are still so many engineers who believe only in "the steam turbine with a connecting rod on it" that the Allis-Chalmers Company has been steadily improving its well-known and efficient direct-current engine-type generators, illustrations of which are presented herewith.

Field Frames and Poles.

The pole frames of these (type "I") generators are made of a soft gray cast iron of ample cross-sectional area for rigidity and for the magnetic requirements. In those types of generators having round field coils the pole pieces are made of cast steel bolted to the inner periphery of the field frame. As a rule, however, the pole pieces are formed of steel punchings riveted together and bolted to the frame. The shunt field coils are form-wound on spools slipped on the pole pieces and held in position by small screw bolts passing through the end of the field-magnet spools.

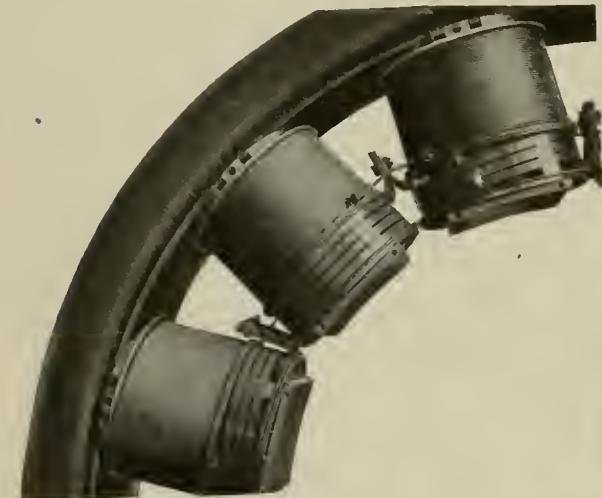
A unique improvement in the series-field winding has been introduced in the design of these generators. As will be seen from examining one of the detailed illustrations presented herewith the series-field winding is composed of laminated copper strips wound in the form of a continuous open spiral separated by insulating blocks. This permits a free circulation of air through the winding, thus keeping its temperature down and reducing its resistance.

Armatures.

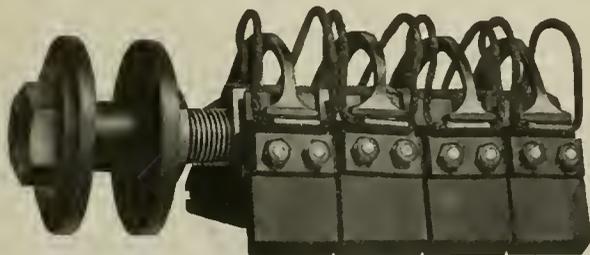
The armatures of these generators, 34 inches or less in outside diameter, are made of one-piece punchings of mild steel, while those of larger diameter are built up of punched mild steel segments dovetailed to fit on the spider with alternately overlapping joints. The inside of the armature is of open construction and a large number of radial ventilating ducts are provided through the laminations to afford ample ventilation and circulation of air through the armature and around the field coils. The armature coils are made of rolled copper strips, bent into shape in such a manner that all the armature coils of a given machine are interchangeable and readily renewable.

The individual conductors are insulated with linen tape and the several conductors that are to be placed in the same slot are grouped together and the slot insulation wrapped around them. The group of conductors with the slot insulation surrounding it is then placed in a steam-heated screw press, in which the insula-

tion is pressed into the shape necessary to fit the armature slot. As the coils are cooled before being taken from the press the insulation retains its shape. The coils are placed in the armature slots, where they are held in position by hard wood wedges fitted into grooves at the tops of the slots. No band wires are used on the armature under the poles, but steel wire bands serve to keep the ends of the coils in place.

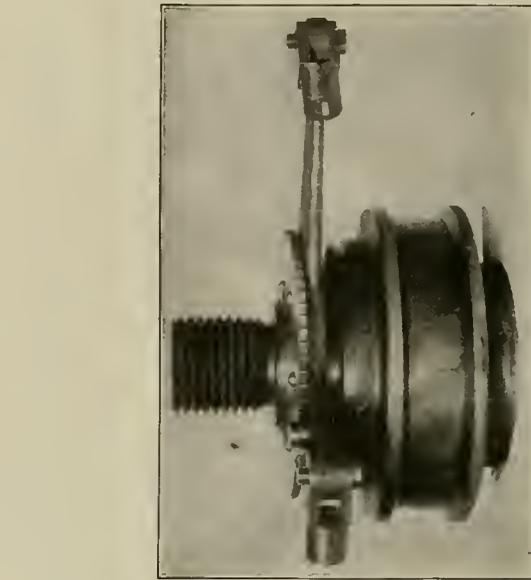


Type K Generators—Field Magnets, Showing Construction of Series Field Coils.



Type K Generators—Brush Holders and Supporting Arm.

The commutator segments are made of hard-drawn copper strip drawn to the proper taper to actually fit a commutator of

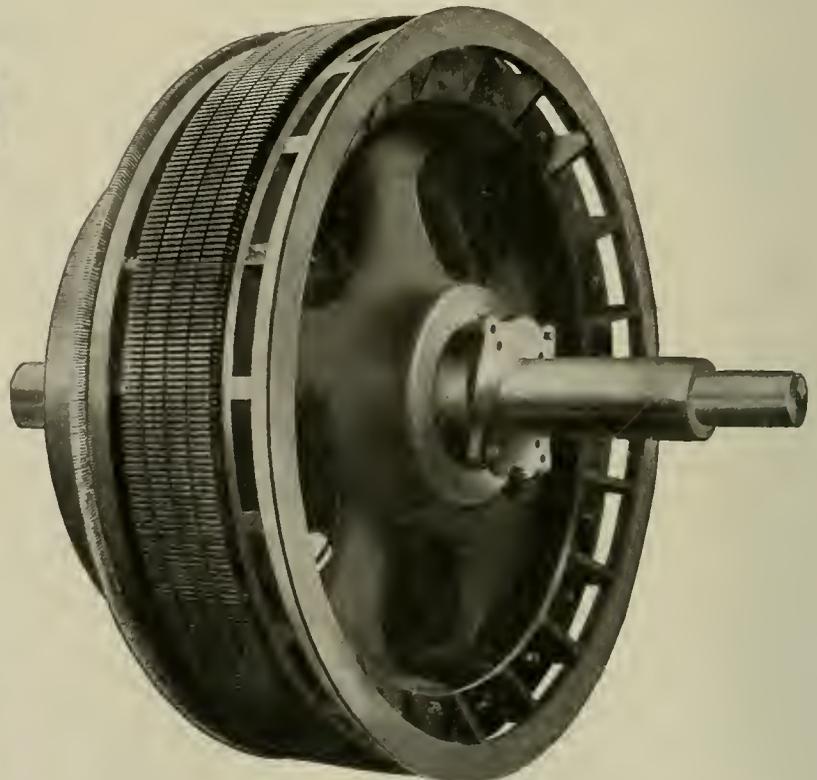


Type K Generators—Showing Details of Brush Oscillator.

to permit free circulation of air about them. The inside of the commutator is open and permits free circulation of air around it and insures cool running with a minimum possibility of warping.

Brush Holders and Brush-Holder Rigging.

The brush holders used on the type "I" generators are of the standard Allis-Chalmers reaction type, carried on substantial brush-



Type K Generators—Armature Core, Showing Strong and Well Ventilated Construction.

holder arms, supported on an adjustable brush-holder ring. The latter can be turned to adjust the position of the brushes by means of a hand wheel. The standard Allis-Chalmers brush oscillator is fitted on these machines. This device gives a transverse movement to the brushes and prevents the commutator from being worn in ridges.

The Sioux City Traction Company, Sioux City., Ia., is equipping about 20 of its cars with air brakes.

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The purpose of the enormous investments of the New York New Haven & Hartford Railroad in electric railways is discussed in a letter of Charles S. Mellen, the president, which is quoted in the Philadelphia News Bureau. An abstract of this letter follows: "The thought of the company in acquiring Massachusetts trolley lines was not to suppress competition, for we do not believe there is serious competition between electric and steam systems of traction. It is our idea that all systems will develop ultimately into the electric, and that street railways will supplement the trunk lines. The solution of the problem of rapid transit will be the use of trunk lines between the cities and of street railways for collection and distribution within the cities." This expresses the common view as to the final effect of the changes which the use of electricity as a motive power is helping to bring about. The statement, however, explains the far-seeing motive of the extensive purchases of electric roads by the New York New Haven & Hartford Railroad. It is estimated now that this company controls 1,400 miles of electric road in various New England states.

It is regrettable that experience demands the use of wrecking cars by interurban railways. But, since no road can afford to have its tracks blocked for more than short spaces of time, it becomes desirable and in most cases financially practicable to make a considerable investment in suitable equipment for quickly clearing wrecks. The car of the San Francisco Oakland & San Jose Railway described in this issue is probably typical of the latest development in tool-car practice. It is provided with materials and supplies for every emergency, and many practical ideas based on the experience of steam railways and other electric railways have been incorporated in its construction and equipment. Attention is called to the

very complete list of materials as presented in the description. The car body is novel in design, extending as it does only three-fourths of the length of the sills. The remaining open platform carries a truck with an adjustable bolster that can be adapted to any height of car body used in and about Oakland. This very complete equipment, properly called a "wrecking tool car," is not provided with a crane for lifting trucks or car bodies. It is thought more desirable to have the crane on separate trucks and haul it as a trailer when necessary. A crane for such service necessarily must be of such large capacity as to be able to handle with facility the heaviest trucks and motors; and, in fact, the management of one interurban road is now considering the purchase of a derrick car that will be powerful enough to lift an entire car body on or off the track as desired. When wrecks occur the question of any reasonable expense for quickly clearing the line is hardly to be considered, and therefore an original investment for a complete ever-ready wrecking outfit should be considered good policy.

There are engineers who believe that boilers can be more safely operated by the use of gauge cocks than gauge glasses.

Gauge Glasses or Gauge Cocks?

There are a number of good reasons for this opinion: With gauge glasses the water tenders will depend entirely upon them, seldom operating the gauge cocks to make sure that the apparent water level indicated by the glass is the actual level in the boiler. No doubt many boiler explosions caused by low water, and wrecked engines caused by high water, have resulted directly from a faulty indication of the water level. Gauge glasses often become so dirty that it is extremely difficult to ascertain the water level, especially if they are not properly illuminated. The only way to impress upon the minds of careless employes the necessity for checking the gauge glass readings by the use of the gauge cocks is to remove the gauge glasses. If there are no gauge glasses the men responsible

will not only give more of their attention to the water level, but will make sure that the water column is clear at both top and bottom. This should be done at least once a day where the feedwater is good, and three or four times a day if the water is bad. The engineer in charge should personally test the water columns at least once a day. A further reason for abandoning the ordinary style of gauge glass is that they frequently break—especially if not cut the proper length and properly put in place. A large number of men have been severely scalded by the breaking of gauge glasses, and, where the gauge glasses are on a level with a man's eye, it has not infrequently happened that an employe has had an eye put out by the flying glass. If gauge glasses are to be retained, a good kind to be used is that with a flat, internally ribbed glass, held in a substantial metal frame. The optical properties of these glasses make the portion under water appear black, while the portion above water reflects light like a crystal, clearly defining the water line, which is easily distinguished even in poor light. Further, a thin coating of oil or dirt does not in the least affect the observation of the water level.

Twenty years ago the Master Car Builders' Association, in convention at Minneapolis, first adopted a standard type of automatic coupler. The report of the committee which considered the subject contained the following conclusion: "Your committee feels that the status of the (automatic coupler) problem at the present

**Repair Parts
and Coupler
Standardization.**

time warrants it in making the recommendation that this association adopt as a form of coupling the Janney type of coupler; that the association procure one of the present make of Janney coupler, and that all other forms of couplers that will automatically couple to and with this coupler under all conditions of service are to be considered as * * * conforming to the standard of this association." In accordance with the method by which the Master Car Builders' Association votes upon all changes in standards, this committee recommendation was referred to a letter-ballot and the M. C. B. automatic car coupler was adopted as standard for the railroads in the United States and Canada. This year, at the annual meeting, the president of the Master Car Builders' Association called attention to the increasing varieties of couplers, all of which conform to M. C. B. standards. This large number of designs entails the tying up of an enormous sum in repair parts which must be carried in stock by railroad companies. The president suggested that some restriction be placed on the introduction of new couplers and that a limit be given the number of couplers for which railroads must carry repair parts. Inasmuch as committees representing the electric railway associations are actively engaged in formulating standards, it should be well to consider this experience of the Master Car Builders' Association and adjust the limiting conditions of any standards adopted for electric railway use, so that the storekeeping departments may realize their share of the many values to be expected from standardization.

In the annual report for 1906 of the Cincinnati Lebanon & Northern Railway, a steam road which is controlled by the Pennsylvania Company, it is stated that

**Competition
with
Steam Roads.**

its commutation business should show an increase during 1907 because the inter-urban railway which parallels the steam railway made "an increase in its rates on December 1, 1906, which has already diverted some business to this company." Competition between steam roads and inter-urban electric railways is inevitable and the problem of the interurban manager is to regulate his service so that the company shall prosper in spite of lines which are parallel or which connect the same terminal points. Circumstances

may render some cases peculiar in themselves, but under ordinary conditions it is not advisable to lower fares or rates if it can be foreseen that they will have to be raised later. Public sanction to an increase is usually difficult to secure. Time will settle many problems of this character. While competition is certain, the electric railway manager is favored by certain physical advantages which are of constant, definite assistance in his efforts to secure business. On account of the inroads made upon its traffic by an electric line the Chicago & Alton Railroad tried the experiment two years ago of operating trains more frequently between certain places, and advertised that these trains would "stop on signal to engineer and on application to conductor at all public road crossings at which it is safe to take and discharge passengers." From the fact that they were soon discontinued, it is naturally inferred that the trains were not profitable. As contrasted with the steam road, the inter-urban electric line can offer frequent and usually more reliable service and it can point to greater convenience and advantage in terminal facilities, as well as to the absence during the ride of annoying smoke and cinders. These arguments are vital.

TAXES IN ANNUAL REPORTS.

Although the practice of deducting taxes from "gross income less operating expenses" is generally followed in annual reports of electric railways, as the recommended form of report of the American Street and Interurban Railway Accountants' Association, some companies, for purposes of their own, still consider taxes purely an operating expense.

In the "Question Box," which was a valuable supplement to the recent proceedings of the Southwestern Electrical and Gas Association at the San Antonio, Tex., meeting, there was published the query, with answers, whether traction company taxes should be included in fixed charges or in operating expenses. Out of four answers which were published, three responded "operating expenses" and the fourth favored the inclusion of taxes in fixed charges.

In its early days the Street Railway Accountants' Association considered this subject in its various aspects, and the division of opinion and practice which prevailed in those years is indicated by the changes which were made. The first draft of a standard report, which was presented to the association in 1897, provided that taxes be classified as a deduction from "gross income from all sources." When the association held its next annual meeting the committee reported that its members were "unanimously of the opinion that taxes, being incident to the ownership of property and the operation of the road, are an operating expense." The committee then found "no logical reason why taxes should not be treated as an operating expense."

The 1899 report of the committee recommended, in view of the interstate commerce commission classification of accounts, the steam railway standard, and in view of the position of the various state railway commissioners throughout the country, considering taxes as a deduction from income and not an operating expense account, that for the sake of uniformity and co-operation with the state railway commissioners and the Association of American Railway Accounting Officers the street railway classification be altered to correspond.

The standard classification of accounts in annual reports as now recommended provides that the deduction of taxes from income shall include all taxes on real estate and personal property, track taxes, franchise taxes, taxes upon capital stock, taxes upon gross earnings, car licenses, and other vehicle licenses; excepting, however, taxes on property such as real estate purchased or conducted as an outside investment, the net income from which is credited to "miscellaneous income." The classification which embodies this provision has been followed generally. It has been adopted officially

by the National Association of Railway Commissioners and it was used by the United States government census bureau in preparation of the street railway statistics which were gathered in connection with the 1900 census.

The operating accounts which, beginning July 1, are to be kept by steam roads under the jurisdiction of the interstate commerce commission provide that the aggregate of revenues from operations will produce total operating revenue, which, reduced by operating expenses, will leave net operating revenue. This phrase is substituted for the phrase income from operation as used heretofore in the form for annual reports. From net operating revenue taxes are to be deducted and the balance will be called operating income and carried to the income account.

Taxes are not governed by the efficiency or the inefficiency of the management, nor are they affected by the relative bond and stock capitalization of a road. A strike may reduce the operation of a road to a minimum and a receivership may eliminate the necessity of meeting fixed charges, but so long as the property is not abandoned some taxes are necessary.

Taxes are not under the control of the management, and to class the item as an operating expense renders the statement liable to misinterpretation. While it is essential to deduct the cost of taxation before arriving at the amount available for returns upon the capital investment, taxes should properly be shown as a separate item of outgo. The policy of showing taxes definitely aids in forming a better idea as to the state of the business.

SOME CHARACTERISTICS OF STEEL WHEELS.

A remarkably thorough series of wheel tests has been carried on during the past two years by George L. Fowler. This experimental work was performed with a view to establishing the value of the metal occurring in solid steel wheels as used for passenger cars. The very interesting results were presented to the Master Car Builders' Association by the experimenter in a topical discussion entitled "Solid Steel Wheels for Passenger Cars."

There are two factors upon which the use of a wheel depends: safety and economy. Many records have been published which show the economy to be obtained by the use of steel wheels or tires. Since the economy factor depends in a direct way on the safety afforded—a long-lived wheel having a larger factor of safety—the experiments mentioned were conducted with the determination of the relative safety of solid steel wheels as their object.

From the railroads there were obtained samples of each make of steel tires or wheels that had failed by what is known as "shelling out." To obtain the comparative value of the metal of the wheels, tensile test pieces were cut from three points in the tread, and these were tested in the ordinary way for maximum strength, elongation, elasticity, contraction of area and hardness.

Little difference was found in the tensile strength of the metal cut from the different tires. This quality increased with the quantity of carbon in the steel mixture. The lowest carbon of any tire was found to be about 0.57 per cent, the highest was 0.716 per cent and the tensile strength varied from 113,000 to 124,000 pounds per square inch. The limit of elasticity, however, could not be considered as varying directly with the tensile strength of the material. The elongation varied almost in direct proportion to the carbon; it ran from 6.87 per cent to 29.5 per cent, the latter figure, of course, being found with the lowest percentage of carbon.

Inasmuch as relative elasticity is a quality upon which is put much credence when preparing designs for any metal structure it is interesting to learn that solid steel wheels have the highest percentage of elasticity in relation to their ulti-

mate strength. The solid wheel was found to have the maximum degree of hardness, although to the credit of the others it is stated that the total range of hardness was slight, since all had been made of steel, the narrow carbon limits of which have been stated.

As a result of these determinations the statement is made that as far as laboratory tests can show the solid forged wheels can be depended on as far as safety is concerned.

Careful microscopical examinations of all the shelled-out wheels that were collected for these tests showed that slag was in each instance the cause of the shelling out. The presence of slag exists from the time a blank is cast. But with a careful inspection of the metal at this early stage of the wheel-forging process and a proper trimming of the ingot there should be obtained a mass of metal practically free from the damaging slag which might be carried from the surface of the mold to the tire of the wheel. There is a determinable difference in the finished product, depending upon whether the blank is cast to the form of a wheel and then given a surface rolling or is cut as a slice from an ingot and then so rolled that the entire shape is changed.

The experimental work showed that the removal of metal by grinding, under similar operating conditions, is four times as fast with cast-iron as with steel wheels. This ratio was determined by counting the number of revolutions of an abrasive wheel required to shorten by a definite length "pencils" of the two metals. The determination—this four-to-one ratio—was checked by skidding a loaded axle that had at one end a steel wheel and at the other a cast-iron wheel and was loaded with 24,000 pounds. When moved along the track at from 2½ to 3 miles per hour it was found that the metal removed, as accounted for by the flat spots, was about four times as much for the cast-iron wheel as for the steel wheel. But, remarkable as it may seem at first thought, when the speed was increased to about seventeen miles an hour, the wearing conditions were exactly reversed. This may be accounted for by the fact that the heat developed at the higher speed reversed the wearing qualities. However, the latter conditions are hardly normal, since heavy braking only occurs at the slow speeds.

As regards flange breakages tests have shown that the strength of a cast-iron wheel flange is about 90,000 pounds, while in these experiments the pressure required to break off, forward the back, the flange of a solid steel wheel was 556,000 pounds. In some parts of the country scrap steel has little or no sale value; therefore, since careful experiments seem to have shown the solid steel wheel to be a strong competitor, physically and chemically, of the steel-tired wheel, the first cost and the value of scrap probably will be the determining factors in any purchase.

LONDON FARES TO BE INCREASED.

London papers report that an agreement has been reached to raise the fares on the various London electric railway systems from July 1. This decision is the outcome of a conference held between representatives of the Metropolitan, the Central London and the Underground Electric Railways Company of London. The Central London Company agrees to abolish the uniform twopenny fare and to charge 3d. as a maximum. The Metropolitan will increase the fare between Aldgate and Hammersmith from 2d. to 3d., and other fares proportionately. Some months ago the District Railway raised certain fares. There is a suggestion that the motor-bus companies may also increase their fares.

The committee on local transportation of the Chicago council inspected on June 27 the section of the city traversed by the Calumet Electric Street Railway and the South Chicago City Railway. Extensions of the lines and improvements in the service have been requested by residents.

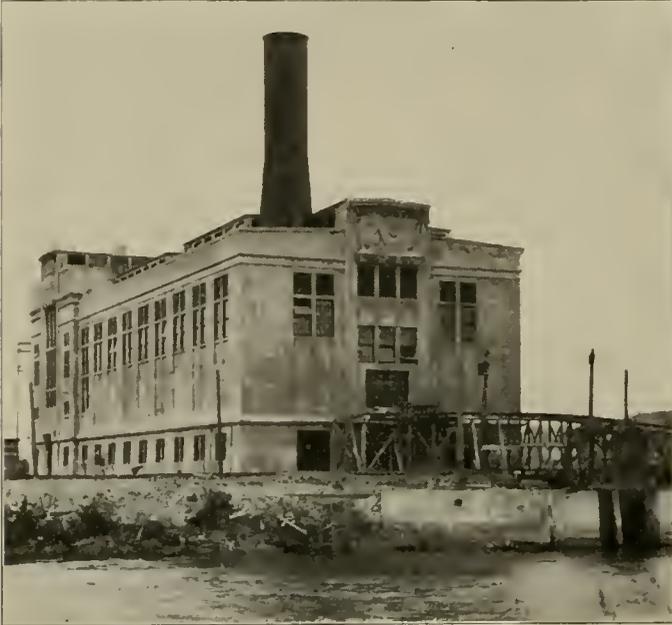
GEORGETOWN POWER STATION OF THE SEATTLE ELECTRIC COMPANY.

One of the largest electric generating stations in the state of Washington will soon be in operation. The new plant is that of the Seattle Electric Company, which is located on the Dwarmish river at Georgetown, a suburb of Seattle. The new power house, which was designed and built by the Stone &

concrete which was used throughout the construction of the foundations and superstructure consisted of a 1-2-4 mixture of Portland cement, sand and gravel. This was mixed in Ransome concrete mixers and was well tamped when in position.

Superstructure.

The concrete in the entire superstructure is reinforced by



Seattle Electric Power Station—Exterior of Power Station.



Seattle Electric Power Station—Ash Hoppers Under Boiler Room.

Webster Engineering Corporation, Boston, Mass., is situated on a large plot of ground owned by the electric company, on which there have also been constructed car barns and shops.

Owing to the character of the soil upon which the foundations were constructed it was necessary to drive piles to sup-

port round mild-steel bars. Several of the illustrations presented herewith show the method of constructing the forms and of carrying out the work.

The exterior view of the building gives an excellent idea of the artistic effects which can easily be obtained by the use



Seattle Electric Power Station—View of Engine Foundation During Construction.



Seattle Electric Power Station—Coal Bunkers During Construction, Showing Method of Constructing Forms.

port the turbines and boilers. These were set on 24-inch centers. The piles for the boiler room and wall foundations were driven in four rows, as shown in the sectional view of the boiler house. After being driven solid, they were cut off level with the high-water mark and the earth excavated from around the tops to the depth of one foot below high water. The whole surface over and around the piles was then covered with reinforced Portland cement concrete. The

of reinforced concrete; besides which a considerable saving in cost of construction also results.

The present building is only a portion of the proposed future power plant. As will be noted by reference to the ground plan the plant comprises two rows of boilers supplying two steam turbines, and their accompanying auxiliaries. Future extensions will be made up of additional bays similar to the one constructed at present. The advantage of this

design will be evident, as it confines the boilers practically in separate buildings, thus localizing any accidents which might occur to the steam piping or boilers themselves.

General Arrangement of Plant.

The general arrangement of the boiler and engine rooms is similar to that adopted for many of the recent installations of large size, namely, the boiler room is at right angles to the turbine room. The boiler room end of the building faces the water front. In the engine room there are two turbines, each with its independent auxiliary apparatus, and there are also installed static and rotary transformers.

Boiler Room.

The boilers are arranged in two batteries of six each, with one central firing aisle. There are installed 12 Stirling vertical water tube boilers of 470 horsepower each. The steam from these boilers is taken out of the rear upper drum and they are fed through the center upper drum. The blow-off is taken out of the bottom front drum. These arrangements will be recognized as rather unusual for Stirling boilers.

The boilers are fitted with plain grates and oil burners. Double ashpits are provided under each furnace. A novel improvement has been introduced in the design of these ashpits, in that the grate is divided longitudinally into two parts by a wall extending down to the mouth of the ashpit. This divides the ashpit into two parts and thus reduces by half the amount of cold air which enters the furnace when the ashes are being removed. An opening from the ashpit is provided to the rear of the boiler back of the bridge wall, which facilitates cleaning out the back connections. Ample space has been allowed back of the boilers to permit free access to the blow-off valves for operating, packing and repairing them. Bridges with hand rails extend the entire length

motor-driven fan delivering the products of combustion into a self-supporting steel stack of 11 feet internal diameter.

Fuel Supply.

Though it is intended to use only oil for fuel at present, provision has been made to change quickly to coal should that



Seattle Electric Power Station—Roof During Construction, Showing Reinforcement and Cable Way for Handling Concrete.

at any time become necessary or desirable. Ample coal storage bins have been provided above the main firing aisle and coal is delivered directly on the boiler room floor through chutes. Coal is delivered into the hoppers by an automatic



Seattle Electric Power Station—View of Boiler, Showing Facilities for Repairs and Inspection.

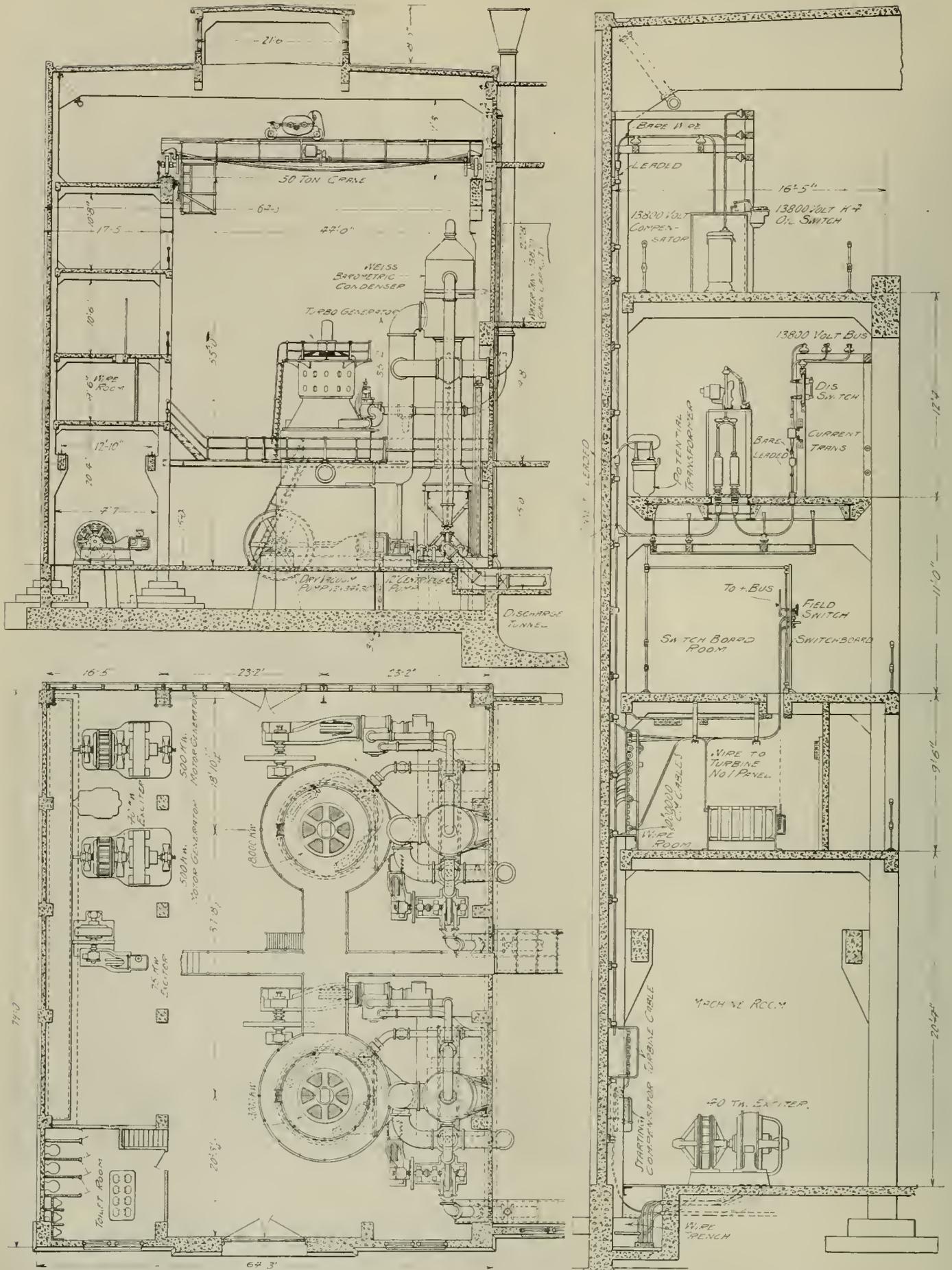
over both rows of boilers and greatly facilitate the manipulating and repairing of the various valves above the boilers and also facilitate getting at the main steam line for repairing or replacing blown-out gaskets.

The boilers are operated with induced draft, one large



Seattle Electric Power Station—Interior of Engine Room, Showing Switchboard Galleries, Engineer's Office and Wash Room.

self-tipping belt conveyor, fed by the coal elevator. The ashes are removed from the pits by cars on an industrial railway. Oil is stored in one 30,000-gallon storage tank situated about 500 feet from the main power house and in three auxiliary storage tanks each 8 feet in diameter by 34 feet



Seattle Electric Power Station—Plan and Section Through Turbine Room, Showing Arrangement of Auxiliary Machinery, and Section Through Switchboard Galleries, Showing High-Tension Electric Wiring.

long. The latter are located outside the power house at the rear of the boiler room.

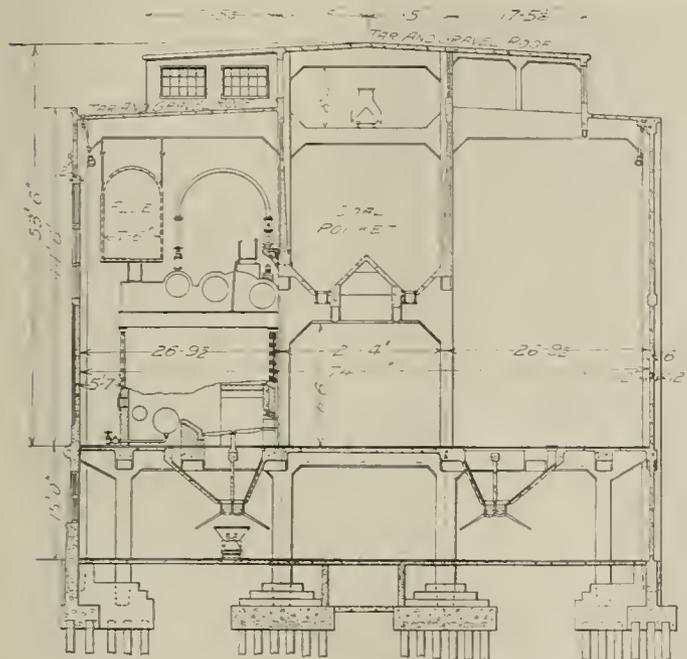
Piping.

The main steam line to the turbines consists of a 12-inch header extending along the front of each battery of boilers. The two 12-inch headers in each boiler room are connected by equalizer pipes, which thus greatly increase the amount of steam available in case of a break at any point of the steam lines. The steam auxiliaries are furnished with steam from two independent 6-inch steam lines which draw steam from the first four boilers of each battery. These auxiliary headers are connected by equalizers, thus reducing the likelihood of serious interruption of service. Two 8-inch boiler feed mains extend the length of the boiler room and branches from the feed mains deliver the water into the central upper drum of the boilers. The feed mains can be connected to either of two feed pumps. As an additional precaution against interruption of the feedwater service, each of the

is heated by the auxiliary exhaust in two 3,000-horsepower open Cochrane heaters.

Electric Installation.

The current is generated at 2,300 volts and transformed in step-up transformers to a potential of 13,200 volts. The generator leads pass through a conduit under the engine room floor to a wire trench extending along the north side of the building. From here they are carried up along the north wall to 13,800-volt type H oil switches through disconnecting switches to the oil insulated current transformers. After passing through the current transformers the current passes through 13,800-volt type H oil switches and out of the station. Each of the outgoing 13,200-volt transmission lines is connected to a 13,800-volt lightning arrester bank. The current for the motor generators is taken from the high-tension transformers and passed through step-down transformers, which reduce the potential for the motors. The direct current is generated at 600 volts, and in addition there is also a 2,300-volt service furnished by the plant. In addition to the type H oil switches there are also the usual high-tension and low-tension switchboards, potential transformers, Tirrell regulators, etc.



Seattle Electric Power Station—Cross Section Through Boiler Room, Showing Boilers, Ash Pits and Coal Pockets.

two 6-inch blow-off mains, extending the length of the boiler room, is interchangeably connected with the feed pumps and has valves at its discharge end, which thus permits using the blow-off connections as auxiliary boiler feed lines.

Main Generating Units.

The main generating units consist of one 3,000-kilowatt and one 8,000-kilowatt General Electric, Curtis, revolving field turbo-alternator. Each of these units is served by a Weiss jet condenser and is also fitted with an atmospheric exhaust. In addition to the main generating units there is installed one 75-kilowatt direct-connected engine-driven exciter and one 40-kilowatt motor-generator exciter. The local direct-current service for the trolley system is furnished by two 500-kilowatt motor generators, taking current through air blast transformers.

Pumps and Heaters.

One 12-inch centrifugal injection pump driven by a high-speed Porter-Allen engine, a rotative dry-vacuum pump and a step-bearing pressure pump are provided for each of the main generating units. In addition to these there are installed two duplex, outside-packed plunger Blake feed pumps, a house pump and fire pump. A motor-driven centrifugal pump has also been installed and is piped so that it can be connected on the fire lines in case of emergency. The feedwater

INFORMATION FOR ACCOUNTANT'S ASSOCIATION.

The American Street and Interurban Railway Accountants' Association has issued a circular asking for the following information:

- Does your company operate both street railway and electric light?
- Does your company indirectly, through lease or stock ownership, control and operate both street railway and electric light?
- Does your company, through a common ownership and operation, control and operate both street railway and electric light?
- Does your company operate, either directly or indirectly, any other public utilities than street railway and electric light? If so, what?

Accompanying this request is a letter from President C. L. S. Tingley, in which he says that at the recent convention of the National Electric Light Association at Washington, the question of a standard classification of accounts for electric lighting companies was discussed, and the matter was re-referred to the committee for further consideration. Mr. Tingley adds:

It seems to me that it would be unfortunate for the lighting companies to adopt a standard classification which would differ in its fundamental principles from that adopted by our association; particularly as many companies, members of our association, are also members of the National Electric Light Association, and a classification divergent in principle would be apt to create confusion, particularly among the smaller companies where the same officers would be obliged to deal with both classifications.

In order that he may have the necessary data to intelligently consider this matter, and bring it to the attention of the Accountants' association at the next convention, Mr. Tingley asks that the desired information be sent promptly.

In this connection Elmer M. White, secretary of the association, writes as follows:

The demand for blanks from companies that operate both railway and electric lighting (and in many cases gas lighting) properties is so frequent that I will ask all companies that operate these various properties to send me with as little delay as possible a duplicate collection of all blanks used by them. Our present collection is not up to date and is not arranged so as to give the best results to the members. These collections I will arrange by companies in suitable binding, one set to be used at the convention and the other to loan to members.

This appeal is made especially to the small companies, whether they have worked out a satisfactory set of blanks for themselves or not.

As you will note from the letter from President Tingley, the subject of electric light classification will receive considerable attention this year. It seems a very suitable time to take up this matter of forms as used by the public service corporations.

NEW YORK STREET RAILWAY ASSOCIATION.

The twenty-fifth annual convention of the Street Railway Association of the State of New York was opened at the Hotel Champlain, Lake Champlain, N. Y., on Tuesday, June 25, 1907. President J. N. Shannahan of the Washington Baltimore & Annapolis Electric Railway, called the convention to order at 10:30 on Monday morning, and following the roll-call delivered the annual address, as follows:

President's Address.

The selection of a meeting place for the twenty-fifth annual convention of this association being left with your executive committee, it was decided after a careful study that the Hotel Champlain at Bluff Point was admirably adapted for the purpose, and the committee trust their selection will meet with the approval of the gentlemen present.

The year just past has been one containing many events of interest and great concern to the electric railways of this state. Among these are the inauguration of electric service on the New York Central railroad in what is termed the Electric Zone, the electrification and inauguration of service on the West Shore Railroad between Syracuse and Utica and on the Erie Railroad from Rochester south, and last, but not least, the important change in policy on the part of the state of New York involved in the passage of the public utilities bill.

The operation of the electrified steam railroads is being closely watched, not only by the men interested in electric traction but also by steam railroad men. An interesting feature of the two instances of steam electrification spoken of above is that two entirely different types of construction have been used—in one direct current fed to the motors through a third rail and in the other alternating current through an overhead trolley. In the latter, an additional factor which will be watched with the keenest interest is the high voltage—13,200 volts being used.

The passage by the legislature of the public utilities act has been watched by the electric railways with the greatest concern. The changes made in the existing law by this act are of a radical nature, and it is a grave question whether the claim made by those favoring the bill, that the "good railroads" have nothing to fear from its operation, will be borne out in fact. It was stated by several gentlemen who appeared in opposition to the bill at the public hearing that one effect would be to stop the building of interurban lines through sparsely settled territory. This statement was not controverted, and should it prove true would cause a condition which would not be too quickly remedied, as even at present this state is far behind in the development of the rural districts by the interurban trolley systems.

That the general prosperity enjoyed by the business interests of this state has been participated in by the electric railways is clearly evidenced by the reports to the state board of railroad commissioners, which show the total gross earnings of street railways for the year ending June 30, 1906, to have been \$78,819,304.09, as against \$70,730,085.66 for the preceding year. The earnings per mile of road were \$36,526.82 for year ending June 30, 1906, as against \$20,579.95 for steam railroads for the same period, and \$33,684.20 for the electric lines for the year previous. A gratifying feature of the reports of the electric lines is the constant decrease in the percentage of operating expenses to gross earnings. In 1897 it was 60.57,

but it has steadily been cut year by year until in 1906 it was 55.19—a decrease of 5.38 per cent. This showing is the more striking when compared with the results shown by the steam railroads during the same period; in 1897 the operating cost of these lines formed 68.12 per cent of the gross earnings of these companies, and in 1906 it was 69.27 per cent, or an increase of 1.15 per cent in the 10 years. These figures undoubtedly give the management of the steam railroads food for thought, and furnish a strong argument for the electrification, at least of such branch lines as may be most readily changed.

The change in policy on the part of this association adopted a year ago, in admitting associate and allied members, has proved most successful. It has proved wise to put on a definite footing the representatives of railway and power companies outside of this state and the representatives of the various supply companies.

Your executive committee has tried to devise a system of dues which would effect a reduction in the dues now charged and provide sufficient funds to meet the running expenses of the association. They have been unsuccessful in this, and in their report recommend the continuance of the present system.

The minutes of the last annual meeting were approved.

William L. Patisson (secretary and counsel Plattsburg Traction Company) extended the courtesies of that line to those in attendance at the convention.

The reports of the executive committee and of the secretary were read, the latter showing 26 member companies who are active members—a gain of three during the last year—nine associate members, 68 allied members.

President Shannahan—At the quarterly meeting held at Albany in September, the association authorized the president to appoint a committee on "Brakes and Braking." The committee was composed of Messrs. Stanley, Fassett, Hanf, Mellen and Harvey. As you doubtless all know, Mr. Stanley went to London the first of March to assume charge of the London Underground. That leaves Mr. Fassett as the ranking member of this committee. I would like to have the report from the committee.

The report was to the effect that the committee found it impossible to recommend a standard system of brakes or rules for braking.

The report of the committee was accepted as read.

President Shannahan—We will take up the paper by J. C. Collins, secretary of the Rochester Railway Company, on "Some Phases of Electric Railway Accounting." (The paper appears elsewhere.)

President Shannahan called on Mr. Fassett to present the report of the standing committee on "Rules."

Mr. Fassett—It seems to me that it is rather superfluous for the committee, which has prepared a standard set of rules which are very generally adopted by the members of the association in the different cities, to have to come here every year and say the same thing. The rules have been printed, adopted and are in use. There are, however, some interurban and suburban rules which some of the companies rather objected to, and the companies up through the Mohawk Valley, Albany, Utica, Syracuse and Rochester are getting up a set of new rules for interurban service which they will



T. W. Wilson, President-Elect.

put in practice. Whether the association wants those rules to be distributed among the member companies for their consideration at the next meeting is something that the association itself will have to decide; but so far as the regular rules are concerned there is nothing to add to them that I am aware of.

Mr. Allen—As I understand the matter, the subject of rules has heretofore been referred to one committee, and their efforts have been expended in compiling, first, a book of rules for city operation, and a supplementary book for interurban operation. I think perhaps a majority of the city roads in the state are operating under what is known as the standard system of rules for city operation, but I think about every interurban road in the state is operating under its own rules; and if it meets with the pleasure of the chairman of the committee, as well as the pleasure of the association, I would suggest that the committee be divided, that a purely interurban committee be appointed to formulate the rules for interurban operation, and also have the present committee, or a like committee, continued, who shall review and report from time to time any changes that may be necessary in the city rules. I move that the question of rules be left to two committees, consisting of a city committee and an interurban committee,

more satisfactory, to work on. If it is agreeable to the lines that are formulating this new code of interurban rules I would suggest that Mr. Allen see that a sufficient number of copies are provided the secretary so that he can send them to the member companies.

I would now like to have a discussion of Mr. Collins' paper on the order system, as he outlined it, in effect on the Rochester railway, and I will call on Mr. Wilson to open the discussion.

Job Order System.

T. W. Wilson—In the Buffalo system we have a scheme in which we use, not a card, but a sheet 12 by 18 inches, on which the estimate is made. In the right-hand upper corner there is a place for the job number, and in the left-hand upper corner for the approval of the manager and president. About four inches of the bottom is left for the records of the auditor of the amount of supplies and cost of labor, and that is posted from time to time. When the job is completed we have a very accurate tabulation of the total cost, both of labor and all kinds of material. That is worked out in price per foot of single track, say, for track work, or per foot of special work. I did not understand whether that card that was spoken of was a card.



Members and Guests of New York Association at Bluff Point.

to be appointed by the president—committees of three each. (Carried.)

The committee on "Interurban Rules" was requested to report at the first quarterly meeting.

President Shannahan—Apropos of Mr. Fassett's remarks to the effect that he has grown tired of reporting year after year that there are no changes in the city rules, I would like to say that for a great many years the American Railway Association, composed of the steam railroads, maintained a similar committee, and from time to time it was found necessary, as the practice changed, to change the rules. I presume that that was the reason why that committee, or why this committee, was maintained year after year.

It would seem wise, in order to provide a basis for discussion, that the code of rules adopted by the lines through the Mohawk Valley should be sent to each member company in order that they may write the chairman of the committee on "Interurban Rules" discussing that particular code and suggesting changes which would seem to them wise and advisable. That will give your committee something to work on; they will know in advance and try, if possible, to meet the conditions on the various properties. It will facilitate the procedure, and when you come to the quarterly meeting you will have something very much more definite, very much

Mr. Collins—A card about five inches long by three inches in width. The estimate made on this is simply, when approved by the president, a minor job system.

Mr. Wilson—It occurred to me that it would not be large enough for all the various items.

Mr. Collins—We have something similar to yours that we call "authorizing."

Mr. Wilson—We have had our plan in force for about six years. It works very well. We always have an accurate cost for everything. We pay especial attention to the price per foot and can make a good comparison of the different jobs in that way.

Mr. Allen—I would like to ask Mr. Collins how far he carries the job order system in his maintenance work. For instance, shop practice, when you pull a car in for general overhauling, say, jacking it, stripping it, taking the motors apart and all that, is it part of the job order system?

Mr. Collins—No, it is not. Outside of the job order system there is certain work that has to be done regularly, that we group under that head, for instance, like cleaning cars, trucks, and so on. That must be done as they are pulled in, and the job order system is not applied to that.

Mr. Allen—Do you use the job order system on anything but reconstruction or renewals?

Mr. Collins—Everything.

Mr. Allen—It would seem to me that a job order system that would take into account work that is done in repairing or maintaining the different units of our electric railway systems would be quite cumbersome and entail the employment of considerable clerk hire; but it does seem that large items, such as renewals of track or rebuilding of a car house, renewal of ties or anything that might be charged to capital account, or anything that might be called extraordinary—that in such cases the job order system would result in furnishing to the proper officials a detail of cost of that work. But I cannot see how the adoption of the job order system for purely maintenance work would be anything but cumbersome. That is the point that is in my mind. I would like to hear from some of the other railroad members upon that.

H. M. Beardsley—We use the same system, or one similar—it does not work out exactly the same—and I do not find it cumbersome, because it is just as easy for the storekeeper, for instance, if he gets a requisition for some material, to charge that material to a job order or a working order, as we call it, "No. 201," as to charge it to "Account 6." He has a column on his monthly report sheet, and it simply means that he must put that amount of money into one column instead of another; and if material is bought outside it can be charged directly to the working order just as well as to Account 1, or 2 or 6, or any other number. The total, when the working order is completed, is simply transferred from Working Order 201 to Account 6, or from Working Order 203 to Account 7, and so on. I want to say that those who have not used this will find it very beneficial, as Mr. Collins says, in checking up storekeepers and so on. I have had several instances of that sort, where material might perhaps have gotten away if it had not been that we were looking after the working order pretty closely.

E. T. Peck—The Schenectady Railway Company has practically adopted the Rochester system. On our jobs, or construction work, or extraordinary maintenance charges, the head of the department from which it originates makes, first, a detailed estimate, and that is submitted to the general manager, and if the job is approved, instructions are then given to apply for a working order, which the department head does, giving his estimate on this working order. That is sent to the auditing department and the working order issued, which is again returned to the general manager for his signature. That gives authority to go ahead with the work. On all maintenance charges we use the regular job system similar to the Rochester system, and it works out very well indeed.

J. H. Pardee—J. G. White & Co. have a system of authorizations and cost analysis that is a little bit different from any that I have seen before. The principle, of course, is the same. It would not be applicable to small jobs or jobs lasting only a very short time, less than a month; but in reconstruction and new construction, or power house work, construction of car barns, work that would last for a period of several months or through a season, with their operating companies, the first of each year there is made up a detailed statement of the construction or reconstruction for the year. That is divided, if there are subsidiary companies, under the head of the different companies, or any convenient division of the work, and the authorization is prepared for that and passed by the board of directors, or approved by the proper officers. Then on the first of each month we get what is called a cost analysis sheet which shows, for instance, on property, the different authorizations, No. 1, 2, 3, 4, as the case may be. The first column is the amount authorized to be spent; the next column, the money actually expended from the start of the job up to the first day of the month; the next column, amount of obligations. The money has not been expended yet but contracts have been made for the material. The next column is balance available; the next column is the estimate of the cost to complete the job; the

next column, either the gain or the loss. If it is a gain it is entered in black ink, and if it is a loss in the estimated—that is, an estimated loss, of course, it is entered in red ink; so that the proper officers can see at a glance how that particular job is going, whether there is going to be an over-run on it or whether they are going to save money on it. The last column shows, also, the percent completed. That works out very well, and at once shows, graphically almost, a complete tab on the whole job and on each individual job.

The next order of business was a paper, "Some Notes on Electric Railway Shops and Shop Practice in Central New York," by Mr. W. H. Collins, of the F., J. & G.

It appears elsewhere.

(Vice-president T. W. Wilson in the chair.)

Vice-President Wilson—In order to start the discussion on this interesting question, I would ask Mr. Benedict, of Albany, to make a few remarks.

New York Shop Practice.

Mr. Benedict—I do not believe I have very much to say on this question, further than that I agree with Mr. Collins in the statement in his paper that it is results we are after. Each man in charge of the maintenance of properties has to study the conditions under which he has to operate. What would do in one case would not do in another. One property is interurban, another city; one has to do with heavy equipment similar to that used in steam railroad practice; another equipment is for city work exclusively where it is considerably lighter, and the tools used in operation should be adapted for the style of equipment. We have to consider also the question of cost. In the development of most roads they have passed through various stages from that of the horse car to that of the present up-to-date interurban lines. The man that has to deal with those conditions cannot obtain the same results as the man who takes hold of a new development, studies his conditions from the beginning and develops his maintenance of equipment along up-to-date lines. On the other hand, the man who has charge of the older systems has to study the conditions and find out what class of equipment it does not pay to maintain, what class of equipment he can afford to throw out or recommend having thrown out, and using in its place modern equipment; and when he has decided as to the style of equipment, then he studies his conditions as to shop practice, and when he has finally decided that he has to adopt what in his opinion is the best method and what I mean by the best method of maintaining equipment is the method that is the least expensive for all concerned.

Mr. Neil—Unfortunately and very regrettably we do not operate any interurban cars. The only thing we find in our practice is that elaborate shop records are top-heavy and ineffective. We make no attempt to keep elaborate and detailed records of every little thing that is done about a car. When a car is overhauled—I look after that myself, and I have loose sheets, and every time a car is overhauled I write out a new sheet for that car with the principal repairs on the car and tear up the old sheet. We found that worked out very well and resulted in considerable economies. I don't know what you other gentlemen do, but we have learned in our small way that the only sensible and reasonable way to keep shop records is to make them just as simple as possible, just as direct as possible, and to keep records only of things that we need. In that way we keep the records of wheels and gears, controller bearings, axle bearings, armature bearings and all that sort of thing. We don't care to know what a car did two or three or four or five years ago, but we do want to know when the last elaborate repairs were made on a car; and since we have adopted that system our shop repairs have been very much reduced, because we proceed intelligibly.

Jos. D. Evans (J. G. White & Co.)—I am very pleased

to be called upon to speak on this subject of shop practices and very much interested in Mr. Collins' paper. I am particularly interested in the feature of the master mechanics visiting the different shops, providing that when they visit the shops they tell the different master mechanics where improvements can be made. Too frequently our visitors come in and say, "Why, everything is very nice." They do not tell us the things that are wrong. That is the principal point, to have some one come in and tell us what is wrong. Then we can make the corrections. I rather think, Mr. President, it is a very good idea for the master mechanics to visit one another, and in my experience I have found that it is quite as frequently as not that we get our best suggestions from the master mechanic who is among those most poorly equipped, who has found it necessary to devise some scheme to meet requirements which the other man did not find necessary.

I think, as has been suggested, that the matter of records can be carried to an extreme, and you get a lot of records filed away up stairs in some dusty loft that are finally sold for so much waste paper; but it does occur to me that it is of vital importance that the actual records of the work as it progresses should be taken care of and filed and brought into shape for ready reference and comparison. I am rather more in favor of a tabulated record showing a comparison with the previous period than the idea of having a number of different sheets, as it frequently occurs that you lose track of the sheets. A tabulated record rather brings the thing before you in more condensed and exact form.

In connection with what has been said, I think a very good suggestion is to arrange the different equipments at different car stations or divisional points, with relation to the character of the equipment and the style of the cars. It very much simplifies the matter of repairs. Very frequently I have found, in my experience, that equipment had been distributed rather promiscuously, and that each car station would have two or three of one kind of equipment and possibly as many as five or six different kinds, whereas one kind could be distributed at one barn, and another at another barn, and in that way the repairs could be very much simplified. That, of course, depends largely on the requirements of the transportation department.

I am not willing to agree with the gentleman who says that the conditions vary in different locations. We are rapidly approaching a condition which I think very urgently requires the standardization of equipment, and I believe that outside of localities where they have excessively steep grades or something of that kind which requires emergency brakes and so on, that the conditions to be met in different localities are very similar; and with that in view I think it behooves nearly all the roads to prepare for the heavier equipment that has been spoken of.

Mr. Cole—I have had a number of properties that I have been out to examine during the last two years, in regard to the design and location of car barns and repair shops, and I have found, as Mr. Collins stated, that one of the great problems has been with relation to the class of machinery that they have in those shops. It has been of a nondescript character, a great deal of it being installed in the earlier days of lighter motors, lighter trucks and smaller cars. With the growth that has taken place in the last ten years in interurban extensions, they have done very little in the way of equipping the shops to meet that growth, and the consequence is that it has become difficult to make the repairs on the urban and the interurban cars in the same shop. I do not think there is any question but that a shop design can be made today so as to handle both the urban and the interurban equipment at the least cost, in the same shop, and machinery can be put in that will do that at the least cost, instead of making two repair shops and necessitating the

master mechanic losing time in traveling from one to the other to look those shops over.

Another condition which is found in repair shops is that there is generally too much handling of material. It is like the old style manufacturers that used to start the manufactured product and before it got to the assembling room they frequently took the material back to the same shop three times. In the shops of the new design the manufactured article starts from one shop and keeps going from shop to shop with absolutely no rehandling, until it goes to the assembling room. The same conditions can be brought about in the design of a car barn or a repair shop, so that your cars come in over the working pits where the general repairs are done. The machine shop should be located alongside, and the material should go direct from the repair pit to the machine shop. Then should come the blacksmith shop, and back of the blacksmith shop should be the carpenter shop, so that the body of the car as it is taken from the track goes through the machine and the blacksmith shop and is pushed to the carpenter shop, and so on. In that way the car undergoes absolutely no return movement. I think that in all accounting of the repairs of cars, material and labor and the time factor during the time a car is in the shop should be carefully considered, and I do not believe that the labor factors are given quite enough consideration in shops. For instance, most roads give their cars a general overhauling twice a year, as they change from the open to the closed or vice versa; and by adopting some method for observing closely the labor factor it gives you a comparison from year to year. About the same amount of labor is done on each car, and that should be given fuller consideration than it has received in the shops.

Mr. G. M. Harvey—In regard to Mr. Collins' paper, I think he has hit the conditions in New York very closely. It appears to me that one reason why this nondescript condition exists, of which he speaks, is the fact that most men in charge of equipment have to deal with the immediate present. They are, as a rule, so busy with the conditions before them that they do not have time to consider the conditions that may exist perhaps six months or a year hence, and frequently in installing new apparatus we find that the last takes the place of something that was furnished just immediately before. I think such things as that are being gradually overcome, and I think the reason for it is largely the result of the meetings which have been had at the different shops throughout the state. I think it has given a lot of the master mechanics a chance to consider the future layout of their individual plants.

Mr. Mays—As I was one of the master mechanics that attended some of these meetings, I followed Mr. Collins pretty closely, and I think he covered most every point that we had to present. I think the meetings are a very good thing. The master mechanics got together and discussed things, saw how the other men did the work and picked up a lot of points. I know I picked up a lot of points that I had not worked out and that had to be worked out. They were brought up in these meetings, and instead of one man having to do the work, I had the benefit of the work of all the rest of them. In regard to the shops, in central New York we all know the roads are growing very rapidly, and every effort is made to get cars to carry the people, and in the meantime the shops have been neglected. Most all of the shops that I have visited have just been overeroded with work, and consequently every one has done the best he could. A number of roads are now starting to build larger shops, and I think in the course of another year the conditions will be better on many of the roads in central New York.

Vice-President Wilson—There is one thing I am very much interested in, and that is as to whether or not the body of a car should be taken off the trucks and work in the shop

done simultaneously in both the paint shop and the truck shop. On a number of different roads, particularly the large ones, they have a different practice in that regard. I think Chicago jacks the car off the trucks and sends the body in on a small pair of pony trucks to the paint shop, the trucks meanwhile going into the truck shop. Has anybody here had any experience in that particular? If so, I would like to hear from those who can give the information.

Mr. Allen—I have no ideas on the particular question you ask, but it strikes me that the whole question of shop practice upon electric railways is one that has not had proper attention. I can cite an instance of a road in New York state that 12 years ago had a shop that was sufficient for the proper maintenance and care of its equipment. In the past 12 years that equipment has become obsolete, though it is still in use; but the 100 cars which had been operated and have been replaced by another 100 cars are still maintained by the same shop facilities. Our cars are our wares; they are what we have to offer the public, what we are selling. The condition of the car is one of the things by which the public judges of our service, whether a car is dirty and unkempt and noisy or out of repair, whether its condition is not one that is presentable to the eye, and the public passes on those questions, and passes on them very quickly. As I said before, I do not believe enough attention has been devoted to the question of proper shop facilities to care for the equipment; and that has been made more emphatic to me in the past year by these visits of the master mechanics of the different roads going over the different properties. The question comes to me, given a system of 100 cars, of which we will say two-thirds are for city service and one-third for suburban interurban service, is it possible to build a shop capable of extension in the same ratio that we add to the number of cars, and can our master mechanics at the present day agree upon a standard plan of shop and a standard method and system of putting those cars through the shop? This is a day of standards. We are all trying to put our equipment, our practice and the whole electric railway business upon a standard basis, and while of course I can draw a deduction, I would like to hear discussed by those who are responsible for the care and maintenance of our equipment the problem as to whether it is possible to pursue standard methods and to design and construct standard shops. It seems to me that until we do that we will have as varied costs, as varied conditions of equipment as ever. In one city you will see it up-to-date, clean and bright, and in the next city you will see an equipment that will make you ashamed of your profession. I would like to hear from some of our master mechanics along that direction.

Mr. Evans—I think the question Mr. Allen has asked is one that is open to a solution that is possible, but under present conditions is not very probable, as at the present time, to my mind, we are just changing from the older to the heavier equipment, and we would have to make provisions for a few years in advance, and it is rather difficult to tell what the requirements would be. It is rather a risky thing to assume, with motors of 200-horsepower capacity each, what other equipment you are going to need to take care of that, and everybody's track is going to suffer very severely when we get those heavier equipments.

With regard to taking care of the equipment, I think it is very possible, and it is a very good plan, to so standardize the trucks, particularly on double-truck cars, that the body can be run in and changed over to another pair of trucks kept ready, and in the meantime have the defective trucks repaired and had ready for the next body. In that way considerable time would be saved that the car would be out of service. It would be possible to arrange facilities whereby you could jack up the body, put it on other trucks and run it through the paint shop or the wood shop if necessary, and in

the meantime the trucks and motors could be entirely overhauled and put in first-class shape. That appears to me, Mr. President, to be the logical and more up-to-date manner of handling the modern equipment.

I just want to say, though, in connection with what has been said that very many of these very heavy cars are still operating on very narrow tread wheels with very small flanges, which of necessity is very severe on the equipment, very severe on the trucks, affects the motor frames and at the same time is hard on the track in general. It seems to me we ought to have a wider flange to carry these heavy loads and wider treads.

Mr. Allen—I just want to pursue this question a little bit further. Suppose a manager has a good bunch of money to spend, and one of the things he wants to spend it for is a new shop. He is going to rely to a very large extent upon his master mechanic for the plan of that shop. The shop is built. Is it capable of extension, is it capable of caring for the equipment at the present day or five years from today? It seems to me that at different times this association has appointed committees; some of them have been productive of good results; I think our Committee on Standard Rules have produced excellent rules. Last year after a heart-to-heart discussion on braking a committee was appointed upon that subject, and you have heard the report today. They have reported that it was not possible to design and adopt a standard system of braking. Now I would like to see how our master mechanics and some of our managers look upon this question as to whether it is possible to design a standard form of shop, that is elastic, capable of being developed as the needs of the transportation system develop and demand. If it is possible, I am sure that there is no way in which the electric railway system can be more greatly benefited than by having a committee of this kind appointed, if it can produce the results.

Mr. Evans—If I understand Mr. Allen's question correctly, it is directed to such a designing of shops as to admit of their being expanded in keeping with the requirements of the roads. That, it seems to me, would be difficult to arrive at, as difficult as it would be to say how many cars we shall require in five or ten or twenty years from now on a system with which we may be connected. To adapt a shop to expansion, the general plan, according to my idea, would require a transfer table through the center and wings leading off from it, with sufficient land to expand each of those wings as the business required. There is considerable objection from the operating point of view to a transfer table. I think the answer to Mr. Allen's question would depend very largely on how much land the company would be willing to appropriate. If they simply got a square and wanted to cover that with shops, that would settle it for all time to come; and if they were willing to buy 25 or 30 acres of land and locate where there was plenty of chance for expansion, it doesn't seem to me that it would be difficult to lay out a shop that would take care of almost anything you might want.

Mr. Benedict—It seems to me in considering the question of design of a shop you must first consider what you have to repair. Now, until you adopt a standard equipment I do not see how you can adopt a standard shop or standard tools for repairs. It is a question of adopting a standard equipment on a system and then designing your shop to take care of that equipment. If one road has an equipment of 100 h. p. motors, its style of shop would be somewhat different than that of another system which was operating short lines with single truck cars and 50 h. p. motors. But the standardization of equipment, it seems to me, should be considered in advance of the standardization of shop. We look back five years and see the changes that have taken place in our equipment. It seems to me that there is no one here that can say what the changes will be in the next five years in the

form of equipment, and therefore that it is impossible to design a shop today to take care of the equipment that will be used five years from today.

Mr. Allen—I just want to say that six years ago I built a shop sufficient to care for the needs of a given number of cars. Now I hear, and have heard for years, that that shop is not large enough and is not capable of expansion. We have not changed the type of our equipment in any way. We have an opportunity to build a shop. We thought at first we were going to build a shop, we will say, in Utica, and would design a shop to take care of the conditions as they look today, and, as we believed, capable of expansion. We changed our mind, decided we would not build in Utica but in Syracuse. We took the same plan and simply put it on a piece of property in Syracuse, and the conditions have not changed at all. Personally I cannot see why a shop cannot be designed for a given number of cars, I will say a 100-car shop, a 200-car shop, a 300-car shop, that will in one plant care for a given number of cars, and construct a shop on that plan. Now we have something to learn every day from our steam railroad brethren, particularly on the question of maintenance, and if I am a correct observer I think you will find the master mechanics of the steam roads have a standard plan of shop that they construct. They certainly do have standard designs for round houses for housing locomotives and making minor repairs, and tearing down shops and erecting shops, machine shops, in most of these large railroad centers—they are all pretty nearly on the same plan. I have no motion to make.

Model Repair Shop.

Mr. Peck—I would like to make a motion that a committee of three, composed of master mechanics, be asked to report as to the design of a model repair shop and report at our next meeting. I am rather surprised at our master mechanics taking this stand, because I am in the same predicament Mr. Allen is in. We have very poor repair shops and our company is ready to provide good ones, but what shall they be, and where are they to be located? If our master mechanics cannot help us out I do not know what we are going to do. It seems to me a general plan of a shop can be made up. It may be that in some cities the land is too valuable, and that has something to do with it, of course. I am satisfied that some plan could be outlined for shop work, however.

Mr. Benedict—I think it would be rather an easy matter to design a model repair shop, but the point under discussion, as I understand it, was whether this model repair shop would be adapted to various roads throughout the country. It would be a model shop and it would cost money. What you have to figure on is what you have to do with, how much your company is willing to spend. If it is simply a question of designing a model car shop and putting model tools into it, that is an easy matter; but to design, as I said, a shop that is adaptable to all the country, that is an entirely different matter.

Mr. Peck's motion was carried.

During the afternoon the members of the association visited Au Sable Chasm and the usual banquet was held in the evening.

Wednesday's Session.

Wednesday's session was fully occupied by the reading of papers in accordance with the programme. There was no discussion. The election of officers:

Officers.

President, T. W. Wilson, International Railway Company, Buffalo; first vice-president, E. S. Fassett, United Traction Company, Albany; second vice-president, E. F. Peck, Schenectady Railway Company, Schenectady; treasurer, H. M. Beardsley, Elmira Water, Light and Railroad Company, Elmira; secretary, J. H. Pardee, J. G. White & Co., New York. Executive committee: C. Loomis Allen, Utica & Mo-

hawk Valley; C. Gordon Reel, Kingston Consolidated Railroad, Kingston, N. Y.; W. S. Darbee, Albany & Hudson; J. C. Calisch, Buffalo & Lake Erie.

Members Present.

Albany—United Traction Company: H. A. Benedict, electrical and mechanical engineer; E. S. Fassett, general manager; C. H. Armatage, traffic manager; T. B. Dixey, director Albany & Hudson; R. P. Leavitt, general mechanical and electrical superintendent.

Buffalo—International Railway: T. W. Wilson, general manager; R. J. Garwood, superintendent of buildings; Thomas Pumfrey, civil engineer; C. W. Clark, engineer of way; W. H. Evans, master mechanic; M. D. Lloyd, purchasing agent.

Canandaigua—Rochester & Eastern Rapid Railway: W. R. W. Griffin, superintendent; J. E. Holmes, roadmaster.

Elmira—Elmira Water, Light & Railroad Company: W. W. Cole, vice-president and general manager; H. M. Beardsley, secretary and treasurer.

Fredonia—Buffalo & Lake Erie Traction Company: E. H. Stichel, general auditor.

Glens Falls—Hudson Valley Railroad Company: A. J. Gies, auditor; J. G. Phillips, assistant general manager; C. C. Dietz, secretary to general manager.

Gloversville—Fonda Johnstown & Gloversville: W. Stewart, assistant purchasing agent; George A. Harris, auditor; W. H. Collins, master mechanic; J. N. Shannahan, general superintendent.

Kingston—Kingston Consolidated Railroad Company: C. Gordon Reel, vice-president and general manager; G. B. te Bow, superintendent; A. M. Day, vice-president.

Peekskill—Peekskill Lighting & Railroad Company: Stuart Wilder, vice-president and general manager.

Plattsburg—Plattsburg Traction Company: E. N. Sanderson, president; W. L. Pattison, secretary and attorney; A. E. Reynolds, manager; E. E. Larkin, M. D., surgeon.

Rochester—Rochester Railway Company: E. J. Wilcoxon, general superintendent; J. C. Collins, secretary and auditor; W. F. Feeney, chief clerk; B. E. Wilson, general passenger and freight agent; B. C. Amesbury, division superintendent; I. E. Matthews, chief engineer; F. P. Maize, master mechanic; W. C. Callaghan, division superintendent.

Schenectady—Schenectady Railway Company: E. F. Peck, general manager; Axel Ekstrom, director; B. Pennoyer, engineer maintenance of way; Frank Walsh, manager freight department; Frank J. Doyle, master mechanic; E. J. Ryon, superintendent.

Syracuse—Syracuse Rapid Transit Railway Company: John E. Duffy, superintendent; J. M. Joel, auditor; F. M. DuBois, master mechanic; W. P. Gannon, attorney.

Utica—Utica & Mohawk Valley Railway Company: H. S. Williams, assistant electrical engineer; B. A. Frankel, chief treasury department; F. C. Dengate, assistant engineer maintenance of way; W. J. Harvie, electrical engineer; C. Loomis Allen, vice-president.

Montreal—Montreal Street Railway Company: Nelson Graburn.

Guests.

J. M. Wakeman, Henry W. Blake, Street Railway Journal; C. B. Fairchild, Jr., Electric Traction Weekly; B. V. Swenson, secretary American Street and Interurban Railway Association; Francis W. Lane, Electric Railway Review; C. H. B. Chapin, B. B. Nostrand, Jr., Empire State Gas and Electric Association; O. M. Diall, Thomas B. Jones, H. D. Hendee, Burlington, Vt.; W. W. Freeman, Brooklyn; J. H. Pardee, J. G. White & Co.; Howard McSherry, Public Service Corporation.

Supply Houses Represented.

Aluminum Company of America, H. K. Spalding, B. M. Polley, Allison, Giles S., G. S. Allison.
American Brake Shoe & Foundry Company, H. S. Bradfield.
American Electrical Works, Francis E. Donohoe.
American Locomotive Company, William Wampler.
American Steel & Wire Company, F. A. Keyes, M. W. Floto.
Altha Steel Casting Company, C. W. Owston, Jr.
Barbour-Stockwell Company, William W. Field.
Brill Company, The, J. G., G. M. Haskell.
Carnegie Steel Company, F. C. Deming, T. Guilford Smith, E. C. Brunke.
Consolidated Car Heating Company, Cornell S. Hawley.
Curtain Supply Company, A. L. Whipple.
Dixon, Joseph, Crucible Company, John A. Coudit.
Edwards, O. M., Company, Edward P. Chaffee.
Electric Cable Company, F. H. Cowles.
Electric Railway Review, John B. Bennett.
Electric Service Supplies Company, Mayer & England Department, Henry R. Swarthy, Jr.

Electric Service Supplies Company, W. V. Sweeten.
 Electric Storage Battery Company, A. H. Ackerman.
 General Electric Company, G. H. Hill, Albert V. Shump, H. N. Ransom, J. J. Regan, H. P. Karnochan, H. G. Grier.
 Goldschmidt-Thermit Company, E. Stutz.
 Gould Storage Battery Company, H. N. Powers.
 Hale & Kilburn Manufacturing Company, Sheridan A. Walker.
 Heywood Bros. & Wakefield Company, Bertram Berry.
 Hildreth Varnish Company, C. C. Castle.
 Johns-Manville, H. W., Company, E. E. Schmid.
 Kalamazoo Railway Supply Company, Fred N. Root.
 Lorain Steel Company, H. C. Evans.
 Marshall, R. W., & Co., R. W. Marshall.
 Midvale Steel Company, Thomas King, Cyrus L. King.
 National Car Wheel Company, E. H. Chapin.
 National Carbon Company, Arthur E. Carrier.
 National Lock Washer Company, F. B. Archibald.
 Niagara Lockport & Ontario Power Company, S. B. Storer.
 Ohio Brass Company, N. M. Garland, Nathan Shute.
 Pennsylvania Steel Company, John C. Jay, J. B. Smiley.
 Pratt & Lambert, Jos. Maycock.
 Pressed Steel Car Company, W. H. Wilkinson.
 Rail Joint Company, Wm. A. Chapman, B. M. Barr.
 Railway Audit & Inspection Company, H. N. Brown.
 Roebblings' Sons, John A., Company, G. W. Swan, H. L. Shippy.
 Sherwin-Williams Company, F. A. Elmquist, A. D. Collins.
 Standard Steel Works, E. Sidney Lewis, Harry W. Sheldon.
 Standard Underground Cable Company, H. P. Kimball.
 Sterling Varnish Company, W. V. Whitfield, A. S. King.
 Taylor Electric Truck Company, John Taylor.
 Westinghouse, Church, Kerr & Co., C. G. Wilson.
 Westinghouse Electric & Manufacturing Company, Clarence Renshaw, J. N. DuBarry, Jr., F. B. Erwin.
 Westinghouse Traction Brake Company, J. R. Ellicott, C. R. Ellicott, F. V. Green, E. H. Dewson.
 Wendell & McDuffie, Jacob Wendell, Jr.
 Wharton, Jr., William, & Co., R. C. McClay.

Exhibits.

The Taylor Electric Truck Company, of Troy, had on exhibition one of its new steel-tired wheels, the company being represented by Mr. John Taylor.

The Westinghouse Traction Brake Company, of Pittsburgh, showed an automatic car and air coupler designed to couple and uncouple both car and air connections simultaneously. It is claimed to be equally successful on cars of varying heights and for operation on sharp curves as well as on straight track. This coupler eliminates all slack between the coupler heads, thus permitting the handling of a train of several cars as a single unit. This device is being adopted by some of the prominent roads of the country. The company was represented by Col. J. R. Ellicott, manager of the New York office, E. H. Dewson and F. V. Green.

The Ohio Brass Company, of Mansfield, O., had an exhibition showing the workings of the Levitern car signal system. This system, by means of an ingenious but simple method of wiring and an auxiliary battery of dry cells, supplies current for one or more rear-end signal lights, one or more classification lights, or both, and does away with the only objection to using current from the trolley circuit for car signal lights. The company was represented by Mr. N. M. Garland and Mr. N. Shute, of the New York office.

Extensive European Electric Railway Project.

It is reported that American interests are planning the construction of a high-speed electric railway between Budapest and Vienna, at a cost of about \$25,000,000. A third-rail system controlled by the Detroit Construction Company is to be used. Starting from an underground station under the Rokus hospital, in Budapest, the line will cross the Danube between Kaposztasmegyer and Bekasmegyer, and then proceed along the right bank of the Danube, crossing that river again in a direct line from Komaron, and entering Austrian territory at Deveny. After leaving Deveny the railway will cross the Danube once more, between Grosz Entersdorf and Frenndenau, and will terminate at the Karlsplatz, Vienna. The road will be 160 miles long, and some of the trains will make the run in two hours, or in half the time consumed by the Hungarian state steam road now operating between the Hungarian and Austrian capitals.

FALSE CLAIM AGAINST UNITED RAILWAYS OF BALTIMORE RESULTS IN CONVICTION.

On account of the case of John D. Robinson, who has been sentenced to the Maryland penitentiary for perjury in connection with a suit for damages against the United Railways & Electric Company, Baltimore, has been received from James R. Pratt, assistant general manager of the company. The account of this interesting case follows:

Basis of the Claim.

Robinson claimed that on July 5, 1905, he was injured while a passenger on a car of the Fairmount avenue line of the United Railways & Electric Company. He stated that the conductor called out for the passengers to change cars, and as he arose to leave the car it was started suddenly and he was thrown across the seat in front. He claimed that a hernia followed as a direct result of the accident. The company had no report of such an accident; in fact, when Robinson first made his claim he stated that he was injured in a collision between two cars, and the declaration in the suit which he afterward filed alleged that the accident happened in this manner. The claim was not made for this accident until some time after it was alleged to have occurred.

Robinson carried an accident insurance policy with the Travelers' Insurance Company of Hartford, Conn. He made a claim and subsequently collected \$2,300 from this company upon the ground that he received a hernia while a passenger on a car of the United Railways Company. The railway company's first knowledge of this case was gained through its chief surgeon, who is also surgeon for the insurance company. It was his opinion that Robinson's hernia was an old one, which was later shown to be true.

Robinson employed an attorney and his claim was refused. He would have been arrested promptly for attempting to get money under false pretenses, but the attorney, instead of asking for settlement, simply filed the claim. As no crime is committed unless a demand is made, the railway company could do nothing but await the result of the suit, which was filed promptly. The case was tried in November, 1906, and resulted in a verdict for the defendant.

Contradictory Evidence.

Robinson testified on the witness stand that on the night of July 9, 1905, he was so ill that his family was assembled around him expecting his death. He said he was in bed from July 9 to July 19. He was confronted with a letter which he had written the railway company complaining that a conductor on the Carey street line had refused to accept from him four transfers on the night of July 9, which was the night, he testified, that he was lying at the point of death. It was also brought out in the testimony that on July 17, when, according to his statement, he was still in bed as a result of the injury sustained on July 5, he called at the office of the company in relation to a transfer dispute.

The trial of this case occupied some days, but the jury quickly brought in a verdict for the defendant. Robinson was immediately indicted by the grand jury on the charge of perjury, and on the additional charge of obtaining \$2,300 from the Travelers' Insurance Company under false pretenses; and, further, for attempting to obtain money from the United Railways & Electric Company under false pretenses. He was arrested on the same day, but was released under \$5,000 bail for trial in the criminal court. On May 29, 1907, he pleaded guilty to the indictment for perjury, and on June 4, 1907, he was sentenced to one year in the Maryland penitentiary.

It was brought out at the trial of Robinson's suit against the United Railways, that he had collected \$215 from the Employers' Liability Assurance Company of London, England, for injuries alleged to have been sustained in Cincinnati on August 8, 1904, in falling down a stairway. At this time he alleged the same injury which he claimed to have sustained in the accident in 1905.

Co-operation Needful.

This case clearly demonstrates what may be accomplished by the hearty co-operation of steam railroads, street railways and casualty insurance companies.

The company and the authorities were enabled to convict Robinson by the assistance of The Alliance Against Accident Frauds, an organization formed to prosecute persons who attempt by fraudulent methods to procure money from the members.

SOME NOTES ON ELECTRIC RAILWAY SHOPS AND SHOP PRACTICE IN CENTRAL NEW YORK.*

BY W. H. COLLINS, GENERAL SUPERINTENDENT FONDA JOHNSTOWN & GLOVERSVILLE RAILROAD COMPANY.

The topic for this paper was suggested by the recent inspection of shops by master mechanics of companies in central New York state. The plan followed was for the several master mechanics to visit each shop in turn, in a body, and submit a report in writing to the general manager.

This inspection demonstrated very forcibly that electric railway practice is rapidly changing. The buildings, tools and methods which have been sufficient in the past are inadequate today. It was also evident from the arrangement of these shops that they were not built with a view toward the rapid and economical handling of work. They are rather a series of additions, and the rest of the property has outgrown them.

Machine Shops.

The machine shops, whether in a separate building or located in a portion of one of the car houses, are so cramped for room that it is impossible to locate the tools to the best advantage. In some cases the tools are good, but in many cases they are inadequate, being nearly worn out. Even where there are good tools they are not, and, in a good many cases cannot be, arranged for the most economical working. As instances of this kind, the following might be cited: A wheel press between the pit and the wall of the building with no room behind it, and so close to the pit that wheels have to be handled across it; a fire-turning lathe at one end of the shop with the wheel press at the other end.

The blacksmith shop, as a rule, is near the machine shop, but instances were found where it is several hundred feet distant. This shop usually has a rather meager outfit, consisting only of tools for light work. Occasionally a power hammer, and in one shop a punch and shears, as well as a spring-tempering furnace, are among the tools.

Paint and Carpenter Shops.

The paint and carpenter shops are sometimes located in separate buildings at some distance apart. In one place they are on opposite sides of the city. In others, they are combined, much to the detriment of the paint shop, as good painting and varnishing cannot be accomplished in a dusty carpenter shop. As an instance of an extremely poor arrangement, one road has its paint, carpenter and overhauling shops all combined in one room. A desirable feature which appeared to be lacking in nearly all of the paint shops is a separate fireproof room for paint stock.

Electrical Work.

In the electrical shops is where the greatest divergence in practice prevails. The practice ranges all the way from making repairs to fields and armatures only to producing many of the most used electrical parts. The outfit for this class of work ranges from a banding machine and a baking oven, situated in a corner of the car house called the armature room, to a shop fully equipped with the tools and apparatus for making electrical parts. It is noticeable, however, that some of the shops have discontinued the practice of making their own coils.

The storeroom is usually well stocked, and bears evidence of being well looked after; but it is, as a rule, inconveniently located with reference to the shops. One road has its storeroom ideally located in the center of its shops, with windows all around, thus giving easy access to the different departments.

Inspection and Cleaning.

There is apparently a lack of uniformity in the methods of inspection, but this is largely due to local conditions. At some places it is possible to arrange for doing nearly all of the inspection in the daytime, but at other places the conditions are reversed, and it is necessary to inspect cars at night. The tendency, however, is toward a closer and more rigid inspection. The writer believes that inspection pays, and that the closer it is the better it pays.

In the matter of car cleaning there is quite a difference in practice. Some roads continue the old method of washing the exterior of cars with soap and water. Others use no water on the outside of the cars at all, but use instead a prepared oil cleaner, which is applied in liquid form. Both methods are effective so far as cleaning the cars is concerned, but there appears to be considerable difference of opinion as to which is the better method with reference to the cost of cleaning, preservation of varnish, etc. It is also the

practice on some roads to give the interiors of cars a general cleaning, such as mopping floors, cleaning windows and wiping the woodwork each day, while on others it is done but once or twice each week. At one place there was a vacuum cleaning device for taking care of plush seats, which did very effective work.

There is no uniform method of keeping service records. Some roads keep few, if any, accurate mileage records. Others keep only the more important records, the mileage of wheels and axles, the oil report, etc., while still others keep the mileage of each part. This can be carried so far that it is cumbersome, besides being an item of considerable expense. It seems to be a good practice to keep records of the more important parts, and occasionally to follow up some particular part the performance of which is not satisfactory. Anything beyond that appears to be in the nature of a luxury.

Summary.

To summarize, these repair shops are very inadequate. On account of the lack of suitable tools and sufficient room they are not in a condition to handle work with the greatest economy.

In the rapid development of these electric railway properties, proper provision does not appear to have been made for the upkeep of the equipment. It now seems that we have reached a point where it is economically practicable to reconstruct our shops. While it is true that electric railway practice is changing, and will continue to change, yet it is sufficiently stable so that plans can be made for providing suitable buildings and tools to handle work with the minimum loss of time.

The harmonious arrangement which prevails in large manufacturing plants, when the process is continuous and where there is so little waste effort, is what we should endeavor to approximate in our repair shops. The buildings should be so arranged that the work can be moved along continuously through the different shops, with the minimum amount of handling.

The organization at these shops seemed to be the redeeming feature. There is a sufficient number of foremen, and the distribution of forces is the result of careful planning. But while each foreman is capable in his own line, it is seldom that one is found who is versatile enough to take the position of head of the department. This is the element of weakness general to the organizations.

With the advent of the large interurban cars, a new element was projected into electric railway shop practice. These cars are usually equipped with steel or steel-tired wheels, solid gears, etc., and range in weight from 25 tons to 50 tons. This class of equipment cannot be compared with the ordinary electric railway equipment, but would seem to approximate more closely with steam locomotive practice. The writer believes that the methods and shop practices which will most successfully cope with this new problem in the traction field must be worked out along the lines which have proved so advantageous in the operation of steam railroads.

Electrification of Terminal and Suburban Lines.

A representative of a large electric company says: "The question has often been asked: Why are the railroads not more aggressive in respect to the electrification of their terminal and suburban lines? The principal reason is that the capacity of the manufacturing establishments is not large enough for the railroads to generally adopt electricity as a motive power.

"It is generally known that the electric companies are taxed as it is to the utmost of their respective capacities, and could not contract to electrify even a small percentage of the country's railroad mileage without being forced to shut off regular sources of consumption to a large extent. This, naturally, would result in disturbing regular channels of business.

"Many railroads have the question of electrification under consideration, and they are watching the experiments of the Vanderbilt lines very closely. There is every indication of the practical success of electric motive power on these lines, which will mark the beginning of a new era in electricity."—Wall Street Journal.

Population and Traffic in New York.

Since 1898 the population of Greater New York has increased 23 per cent. In the same time the street railroad passenger traffic in New York county has increased 73 per cent. Since 1900 the population of Manhattan has increased 17 per cent, while the street railroad passenger traffic has expanded 55 per cent. In these figures are to be found the secret of the street railroad congestion.

*Paper presented at the annual meeting of the Street Railway Association of the State of New York, June 25, 1907.

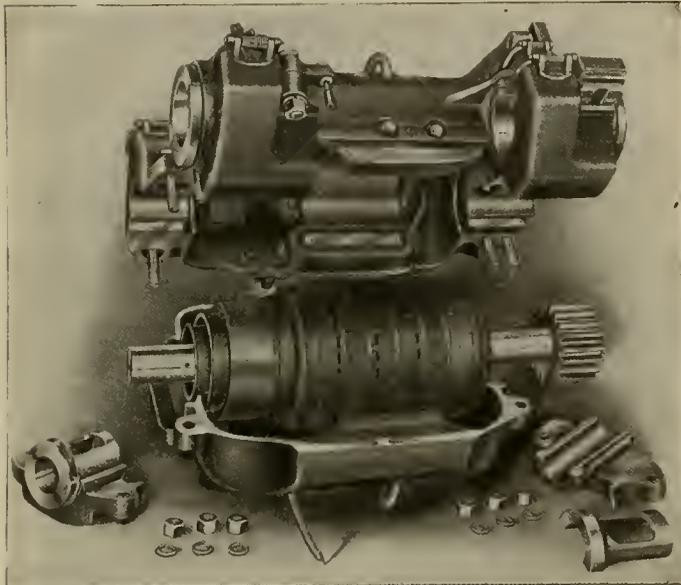
RECENT IMPROVEMENTS IN MOTORS AND CONTROL.*

BY G. H. HILL, RAILWAY ENGINEER GENERAL ELECTRIC COMPANY.

A review of the development of the electric railway during its 20 years of history is particularly impressive on account of its marvelous growth. While recognizing as a prime factor in this growth the universal demand for transportation facilities, a generous measure of the success can well be credited to the sound and sensible engineering that has dominated the art from its inception. From the diverse and various methods proposed a uniform system was early settled upon, which time and experience have proved to be good and adaptable to a development far greater than could have been anticipated. The progression of application from purely urban service to interurban has marked the most recent era of development, and it is toward this phase of railway work that a review of recent progress is chiefly directed. Interurban service primarily has required increased speed, larger cars, and consequently greater capacity in equipments; attendant on this are a higher voltage, greater mechanical and electrical strain and necessity for increased reliability. The improvements made to meet interurban requirements have naturally influenced the existing apparatus to a considerable extent. A review of each portion of the car equipment will, perhaps, serve best to illustrate what the recent improvements are and to indicate their relative value.

Motor Design.

Probably no similar problem has presented more difficulties than railway motor design. Subject to exceptional and sudden electrical strains, extreme ruggedness is essential. Ex-



Motor and Control Improvements—GE-204 Motor with Commutating Poles.

posed to heat and cold, mud and dust, water and grease, its surroundings could hardly be worse, and unusual protection to its winding is required. Placed in a service where great refinement of attention is impossible, it must nevertheless be reliable and withal efficient.

Although improvements are mostly detailed in character, they are the results of painstaking study and are of much practical value. As an example of modern construction and one of the most popular of recent designs, may be selected the G. E. 80 motor of 40-horsepower rating, which is of the split frame design found most suitable up to 75-horsepower size. Above this the box type is usual, and of this form the G. E. 73 may be taken as typical.

The improvements in motor construction which may be considered as recent may be classed as follows: Field coil insulation, lubrication of bearings, shaft and gear strength, gear case design, commutation.

Field Coil Insulation.

The modern coil is of the "mummy" type, heavily wrapped and made complete without any outside retaining spool. The insulation as now applied, instead of forming only an exterior coat, penetrates to the very heart of the coil. This effect is

attained by the vacuum process, which exhausts all moisture and air entrained in the coil and replaces it with an insulating compound. The treatment is not only at a higher temperature than formerly, but for a longer time. A cross section of a modern G. E. coil illustrates how thoroughly this insulating compound impregnates the winding. In consequence, unless the coils are "roasted" by a too severe load, they are able for many years to resist the action of the water and oil to which they are bound to be exposed. The "mummy" coil is more compact than a spool wound coil, is less affected by a gradual shrinking of the covering, and can be held more effectively against vibration and chafing. Incidentally, the field coil terminal has been improved in strength and insulation and is provided with a shroud or guard to protect the lead from breaking by vibration.

Lubrication of Bearings.

The change from grease to oil lubrication has proved a most practical advance. The use of oil, particularly in the armature bearings, has greatly reduced the cost of inspection and maintenance, and has probably doubled the life of the bearings, with a corresponding reduction of damage due to the armatures getting down on the poles. Conservative experience indicates a life of 50,000 car-miles for a bearing with oil lubrication. The amount of oil required will vary somewhat with local conditions, but with systematic attention, one gill of oil for the commutator end bearing and one and one-half gills for the pinion end bearing have been found ample quantity for 1,000 car-miles. The axle bearings may be treated the same as the car journals, and three gills for each 10,000 car-miles should ordinarily be sufficient.

Shaft and Gear Strength.

Improvement here is largely a matter of quality, which has been steadily raised, and now the tensile strength is from 70,000 to 75,000 pounds per square inch. The strength of shaft at the pinion end has been further increased by increasing the diameter of the taper to as near that of the shaft as possible.

Pinion material is now readily procurable with a tensile strength of 85,000 to 100,000 pounds per square inch. The strength of cast gears is, of course, somewhat below this, but for the larger motors a solid gear or a gear composed of a forged rim shrunk on a cast-steel center permits the use of a high quality steel in the teeth and has given excellent results. The split gear is almost exclusively used on the smaller equipments on account of its convenience. The four-bolt design, which has practically superseded the eight-bolt design, permits a more sturdy structure and a stronger bolt. Experience indicates that the bolts in the eight-bolt design were frequently weakened by too strenuous efforts in tightening them.

The adoption of a gear case with three points of suspension instead of two produced a most gratifying relief from breakage. Up to the present, malleable iron has been found the most satisfactory material for cases, but on account of the possible saving in weight some experiments have been conducted with the use of sheet steel riveted. The ordinary riveted case, of which there are several on the market, cannot be considered entirely successful, since with a very few exceptions on roads with unusually smooth track the vibration loosens the rivets and the case rattles itself to pieces. Appreciating the advantages and demand for a lighter case than is possible with malleable iron, careful study has been given the problem, and it is expected that a construction now being tried, in which the rivets and seams are welded by a special process, will prove satisfactory.

Commutation.

The commutator and brushes have usually required more care and attention than all other parts of the motor. The importance of brush quality as affecting commutator blackening, flashing and wear is frequently overlooked. Unfortunately the quality of American-made brushes has not been as high as it should be, and a better understanding of what is desirable would undoubtedly create the necessary demand for improvements, particularly in the direction of uniformity of product.

The chief ingredients of carbon brushes are hard gas coke and graphitic carbon, with a suitable binder of pitch or similar material. The coke supplies an abrasive action which grinds down the mica and keeps the copper surface clean. The soft graphitic carbon is lubricating in nature and of lower electrical resistance than the coke.

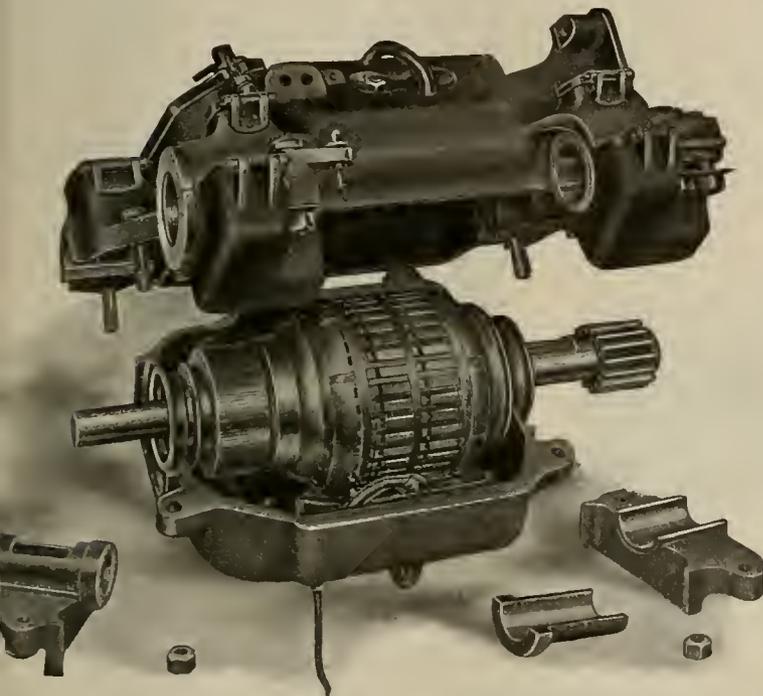
The proper proportions of these two elements will vary for different motors, depending upon the proportional amount and quality of mica in the commutator, whether the commutator is grooved or not, the speed of the commutator, the thickness of brush, and, to a certain degree, upon the service conditions. The fineness to which the ingredients are ground, the thoroughness with which they are mixed and the compactness to which they are compressed, that is, the amount of cellular space existing, all have a most practical bearing on

*Abstract of paper presented at the annual convention of the Street Railway Association of the State of New York, Lake Champlain, June 25-26, 1907.

the quality and service results. The most frequent cause of chipping and breaking is the stratification of the brush, which is hard to avoid in the extruded or "squirted" type of product. The reduction of expense of motor upkeep would in most cases handsomely repay the attention necessary to procure brushes that conform uniformly to rigid specifications, as to hardness, specific gravity, absence of stratification and fineness of texture.

Commutating Poles.

There is one recent departure in motor construction that merits particular mention. This is the addition to the motor of commutating poles. Motors so constructed are superior in commutation to the ordinary motor, and the limit of motor capacity for any service is no longer a matter of commutation possibilities, but of heating alone. Perfect commutation with extreme overloads, both as to current and voltage, is easily obtained. The commutating poles are small in size and are placed between the exciting fields, as may be seen in the illustration. They permit a reduction in weight of the exciting fields and a greater freedom of electrical design without sensibly increasing the weight of the motor. Briefly, the function of the commutating poles is to counteract



Motor and Control Improvements—GE-80 Motor.

the armature reaction and consequent field distortion and produce a commutating field of constant strength and position with relation to the brushes, unaffected by load or speed of the motor. Many incidental but valuable improvements attend this new departure, which will undoubtedly become a standard construction. Among these are absence of flashing and burning of commutator and brush holders, less brush and commutator wear, absence of sparking, lighter and more easily handled field coils.

A complete line of motors of this type has been designed and several hundred have already been sold. A more complete discussion of the theory of this interesting development will shortly appear through appropriate technical channels.

Control.

The recent improvements in control and equipment devices may be classed as follows: Cylinder controller details, contactor attachment, rheostat construction, car wiring, train or type M control, circuit-breakers and main switches, fuses, trolleys.

Cylinder Controller.

As with the motors, the improvements of the cylinder controller have been more a matter of construction details than methods. The higher voltage usual in interurban lines and the general increase in station and feeder capacity, making it possible to sustain very heavy short-circuit arcs, have made it necessary to remodel the controller to provide greater strength of blowout, more complete isolation of arcs and insulation of circuits, and a more rigid fireproof construction.

The K-35 controller may be taken as representative of the

most recent construction. The blowout magnet, instead of being a single coil placed at some distance from the arc points, is composed of individual coils, each placed close to the arc which it controls. The magnetic lines cross the arc so as to blow it outward from the contact tip into a chamber formed between the arc deflectors and the cover, instead of blowing it sidewise off the edge of the finger and against the arc deflector, as in the older forms of controllers, such as K-6 and K-2S. The effectiveness of the new arrangement is many times greater than the old, and as the arc is ruptured much more quickly the burning and blistering of the contacts are much reduced.

The construction and shape of the arc deflectors are such as to separate the fingers and contacts more effectively than in previous designs, and the insulation of the frame and cover is very thoroughly carried out with fireproof and non-hydroscopic material.

The cylinder is made up of cast segments clamped upon an insulated hexagonal shaft by means of flat keys and set screws. This construction is quite a departure from the molded type of insulation for cylinder castings which has been in use for a long time. A distinct advantage is that the cylinder may be more easily repaired in case of damage to one of the contact segments. At the same time, the drive of the segments is more positive and a loosening of the castings less likely to occur from careless or vicious handling. If they should loosen, they may easily be tightened by the set screws.

Motor Connections.

The connections of the motors have also undergone some changes of importance. Some of the new type of controllers are arranged with the bridge form of transfer from series to parallel connection, which avoids the opening of the circuit of either motor during the transition and thereby continues the full torque of both motors throughout acceleration. For very small cars this refinement may not be entirely necessary, but for the larger equipments, particularly those geared for high speed and intended for drawing trail cars, the bridge form of control is very desirable in order to avoid the unpleasant jerk when passing from series to parallel. In accomplishing this arrangement several extra control fingers are required and a division of the rheostats into two blanks is necessary. The slight complication is more than warranted.

Another change is that of reversing the motors by reversing the field connections instead of the armature connections. In doing this the fields are kept on the ground side of the motor as is quite necessary. The advantage lies in the fact that the reversing cylinder is not subject to the full voltage, but has across its contacts only the drop of the field, which is not over 20 volts. This eliminates the burning of the reverser contacts, which is apt to occur on hand controls for four motors when the reversing switch is used in an emergency.

Contactors with Controllers.

The attention of operators has been drawn to the controller difficulties very strongly on account of the burnouts, with the attendant flashing and frightening of passengers, which seem to occur more frequently than some years ago. The difficulty has arisen on those controllers which were constructed for a 500-volt circuit and which are now made to operate on a 600 or 650 volt circuit, in order to make these controllers thoroughly safe on the higher voltages, an arrangement has been perfected for operating two contactors, of similar form to those used on train control, in connection with the cylinder, so that the contactors will make and break the motor circuits and thus take all of the arcing. The attachment for doing this is placed at the bottom of the cylinder and consists of a small contact which controls the circuit to the coils of the contactors, the contactors being placed under the car. The arrangement has been installed on several roads and has given such satisfaction that provision has been made so that all of the old cylinder controllers can be fitted with this attachment. The separate, magnetically operated contactor is able to handle high-voltage and heavy-current arcs without difficulty, and, in addition to the duty above described, may also be used as an overload circuit-breaker. In this way no motor current is broken on the platform of the car, a point which will be appreciated by all operators. The overload device consists of a tripping coil on the contactor, which is controlled by a small switch placed in the vestibule convenient to the motorman. This small switch opens only the circuit to the coil of the contactor, which, of course, carries only a small amount of current, but is tripped in case of overload by a coil carrying the motor current. It is closed by the motorman in the same way as the ordinary circuit-breaker.

The use of cast grid rheostats is so universal that no comment upon them is necessary. The advantages of the cast grid type over the wire or ribbon-wound type are better insulation, better protection from moisture, more rugged con-

struction, ability to withstand more severe overloads of current without damage, and greater ease of repair.

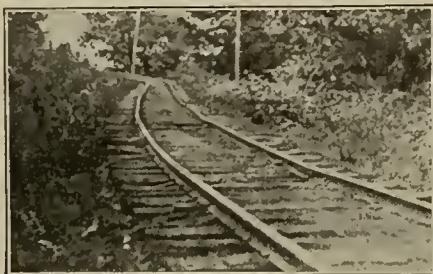
Trolleys.

For city service the standard US-6 trolley, with 4½-inch wheel, has given splendid results, the average life being about 10,000 miles. For greater capacity of equipment and higher speeds, however, a trolley base which will swivel more readily is desirable and a different construction of wheel is necessary to secure a reasonable life.

The US-13 roller-bearing trolley base has been designed to meet this demand. The base swivels on a roller bearing designed with ample margin for the strain of the pole. The height of the base when the pole is retracted is five inches, and its weight is approximately 100 pounds. Four sets of bearings are provided. Operating under tension with a 14-foot pole, a pressure of 35 pounds at an angle of 45 degrees can be given the trolley wheel, which, it is expected, will take care of the higher speed service.

The wheel used for high speeds is known as the form 21. It is 5¾ inches in diameter and has a bearing 3 inches long with a ½-inch pin. The diameter of the pin is made shorter than on the form 6, to reduce the speed of the rubbing contact, and this, with the increased length of bearing, has made the new wheel very serviceable on equipments as large as 500 horsepower. When operating at a maximum of 60 miles per hour under these conditions, it has an average life of 5,000 miles.

It should be borne in mind in operating these high-speed trolleys that the side spring for conducting the current from the wheel to the pole is absolutely essential to satisfactory life of the wheel, and these springs must be provided with proper tension against the wheel. If this is not done the current carried through the bearing will soon destroy it. The



Track and Equipment—Views of Poor Track.

shape of the fork is such as to, prevent its being caught in frogs and switches.

The pantagraph form of trolley has many commendable features for catenary overhead construction, which will undoubtedly come into general use on interurban roads. The results so far obtained in the use of this form of trolley will not justify us in making a complete recommendation for its adoption until further developed. Under special conditions where an ordinary trolley is extremely inconvenient its use is warranted, but it is believed that substantial improvements can be made in the pantagraph type which will make it very satisfactory, and tests and experiments are now being carried on.

Single Phase and High Tension.

In this review no reference has been made to the more radical departures from standard practice which are being given much attention, i. e., the use of single-phase and high-tension direct-current motors. The reasons for using either single-phase or direct-current motors do not arise from consideration of the equipments, but from the desirability of reducing the cost of transmission and distribution of current over long distances. Of the two, the single-phase is the more radical departure, and the problems in the design of the single-phase motor are occupying the earnest attention of able designers. The 1,200-volt, direct-current motor is more directly in line with standard practice, and the use of commutating poles has made such a motor thoroughly practicable. In fact, with such a system the problem of greatest importance is the method of distributing and collecting the current. The discussion of these broader subjects, however, would lead beyond the scope of the present review.

Petitions bearing over 5,000 signatures are reported to have been forwarded to the officials of the Georgia Railway & Electric Company of Atlanta, Ga., asking that smoking be permitted on the street cars. It is stated that the signatures include those of many prominent citizens of the city. Copies of the petition were placed in nearly every tobacco store in the city.

RELATION OF TRACK TO MAINTENANCE OF EQUIPMENT.*

BY W. R. W. GRIFFIN, SUPERINTENDENT ROCHESTER & EASTERN RAPID RAILWAY.

In traveling over different interurban lines, noting track and shop conditions, the writer has come to the conclusion that track condition enters largely into the cost of equipment maintenance. Rough track, with low joints, bad surface and line, racks car bodies and trucks, and is hard on car wheels as well as dangerous. It is also hard on motor armatures and is continually tearing off motor cables.

On one road requiring about 13 cars of heavy equipment to fill a schedule of 28 miles an hour, a visit to the shop showed seven busy men in the armature room and other parts of the shop similarly engaged.

On a visit to another road, the superintendent was seeking advice on maintenance of equipment and ways and means of keeping up repairs sufficient to keep his cars on the road. An inspection of his track showed low joints and track badly out of surface and line.

An analysis of two years' maintenance of track and equipment of the Rochester & Eastern Rapid Railway makes a very interesting study. In 1905, the second year of operating the road, there was spent on maintenance of track \$175 per mile of road, or \$11.20 per 1,000 car-miles, and track was kept in none too good condition.

On maintenance of cars (Acct. No. 6) there was spent \$14.52 per 1,000 car-miles.

On maintenance of electric equipment of car, \$5.20 per 1,000 car-miles.

In 1906, the third year, there was spent on maintenance

of track \$245 per mile of road, or \$15 per 1,000 car-miles; maintenance of cars (Acct. No. 6), \$10.77 per 1,000 car-miles; and maintenance of electric equipment, \$5.42 per 1,000 car-miles.

Records for 1906 show a large falling off of general repairs to car bodies, trucks, wheels, brake gear and brake-shoes, during the year 1906 over 1905, all of which is directly due to smoother track.

The figures regarding motor equipment do not show as decided improvement except in the item of motor cables. At the same time considering the fact that the average schedule speed was increased 12 per cent in the year 1906 over 1905, and also that the electrical equipment was a year older, it is evident that the improved track must have had a great deal to do with keeping the electrical repairs as low as they were.

In summing up: Eliminating painting and damaged cars, in body repairs, since these two items have no relation to track, the figures were:

	Acct. 6.	Acct. 7.	Track.	Total.
Per 1,000 car-miles, 1905.....	\$13.59	\$5.20	\$11.20	\$29.99
Per 1,000 car-miles, 1906.....	8.53	5.42	15.00	28.98

Making a total saving of \$1.01 per 1,000 car-miles.

From the above figures, it seems that it is good policy still further to increase the ratio of total expenditure on track since the track is the real permanent part of the railroad, and in so doing not only is a far better permanent way built up, but the time of renewal of cars and electrical equipment is greatly extended.

The enormous development of 20 years in electric railroads, from eight miles of track in 1886 to nearly 33,000 miles in 1906, consisting of 1,081 railroads operating approximately 77,000 motor and other cars, with capital stock aggregating nearly \$2,000,000,000 and a funded debt of over \$1,500,000,000, has been a very prominent factor in the expansion or evolution of certain lines of industrial manufacture.—Wall Street Journal.

*Abstract of paper presented at the annual convention of the Street Railway Association of the State of New York, Lake Champlain, June 25-26, 1907.

RECENT IMPROVEMENTS IN MOTORS AND CONTROL.*

BY CLARENCE RENSCHAW, RAILWAY ENGINEER WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY.

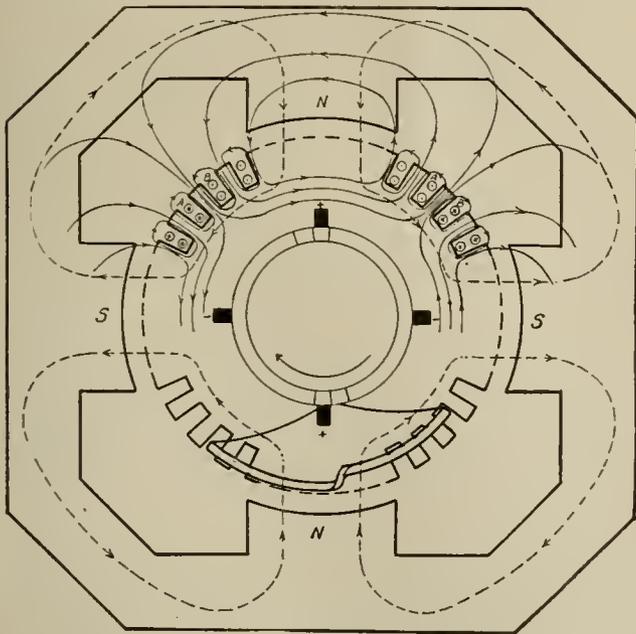
In dealing with the rather large subject of recent improvements in motors and control, I have not attempted to cover the matter broadly, but have devoted my time to three specific divisions with which I am most familiar, namely, interpole motors, unit-switch control and the single-phase system.

INTERPOLE MOTORS.

Probably the most promising improvement in direct-current railway motors for many years is the introduction of the interpole motor. The commutation of high-voltage current in railway motors has always been a most difficult problem for the designers of such machinery to solve, and the care of commutators and brushes forms no small part of the duties of the mechanical and electrical force of a railway company. Most commutator and brush troubles are due either directly or indirectly to sparking, and it is to correct them by correcting their cause that the interpole motor has been designed.

High Mica.

Sparking on a commutator bites away a small amount of copper and carbon at each spark, but does not affect the mica between segments. If the sparking is continued, the copper is soon eaten down, thus leaving the mica sticking up. This "high mica" in turn makes the sparking worse and causes a general roughening of the commutator, flattening of the bars, etc., with consequent rapid wear of the brushes, which fills the motor with carbon and copper dust, and sometimes causes it to flash, ground, etc. Milling down the



Improvements in Motors and Control—Figure 1—Magnetic Flux in Ordinary Motor.

mica below the copper prevents some of this trouble, but does not go to the root of the matter.

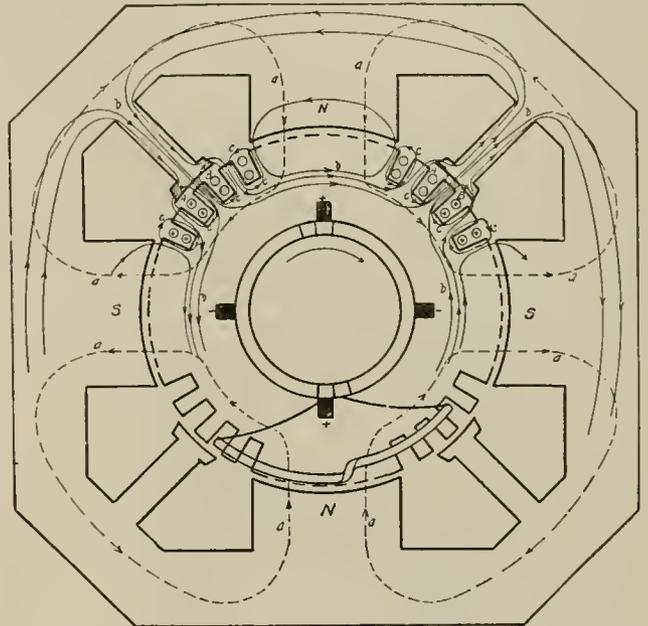
In service a railway motor does not run continuously with power on, but the time that it is operating under load is varied by a certain amount of coasting and stopping. During this no-load running the roughening which has been caused by the action of the current is partly corrected by the scouring and polishing effect of the brushes without load. In many cases the scouring action predominates so that the commutators remain bright and clean and take on a good polish.

Action of Interpole Motor.

The action of the interpole motor in preventing sparking and thus greatly reducing the wear on commutator and brushes can best be understood by the aid of a few simple diagrams. In these a multiple-wound armature has been shown for the sake of simplicity and clearness, although on

an actual motor a two-circuit winding would ordinarily be used.

In a motor without interpoles, as shown in Figure 1, there are three sets of magnetic fluxes produced: First, the lines "aa" due to the main field coils; second, the lines "bb" due to the current in the armature winding as a whole; and third, the leakage "cc" around each of the slots, due to the current in the conductors in that particular slot. The first set of lines may be regarded as the useful lines, and the second and third as incidental. It is to these last two that sparking is due. The coil "AA," which is just about to have the current reversed in it, lies in such a position that it is not cutting the lines "aa," and hence has no voltage generated in it from that source. It is, however, cutting the lines "bb," so that it has a voltage generated in it by them. When the coil is short-circuited by the brush, this voltage causes a local current to flow across the face of the brush in addition to the line current, which greatly increases the amount of



Improvements in Motors and Control—Figure 2—Effect of Interpoles Without Coils.

current that the brush must carry. As the coil passes under the brush, also, from position "A" to position "B," the current in the conductors in the slots "A" is stopped preparatory to being reversed, so that the leakage lines "cc" are also stopped preparatory to being reversed. This causes an inductive voltage to be created in the coil in addition to the voltage of rotation generated by the lines "bb," and these two voltages added together produce a spark between commutator bar and brush.

Construction.

In an interpole motor the interpoles consist of thin poles, each carrying a coil inserted into the frame between the main field poles and projecting down to the points on the armature at which the sides of the coils short-circuited by the brushes lie. If the interpoles alone were used without any coil, as shown in Figure 2, their effect would be to concentrate and increase the lines "bb," due to the armature magnetization, and also the lines "cc," due to the leakage around the slots, owing to the additional iron in the path of these two sets of lines, and thus raise the voltage in the short-circuited coil, and increase the sparking.

With coils on the interpole of a sufficient number of turns to just neutralize the armature magnetization, the effect of the lines "bb" will be eliminated, as shown in Figure 3, so that there will be no voltage generated in the short-circuited coil by its rotation, but the lines "cc," due to leakage around the slots, will still remain, and the increase in these, due to the presence of the interpole, would ordinarily give a sufficiently high inductive voltage to more than offset the advantage gained by the neutralization of the rotation voltage.

If, however, a greater number of turns be wound on the interpoles, so that their excitation overbalances the armature magnetization instead of merely neutralizing it and sets up a flux in the opposite direction, as shown in Figure 4, this flux can be made of such a strength that the leakage lines around the coil, which is being commutated, will also be elimi-

*Abstract of paper presented at the annual convention of the Street Railway Association of the State of New York, Lake Champlain, June 25-26, 1907.

nated, so that practically all of the voltage in the short-circuited coil is neutralized and sparkless commutation is obtained. Since the interpoles neutralize the active voltage in the short-circuited coils, they also eliminate the extra local current in the brushes and thus reduce the total current in the brushes to its minimum value, that is, to the line current. The elimination of sparking and of local currents in the brushes reduces the wear on the commutator and prolongs the life of the brushes to a remarkable extent.

The interpole winding is connected permanently in series with the armature winding, as shown in Figure 5, forming the "armature circuit," and in reversing the direction of rotation of the motor the armature windings and interpole windings are reversed together as a unit.

Advantages.

Aside from the general reduction in wear of commutator and brushes, the interpole motor has many incidental advantages. A properly designed motor of this type should run practically sparklessly from a load so light as to give treble the normal speed up to loads as heavy as double its ordinary one-hour rating. It should permit high voltages to be thrown on it, either at standstill or when running at high speeds, and its stability should be so great that it will commutate without appreciable sparking rushes of current which in the ordinary motor would invariably cause flashing. This great freedom from sparking and flashing makes the interpole motor especially well adapted for high-voltage service.

The use of the interpole increases the scope of the designer of railway motors in many cases where limitations of speed and weight determine the design, and in general it permits of a somewhat lighter motor. It gives less advantage in small motors than in large ones, as the commutating conditions in such motors are not so serious a problem. However, its general advantages will doubtless extend its use to sizes as small as 40 horsepower. Improving as it does those features of the railway motor which are universally acknowledged to be in greatest need of improve-

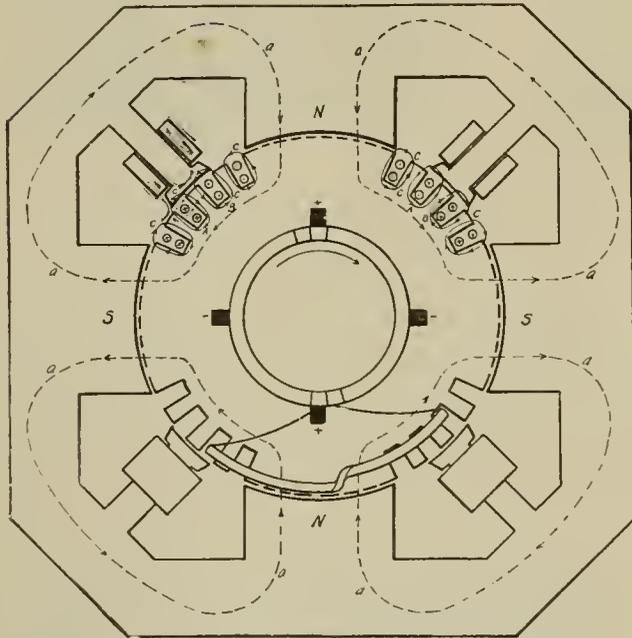
ment, the introduction of the interpole motor is an important step in electric railway development.

UNIT-SWITCH CONTROL.

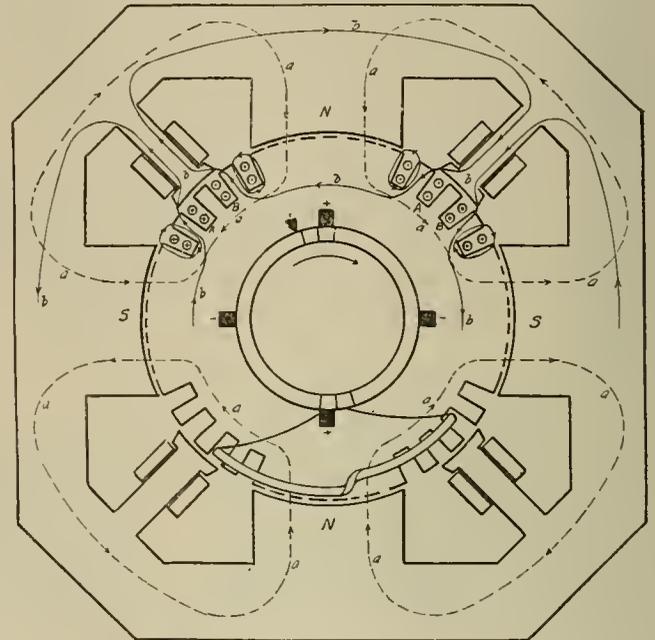
A most important development in control apparatus is the perfection and standardization of unit-switch control equipments for all sizes of motors. The ordinary drum type of controllers, while in general satisfactory for small equipments, leave much to be desired where it is necessary to handle large cars and powerful motors. Such controllers of large capacity must necessarily be heavy and bulky in order to contain sufficiently liberal contacts and blow-out coils to handle the large currents which pass through them. The weight of such controllers, moreover, must be mounted at the extreme end of an overhanging platform where it is least desirable and a large bunch of heavy cables must be led out there. On account of the size and pressure of the con-

tact fingers also, the drum requires considerable effort to turn it, especially should the contacts become slightly roughened and quick movements be impossible. Finally, it seems impracticable to design a blow-out which will enable such controllers to break the current with certainty under all circumstances, and in certain parts of the country it is not an unusual sight to see a motorman nursing an interurban car along the streets of a city by means of the overhead circuit-breaker and shooting out a stream of fire every time it is necessary to cut off power. The drum-type controller, however, is a rough-and-ready piece of apparatus, and when out of order its faults can be easily located and repaired by a comparatively cheap man if only a sufficient stock of spare parts is kept on hand.

The unit-switch control system was originally designed with special reference to the operation of two or more motor



Improvements in Motors and Control—Figure 3—Interpole Motor with Armature Magnetization Just Neutralized.



Improvements in Motors and Control—Figure 4—Magnetic Flux in Interpole Motor.

cars in a multiple-unit train, and it was at first adapted only for use in connection with the larger sizes of motors. Its other advantages, however, in providing a positive and reliable control, in placing all main circuit contacts and heavy cable out of the way beneath the car and in reducing to a minimum the amount of high voltage and heavy current wiring, are now rapidly extending its use to single-car operation and to smaller sizes of equipments.

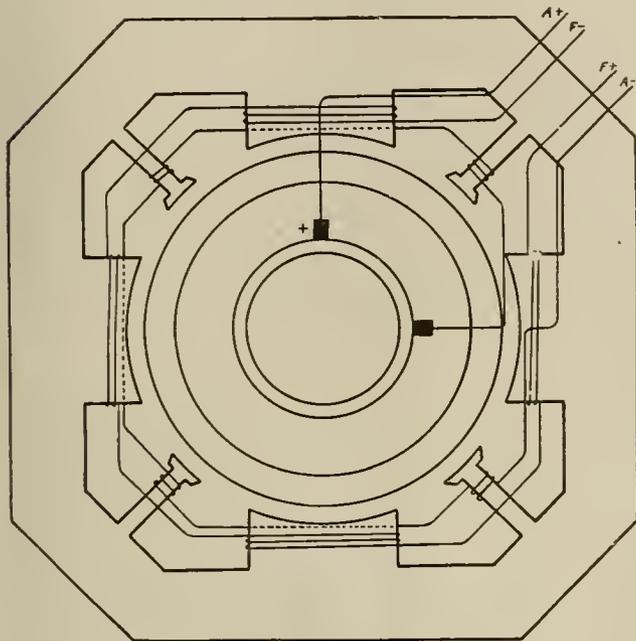
Essential Parts.

In the unit-switch control system the main or power drum of the hand control is replaced by a group of 10 or 12 (according to the size of the equipment) independent or "unit" switches, each provided with a strong magnetic blow-out and normally held open by a powerful spring. Each switch is closed when desired by a suitable pneumatic cylinder, using compressed air from the brake system. This combination of switches is called a "switch group." The reverse drum of the controller is replaced by a similar drum, except that it is more liberal in capacity, built in a separate case and moved to the forward or reverse position by one or the other of two cylinders having a common piston rod. This device is called a "reverser." The overhead circuit-breaker is replaced by a "line switch," which is essentially the same as one of the switches of the switch group, except that it is placed in a case by itself and is provided with an automatic trip, which causes it to open in case of an overload or short-circuit. These three pieces of apparatus effect the various necessary connections between motors, resistance and trolley.

Forming an essential part of the pneumatic cylinder for operating the switch group, line switch and reverser is a magnet valve which governs the admission or escape of air to or from that cylinder. These magnet valves are operated by means of a small 14-volt storage battery, and their opening or closing is regulated by means of a "master controller" to which their circuits are led. The switch group, reverser and line switch may thus be located in any convenient position, and nothing but the master controller need be located on the platform, and only the small low-voltage battery circuits need be carried to it.

For train operation the circuits from the battery and magnets are carried to "train line receptacles" at each end of the car, as well as to the master controllers, and when two cars are coupled together the corresponding receptacles on each car are then connected by a multi-point "jumper," so that the circuits are continued from car to car. When several cars are connected in this way the movement of a single master controller closes simultaneously the corresponding magnet circuits on all of the cars and thus operates also the corresponding main circuit switches.

Connected to the piston rods which move the various switches are a number of small contact switches which open or close auxiliary circuits between stationary fingers arranged to press on them. These auxiliary contacts are called "interlocks," and the circuits which operate the magnet valves of each of the various switches are carried through the interlocks



Improvements in Motors and Control—Figure 5—Method of Connecting Interpole Windings.

of other switches in such a way that the switches cannot be closed except in the proper order.

Acceleration.

The unit-switch control system, however, does not consist merely in replacing the ordinary controller with a set of pneumatically operated switches, which may be closed properly or improperly entirely at the discretion of the motorman, but the action of the switches is regulated so as to give a uniform current through the motors while operating on the resistance steps, and to thus secure a smooth and even acceleration of the car and protect the equipment from abuse. This is accomplished by means of a "limit switch." The limit switch consists of a coil, placed in series with the motor circuits, which lifts an armature whenever the current exceeds a predetermined amount. To the armature of this coil is attached a disc which closes a secondary circuit between two contacts when the armature is down, and opens this circuit when the armature is raised. The circuits for closing the various switches of the switch group are so arranged that it is not necessary to move the master controller step by step to cause the closing of the different switches, but so that by placing the master controller in a single definite position and holding it there the circuits to the first switches are closed, and the closing of these switches then automatically closes the next ones, etc., by means of the interlocks. The circuit from the battery which supplies power for this automatic operation is led through the secondary contacts of the limit switch, so that as long as the current through the motors does not exceed the desired value, the different switches will close one after the other almost instantaneously. Should the current through the motors at any time exceed the desired amount, however, the armature of the limit switch will instantly rise and thus prevent the closing of any more switches until the current has fallen to the desired value.

The regulation of the current during starting is thus taken entirely out of the hands of the motorman, who simply advances the handle of the master controller to the last notch and holds it there, and the closing of the switches is then

governed automatically by the limit switch. In order to provide for the handling of the car under special conditions, however, the apparatus is so arranged that the motorman may readily notch up more slowly than would be done by the limit switch, or may stop on any notch, and also so that by going to some extra trouble (enough to prevent his doing it unnecessarily) he can short-circuit the limit switch and notch up entirely independent of the current.

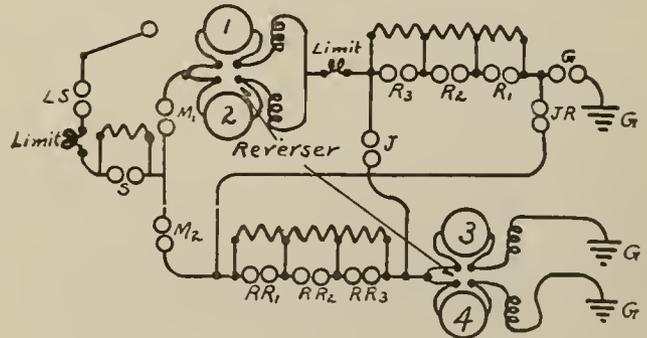
Master Controller.

As ordinarily built, the master controller for use with the unit-switch control system contains three notches for forward running and three for reverse. If the handle is moved to the first notch a slow-speed resistance point is obtained which is used principally in shifting cars. This first notch is hence called the "switching" position. If the handle is moved to the second notch, either with or without pausing on the first one, the switches close one after the other until the motors are connected in series. The second notch is therefore called the "series" position, and is, of course, a running point. If the handle is moved to the third notch, either at once or after pausing on one or both of the first two notches, additional switches will then close in sequence until the motors are

Sequence of Switches.

Notch	LS	M ₁	S	M ₂	G	JR	RR ₁	R ₁	RR ₂	R ₂	RR ₃	R ₃	J
1	○	○											
2	○	○	○										
	○	○	○	○									
	○	○	○	○	○								
3	○	○	○	○	○	○	○	○	○	○	○	○	○
	○	○	○	○	○	○	○	○	○	○	○	○	○
	○	○	○	○	○	○	○	○	○	○	○	○	○
	○	○	○	○	○	○	○	○	○	○	○	○	○
	○	○	○	○	○	○	○	○	○	○	○	○	○
	○	○	○	○	○	○	○	○	○	○	○	○	○
	○	○	○	○	○	○	○	○	○	○	○	○	○

○ Series. X Transition.
● Parallel.



Schematic Diagram.

Improvements in Motors and Control—Figure 6—Sequence of Switches and Schematic Diagram of Unit-Switch Control.

connected, in full multiple. The third notch is hence called the "parallel" position.

Transfer Resistance.

Figure 6 shows a schematic diagram of the switches and main circuit connections for an equipment of four 90-horsepower motors, and indicates the sequence in which the various switches close. In addition to stopping the handle on any one of the three notches, as already mentioned, and obtaining the switching, series or parallel connection, the motorman may so manipulate the master controller as to hold the switches in any one of the series and parallel positions indicated on the diagram. In connection with the above diagram it will be noted that instead of opening the circuit in changing from series to parallel, as is done in the large drum-type controllers, a special resistance connection is used for making the transfer without decreasing the current through the motors. The use of this connection avoids the jerk sometimes

obtained with drum-type controllers in passing from series to parallel, and helps in maintaining a smooth and uniform acceleration.

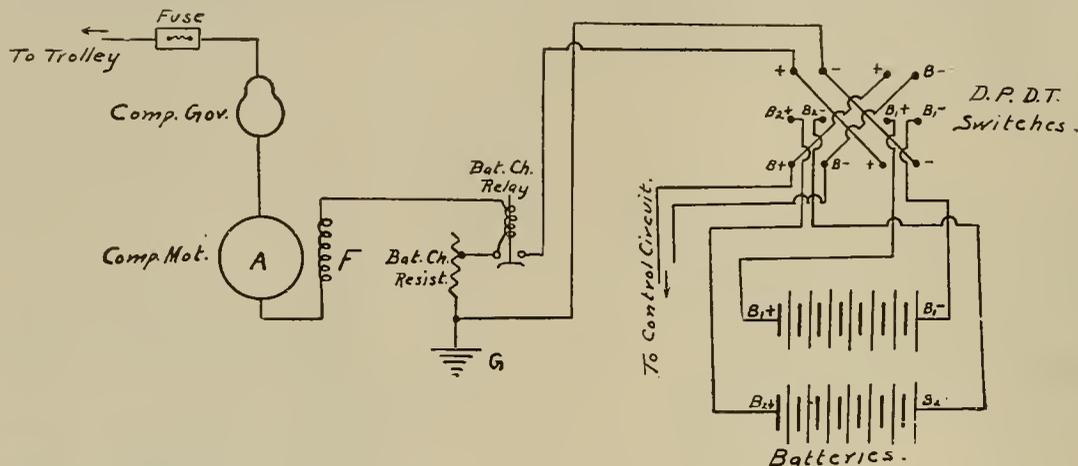
Storage Batteries.

An interesting detail in connection with this system of control is the method of charging the small storage batteries used for operating the magnet valves. Two batteries are carried on each car, and these are connected to the air-pump motor circuit, as shown in Figure 7. The two double-throw switches are always thrown either both up or both down, so

Many other details might be mentioned, but the above are sufficient to indicate the completeness with which every feature of the equipment has been worked out.

In providing for the control of the different sizes of motors most commonly used, two sizes of switch groups are employed. The construction of the smaller of these is shown by the cross sectional view in Figure 9. A similar view of the large switch group is shown in Figure 10. Figure 11 is a photograph of the reverser, with its cover removed.

This form of control possesses many advantages, not only over the drum-type controller, but also over any other type of

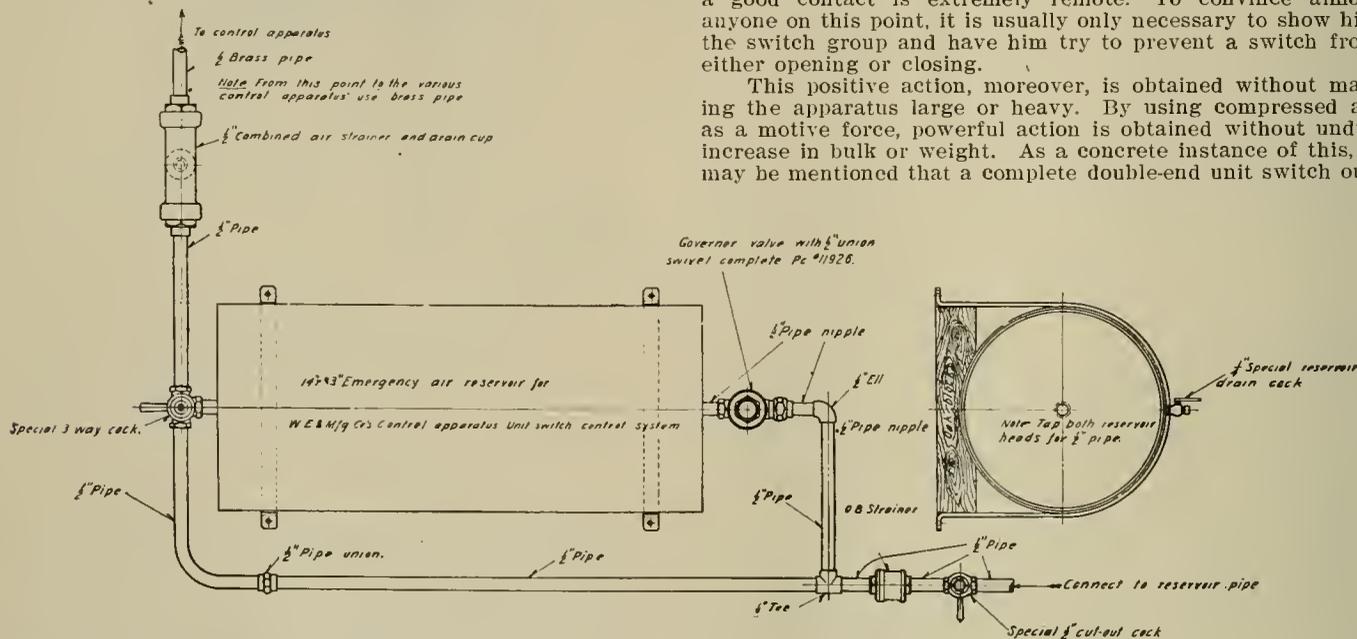


Improvements in Motors and Control—Figure 7—Connections for Charging Storage Batteries.

that one battery is connected to the control circuit while the other is being charged. Whenever the pump is running the battery which is being charged is connected by the "battery-charging relay" to the circuit of the pump motor. The resistance in series with the pump motor is so adjusted, in connection with the relative amount of time that the pump is running, and that the control circuits are closed, so that the battery will receive on the one hand sufficient current to charge it

multiple control now on the market. One of the most important of these advantages is the powerful force which is available both for opening and closing the switches, so that their action is most positive. In the smaller switch group, for instance, a force of approximately 75 pounds is available at the contacts for opening or closing them, and in the larger group this is increased to over 90 pounds, so that the chance of these switches failing either to open quickly or to make a good contact is extremely remote. To convince almost anyone on this point, it is usually only necessary to show him the switch group and have him try to prevent a switch from either opening or closing.

This positive action, moreover, is obtained without making the apparatus large or heavy. By using compressed air as a motive force, powerful action is obtained without undue increase in bulk or weight. As a concrete instance of this, it may be mentioned that a complete double-end unit switch out-



Improvements in Motors and Control—Figure 8—Control Reservoir and Air Piping.

properly without, on the other hand, receiving enough current to make it boil or gas. When this adjustment has once been made, the batteries will require little attention other than the reversal of the two switches once each day.

Another detail of the equipment is the air-storage system. A separate "control reservoir" is piped to the air-brake system, as shown in Figure 8, in connection with a "governor" or check valve and a three-way valve. Ordinarily the three-way valve is turned so that the air is drawn directly from the brake system, but in case of accident to the compressor or main reservoir the three-way valve may be turned 90 degrees and the reserve supply of air in the control reservoir is thus available to return the car to the car house.

fit for controlling a quadruple equipment of Westinghouse No. 121 motors (90 horsepower each) weighs only approximately 1,650 pounds, including the switch group, reverser, line switch, master controller, control reservoir and all details except wiring and resistance.

Another advantage of almost equal importance is the use of a low-voltage battery for operating the control circuits and the fact that the operation of the control is entirely independent of the line voltage. This point is of especial importance on interurban lines where wide fluctuations in voltage are frequently met with.

Although the elimination of bulky controllers and heavy cables from the platforms and the securing of control appara-

tus which will positively open the circuit under all conditions are in themselves sufficient reasons for the use of unit-switch control, the ability to operate two or more cars together with a single motorman, when required, is no mean advantage. There are many instances where trailers are now used, overloading the equipment and slowing down the schedule just at the time when rapid car movement is most needed, where multiple-unit operation would give superior service at less expense. This is becoming widely recognized even in the case of comparatively small equipments for city service, as may be seen from recent orders for 20 equipments of unit-switch control for operating double 60-horsepower motors in New Haven, Conn., and for 80 equipments for operating quadruple 55-horsepower motors in Baltimore, Md.

THE SINGLE-PHASE SYSTEM.

A consideration of recent improvements in railway motors and control would be very incomplete if no mention were made of the single-phase system, although the essential economies of single-phase operation are effected not by the change in motors or control, but in the other parts of the system. In order to obtain these economies, however, car equipments differing from direct-current equipments in certain particulars must be used, and it is proposed to mention briefly the essential features of these.

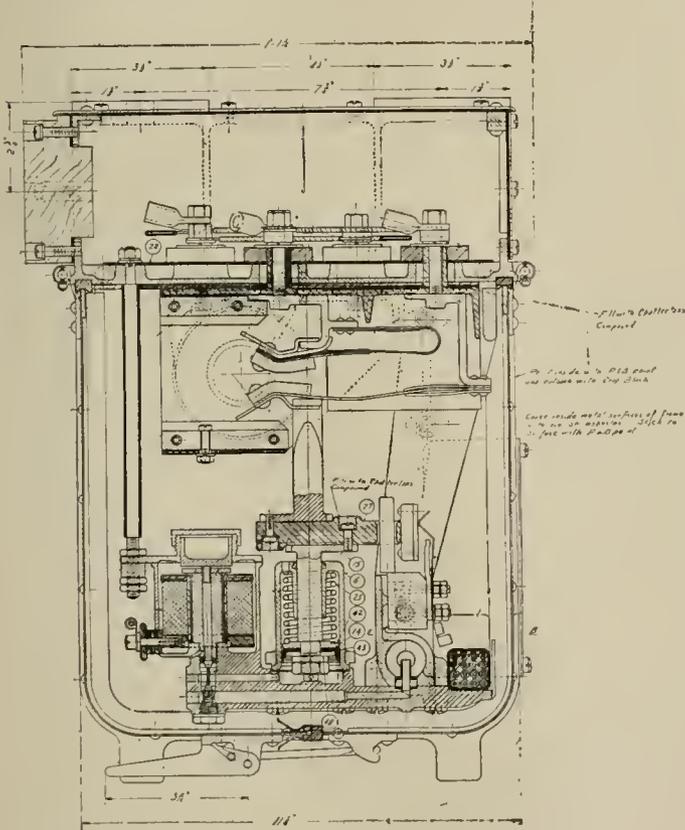
Advantages.

The single-phase railway system accomplishes the same results in car movement that have heretofore been secured by the use of direct-current equipments, but it does this in many cases with less first cost, less operating expense, increased flexibility and greater simplicity. These advantages are obtained principally by a simplification of the substations and the omission of substation attendants and by the elimina-

tion of a transformer on the car the voltage of the trolley and that of the motors may have any desired ratio. As it is entirely feasible to employ a voltage of 11,000 (which permits the distribution of a large amount of power with a very small current) on a properly insulated trolley wire, the single-phase system affords means of operating even the heaviest cars or trains from an ordinary trolley wire of moderate section with no additional feeders.

Single-Phase Motor.

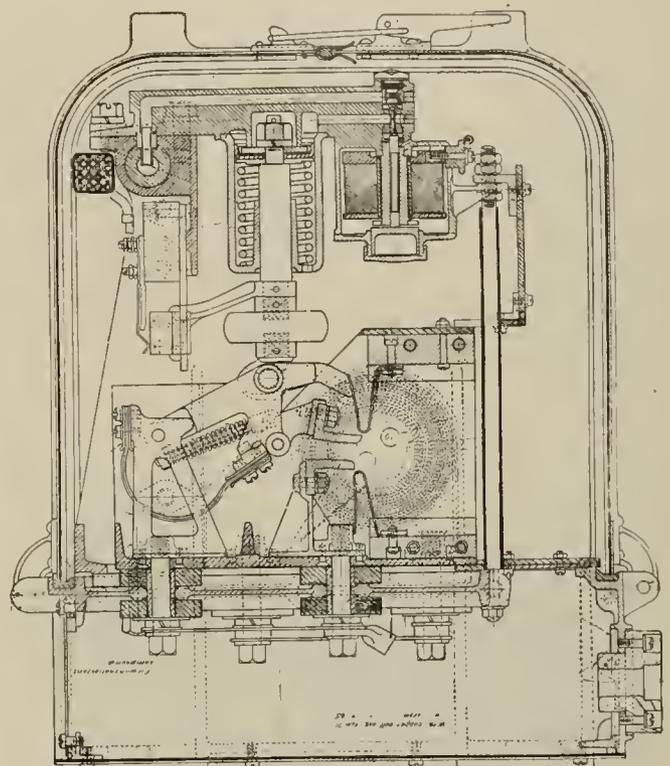
The one element upon which the entire single-phase system depends is the single-phase railway motor. This does not involve any particularly new or mysterious principle, but depends for its operation upon an extension of the well-known



Improvements in Motors and Control—Figure 9—Cross Section of Small Switch Group.

tion of practically all trolley feeders. At the substations the alternating-current power which is received from the generators is merely reduced in voltage by single-phase transformers and supplied at once to the cars, instead of being changed into direct current by polyphase transformers and rotary converters. The equipment of such a substation is so simple that, except for an occasional inspection, it may be left entirely without attendants.

One of the fundamental characteristics of alternating current is the readiness with which it can be transformed from one voltage to another. Where alternating-current motors are used, therefore, it is not necessary as with direct current to supply power to the cars at the voltage of the motors, but



Improvements in Motors and Control—Figure 10—Cross Section of Large Switch Group.

fact that reversing the current at the terminals of a series direct-current motor does not reverse the direction of rotation or interfere with the operation. This principle holds good no matter whether the current is reversed once every hour or once every minute. Since an alternating current gives merely the same general effect as a very rapid and continuous reversal of a direct current, it would be only natural to expect any ordinary direct-current railway motor to rotate if suitable alternating current were applied to it. Within certain limitations this is the case.

Windings.

The single-phase railway motor is essentially a series-wound motor very similar to the direct-current motor. On account of the rapidity of the reversal of the alternating current, however, a number of new phenomena are introduced, and in order to secure satisfactory commercial operation from the motor with this current certain changes in the design of the ordinary railway motor must be made. One of these is to make the entire magnetic circuit laminated instead of merely the pole pieces, to prevent excessive losses, due to the rapid reversals of the magnetic flux. Another essential feature is the "auxiliary" or neutralizing winding which is wound in the slots between the poles in order to neutralize the magnetizing action of the armature and hence its self-induction. This winding is connected in series with the armature in the same way as the interpole winding of the interpole motor. Instead of being located on definite poles, the auxiliary winding is distributed in slots in the faces of the main pole pieces so that the neutralization will be more complete and effective. Unlike the interpole winding, however, the auxiliary winding is not used to improve the commutation, but to improve the power factor of the motor.

Owing to limitations of design, the single-phase motor is

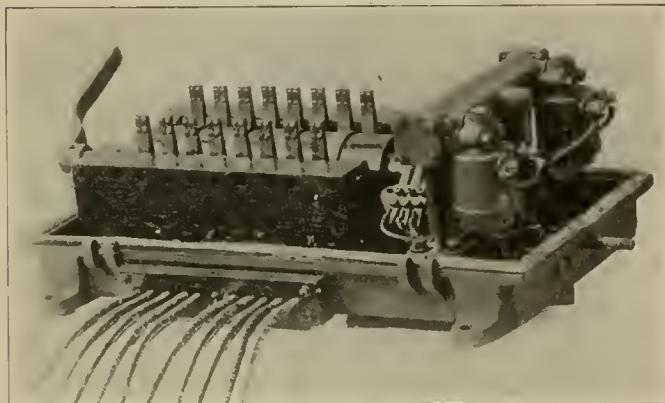
ordinarily wound for a voltage of from 200 to 250 instead of 500 or 550, as in the case of direct-current motors. The larger currents which must be handled on this account necessitate greater brush capacity than in direct-current motors, so that four brush arms are ordinarily required with a four-pole motor or six with a six-pole motor.

Performance.

The performance of the single-phase railway motor is very similar to that of a direct-current series motor, the principal difference being that the speed curve is steeper. The general effect of this is to cause a car equipped with such motors to run slower on heavy grades and faster on the level than a car equipped with direct-current motors geared for the same speed at an intermediate load.

The single-phase motor differs from the direct-current motor also in that on account of its self-induction it requires the application of a much greater percentage of normal voltage in order to send a given proportion of full-load current through it. On this account, it is not possible to allow as great a variation in the voltage at the car as is sometimes done with direct-current equipments, and to secure satisfactory operation the minimum voltage should never be less than about 80 per cent of the normal. Owing to the small currents used, however, this is a matter that is very easily taken care of. For the same general reason, the voltage on the motor may be varied in larger steps than with direct-current motors, so that fewer controller notches are necessary in order to secure a smooth acceleration, five notches, for instance, being ample for a quadruple 100-horsepower equipment. For the same reason, also, the motors are much less likely to be damaged by too rapid feeding of the controller, and hence automatic acceleration is usually not necessary.

The standard trolley voltage for single-phase operation is



Improvements in Motors and Control—Figure 11—Reverser, with Cover Removed.

6,600, although voltages of 3,300 and 11,000 are also employed in some cases. In order to collect current at this voltage from the trolley wire, a pneumatically operated pantagraph trolley has been devised which can be readily raised or lowered by the motorman without leaving his cab. In multiple-unit equipments, moreover, the trolleys on the entire train may be simultaneously controlled from any one point. This trolley is normally held against the wire by means of a spring, but is lowered and automatically locked down by the application of compressed air. Application of the air to another point will then unlock the trolley and allow it to rise.

To reduce the trolley voltage for use at the motors an oil-insulated, self-cooling auto-transformer is used. As this is ordinarily the heaviest single piece of apparatus on the car, it is commonly mounted in the center in order to simplify the matter of balancing.

As with direct-current motors, the speed of the single-phase motor varies with the voltage at its terminals, and the motor is controlled in this way. In order to get a variable voltage for this purpose, however, it is not necessary, as in direct-current practice, to change the grouping of the motors, or to introduce resistance into the circuit, but simply to connect the motors to different taps on the auto-transformer.

Control.

The various connections between motors and transformer may be made either by drum-type controllers or by unit switches, as with direct-current equipments. On account of the absence of any necessity for making series-parallel con-

nections, both drum-type controllers and unit-switch groups for single-phase equipments are simpler than those for direct-current operation. For instance, a switch group for handling four 100-horsepower direct-current motors weighs approximately 760 pounds, while one for handling four single-phase motors of the same capacity weighs only 400 pounds. An entire equipment of single-phase motors, however, is considerably heavier than an equipment of direct-current motors of the same capacity, so that a car equipped with the former and carrying the same passenger load will ordinarily weigh from 10 to 15 per cent more than one equipped with the latter. Switch groups for single-phase operation are controlled by small storage batteries in the same way as those for use with direct-current equipments, but in this case the batteries are taken off of the cars at intervals and charged from a suitable source of direct current at the car house.

Alternating-Direct Current Operation.

The qualities which make the single-phase motor suitable for operation on alternating current make it also an excellent direct-current machine, and such motors will operate beautifully on direct current of the proper voltage. It is often desirable to obtain the benefits of single-phase operation with cars which for a part of their route must run over the same tracks and use the same power as direct-current cars, and by connecting two or more single-phase motors in series for such operation they can readily be arranged to run from a 550-volt trolley wire, as well as from a 6,600 or other high-voltage one. Single-phase motors run somewhat faster with direct current of a given voltage than with alternating, while where operation on direct current is required of such motors, it is usually over city streets or in other places where only a moderate car speed is desired. On this account equipments for operation on both alternating and direct current are usually supplied with four motors, which are permanently connected in two pairs of two in series. These pairs are run in parallel on alternating current and in series (so that all four motors are in series) on direct current. This arrangement usually gives a speed on 550 volts direct current about two-thirds or three-fourths as great as that obtained when operating from normal voltage alternating current. When running on alternating current, the motors of such an equipment are controlled in the usual way by connecting them to different taps on the transformer. When running on direct current they are controlled by means of a resistance in series.

Change-Over Methods.

Equipments for operating on both alternating and direct currents are somewhat more complicated and expensive than those for operating on alternating current only, but they are equally satisfactory in operation, and the majority of single-phase equipments now in use are arranged in this way. In such equipments with drum-type controllers, the controllers are made with two drums, and in changing from alternating to direct current, for instance, the controller handle is moved from the shaft of the alternating-current drum to that of the direct-current drum. In multiple-control equipments, the circuits from the master controller to the various magnets are carried through a change-over switch. This is in the nature of a number of double-throw switches with the wires from the master controller connected to the middle points, so that with the change-over switch in one position a movement of the master controller operates one set of magnet circuits and closes the proper switches for alternating-current operation, while with the switch in the other position the same movement of the master controller operates a different set of circuits and closes the proper switches for direct-current operation. This change-over switch is governed by two relays, one connected to the transformer and arranged to operate on alternating current only, and the other connected to the direct-current trolley and arranged to operate on direct current only. With such an equipment, therefore, if alternating current is supplied to the car, the change-over switch will automatically set itself in the alternating-current position, or if direct current is applied to the car, it will set itself in the direct-current position. The movement of the same master controller in exactly the same way, therefore, closes an entirely different set of switches, according to the kind of current that is being used. Thus, in changing from alternating current to direct current, or vice versa, it is only necessary to see that the proper trolley is on the wire.

On a basis of the experience gained from 15 operating roads in America and several abroad, single-phase equipments have been standardized to a remarkable extent, considering the comparatively short time the system has been in use, and the advantages of the system have been so thoroughly recognized that at the present time no new railway line is laid out without carefully considering the advisability of using the single-phase system on it.

ELECTRIC RAILWAY ACCOUNTING.*

BY J. C. COLLINS, SECRETARY AND AUDITOR, ROCHESTER RAILWAY COMPANY.

According to the programme I am to discuss "Some Phases of Electric Railway Accounting," but in considering what I should talk about it seemed to me that you would be better pleased if I confine myself to one of the many topics that interest the operating man. And if I could bring you certain facts relative to the experience of the Rochester Railway Company, it would be not only more interesting for you but more valuable. I shall therefore speak to you this morning concerning the job-order system, which is, in my opinion, the best method to arrive at the detail of costs.

The standard system of accounting makes no provision for a subdivision of the 39 operating accounts that go to make up the operating expenses; consequently it is left to each road to devise some method that will give to the officials the details of cost in their respective departments, and at the same time give to the general manager or general superintendent the necessary detail to keep him in touch with what is going on. This is especially true of the track, line and mechanical departments.

In operating subsidiary accounts the tendency, in my opinion, is to go into so much detail that the system becomes cumbersome, in which event it becomes necessary to analyze the detail. It is not unnecessary complication that each road is looking for, but the shortest and simplest method that will place the facts in the possession of the various department heads. It seems to me that the job-order system of cost accounting affords the solution of the problem.

An Aid in Preparing Costs.

This system permits the separation of the details of cost of the various operations to any degree of fineness which may be thought necessary, and is a great aid in preparing costs. The idea of preparing unit costs is daily becoming more popular with our department heads, as it is of immense service in the making of new estimates. It is also of great benefit in making comparisons, for with this information the man in charge can quickly tell which of his foremen is the most competent.

For instance, in a case of track construction at two or more locations, it is very interesting to compare the cost per foot for track laying, cost per cubic yard for placing concrete, and so on. By this comparison the head of the department can base on facts his opinion as to the capabilities of his foremen, the facts being actual unit costs for work done under exactly similar conditions.

The day has passed when department heads are content to wait until the end of the month to know, in their respective departments, what it is costing to operate. For that reason the job-order system must be such that this information can be given daily. It is obtainable by the system used by the Rochester Railway Company, and as we have received a number of inquiries as to how we arrive at our detail of costs, I thought a description of our system might be of interest to the representatives of the different companies assembled here.

Estimate Card.

An estimate card, on which is noted the cost in detail of the proposed work and the account to be charged, is made out by the head of the department in which the estimate is prepared. When the head of any department makes an estimate of the cost of some particular work he desires to do, the knowledge that the actual cost will be compared with the estimated cost, and with work in other departments, serves to make him careful to reduce the cost to the lowest possible figure consistent with good work.

After the estimate card has been prepared it is transmitted by the department head to the general manager, whose signature carries with it the authority to proceed with the work, and the approval of the account to be charged. The general manager, through his approval of the estimate cards, is constantly in touch with the work being done, and the actual cost to date.

From the general manager the estimate card is forwarded to the auditor, who examines and verifies the charge, and then forwards the card to the job-order clerk. The cards are numbered consecutively beginning with No. 1, the first issued in the calendar year.

As soon as the job-order clerk receives the card, he numbers the job and places the card on file. The number is

(then telephoned to the department making the estimate, as well as to the storekeeper, and is confirmed as soon as possible by sending typewritten copies, on which are noted the number of the job, the account charged and a description of the work, to the heads of all departments. The foremen of the different departments, when necessary, are advised of the number, and instruct their men to use it on their time sheets, except in the track department. In that department, where we employ a number of Italian laborers, each track foreman makes one sheet covering the work of the men in his gang. These time sheets are then sent to the timekeeper, who posts the time and forwards the sheets to the job-order clerk. The latter, in figuring out the costs of the various jobs, also makes a complete distribution of the payroll on a distribution sheet, the footings of which are posted on the back of the estimate card.

Actual and Estimated Cost.

The job number is given on the requisition under which the material is drawn from the storeroom. These requisitions, when filled, are assembled daily by the storekeeper, and totals by accounts are posted on his distribution sheet. From this sheet at the end of the month the auditor gets his posting figure for materials charged to the different accounts. These requisitions are sent daily to the job-order clerk, who sorts them according to job numbers, figures the cost of each job to date, and posts the cost to date on the back of the estimate card. When the job is completed the actual cost in detail is compared with the estimated cost, and the head of the department that prepared the estimate is given a copy of the record for his information.

The working out of these estimate cards requires attention to figuring the cost of the work, and at the same time the fact that an estimate has been made out, and that the estimate will be compared with the actual cost, is an incentive to the different heads to keep more closely in touch with the progress and cost of work. This record is constantly referred to, and has proved by practice to be a feature of great value.

Check on Timekeeper and Storekeeper.

The job-order system also acts as a check on the timekeeper and storekeeper, as has been demonstrated several times within our experience. We have a system which we thought would not permit mistakes to be made by the timekeeper, but since adopting the job-order system we have discovered where the timekeeper has credited too much time to a man, or the wrong rate, and the mistake has passed unnoticed until the distribution of detail costs has been made up. The same is true of the storekeeper, so while our real object is to make a complete analysis of each account, we are also making a very careful audit of both the timekeeper and the storekeeper.

Another highly important advantage is that the miscellaneous charge is brought down to a minimum. This charge, under other methods that we have used, is often of such dimensions as to cause remark, but apparently it could not be lessened; but under the present system, with the various items admirably separated, the charge is always so small as to be passed over by the most exacting official without comment. The system also provides order in procedure. Before it was put into effect work was done and charged to its proper account before the exact amount involved was known. The bad effects of this plan are evident, and are avoided by the thorough method that is an essential part of the job-order system.

Summary of the Advantages.

A summary of the advantages of the system may be of interest. It provides for a fine subdivision of the operating accounts, and enables the general manager to keep constantly in touch with everything that is going on. It aids in preparing unit costs, and permits comparisons to determine the relative efficiency of foremen. It gives the detail of the cost of operation from day to day, and enables the general manager to see at a glance the variation from year to year in such cost. It tends to increase carefulness in the preparation of estimates, and, through comparison of the estimate with the actual cost, assists the official making the estimate to avoid errors that lead to estimates that are too low or too high. It affords an incentive to heads of departments to keep very closely in touch with the progress of work, and requires order in procedure, with the additional advantages of reduction of miscellaneous chargings and a thorough check upon the timekeeper and storekeeper.

It is reported from London that an agreement has been reached by the underground and other electric railways for an advance in fares to take effect on July 1.

*Paper presented at the annual meeting of the Street Railway Association of the State of New York, June 25-26, 1907.

NEW WRECKING TOOL CAR AT OAKLAND, CAL.

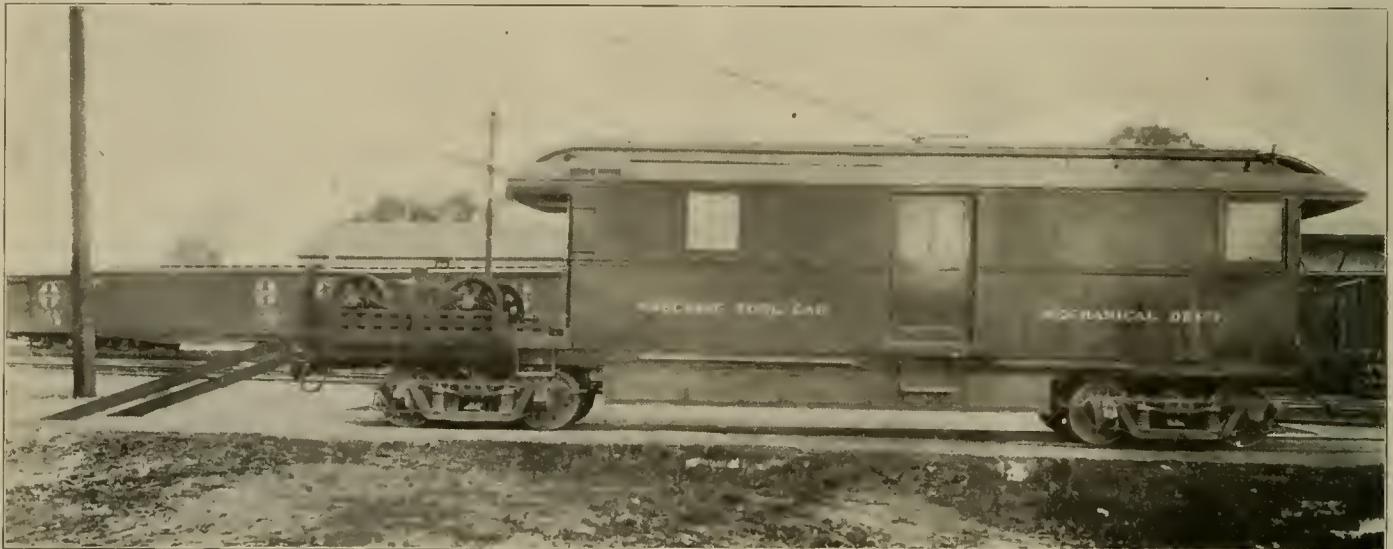
There recently has been completed in the Key Route shops at Oakland, Cal., a very complete wrecking tool car. This equipment is similar to the tool cars which were built by the Brooklyn Rapid Transit Company some two years ago for use on its elevated lines. The complement of tools which is carried on the new car is probably the most complete to be found outside of steam railroad practice. It is necessary to carry a sufficiently diversified equipment to provide for accident work on the city system of the Oakland Traction Company and the high-speed interurban system of the San Francisco Oakland & San Jose Railway Company (Key Route). This latter company has a double-tracked pier extending three miles into the bay to its ferry terminal, and therefore life preservers and tools for repairing the piers also are necessary in the car's equipment.

The new tool car comprises a 30-foot body, 8 feet wide and 8 feet high, mounted on a floor structure 46 feet long over buffers. The electrical equipment comprises two G.E.-66 motors with multiple-unit control. The car is mounted on

interior and exterior lights on the cars are wired with separate circuits. The classification lamps and tail lamps are so wired that they always show red behind and white in front and on the sides and front end. To provide additional storage capacity for tools, boxes, as shown in the engraving, are built under the floor of the car. There is a master key for these boxes which is fastened to a large brass tag and hung in a special place inside the car. Whenever the car is taken out in times of trouble it is the first duty of the motorman to unlock all these boxes and it also is his duty to see that they are locked again before the car starts on its return trip. The master mechanic carries duplicate keys for the car doors and lockers.

The tools and all the supplies carried in the car are painted green and red and are also marked with the number of the bin where they belong. A complete list of the material in each bin or box is posted on the box, and it is expected that these materials and the list shall agree at all times. Swinging brackets are mounted on the door frames, so that heavy tools, such as bridge jacks, can easily be lowered and raised between the car floor and the roadbed.

As earlier stated, the tools and equipment of this car are



Oakland Wrecking Car—View of Car, Showing Skids Placed for Lowering Emergency Trucks.

high-speed interurban trucks provided with a complete air brake equipment. Gould radial couplers and steel-tired wheels are used. From the illustrations it will be noted that the body of the car is shorter than the floor structure and that a platform at one end 3 feet 6 inches long is left for convenience in getting in and out of the car. The platform at the other end of the car is 12 feet long and provided with rails supporting a truck which may be lowered on portable skids to the track on which the wrecking car stands. An interesting detail is the provision made for varying the height of the rigid bolster of this spare truck to suit the several wheel sizes used on different cars of the system. The extra truck has no springs and the bolster is held in the truck frame by means of two iron pins. These pins pass through the plates of the truck frame and through the bolster. There are three sets of holes provided at varying heights in the plates, so that by moving the pins the truck and bolster may be adapted for use under cars having 30, 33 or 36 inch wheels. The total weight of the car and equipment is 70,000 pounds.

The interior of the car below the rails is painted a medium green and above the rails a lighter green similar to the shades used in locomotive cabs. The floor is oiled and the side sheathing inside is beaded and placed horizontally. The back platform is protected by a pipe railing with an opening opposite the door. All windows are provided with heavy gratings and shutters which can be bolted from within. The

especially complete, and it is thought that a list giving the number of pieces and their characteristics will be of interest:

Equipment on Wrecking Tool Car.

Rope and Tackle (Manilla).

No.	In.	D.	Feet.	Description
1	3		50	Link in one end. Vulcan hook in other.
1	1½		300	One double and one triple block.
1	1		300	One double and one triple block.
3	1		250	Two double blocks.
3	¾		250	Two double blocks.
1	5/8		100	
1	1¾		185	Sling for turning over cars.
1	2		30	Link in one end. Vulcan hook in other.

Lashings (Manilla Rope).

(Ends marked. To be neatly coiled and hung on hooks.)											
No.	In.	D.	Feet.	No.	In.	D.	Feet.	No.	In.	D.	Feet.
2	½		10	2	¾		20	2	1		20
2	½		20	2	¾		30	2	1		30
2	½		30	2	¾		50	2	1		50
2	¾		10	2	1		10				

Steel Hoisting Cable.

No.	In.	D.	Feet.	Description
1	1		60	Link in one end, 1-inch steel. Other end 10 feet of ¾-inch chain with square grab hook.
1	1		30	Link in one end, 1-inch steel. Vulcan hook in other.

Slings.

No.	In.	D.	Feet.	No.	In.	D.	Feet.
2	2½		12	2	¾		12
1	1½		6	4	1		3
1	1½		12	2	1		1.5
1	1		6	1			small steel for armatures.
1	1		12				

Blocks (Snatch, Extra Heavy, Iron.)

2 for 3-in. rope; 1 for 1½-in. rope; 3 for 1-in. rope; 2 for 1¾-in. by 16.

Chain.

No.	Inch.	Feet.	Description
1	1	20	BB....Round link, 1¾ by 4, one end square, grab hook on other.
2	1	10	BBB....Round link and square grab hook one end. Round link and Vulcan hook on other.
1	1	5	BBB....Round link and Vulcan hook.
1	7/8	16	Car....Link and 1¼-inch square grab hook.
1	7/8	20	BBB....Link and Vulcan hook.
1	7/8	15	BBB....Link and square grab hook.
1	7/8	10	BBB....Link and Vulcan hook.
1	7/8	5	BBB....Link and Vulcan hook.
1	3/4	16	Log....Link, 1½ by 4 square grab hook.
1	3/4	10	Log....Link, 1½ by 4 square grab hook.
1	3/4	5	Log....Link, 1½ by 4 square grab hook.
1	3/4	5	BBB....Link, 1½ by 4, Vulcan hook.
1	3/4	10	BBB....Link, 1½ by 4, Vulcan hook.
1	3/4	15	BBB....Link, 1½ by 4, square grab hook.
1	3/4	20	BBB....Link, 1½ by 4, square grab hook.
2	5/8	16	Log....Ring and square grab hook.
1	5/8	10	Log....Ring and square grab hook.

12	3x12	2	10	2x12	1.5	Oak wedges
12	1x 6	2	8	2x12	12	
12	½x 6	1	10	1x12	12	
12	1x 6	1	2	1x 6	12	
12	¾x 6	1	6	2x 4	10	
12	2x 6	1				

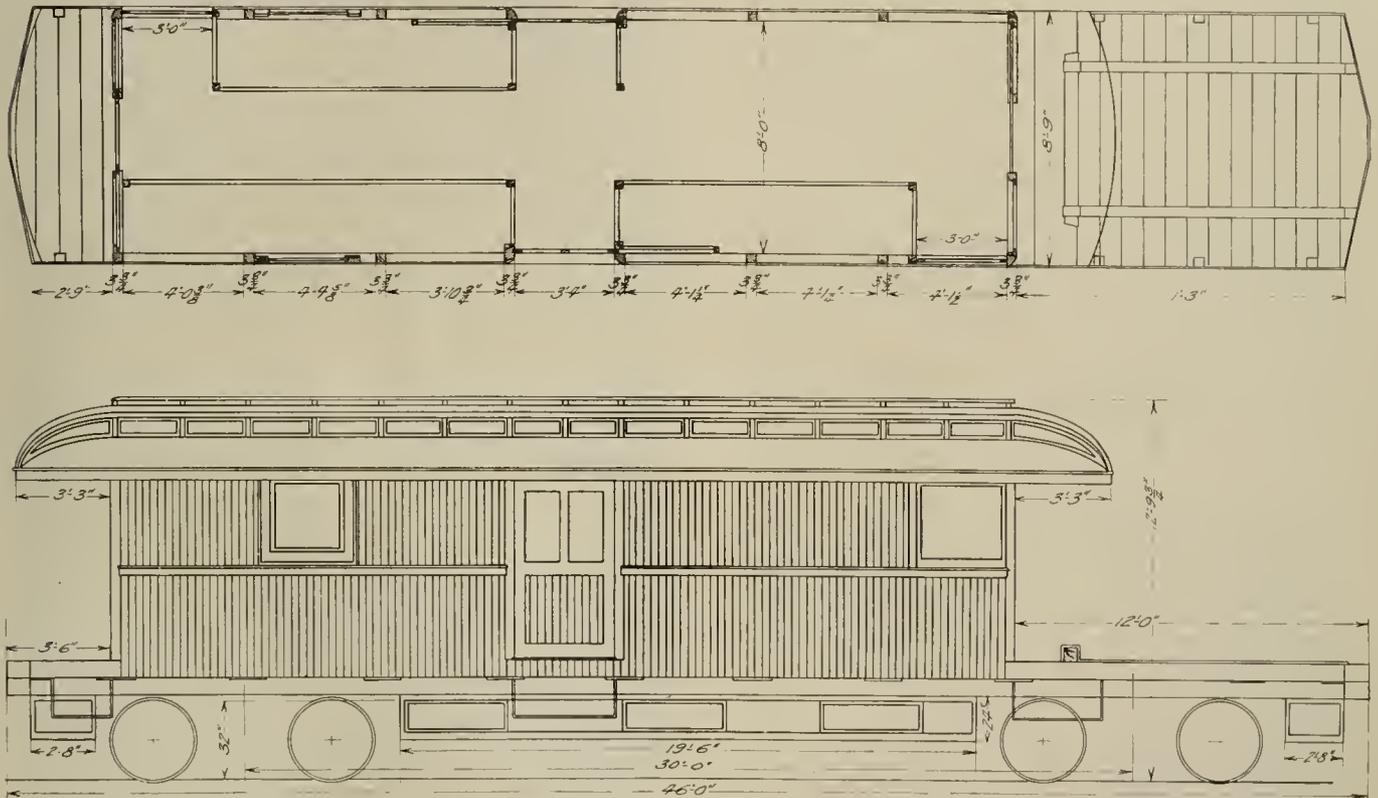
1 lot assorted wedges and shims.
½ bundle cedar shingles for shims.

Jacks, Etc.

No.	Description	No.	Description
2	30-ton Watson & Stillman crown and toe hydraulic.	2	8-inch screw, with bar.
4	15-ton Barrett.	1	½-ton differential chain block.
2	10-ton Barrett.	2	Pearson replacing jacks, 24-inch.
1	No. 8 Barrett car box.	2	Pearson pulling jacks, 10-ton.
2	24-inch screw, with bar.	1	Burgess rail anchor.
2	18-inch screw, with bar.	2	rail clamps.
2	12-inch screw, with bar.		

Replacers.

No.	Description	No.	Description
4	small Tilden replacers.	1	push pole.
4	large Alexander wrecking frogs.	2	pieces slot rail, 10-foot.
		2	pieces slot rail, 16-foot.



Oakland Wrecking Car--Plan and Elevation Showing Arrangement of Bins for Storage and Open Platform for Extra Trucks.

2	5/8	5	Log....Ring and square grab hook.
1	5/8	5	BBB....Ring and Vulcan hook.
1	5/8	10	BBB....Ring and Vulcan hook.
1	5/8	15	BBB....Ring and Vulcan hook.
2	1/2	12	Log....Complete with hooks, etc.
1	3/8	10	Log....Ring and square grab hook.
1	3/8	10	Log....Ring and Vulcan hook.
2	3/8	5	Log....Ring and square grab hook.
2	3/8		12 50-lb. log....Complete with hooks, etc.

(All hooks and rings per standard blueprint.)

- 2 clevises for each size chain.
- 2 cold-sluts.
- 2 bulge links.
- 1 double grab hook for each size chain and links.
- 2 S-hooks, 2-inch iron.
- 1 18-inch link, 3-inch diameter, 1½-inch iron stock.
- 1 24-inch link, 3-inch diameter, 1½-inch iron stock.
- 1 30-inch link, 3-inch diameter, 1½-inch iron stock.
- 1 2-link coupling, 1½-inch stock.
- 2 S-hooks, 1½-inch steel.
- 2 S-hooks, 1¼-inch steel.
- 2 S-hooks, 1 -inch steel.
- 2 S-hooks, ¾-inch steel.

Blocking (Pine).

No.	Inches.	Feet.	No.	Inches.	Feet.	
10	6x 8	8	Built up	20	3x 6	1
12	6x 8	4	Built up	12	4x 6	1
24	6x 6	3		12	10x10	3
12	4x 6	3		12	5x12	2
12	2x 6	2		10	1x 6	1

Jack footings
Oak wedges

2	Brooklyn replacing frogs.	1	drawbar (pipe), 10-foot.
2	wrecking inclines, 3 feet long by 8 inches.	1	drawbar, flat, 5-foot.
2	wrecking inclines, 4 feet long.	1	drawbar, flat, 2-foot.
1	steel plate, ¾ by 12 inch by 5 feet.	1	drawbar, flat, 1-foot.
		2	large coupling pins.
		4	small coupling pins.

Carpenter Tools.

No.	Description	No.	Description
1	28-inch hand saw.	4	socket paring chisels, 1, 1¼, 1½ and 2 inch.
1	28-inch rip saw.	2	4-inch broad hatchets.
2	1¾-inch claw hammers.	1	12-inch draw knife.
1	12-inch ratchet brace, ¼, ¾, 1½, ¾, 7/8 and 1 inch bits.	2	4-inch axes.
1	1-inch hand auger.	1	18-24 steel square.
1	1½-inch hand auger.	2	5½-foot Tuttle tooth cross-cut saws, extra heavy handles.
1	2-inch hand auger.		
1	4 by 6 hickory mallet.		

Track Tools and Supplies.

No.	Description	No.	Description
1	4½-inch railroad adz.	2	12-inch hack-saw frames.
2	5-foot clawbars with heels.	24	12-inch hack-saw blades.
1	5-foot chisel bar.	1	14-foot track lever.
1	2-foot chisel bar.	50	pounds 9-16 by 5½ track spikes.
2	5-foot lining bars.	50	track bolts for 70-pound rail.
2	tamping bars.	2	pairs angle plates for 70-pound rail.
6	track chisels.	1	8-pound sledge.
2	mill brooms.	1	10-pound sledge.
1	track gauge and combined level board.		

- 1 100-foot chalk line.
- 1 50-foot linen tape line.
- 2 spike mauls.
- 4 railroad picks.
- 4 D-handle shovels.
- 1 long handle shovel.
- 1 spade.
- 1 cant-hook.

- 1 14-pound sledge.
- 1 16-pound sledge.
- 2 12-pound sledges.
- 1 3-foot 4-inch pinch-bar.
- 1 4-foot pinch-bar.
- 1 4-foot 6-inch pinch-bar.
- 1 5-foot pinch-bar.
- 1 5-foot 6-inch pinch-bar.

- 4 rolls black tape.
- 12 2-way connectors.
- 1 sponge.
- 1 3-gallon sprinkling can filled with sand.

- 1 1-gallon pail, with lid, cup grease and paddle.
- 1 packing hook.
- 1 packing knife.

1 special truck with adjustable center and side bearings to fit every type of car body on S. F. O. & S. J. Ry. and O. T. Co. lines. Suitable means for loading and unloading same.

Assortment of following: Lag screws and boat spikes, machine bolts, screws, cotter keys, wire nails (60, 40, 20, 10, 8), brake pins, drift bolts.

Machinists' Tools.

- No. Coes steel-handled wrenches (8 for tool boxes)—
- 2 6-inch.
- 9 8-inch.
- 1 10-inch.
- 2 12-inch.
- 1 18-inch.
- 1 24-inch.
- 1 12-inch Trimo pipe wrench.
- 1 18-inch Trimo pipe wrench.
- 1 24-inch Trimo pipe wrench.
- 1 36-inch Trimo pipe wrench.
- 1 large alligator pipe wrench.
- 1 lot special motor wrenches.
- 1 socket wrench for lag bolts on pier.
- 6 2½-inch ball-peen hammers (4 for tool boxes).
- 1 4½-inch snips.
- 1 ⅝-inch capacity 36-inch bolt clipper.
- 4 8-inch pliers.

- No. 1 8-inch gas pliers.
- 1 10-inch gas pliers.
- 1 14-inch gas pliers.
- 1 5-inch screw driver.
- 1 6-inch screw driver.
- 1 8-inch screw driver.
- 1 10-inch screw driver.
- 1 extra large screw driver.
- 10 assorted cold chisels.
- 6 assorted drift pins.
- 8 assorted files, 14-inch.
- 1 ½ to 2 Trimo pipe cutter.
- 1 set ½ to 1 Little Giant stock and dies.
- 1 6-inch Prentiss machine vise.
- 4 10 by 14 inch maple hand tool boxes.
- 1 Post drill and drills, ¼, ⅜, ½, ⅝, ¾, ⅞ and 1 inch.
- 1 small forge.
- 1 small anvil and tools.

Overhead Tools and Supplies.

- No. 2 come-alongs.
- 1 ¾-inch block and tackle, 150-foot rope.
- 1 Clayton & Lambert blow pot.
- 1 soldering iron.
- 1 iron solder pot and ladle.
- 2 pounds solder.
- 2 pairs rubber gloves.
- 1 bottle Yeager's soldering salts.
- 1 portable telephone.
- 1 200-foot 4-0 trolley.
- 1 200-foot 2-0 round trolley.
- 1 200-foot 5-16-inch span wire.

- No. 1 200-foot 4-0 feeder copper cable.
- 4 4-0 splicing sleeves.
- 4 1-0 splicing sleeves.
- 4 2-0 splicing sleeves.
- 6 4-0 clamp ears, caps, cones and hangers.
- 6 1-0 ears.
- 1 500-foot No. 6 wire, insulated.
- 1 500-foot No. 14 wire, insulated.
- 1 30-foot extension ladder.
- 1 12-foot ladder.

Appliances—Miscellaneous.

- No. 2 6-inch iron roller dollies.
- 4 3¼ by 15 inch steel rollers.
- 4 1 by 18 inch iron pipe rollers.
- 4 1½ by 24 inch iron pipe rollers.
- 4 2 by 24 inch iron pipe rollers.
- 6 2 by 36 inch iron pipe rollers.
- 1 wheel gauge.
- 4 3-foot steel gads.
- 1 heavy switch iron, 5 feet long.
- 1 of each kind switch key with large tag.
- 4 3-gallon Stempel fire extinguishers.
- 2 fire axes.
- 3 galvanized iron pails, with rope attached to bail.
- 6 malleable iron torches.
- 6 torpedoes.
- 1 wall match box and matches.
- 6 white railway lanterns.
- 4 red railway lanterns.

- No. 2 green railway lanterns.
- 2 blue railway lanterns.
- 4 Dietz inspector's lanterns.
- 2 white lantern globes, extra.
- 2 red lantern globes, extra.
- 1 green lantern globe, extra.
- 4 red signal flags, with spike in stick.
- 2 green signal flags with spike in stick.
- 2 white signal flags with spike in stick.
- 4 light clusters, 32-candlepower, on poles, waterproof.
- 4 extension lamps with waterproof cord.
- 1 100-foot No. 1 R. C. wire, with pole, to carry current to de-railed car.
- 1 life ring buoy.
- 1 log book.

Parts and Supplies.

- No. 1 M. C. B. coupler, No. 65 knuckle.
- 2 pins for same.
- 1 air hose and cock (brake).
- 1 air hose and cock (signal).
- 1 lot king pins, assorted.
- 2 hanks trolley rope.
- 1 trolley wheel, spindle and washer.
- 1 16-foot trolley pole and wheel.
- 1 ball heavy twine.
- 1 lot marlin.
- 1 lot car fuses, assorted.
- 12 headlight carbons.
- 1 lot motor brushes, assorted.
- 6 incandescent lamps and adapters.
- 1 bar ½-inch round iron.
- 1 bar ⅝-inch round iron.
- 1 bar ¾-inch round iron.
- 1 bar 1-inch round iron.
- 1 bar ¼x4-inch 6-foot iron.
- 1 bar ½x3-inch 6-foot iron.
- 1 bar ⅞x3-inch 6-foot iron.
- 1 bar 1x2-inch 6-foot iron.
- 4 rolls acme tape.

- No. 1 each, spare journal brasses. Class I, M. C. B. 23, 23B, 20, Taylor.
- 2 large malleable iron squirt cans (machine oil).
- 2 tallow pots (car oil).
- 6 sheets sandpaper, coarse.
- 6 sheets sandpaper, fine.
- 6 sheets emery cloth, coarse.
- 6 sheets emery cloth, fine.
- 10 pounds cotton waste (in iron can with lid).
- 10 pounds wool waste (in iron can with lid).
- 10 pounds clean rags (in iron can with lid).
- 1 1-gallon can kerosene.
- 1 1-gallon can signal oil.
- 1 1-gallon can XX special oil.
- 1 1-gallon can Eldorado or other engine oil.
- 1 1-gallon can car oil.
- 1 1-gallon can gasoline.
- 1 1-gallon pail, with lid, track oil and brush.
- 1 1-gallon pail, with lid, gear grease and paddle.

Emergency Supplies.

- No. 2 canvas stretchers.
- 2 wool blankets (wrapped in stout paper).
- 1 rubber blanket (wrapped in stout paper).
- 2 small enamel bowls.
- 2 medicine glasses.
- 1 4-ounce graduate.
- 2 tablespoons.
- 2 dessertspoons.
- 2 teaspoons.
- 1 pair straight scissors.
- 1 pair curved scissors.
- 12 assorted ligatures.
- 2 packages safety pins.
- 1 package common pins.
- 1 pair dressing forceps.
- 2 rubber tourniquets.
- 6 small towels.
- 6 first aid packages.
- 1 roll iodoform gauze.
- 6 small rolls absorbent cotton.
- 2 large rolls absorbent cotton.
- ZO adhesive plaster—
- 1 roll ½-inch.
- 1 roll ¾-inch.
- 1 roll 1-inch.
- 1 roll 2-inch.
- Cotton gauze bandages—
- 12 rolls ¾ by 1 yard.
- 6 rolls 2¼ by 5 yards.

- No. 6 rolls 3-inch by 8 yards.
- 1 bottle colodion with brush.
- Directions on all bottles—
- 10 oz. tincture arnica.
- 4 oz. paregoric.
- 2 oz. chloroform.
- 8 oz. camphor.
- 4 oz. peppermint.
- 4 oz. aromatic spirits of ammonia.
- 8 oz. whisky.
- 10 oz. witch hazel.
- 2 oz. vaseline.
- 10 oz. liniment (½ aconite and ½ chloroform).
- 10 oz. liniment (¼ aconite, ¼ chloroform, ½ sweet oil).
- 10 oz. carron oil.
- 8 oz. castor oil.
- 8 oz. listerine.
- 4 oz. laudanum.
- 2 oz. hartshorne.
- 8 oz. salt.
- 8 oz. sugar.
- 1 oz. powdered alum.
- 1 oz. iodoform.
- 1 oz. bicarbonate sodium.
- 1 oz. chloride mercury tablets.
- 1 framed copy of "Emergency Instructions."

The car contains a very complete emergency cabinet. A list of the contents of this cabinet is given later. A large card of instructions, posted near by, explains the uses of the first aid packages contained in the cabinet. These instructions follow:

Emergency Instructions and Contents of First Aid Package.

(Original card, 16 by 13 inches.)

- For wounds on any part of the body:
- Gauze.**—For large wounds.
- Cotton.**—To cover over on top of gauze.
- Rubber Band (Tourniquet).**—To fasten around a limb or around the head to stop hemorrhage, particularly in case of crushed limb.
- Adhesive Plaster.**—To hold dressings, but never to be applied to an open wound.
- Cotton Bandages.**—To be used over first dressings where there is much bleeding.
- Gauze Bandages.**—To fasten splints in place and to support light dressings where there is no hemorrhage.
- Safety Pins.**—To fasten bandages, etc.
- First.**—Don't give a drink of whisky.
- Second.**—Don't pour ice or very cold water on wounds.
- Third.**—If the person is suffering from "shock," that is, pale, with pinched expression of face, drooping eyelids and cold surface of body, with feeble pulse, give spoonfuls of hot tea or coffee; if this cannot be had, teaspoonful of whisky or some other alcoholic stimulant, in a tablespoonful of hot water, every ten minutes, until five or six doses have been taken. Wrap in a warm blanket and put hot water bottles or heated bricks about the body.
- Fourth.**—The patient should be placed on his back, with head low, and this position should be continued in transporting.
- Fifth.**—Remove the clothing from the wounded part by cutting it away. Do not attempt to tear or draw clothing off, as this may further injure the wounded part. Always see the wound and know by your eye just what the nature of it is.
- Sixth.**—If a limb is crushed or torn, apply over the wound a thick pad gauze, then a large covering or pad of cotton, fastened with several turns of the bandages, handkerchief, or an elastic suspender.
- Seventh.**—Hemorrhage. This follows shock and is very rarely severe unless reaction takes place. Too much stimulation increases hemorrhage, and for this reason it is best to give only a little stimulant, well warmed, and repeat the dose if reaction is delayed. Bleeding is of two kinds: First, arterial, when the blood comes out bright and red in spurts; second, venous, when the blood is dark and flows in an even stream. Avoid trying to stop bleeding by twisting cords or handkerchiefs around limbs with sticks. When the wound is large and blood comes out in spurts, apply the rubber band tightly just above the wound, previously raising the wounded member or part, especially if it be a limb. Be careful to put the band on uninjured flesh (if the limb be crushed), and about three inches above the crushed tissues, else it will slip down and increase the hemorrhage. Be careful to see that the band be firmly hooked and fixed before leaving it. Small wounds, even though the hemorrhage be

arterial, require only a firm compress of the sublimated gauze, placed immediately over the wound and bandaged tightly in place with one of the muslin bandages. It is best after this to bandage firmly from the extremity of the hand or foot upward to beyond the wound with muslin bandages. Venous bleeding, which occurs when the wound is shallow (does not go deeper than the skin), as a rule, requires firm pressure over the wound and especially below it. If the wound be quite small, put a pad of styptic cotton into it and over it and bandage tightly in place and then apply a bandage from below upward. If only the scalp is involved, it may also be controlled by drawing a rubber band around the head, encircling it just above the eyebrows. This is very painful, however, and unless the bleeding is severe, it may be controlled by bringing the wounded or torn surface together and applying along the wound a thick layer of styptic cotton, and over this another layer of absorbent cotton and a tight muslin bandage. It is well to pass the bandage under the chin if the wound be on top of the head, as this holds it firmer and tighter.

Eighth.—After hemorrhage has been controlled apply gauze next to the open wound always, and never let an open wound remain uncovered longer than is absolutely necessary to control

injury. Injuries to the head require that the head be raised higher than the level of the body. In all cases, if practicable, lay the patient on his back, with the limbs stretched out in their natural positions; loosen the collar and waistbands, and, unless the head be injured, remember to have the head on the same level as the body; do not bolster it up with anything.

Thirteenth.—To place a person on a stretcher to carry him. Three persons are necessary to do this—two to act as bearers of the stretcher and one to attend to the injured part. Place the stretcher at the head of the patient on a line with the body, the foot of the stretcher being nearest the patient's head. One bearer kneels on each side of the patient and joins hands underneath his hips and shoulders with the bearer on the opposite side. The third man attends to the wounded limb, or looks after any bandages or splints that may have been applied. The bearers then rise to their feet, raising the patient in a horizontal position, and, by a series of side steps, bring the patient over the stretcher. He is then lowered gently on it and made as comfortable as possible. One bearer starts with the left foot and the other with his right; should they keep step the stretcher would roll badly.

In all cases of accident notify the claim department promptly, and also notify the head of the department in which the accident occurs.

SAN FRANCISCO OAKLAND & SAN JOSE RAILWAY and OAKLAND TRACTION COMPANY.

J. Q. Brown, Assistant General Manager and Engineer.

We acknowledge our indebtedness for the description of this car to its designer, J. Q. Brown, assistant general manager and engineer Oakland Traction Company and San Francisco Oakland & San Jose Railway.

EMPLOYES' BENEFIT ASSOCIATION IN MONTREAL.

The fourth annual report of the Montreal Street Railway Mutual Benefit Association has been issued. An abstract of the statement of Duncan McDonald, the president, follows:

The following is a summary of the relief work done during the year:

	1906-7.
Number of members disabled through sickness or injury..	728
Number of visits made by physicians to disabled members.	1,801
Number of consultations given by physicians to disabled members	7,578
Number of prescriptions issued.....	6,435
Amount paid for sickness and injury.....	\$9,737.00
Amount paid for medicine.....	1,894.73
Amount paid for pensions.....	30.50
Amount paid for death and burial insurance.....	6,016.69

The membership of the association now includes practically all the employes who are eligible for membership.

It will prove of interest to the members to know that the amount of \$53,911.75 has been paid out in benefits, since the organization of the association, divided as follows:

For sickness and injury	\$27,732.75
For medicine	4,483.32
For pensions	245.50
For deaths and burials	15,834.37
For medical attendance	5,615.81

Total

Owing to the long and very severe winter of the past year much sickness was prevalent among the members, and in consequence a very large amount was paid out in sick benefits: in fact, this item alone has taken up practically all the fees and dues paid in by the members during the year.

The third annual picnic, under the auspices of the association, was held at Dominion park in August, and lasted for a period of seven days, and your committee is pleased to report that the same proved successful. The picnic netted a profit of \$6,381.09.

Your "Committee of Management" gratefully acknowledges the special Christmas donation of \$3,000 received from the Montreal Street Railway Company, this being in addition to the contributions agreed to under Clauses 21 and 22 of our rules and by-laws, making the total contributions from the company \$13,397.30. This amount, together with the fees and dues received from the members, viz., \$10,891.50, and the proceeds of the picnic, and interest on investments and bank deposits amounting to \$7,679.79, makes a total revenue for the year of \$31,968.59, and the expenses being \$24,555.97, leaves a surplus of \$7,412.62.

The financial report of Patrick Dubé, secretary-treasurer, shows a total surplus at the end of the fiscal year of \$25,756.42. Of the total revenue for the year of \$31,968.59, there was paid out \$24,555.97, of which \$4,797.05 was for management expenses.

The report contains a copy of the blank used for giving notice of disablement and application for sickness or bodily injury benefit.



Oakland Wrecking Car—Interior, Showing Very Complete Equipment of Tools.

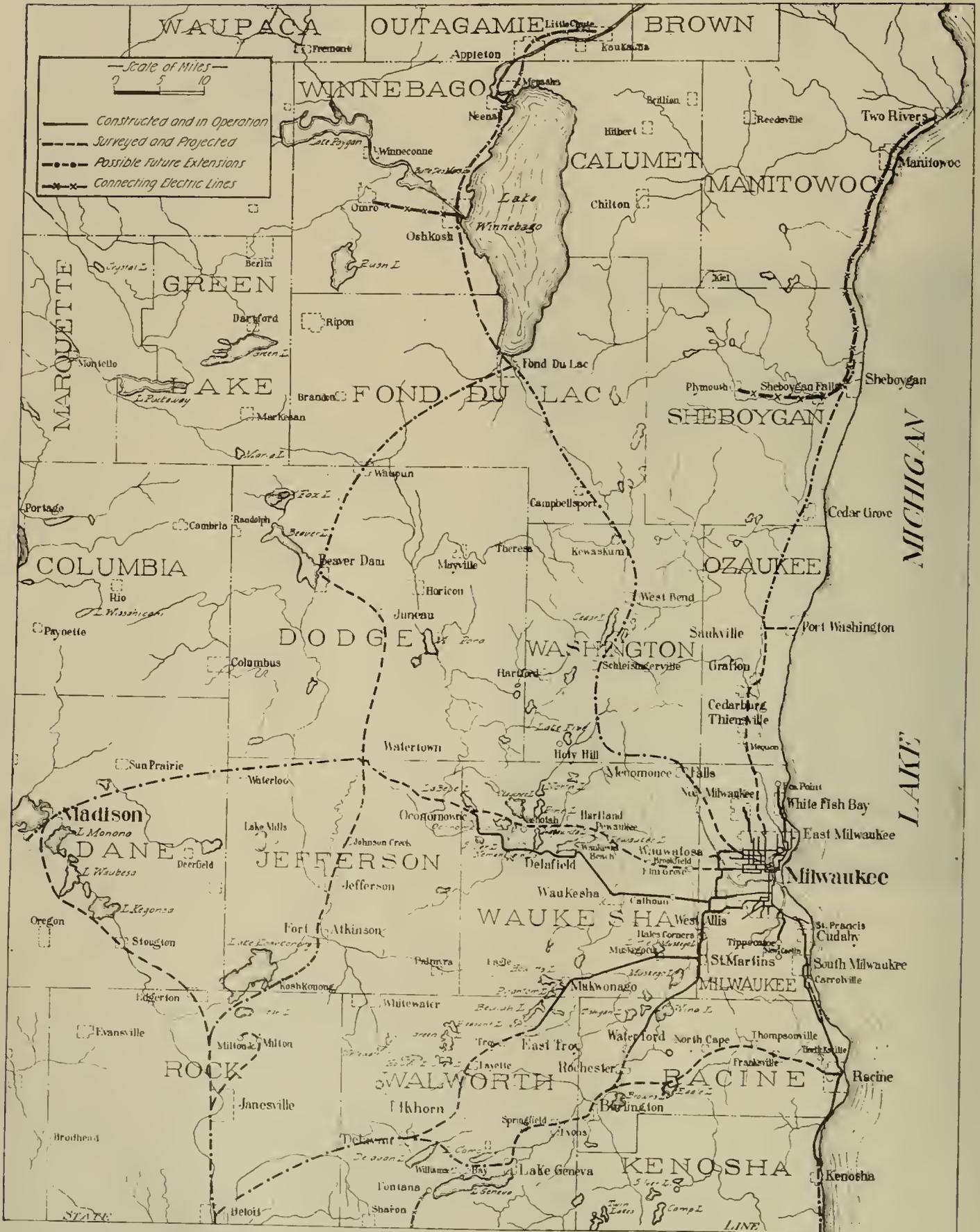
the hemorrhage; but, remember, a soiled or dirty covering is worse than none at all.

Ninth.—If a leg or arm is broken, straighten it gently and lay on a pillow, then tie the pillow up with several strips of muslin, bandage or splints found in the stretcher. Laths or barrel staves padded with some soft material may be used for this purpose. This should be done before the injured person is moved any distance.

Tenth.—Compound fractures are fractures accompanied by a wound of the soft tissues at the point of fracture, so that the bone is exposed to the air. In these cases treat hemorrhage and the wound according to the foregoing rules and then apply the splints. If the bones project beyond the skin, remember to bring them back into place by pulling the extremity in the direction of the displacement until the ends of the fragments are quite free from over-riding. Remember to always cover these wounds with the sublimate gauze and bandage.

Eleventh.—Burns. Carefully remove the clothing by cutting it off, if the part be clothed, and apply immediately three or four thicknesses of the sublimate gauze (dry or wet, in warm water in which one tablespoonful of bicarbonate of soda to the quart has been dissolved). As a rule never attempt to clean burns immediately after they occur. Cover the wounded part immediately, as directed above, and leave the cleansing to the surgeon afterward. Extensive burns are attended with great shock, as a rule, and require free stimulation. As burns are rarely followed by hemorrhage, stimulants may be and should be given in considerable quantities.

Twelfth.—Position in which a person should be placed after



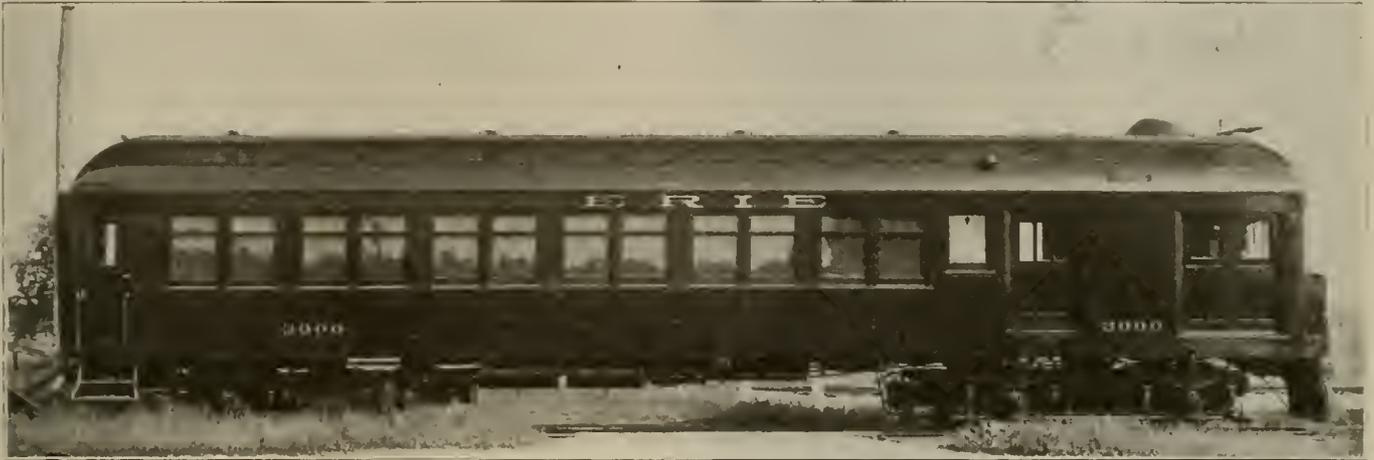
Map of Operating and Proposed Lines, Milwaukee Electric Railway & Light Company and Milwaukee Light Heat & Traction Company.

PROPOSED EXTENSIONS OF THE MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY.

In the Electric Railway Review of April 27, 1907, page 558, was presented a map of the city lines of the Milwaukee Electric Railway & Light Company, showing lines in operation and proposed extensions, as illustrating the ideas of John I. Beggs, president, of the new lines required to complete an ideal city system. Through the courtesy of Fred G. Simmons, superintendent of construction and maintenance

GANZ STEAM MOTOR CAR FOR THE ERIE.

The first Ganz steam motor car to be constructed and given its initial operating test in this country was delivered to the Erie Railroad at Dayton, O., on June 24 by the Railway Auto Car Company of New York. The car left Dayton for a leisurely trip to Jersey City over the Erie Railroad under its own steam. After reaching Jersey City the car was placed in regular service on one of the suburban lines of the Erie, and will be subjected to thorough tests. The



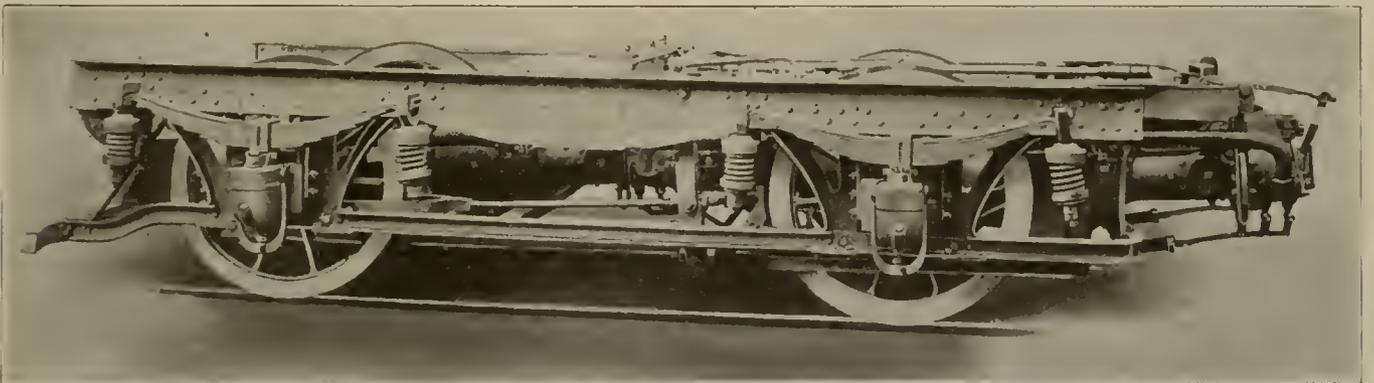
Ganz Steam Motor Car—General Appearance of Erie Car.

of way, we are now able to present an excellent map which has just been prepared of the entire system of the Milwaukee Electric Railway & Light Company and the Milwaukee Light Heat & Traction Company, which is controlled by the former and operates suburban and interurban lines in the vicinity of Milwaukee. This map shows the lines constructed and now in operation, the lines surveyed and projected, possible future extensions not yet surveyed and connecting lines operated by other companies.

The company has recently put into operation 13 miles of

only other Ganz car in actual service in this country is the one in use on the Florida East Coast Railway. This car was imported from Europe, where a great many of the cars are in use, giving satisfactory service.

The Erie car, as may be seen from the accompanying illustrations, is similar in appearance to the standard suburban passenger coach of the railroad company. The car is divided into four compartments. The motor compartment in the forward end occupies six feet. Immediately behind this is a similar space for baggage. Next is the smoking



Ganz Steam Motor Car—Truck Carrying Engine Cylinders.

new track between Waukesha Beach and Oconomowoc, and intends within the next few days to begin operating over about 11 miles of additional new track from Muskego Center to Mukwonago. This will be followed within a very short time by the opening of seven miles of new lines, still further extending this new line to East Troy. Work is now in progress on a line from St. Martin's to Waterford and Burlington, which will probably be opened this fall, and construction is being rapidly pushed on the line between Oconomowoc and Watertown, 14 miles, which is expected to be in operation next spring. Numerous other lines are being prospect, surveyed and laid out.

compartment with 12 seats. The rest of the car is the general passenger compartment. The car is 58 feet long over all and has seats for 50 passengers. The weight in working order is 45 tons, the use of a wooden body making the car heavier than the all-steel construction Ganz car, which is being built for the Chicago Rock Island & Pacific Railway, and is to weigh 36 tons.

The car is equipped with two compound inclosed steam motors of 60 horsepower each. These are mounted in the forward truck, each driving one axle through gears. The cylinders are 4.7 inches and 6.7 inches with a 5½-inch stroke. The maximum tractive effort is 3,700 pounds, and the motors

are arranged so that either may be operated independently of the other. All the working parts of the motors are inclosed in water and dust proof cases and run in oil. The steam generator, which is 42 inches in diameter and 5 feet high, is of 120-horsepower capacity, with a heating surface of 212 square feet and 6 square feet of grate area. The



Ganz Steam Motor Car—Interior of Cab, Showing Boiler.

steam pressure is 270 pounds, the steam being superheated. The boiler compartment also contains the control levers.

The fuel to be used is anthracite coal or coke, and this is carried, as shown in one of the accompanying engravings, in a bunker on the front end of the car which will hold enough coal for a continuous run of 50 miles. The fuel consumption is not expected to exceed 15 pounds per mile.

of 30 miles on level track or at 11 miles per hour on 2 per cent grades.

The Ganz principle for motor car operation has been described in detail at various times and was recently the subject of an interesting paper presented before the New York Railroad Club by Charles Ducas, secretary of the Railway Auto Car Company.

RECOVERY OF METALS FROM SCRAP.

A comparatively new industry has sprung up in the refining of non-ferrous scrap metal and the present high prices asked for all metals of this class has led to unusual activity in the scrap market.

Brass and other alloy scrap is recovered by remelting in crucibles with new metal. Fine particles of brass, such as occur in ashes, skimmings and sweepings, are recovered by a system of washing and jigging. Concentrates obtained from jigging processes are smelted in a reverberatory furnace or melted in crucible or oil-burning furnaces.

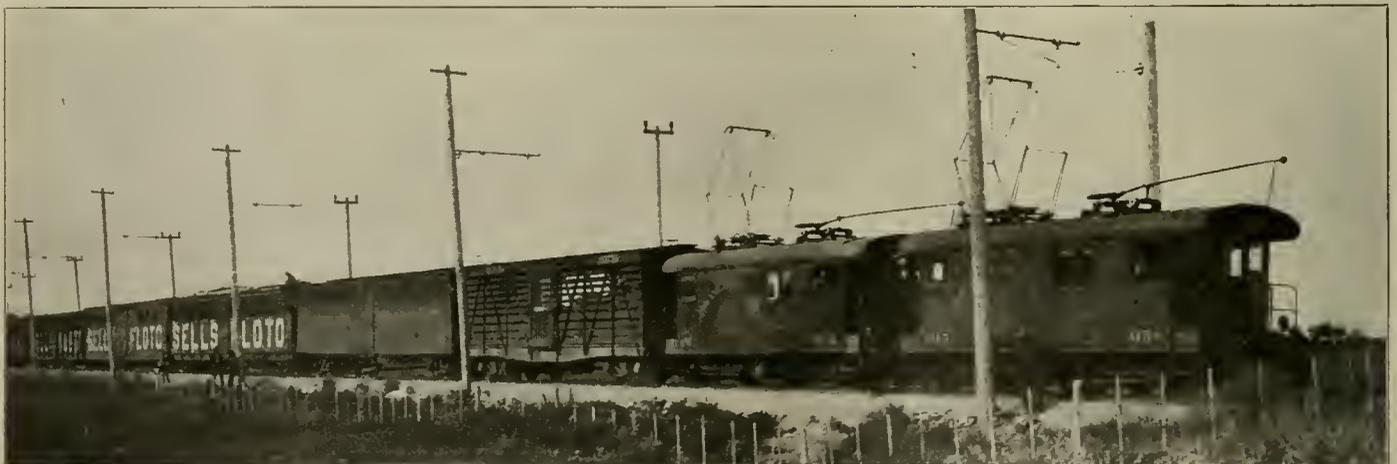
Copper scrap is treated differently according to the character of the material. The copper may be in the metallic state, as in trimmings from copper sheet, borings, grindings, punchings, etc., or it may exist in chemical combination with some other element, as in copper scale or blue vitriol.

Metallic scrap copper may be melted in reverberatory furnaces of similar design to those used in the copper mining districts. The slag skimmed off consists of impurities originally contained in the charge, and combinations of copper with oxygen and the fire brick lining of the furnace. The slag may contain from 30 to 70 per cent copper, which is recovered by smelting in a cupola or a small round water jacketed blast furnace.

Certain processes of manufacture yield some very dirty scrap mixed with grease and refuse, which appears almost worthless. If the metal is present in paying quantities, however, it can be recovered, no matter how polluted, by judiciously drying, sorting and smelting.—Copper and Brass.

HANDLING A CIRCUS TRAIN.

The accompanying illustration shows two of the powerful single-phase locomotives of the Spokane & Inland division of the Spokane & Inland Empire Railroad system, coupled to a circus train. This train comprised 23 cars, owned by the



Handling a Circus Train on the Inland Empire System.

The water tank, with a capacity of 600 gallons, is built into the underframe of the car. The air brakes are of the Westinghouse type, the air compressor being mounted on the trailer truck. The lighting is by Commercial acetylene gas and the car is heated by steam. The car is designed to make a speed of 40 miles an hour on level track and 15 miles an hour on 2 per cent grades, and will haul a trailer at a speed

Sells-Floto Circus Company, aggregating 2,300 tons, and including five 60-foot Pullman coaches, seven standard stock cars and eleven 60-foot flat cars. This train was hauled for a distance of 76 miles over the Spokane & Inland division of the Inland Empire system, from Palouse to Spokane, Wash., where the circus exhibited on the new grounds east of the city, owned by the electric railway company.

THE WORK OF THE CHICAGO SANITARY DISTRICT.

An extra meeting of the Western Society of Engineers was held in the Monadnock block, Chicago, Ill., on Wednesday, June 26, 1907. The speaker of the evening was Mr. Isham Randolph, chief engineer of the Sanitary District of Chicago. The title of his paper was "The Work of the Sanitary District of Chicago, Already Accomplished and Yet Contemplated, South of the Controlling Works at Lockport." It was read by the author and illustrated by numerous lantern slides.

The Sanitary District of Chicago now includes an area of about 350 square miles, and to dispose of the sewage from this district the flow of the Chicago river has been reversed, a grant having been obtained from the United States War Department to withdraw 10,000 cubic feet of water per second from Lake Michigan. A ship canal is being built which will connect Lake Michigan with the gulf of Mexico. About 14 years ago Mr. Randolph conceived the idea of utilizing the power available at Lockport, Ill., where there is an available fall of 34 feet, and at Lake Joliet, where there is another fall of 34 feet.

The construction of the drainage canal and power house at Joliet involved some extremely difficult engineering problems, one of the most extensive of which is an immense butterfly valve which is now in the course of construction at Lockport to prevent a serious flood in the Desplaines valley, should a break in the embankment of the drainage canal occur. This valve has a width of 184 feet and a height of 30 feet, and is supported at its center on a steel pivot 36 inches in diameter, and is designed to resist a total thrust of about 5,000,000 pounds when closed. The pivot is supported at its upper end by a steel bridge having a span of 210 feet, supported on two concrete piers in the center of the stream.

The method developed for operating this gate is an ingenious one, originated by Mr. Randolph. The butterfly valve is turned through a sufficient angle by means of an electric motor until its ends project into the stream. Near each end of the butterfly valve there are five gates which are operated electrically. By closing the gates in the upstream end of the butterfly valve and opening those in the downstream end the water itself causes the valve to close and shut off the water. The small gates which were open are then closed and the only water passing will be that which leaks under the main valve. To open the butterfly valve it is only necessary to open the small gates on the upstream end of the valve and leave those on the downstream end closed. The pressure on the downstream end of the valve then being greater than that on the upstream end will cause the gate to swing around to its original position.

The power house which has been constructed at one side of the locks is 368 feet long, 69 feet wide and 72 feet high from the tail-race to eaves. In it will eventually be installed eight 6,000-horsepower turbines direct connected to 4,000-kilowatt alternating-current generators and three exciter units of 600 horsepower each. The power house is constructed of hollow concrete blocks made in the shape of the letter T. The turbines are of the horizontal type, there being six turbines on each shaft. The runners, guides and gates of the turbines were built by J. W. Jolly, Holyoke, Mass., and the casings were constructed by Wellman-Seaver-Morgan Company, Cleveland, O. The shafts of these turbines, which are 12 inches in diameter and 75 feet long, are built up of three sections, the first being open-hearth steel, the second nickel steel and that nearest the generators nickel steel annealed.

A unique feature in the construction of the turbine casing is that the bearings, instead of being made of lignum vitae, water lubricated as usual, are lubricated by oil under pressure, and tubes lead from the floor above the wheel-pits down to each bearing, so that they can be examined and

watched while the wheel-pits are filled with water. The advantages of this unique construction are obvious. The speed of the turbines is controlled by Lombard mechanical governors, made by the Holyoke Machine Company.

Crocker-Wheeler revolving-field alternators are direct connected to the turbine shafts. These generators have 40 poles, and the revolving field, which is 29 feet in diameter, makes 162½ revolutions per minute. Current is generated at 6,600 volts.

The current generated by this station will be used for lighting and power. The Sanitary District owns about 9,000 acres of land in the immediate vicinity of the power house and it is proposed to sell or rent about 5,000 acres of this land for factories which will purchase power from the Sanitary District. With the completion of the second power house at Lake Joliet, making the total power available about 85,000 horsepower, there should be a rapid development of the country surrounding Joliet, which will have a marked influence on the electric traction business in that section. It is estimated that the sale of power from the power houses will be sufficient to pay the expense of building the canal and power houses.

INDIANA RAILWAY COMMISSION GATHERING DATA ON SAFETY APPLIANCES AND CROSSINGS.

The Indiana railroad commission is sending out to the railway companies in the state a set of information blanks inquiring in regard to interlocking devices, block signals and highway and street crossings, under authority granted the commission by the amended law of 1907. It is understood that the information gathered on these blanks will be used for reference in any proceedings in regard to the use of these safeguards.

Most important, perhaps, is the information concerning highway crossings. The blank asks for the number of grade street crossings on each line; number of grade highway crossings; number of overhead street and highway crossings; number of undergrade street and highway crossings; and the number of all the crossings named above protected by watchmen, gates, bell or otherwise, or not protected at all.

The interlocking blank asks for the number of such devices in which each road is concerned; the year constructed or rebuilt; whether mechanical or electrical; name of the company operating them; average daily train movement; the number of laborers employed; and the total number of their hours of labor; also the number of levers operated.

The block signal blank is divided into three sections: one concerns the lines now equipped; the second the lines to be equipped, and the third lines not to be equipped. With reference to the first two, the information asked concerns the date of construction of the system, existing or contemplated; the number of miles of automatic block; number of miles of manual telegraph block; miles of controlled manual block and the total number of miles of all kinds in the state, actual or contemplated. In addition there is space for the railroads to outline the expenses of construction, maintenance and operation; the questions asking for the average cost per mile for the construction of each kind; average cost a mile for the maintenance of each kind, and the average cost a mile for the operation of each kind.

The Detroit Jackson & Chicago Railway, which is controlled by the Detroit United Railway, has announced a reduction in passenger rates of about 15 per cent. The limited cars will hereafter make the run between Detroit and Jackson, Mich., in 2¾ hours, and there will be no excess fare charged on these cars. The fare reductions are material. For instance, the present fare from Jackson to Detroit is \$1.20; the new rate will be \$1.00. The new timetable will give 2-hour service between Jackson and Detroit for the present, which is a less frequent service. But as soon as the traffic demands it new cars will be installed.

ADJUSTING STREET GRADES IN SEATTLE.

Municipal engineering work of an especially interesting character is now being carried on in Seattle, Wash. This work comprises the readjustment of a large number of street grades and cutting down the elevation of some hills more than 60 feet. The accompanying halftone engraving shows the temporary trestle-work necessary on several streets to

We are indebted to him for the interesting information herewith given.

CHINESE AVERSE TO THE TROLLEY.

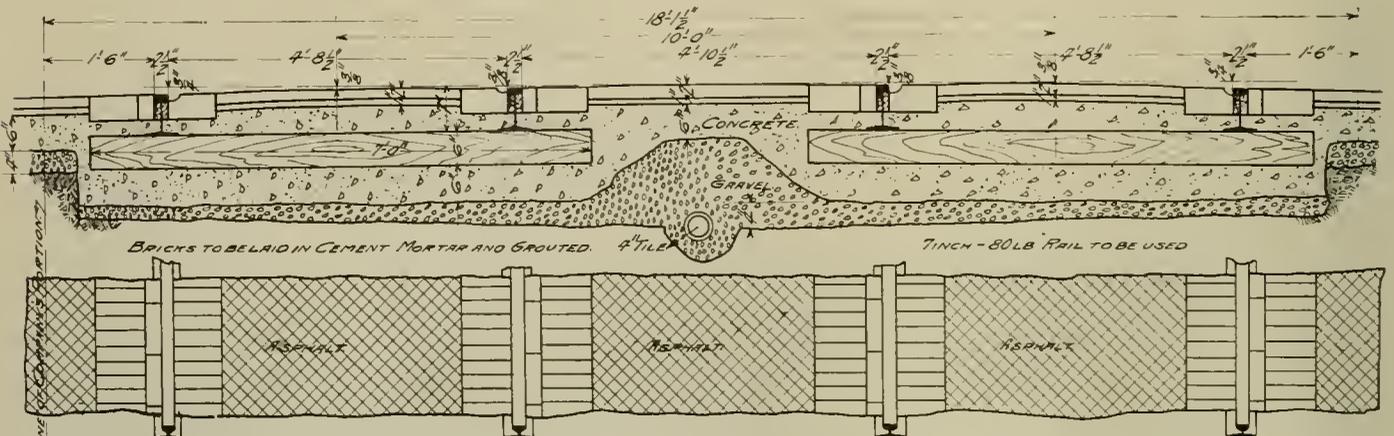
A feeling of apprehension exists among the foreign residents of Shanghai that serious disturbances may follow the opening of the new electric street railway system in July.



Adjusting Grades in Seattle—Blocking Up Track 17 Feet Prior to Raising Street Grade.

permit the continued operation of the cars of the Seattle Electric Railway. At the street intersection illustrated the grade of the pavement is being raised 17 feet. There are some streets on which cable lines are operated that are having jinrikisha men being thrown out of employment and em-

For some time the native press has been agitated over the installation of the electric car lines and frequent articles of a highly inflammatory character have appeared. A recent article points out the danger which will result from so many jinrikisha men being thrown out of employment and em-



Adjusting Grades in Seattle—Permanent T-Rail Track Construction of the Seattle Electric Railway.

more interesting problems in blocking up the track to permit of continued operation.

The accompanying line drawing shows the type of track structure being placed in the streets of Seattle that have been adjusted to their permanent grades. A 7-inch 80-pound T-rail with high web is used and the 7-foot ties are bedded in concrete. The concrete rests on gravel ballast drained with 4-inch tile. M. Lowd is chief engineer of the Seattle Electric Company, in charge of maintenance and reconstruction work.

phasizes the probable loss to commerce because of the inability of pedestrians to use the streets on which the tramway runs. After making the statement that from 5,000 to 6,000 persons have been killed by the electric railways in Tokyo, the writer says:

"During a storm of lightning or rain the electricity of the cars and that of the air will unite and passengers on the trams will be unable to leave them, whatever efforts they make."

News of the Week

Philadelphia Ordinance to be Reconsidered.

The Philadelphia Rapid Transit ordinance was passed by councils on June 20. Mayor Reyburn was waited upon by 20 members of councils on June 24, who urged him to have the ordinance recalled for further consideration and amendment, or else to veto it. It has been decided to consider the ordinance on July 1. The ordinance as passed embodies, with some changes, the provisions of the original bill, an abstract of which was published in the *Electric Railway Review* of May 11, 1907, page 615.

The right of the Broad Street Rapid Transit Company, Philadelphia, to lay tracks in Broad street was established by the Pennsylvania supreme court in a decision which dismissed an action brought by the Thirteenth and Fifteenth Streets Passenger Railway Company, seeking to enjoin the defendant from becoming a competitor.

Legislation Affecting Electric Railways.

Wisconsin.—The senate committee on transportation has reported a new street railway bill providing for indeterminate franchises in place of limited franchises. Municipalities are given the right to purchase at a valuation determined by the railroad commission. Every new franchise granted shall be indeterminate. A street railway operating under an existing license may surrender it and receive an indeterminate license. A company so doing shall be deemed to have consented to the future purchase of its property by the municipality at the commission's valuation and terms. The right of appeal to the courts from the determination of the commission is reserved. Any municipality may acquire by condemnation the property of a street railway company operating under a franchise existing when this act goes into effect.

Michigan.—The house has defeated the Tuttle bill, which removes many of the provisions restricting the acceptance of electric railway securities by state banks.

Object to Reducing Fares.

The Lincoln (Neb.) Traction Company, against which the city attorney recently filed a complaint with the state railroad commission to compel it to sell six tickets for 25 cents, has filed its answer with the commission. The company declares that to enforce such a demand would be confiscatory and that the Citizens' Street Railway, mentioned in the complaint as giving the lower rate, is operated at a loss and its officers have announced publicly that it does not intend to operate the system at a profit, but expects to sell its road to the city when completed. The company also states that it is selling tickets now cheaper than 90 per cent of the roads in the country covering a similar territory. The company has filed with the federal court a dismissal of the injunction suit against the city to restrain it from lowering fares, as the state commission now has the power to regulate the fares and the injunction against the city is to no purpose.

The Omaha Lincoln & Beatrice Railway, which was also included in the complaint to the commission, has filed an answer stating that it is a railroad and not a street railway and that its local business in Lincoln is only incidental to its interurban business.

Right to Build Transmission Lines.

The Indiana supreme court decided in favor of the Indianapolis & Cincinnati Traction Company on June 21 in the suit started by Leonidas H. Mull. The decision of the lower court was confirmed. The question involved is that of the right to condemn a right of way across private property for a transmission line from a power house to another line leased and operated by a traction company. The question arose by the condemnation of a right of way from the power house in Rushville of the Indianapolis & Cincinnati Traction Company, across the country to the road from Greensburg and Shelbyville to Indianapolis, which the company operates under lease. The farmers objected to having the high-voltage wires cross their fields and appealed to the court. A digest of the opinion follows: (1) The power conferred on interurban railroads by the acts of 1902, page 92, to condemn lands for uses appurtenant to all roads "acquired" by them includes power to condemn a right of way for a transmission line of poles and wires appurtenant to a leased line. (2) Said act is constitutional. (3) Said right of condemnation is not affected by the fact that the transmission line extends across country from a power house on the road leading east through Rushville to the road leading southeast to Greensburg. (4) This rule that a lawful business or structure is never a nuisance per se applies to a high-voltage electric line built across a farm by authority of law.

Chicago Arbitrators to Hold Hearing.

The first public hearing of Judge P. S. Grosscup and Prof. John C. Gray, the arbitrators who are to decide on the distribution of Chicago Railways Company stock in the reorganization of the Chicago Union Traction Company and its underlying roads, will be held on June 30. The attorneys representing the New York interests will present a plan for distribution and the protective committees representing the stockholders of underlying companies will offer such suggestions as they may desire. The decision of the arbitrators, which will be final, will probably be announced within three weeks. Judge Grosscup says that the rejection of the ordinance is no longer a possibility.

The Union Traction Company stocks will be deposited with the Chicago Title and Trust Company in accordance with the ordinance as soon as the majority stock of the underlying com-

panies, which is controlled by the committees, is ready for deposit. In their letter to shareholders the protective committees state that the underlying stocks will be deposited in escrow, the deposit to become absolute provided a certificate, signed by Judge Grosscup and Professor Gray, shall be filed in the following form:

"We hereby certify that a plan of reorganization formulated by the authority of the Chicago Railways Company has been filed with us and that in our judgment said plan makes full provision, all things considered, for the execution of whatever finding may be hereafter made by the arbitrators in the matter of the issuance and distribution of the securities of the Chicago Railways Company."

Proposed Monorail in New Jersey for New York "Commuters."

John H. Starin, Charles Stewart Smith and Woodbury Langdon, members of the New York rapid transit commission, which, under the public utilities law, goes out of existence on July 1, have become identified with a project to build a four-track monorail road between Jersey City and Newark, N. J. It is stated that a company will soon be formed and that a franchise will be applied for under the state franchise laws of New Jersey, which will do away with the delay of waiting for the sanction of the municipal authorities of Jersey City and Newark. It is proposed to run trains at intervals of not more than 10 minutes and at a speed of from 60 to 100 miles an hour, and to charge a 3-cent fare between Newark and Jersey City, eight miles, and a 5-cent fare between Newark and New York City. If arrangements cannot be made with the Hudson Companies' tunnel system to transfer passengers under the Hudson, it is proposed to establish a ferry service. It is stated that the type of monorail to be used is the one now being exhibited at Jamestown, and which is the invention of Howard H. Tunis, chief engineer of the American Monorail Company, Baltimore, Md. The American monorail, as it is called, is described as a system by which a car 47 feet long and 6 feet wide, and tapering at each end, is supported on two trucks of two wheels each, flanged on each side and running on a single rail. The car being light, and its weight principally at the bottom, it tends naturally to support itself in an upright position, but is held securely in that position by what is called the equilibrium device, arranged on top of the car, and running between light guide rails. The car is equipped with eight motors.

Use of Streets by Interurban Railways Constitutes No Basis for Damage Claim.

The Indiana supreme court on June 26 gave an important decision in regard to the use of city tracks by interurban railroads in the case of Lottie Armstrong against the Indiana Union Traction Company, in which the plaintiff asked for damages for the operation of cars on College avenue in Indianapolis. The court held that the use of the streets by interurban cars is no more an "additional servitude" than their use by city street cars, as long as they are operated within the city like street cars. But the court holds that whatever special damages they inflict on adjoining property by fast running or by the improper operation of their cars in other respects, must be paid. All of the judges express the opinion that interurban cars cannot be excluded from the streets by abutting owners, the owners having a right, at most, to recover damages.

The decision was by a majority only of the five judges, two of them contending that the mere use of the streets by interurban cars gives adjoining owners a right to damages as in the case of steam railroads. The fact that freight or express cars are run by the interurban railroads is discussed at length, but is held to make no difference in their right to use the streets.

The decision of the court is thus expressed: "The majority of the court hold that under the facts averred in the complaint and the law applicable thereto, appellee's railroad does not constitute an additional burden or servitude upon any of the public streets of the city of Indianapolis; that the complaint states a cause of action in favor of appellant only for the recovery of the special damages which she has sustained, as shown by the facts alleged, and for this reason only it is held by the majority that the lower court erred in sustaining the demurrer to her complaint."

Rapid Transit Affairs in New York.

It is reported that the Interborough Rapid Transit Company is planning to replace much of its rolling stock on the surface lines. It is stated that the type of car has not been adopted, but that the Montreal "pay-as-you-enter" car and the Minneapolis gate are being considered. The Montreal car, which was exhibited at the Columbus convention last fall, and which was described in the *Daily Electric Railway Review* at that time, has an exceptionally large platform, on which the conductor stands at all times and collects the fares as passengers enter the car. It is estimated that the company loses \$2,000,000 a year in fares which the conductors miss, a loss which would be eliminated by the use of this type of car. The Minneapolis cars are provided with a rear platform gate, which the motorman closes by a lever when he turns on the power.

The board of estimate on June 21 approved the application of the New York City Interborough Railway for several alterations in routes in the Bronx. The board also approved the application of the Hudson & Manhattan Railroad for permission to build a bridge connecting the third stories of its new terminal building across Dey street, between Church and Greenwich streets.

The Interborough Rapid Transit Company on June 22 began using a new system for separating the boarding and leaving passengers at its Grand Central subway station. The system consists of a line of railings about four feet back from the train, with openings opposite the ends and the middle of the cars. The openings opposite the middle are marked "entrance," and those opposite the ends are marked "exit." The former are kept closed by a long sliding bar until the alighting passengers have left the train. A "platform man" is in charge of each of these sliding bars. Considerable

confusion resulted at first because the passengers were not used to the plan, but it is expected that it will result in a relief from the congestion.

After 13 years of existence the rapid transit commission on Thursday of this week adjourned sine die and on Monday the board will cease to exist, being succeeded by the public utilities commission.

Engineering Association Issues Bulletin.

S. W. Mower, secretary of the American Street and Interurban Railway Engineering Association, under date of June 25, has sent out a circular letter to the members, containing information regarding the meetings of the association at the annual convention of the American Street and Interurban Railway Association and the affiliated associations, to be held at Atlantic City, N. J., during the week beginning October 14 next. The meeting of the Engineering association will convene at 2 o'clock p. m., on Monday, October 14, and will continue during Tuesday morning and afternoon. On Wednesday morning, October 16, at 10 o'clock, the joint meeting of all the associations will be held, with the closing session of the Engineering association at 2 o'clock the same afternoon. The headquarters of the association will be at the Hotel Dennis.

In the circular letter particular attention is called to the "question box," which is provided as a means of bringing miscellaneous matters before the convention. Although papers have been assigned on several subjects, it is thought likely that some matters of particular individual interest may not have been included. For this reason, therefore, a blank on which is printed a request that certain questions (to be named by the recipient) be discussed at the meeting, is inclosed with each letter, the blank to be filled out and returned to the secretary at London, Ont. During the first part of July these lists of questions will be printed and forwarded to the members for answers, the questions and answers to be printed later and sent out with the advance papers. It is hoped that the members to whom these blanks are sent will give the matter their early attention and thus facilitate the work of preparing these lists.

Applies for Freight Permit.—The Allentown & Reading Traction Company of Allentown, Pa., has applied to the city councils for a permit to carry freight, under the provisions of the Homsher law, passed by the last legislature.

Three-Cent Fare Bill in St. Louis.—A bill has been introduced in the St. Louis municipal assembly which provides that street railways in the city shall charge a fare of three cents for a continuous ride in one direction for persons over 12 years of age and two cents for children between the ages of 3 and 12.

Winona Interurban Will Handle Express.—A contract for the operation of the United States Express Company over the line of the Winona Interurban Railway from Warsaw to Goshen, Ind., effective on July 1, has been signed by both companies. Offices will be opened in the near future in the principal cities and towns along the route.

Electric Lines in Pennsylvania Must Report on Mileage.—Attorney-General Todd of Pennsylvania has given an opinion that the recently approved law requiring railroads to file with the department of internal affairs a statement of the length of their lines, the distance between termini, and the distance between stations, applies to electric as well as steam railways.

Aurora Elgin & Chicago Increases Wages.—The Aurora Elgin & Chicago Railway, Wheaton, Ill., has signed a new wage contract with the members of the Brotherhood of Interurban Trainmen employed on its lines, whereby the men will receive 23 cents an hour for the first year, 26 cents for the second year and 29 cents thereafter. The old scale was 22 cents for the first year, 25 cents for the second year and 27½ cents thereafter.

Ft. Wayne & Wabash Valley Benefit Association.—An employees' benefit association is being organized among the employees of the Ft. Wayne & Wabash Valley Traction Company of Ft. Wayne, Ind. The members will pay dues of 50 cents a month and will receive 50 cents a day in case of sickness or 75 cents in case of accident. Death benefits of \$100 will be paid. Officers are to be chosen by trustees elected by the members. Officers of the company have made donations to the benefit fund.

Trolley Trips in and About Montreal.—The Montreal Street Railway Company has issued a 16-page folder entitled "Trolley Trips in and About Montreal," which describes and illustrates with half-tones many of the numerous points of interest which may be reached over the company's lines. Montreal is fortunately situated in this respect, for in addition to many points of historical importance there are many picturesque suburban places to attract the summer traveler, including Mt. Royal Park, Lachine, Cartierville, Sault au Recolet, Bout de l'Isle. The Bout de l'Isle line passes through several quaint old French-Canadian villages. The folder is well arranged and gives concise information as to schedules, rates of fare, connections, etc., with an excellent map of the company's system.

To Test Validity of Half-Fare Law.—The first step to test the constitutionality of the law which provides that street railway companies shall sell to pupils of public and private schools transportation at half the regular rate was begun in Northampton, Mass., on June 18, when at the request of Chief Justice Aiken of the superior court a jury in that court, criminal session, rendered a verdict of guilty against the Connecticut Valley Street Railway Company of Greenfield, Mass. The case will be taken on appeal to the supreme judicial court. The case reached the jury on an agreed statement of facts presented by District Attorney Richard W. Irwin, representing the commonwealth, and Bentley Warren of Boston, representing the defendant corporation. The company had been indicted because of the refusal of the Northampton agent of the company to sell transportation at reduced rates to Fred W.

Chapin of Amherst, a student in the Northampton Commercial College. The defense is that the Northampton college is not a school of the kind contemplated by the makers of the law and that the section of the law entitling students of such schools to transportation at reduced rates is unconstitutional.

Accounting Committees Meet at Cleveland.—The committee on standard classification of accounts of the American Street and Interurban Railway Accountants' Association met at the Hollenden hotel in Cleveland on June 25, to confer on forms of accounting that will conform with rulings of the interstate commerce commission. Conferences will follow until suitable forms are recommended to the association for general adoption. Comptroller W. F. Ham of the Washington Railway & Electric Company, Comptroller C. N. Duffy of the Milwaukee Electric Railway & Light Company, Auditor F. R. Henry of the United Railways of St. Louis and Auditor W. G. McDole of the Cleveland Electric Railway were present. A sub-committee on interurban accounts, composed of A. B. Bierck, auditor of the Long Island Railroad; W. H. Forse, Jr., assistant treasurer of the Indiana Union Traction Company, and A. C. Henry, auditor of the Lake Shore Electric Railway, was also in session.

Geary Street Railway Seeks to Enjoin Acquirement by City.—The officers of the Geary Street Park & Ocean Railroad of San Francisco, Cal., on June 21 began an action in the superior court against the board of supervisors for the purpose of securing an injunction restraining that body from exceeding the dollar limit in its tax levy for the coming fiscal year for the purpose of acquiring and improving the Geary street system. It is held by the plaintiffs that the cost of acquiring the Geary Street Railway cannot be paid out of the general fund, and attention is called to the fact that the electors have twice refused, by their votes at elections, to authorize a bond issue for the purpose. The court is asked to grant an injunction immediately restraining the board of supervisors from making two separate tax levies for the general fund, or any additional or special tax levy; from making any tax levy in excess of \$1.00 on every \$100 of valuation; from levying any tax to pay for a municipal street railway, and from incurring any indebtedness for the purpose. The court is also asked to declare the appropriation of \$720,000 for the acquirement of the Geary street railway to be null and void.

Seattle Engineers Visit Spokane.—Nine members of the Seattle (Wash.) branch of the American Institute of Electrical Engineers visited Spokane on June 15 and 16, to inspect the power stations of the Washington Water Power Company and especially the Spokane & Inland Empire Railroad, which uses the single-phase system. On June 16 the party took a trip to Waverly over the Spokane & Inland line to visit the substation at that point. At a meeting on the evening of June 15 J. B. Ingersoll, general manager of the Spokane & Inland Empire Railroad, was to have read a paper on "Single-Phase Electric Railways," but was unable to be present. Mr. H. R. Stevens, consulting engineer for the A. S. Downey Company, said: "This territory has taken the lead in the matter of electric lines and transmission, being far ahead of the coast cities in the extensiveness of its electric lines and equipment. The single-phase system of operating electric lines, as used by the Inland Empire lines, has, we think, been shown to be a complete success." The party included: C. E. Magnusson, professor of electrical engineering in the University of Washington; W. S. Wheeler, franchise inspector for the city of Seattle and secretary of the Seattle branch of the American Institute of Electrical Engineers; G. W. Pielver, general manager for the Allis-Chalmers Company at Seattle; A. C. Babson, general manager for the General Electric Company at Seattle; C. Reuschell, salesman for the Allis-Chalmers Company; A. L. Snyder and C. A. Sears, of the Seattle Electric Company; Fred G. Simpson, of the Kilvern-Clarke Company; and H. R. Stevens, consulting engineer for the A. S. Downey Company of Seattle. The trip to Spokane was made at the close of the annual convention of the electrical engineers of the state, recently held at Seattle. Professor Magnusson was chosen delegate to the national convention of the institute, to be held this week at Niagara Falls.

Interstate Railways Company Plans to Carry Freight.—Unless present plans fail, the Interstate Railways Company of Philadelphia expects to begin hauling freight between Wilmington, Chester and Philadelphia in the fall. Much money is being expended upon track repairs, new sections of roadbed are being put in and in various ways the company is preparing for the extension of its business in the delivery of milk, fruit and general merchandise. One of the first items of traffic to be developed will be the milk trade. The southwestern division of the Chester Traction Company's system enters Philadelphia at Third and Jackson streets, and traffic arrangements will be made with all the lines of the Philadelphia Rapid Transit Company between Second and Thirtieth streets, which will make it possible to deliver milk to any point in the city at an early hour and before the passenger traffic of the day begins. It is the intention of the company, according to A. G. Jack, superintendent, to enter into active competition in another season for the fruit grown on the northern section of the Delaware peninsula. The Wilmington division of the company's system begins at the Christiana river, but a branch line extends to Delaware City, and it is the intention to make traffic arrangements with the Delaware lines, which would enable the company to land fruit in the wholesale district of Philadelphia in a run of not more than three hours. Only a package business, it is expected, will be done on the Chester and Darby division, the southwestern line to be used for all the through freight. It is not expected that a general freight business between Philadelphia and Chester will be developed, as the Chester boats give a rate that makes competition unprofitable for trolley cars, but the company expects to find a growing business in freight carrying between the suburban towns and between Philadelphia and the suburban sections through which the trolley lines pass.

Construction News

FRANCHISES.

Amityville, N. Y.—A 50-year franchise has been granted to the Huntington & Babylon Railroad to operate an electric line in this city.

Bisbee, Ariz.—The Warren Street Railway Company of this city has been granted a franchise to build and operate an electric line between Upper Tombstone canyon and Warren, Ariz. L. W. Powell, president, Bisbee, Ariz.

Bristol, Va.—A 30-year franchise has been granted to the Bristol Street Railway to build and operate an electric line in this city. Work is to begin at once.

Brooklyn, N. Y.—The Brooklyn Rapid Transit Company has filed with the borough authorities plans for a complete loop system at the Brooklyn Borough Hall, in anticipation of the early completion of the East river tunnel and the operation of trains direct from the Bronx to the Borough Hall station in Brooklyn. In this way it is proposed to relieve the congestion which undoubtedly would result by the landing of 30,000 extra passengers, which it is estimated will be handled during the morning and evening rush hours after the completion of the tunnel. It is stated that the borough authorities will insist on several modifications of the plans before filing their approval.

Buffalo, N. Y.—The Buffalo Genesee & Rochester Railway, recently incorporated with a capital of \$7,500,000, has been granted a certificate of necessity to construct a double-track electric line from Depew to Rochester, about 60 miles. As now planned the road will connect with the Buffalo & Depew Railway, where the Genesee street line of the International Railway enters Cheektowaga. The granting of this franchise is the culmination of a contest begun three years ago, caused by the refusal of the state railroad commission on two different occasions to allow the Buffalo & Rochester Railway the right to build its interurban line, on the ground that additional transportation facilities were not needed in the district. Much of the work of grading and extension, which already had been done, was stopped by the action of the commission; therefore the Buffalo Genesee & Rochester Railway was incorporated, as noted in our issue of June 1, with a slight change in the route as originally laid out by the Buffalo & Rochester. This overcame some of the objections formerly made by the commission and it now is believed that further proceedings against the building of the road will be discontinued. J. T. Mooney, general superintendent of the Buffalo & Depew Railway, will build the new line.

Chehalis, Wash.—The Centralia-Chehalis Electric Railway & Power Company again has applied for a franchise to build its line in Chehalis and from that city to Centralia. E. J. Weeks, Tacoma, Wash., representing the company, is quoted as saying that steel sufficient to lay one mile of track is on hand and that enough for six additional miles has been promised in the near future. If the franchise is granted actual construction work will be started within 60 days.

Davenport, Ia.—The city council at its meeting on June 19 passed an ordinance granting a franchise for an entrance into the city to the Eastern Iowa Traction Company, which proposes to build from Davenport to Maquoketa and Dubuque, Ia. Franchises over practically the same routes were also granted to C. G. Hipwell and to a company which proposes to build from Davenport to Manchester, Ia. Amendments were added to each ordinance providing that the company which first builds 20 miles of track outside of the city shall have the right to build the city tracks and the other two may make trackage agreements with the first.

Dunkirk, N. Y.—A franchise has been secured by the Buffalo & Lake Erie Traction Company to build its line into this city from Buffalo. This includes right of way from the eastern boundary line of Chautauqua county at Irving into and through the city of Dunkirk to its western city limits.

Evanston, Ill.—A franchise granted to the Chicago Consolidated Traction Company recently by the Evanston city council, giving the company the right to extend its tracks two blocks from Central street and Florence avenue to the city limits, to connect with a line to the Glen View golf links, was returned on June 24 by Mayor Joseph E. Paden with his veto, because it was passed by the council without advertising it for 10 days before passage.

Gainesville, Tex.—The city council has renewed the franchise granted some time ago for the building of the Gainesville Whitesboro & Sherman Interurban Railway. The renewal is for one year from July 1, 1907, at which time it is promised that the line will be in operation. A bonus of \$250,000 has been subscribed by local interests and will be paid over at the proper time.

Greenville, S. C.—Franchises to operate electric lines in this city have been granted to the following companies: South Carolina Public Service Corporation, Greenville-Anderson Interurban Railway and a proposed line from Greenville to Williamston.

Hot Springs, Ark.—H. McCafferty of this city has applied for a franchise to construct an electric line in Hot Springs, from the end of Spring street to a point two miles east of the city, where a hotel is located, and where it is proposed to build an artificial lake. It is announced that surveyors also are at work on a six-mile scenic railway, which it is planned to have in operation by October 1 next.

New Westminster, B. C.—The Burrard Westminster & Boundary Railway & Navigation Company, which proposes to build an electric railway from New Westminster to Seattle, has applied for a franchise.

Richmond, Ind.—The city council of Richmond at a recent meeting voted against the granting of a franchise to the Dayton & Western Traction Company, which is now without right to enter the city, unless it provides for universal transfers between its line and the city lines, and from the city lines to the interurban lines within the city limits. The same decision was reached with regard to the Terre Haute Indianapolis & Eastern Traction Company, which wishes to enter the city with its freight cars. The council also demanded the stoppage of cars at crossings upon the proper signal being displayed within the city limits.

Seattle, Wash.—The Seattle Electric Company has been granted a franchise for the extension of its line in East and North Fortyninth street, connecting the Green Lake and University lines.

Southport, N. Y.—The Elmira Corning & Waverly Railroad Company has secured a franchise to operate an electric line in this city.

Toledo, O.—The county commissioners have granted a 25-year franchise to the Toledo Railways & Light Company for the operation of its line on Phillips avenue, from Detroit avenue to the end of Phillips avenue. This will replace the franchise for the present single-track line, which has been operated for 16 years.

Toledo, O.—The Lima & Toledo Traction Company has been granted a franchise by the county commissioners to cross eight county roads on its route through Lucas county to Toledo. It is stated that a change in the location of a bridge over the canal where Glendale avenue crosses the railroad will probably be made, for which the company will pay the county \$400.

Vancouver, Wash.—The Washington Railway & Power Company of Portland, Ore., has been granted an additional franchise, through its attorney, Arthur Langguth, for several streets in Vancouver. The company is now pushing construction work as rapidly as possible and has purchased nearly all the material for construction.

Virginia, Minn.—The Mesaba Traction Company has secured a franchise to operate its line in this city, with 18 months in which to have the first mile of track completed and in operation. F. B. Myers, Biwabik, Minn., president.

Waycross, Ga.—Acceptance of the franchise recently granted by the city council to Burdette Loomis, Hartford, Conn.; George W. Deen of Waycross, and F. H. Ellmore, Jacksonville, Fla., has been filed, and it is expected that work on the surveys for the road will be started soon. The franchise also included the right to operate a gas plant.

RECENT INCORPORATIONS.

Chicago & Wisconsin Traction Company, Chicago, Ill.—Incorporated in Illinois to build an electric railway in a northerly and northwesterly direction from Chicago. Capital stock, \$10,000. Incorporators: H. R. Yaryan, Lewis E. Starr, Walter F. Wantke, Philip R. Lynch and George W. Miller, all of Chicago.

Danbury & New Milford Street Railway.—The bill for the incorporation of this 16-mile electric railroad has been passed by the Connecticut senate. The cost of construction is estimated at about \$30,000 per mile. Capital stock, \$200,000, which may be raised to \$900,000.

Douglas & Coos Electric Railroad, Marshfield, Ore.—Incorporated in Oregon to build an electric railroad from Roseburg to Marshfield. Capital stock, \$500,000. The following temporary officers have been elected: L. J. Simpson, North Bend, Ore., president; A. E. Marsters, Myrtle Point, first vice-president; L. H. Hazard, Coquille, second vice-president; Henry Sengstaken, secretary; J. H. Flanagan, Marshfield, treasurer.

Evansville (Ind.) Railways Company.—Incorporated in Indiana to take over the Evansville & Eastern Electric Railway and the Evansville & Mt. Vernon Electric Railway. Capital stock, \$1,000,000. Officers: W. L. Sonntag, president; C. H. Batlin, vice-president and general manager; M. S. Sonntag, treasurer; F. W. Reitz, secretary; and W. H. McCurdy, chairman of the board of directors; all of Evansville, Ind. It is stated that the Mt. Vernon line will be rock ballasted and the Rockport line extended to Grandview, Ind.

Norwich Colchester & Hartford Traction Company, Colchester, Conn.—The railroads committee of the Connecticut senate has reported favorably on the bill authorizing this company to operate its lines in Norwich, Bozrah, Lebanon, Colchester, Marlborough, Glastonbury and East Hartford and do a lighting and power business in Colchester. Capital stock may be from \$100,000 to \$1,000,000. The company may issue bonds and mortgage its franchise.

Phoenix & Western Development Company, Phoenix, Ariz.—Incorporated in Arizona to build and operate an electric line in Phoenix and an interurban railway from this city to outlying points. Application for franchises already has been made. Capital stock, \$1,000,000. Incorporators: S. S. Scull, S. S. Green, Lloyd B. Christy, Lysander Cassidy, Phoenix, Ariz., George W. Mische, Rochester, N. Y.

Southern Wisconsin Railway, Milwaukee, Wis.—Incorporated in Wisconsin to build and operate passenger and freight electric lines and to build or acquire electric light and power plants. Capital

stock, \$100,000. Incorporators: Charles F. Smith, William F. Adams and Albert R. Denu.

TRACK AND ROADWAY.

Abilene, Tex.—Work has commenced on the street railway line for this city and will be pushed rapidly to completion. The first work was begun at Park Heights, in southwest Abilene. The first shipment of ties is expected soon and the road will be put in operation about October 1. Three cars will at first be used and this number will be increased as the business demands it.

Alabama City Gadsden & Attalla Railway, Gadsden, Ala.—It is reported that this company will shortly begin the construction of its Alabama City loop, which will run south of the plant of the Southern Steel Company. The present Walnut street line will be used to get into the city.

Albia (Ia.) Interurban Railway.—It is reported that the right of way for the line from Albia to Hocking, Ia., has been acquired and contracts have been let for the construction of the line. The Engineering Construction & Securities Company of Chicago has the general contract, agreeing to have the work completed by November 1, and a subcontract for grading has been let to W. W. Cummings of Ottumwa, Ia. As soon as work on this line is under way surveys will be started for an extension north to Hiteman and Buxton. Calvin Manning of Albia is interested.

Alton Jacksonville & Peoria Railway, Jerseyville, Ill.—This company has begun the work of stringing the trolley wire on its line between Alton and Godfrey and it is stated that service between the two points will be inaugurated within the next few weeks. For the present power will be furnished by the Alton Granite & St. Louis Traction Company.

American Electric Railroad, Des Moines, Ia.—This company, which proposes to build an electric railway from Muscatine to Council Bluffs, Ia., is stated to have been quietly at work for several months and to have completed three surveys and secured half the right of way for the first section of the line, from Des Moines to Greenfield. It is also stated that construction will begin out of Des Moines in 60 or 90 days and that practically all of the construction material and equipment has been contracted for. The company was incorporated last October with \$20,000 capital stock and is said to represent a large Chicago bonding company. The incorporators were J. D. Pollard, C. F. Casselman and C. W. Baker, president, with offices in the Clapp building, Des Moines. The route from Muscatine to Council Bluffs as projected includes Muscatine, Sigourney, Oskaloosa, Knoxville, Des Moines, Indianola, Winterset, Greenfield, Fonatella, Griswold and Carson, Indianola is to be reached by a branch from Spring Hill, south of Des Moines.

Berkshire Street Railway, Pittsfield, Mass.—It is reported that this company will soon let contracts for an extension from Great Barrington to Canaan, Mass.

Birmingham (Ala.) Railway Light & Power Company.—The new street railway line to Mountain Terrace, the new residence district in the Highlands, southeast of Birmingham, was opened for traffic on Saturday, June 22.

Boise, Idaho.—It is announced that W. S. Kuhn of Pittsburgh, Pa., is financing an electric railroad, to be built from Twin Falls to Ely, Nev., and Boise, Idaho. Some of the preliminary work has been started and part of the material is on the way. Power to operate the line will be secured from Shoshone Falls.

Boston & Eastern Electric Railroad, Boston, Mass.—Another hearing before the Massachusetts railroad commission was held on June 19 in regard to the company's plans for the line from Boston to Lynn, Mass., and John H. Bickford, chief engineer, said it was planned to cross the Mystic river on a pile bridge with steel draw. Other bridges necessary were similarly planned. No traffic arrangements have been made with the Boston Elevated Company, but the plan was to approach the Sullivan square terminal by an elevated structure, to which the cars would rise by a 1 per cent grade from the company's Mystic river bridge, the new elevated being in or over Alford street, with station platforms parallel to that street and adjoining the present "L" terminal.

Boone Webster City & Ft. Dodge Interurban Railway, Boone, Ia.—At a recent meeting of the directors the following officers were elected: E. E. Hughes, Boone, president; F. A. Sackett, Webster City, first vice-president; John L. Goepfinger, Boone, second vice-president; J. H. Herman, Boone, treasurer; J. S. Crooks, Boone, secretary. The company discussed plans for financing the road from Boone to Webster City. The probability is that the line will be started this summer. Eastern capitalists are said to be interested.

Butler Saxonburg & Tarentum Street Railway, Butler, Pa.—It is announced that this company will apply on July 21 for a Pennsylvania charter to build an electric railway, 26 miles long, to connect the towns named in the title. It is stated that financial arrangements have been made and that the company will be in shape to begin construction as soon as the charter is obtained. Much of the right of way has been obtained. Those interested include William McDowell, E. C. and O. W. Rudert and James Cirigliano of Saxonburg.

Canton Youngstown & Akron Railway.—Active work will be begun on this new line within the next 30 days, according to the latest statement of John E. Monnot, promoter, who was in Youngstown last week, in the interests of the new trolley project. "I cannot say at what place the work will first be started," explained Mr. Monnot. "That will be determined upon later, probably this week. Everything is looking good for an early building of the line." The Collins Construction Company, Chicago, has secured the contract

for the work, which will be rushed along as rapidly as possible. The new road will require the building of 65 miles of track and roadbed, involving an expense of about \$2,000,000. The money to build the road is already available. There will be a direct line from Canton to Youngstown, a direct line from Youngstown to Akron, and a direct line from Akron to Canton.

Central Pennsylvania Traction Company, Harrisburg, Pa.—It is reported that this company has made arrangements to extend its line from Harrisburg to Dauphin, Pa., nine miles.

Chicago Lake Shore & South Bend Railway, South Bend, Ind.—J. B. Hanna, president, reports rapid progress on the line from South Bend, Ind., to Kensington, Ill. About 20 miles of track has been laid out of South Bend and work on the grading and on the power house at Michigan City is progressing satisfactorily. Mr. Hanna sets February 1 as the date of beginning operation.

Chicago & Milwaukee Electric Railroad, Greenwood, Ill.—The Columbia Construction Company of Milwaukee, Wis., has received a contract for laying this company's double track in the south side of Milwaukee and will begin work this week on Grove street. The company has until August 27 to lay two miles of track.

Cincinnati Dayton & Ft. Wayne Traction Company, Dayton, O.—The directors have decided to increase the capital stock from \$1,000,000 to \$3,000,000 and it is stated that construction will begin at once. Dr. George of Dayton is president.

Columbus (Ga.) Railroad.—This company proposes to build an extension of its street railway system on Twelfth avenue, from Eighteenth to Twenty-ninth streets, and has requested the city authorities to provide the necessary grades, etc.

Denver & Greeley Railroad, Denver, Colo.—J. D. Houseman writes that this company, recently incorporated to build a system of electric lines between Denver and Greeley, Colo., is now securing right of way and terminals. Surveys are not completed.

Denver & Interurban Railroad.—Construction is now in progress on the city lines in Ft. Collins, Colo. Grading was started last week on the Mountain avenue line. It is the intention to complete this line to Prospect Park and have the cars in operation in time for the stock show the last week in August.

Erie Cambridge Union & Corry Railway, Erie, Pa.—A meeting of the stockholders has been called for July 8 to consider an increase in the bonded indebtedness in order to complete the construction of the road, which was promoted by the late Senator Gibson. Considerable grading has been done, but the progress of the work was delayed by Mr. Gibson's death.

Franklin & Towamensing Electric Railway, Allentown, Pa.—Surveys for the route of this company's proposed nine-mile electric line between Slatington and Leighton, Pa., have been completed by Charles W. Grossart, Allentown, Pa.

Gainesville Whitesboro & Sherman Railway, Gainesville, Tex.—It is reported that financial arrangements have been made for completing this road from Gainesville to Sherman, Tex., on which nine miles of grading was done last year, provided the franchises can be renewed. John King of Gainesville, vice-president and general manager.

Galt Preston & Hespeler Street Railway, Galt, Ont.—This company is double-tracking its line between Galt and Preston, Ont.

Hanover & York Street Railway, York, Pa.—Rapid progress is being made on this extension of the York County Traction Company from York to Hanover, Pa., 20 miles. Grading is in progress at five places and many of the culverts and bridge abutments have been completed. One of the largest structures on the line will be the highway crossing at Eyster's Mill. Dodge & Day of Philadelphia are the contractors. Rails and ties have been delivered at several points.

Hornell Bath & Lake Keuka Railway.—This company has been authorized by the New York railroad commission to build its proposed road from Hornell to Bath, Hammondsport and Branchport, N. Y., 50 miles. The company has a capital stock of \$1,000,000. F. W. Hastings of Bath is interested.

Illinois Traction Company, Champaign, Ill.—A public hearing on the plans for the bridge across the Mississippi from Venice, Ill., to St. Louis, Mo., was held last week by Col. Clinton B. Sears of the United States army engineering corps. Representatives of different civic associations and of steam railroads whose tracks are to be crossed were present and no objection to the plans was offered. They will now be submitted to Secretary of War Taft for approval. The plans were prepared by Ralph Modjeski of Chicago.—Twenty carloads of steel rails have been delivered for use on the Lincoln-Mackinaw line. Graders are now at work just east of the Lincoln College grounds. The line is 27.9 miles long and enough grading has been completed so that it is predicted that tracklaying will begin in August. It is stated that grading is also to begin on the Springfield-Jacksonville line this year, between Jacksonville and New Berlin, where the line has been located.

Indiana County Railway.—This company, which is controlled by the Jefferson Traction Company of Punxsutawney, Pa., has laid about six miles of track, from Indiana to Ernest and Creekside, Pa. Fifteen miles, from Indiana to Clymer, has been graded and a line from Indiana to Blairsville, 16 miles, is to be graded this summer.

Indianapolis Crawfordsville & Western Traction Company, Crawfordsville, Ind.—E. P. Baker, vice-president, has announced that the tracklaying on this line from Indianapolis to Crawfordsville, Ind., 44 miles, has been completed and all of the ballasting except about eight miles. The power houses and substations are practically completed and cars are to be operating by July 4.

Indianapolis Huntington Columbia City & Northwestern Railway, Syracuse, Ind.—It is reported that Benjamin Raupfer and Thomas R. Marshall, with other stockholders, propose to reorganize this company, which is now in receiver's hands, and complete the road. It is stated that the indebtedness of the company is but \$18,000 and over \$100,000 has been expended on the road. It was proposed to build from Huntington to Goshen, 66 miles. About five miles of track has been laid and about 10 miles additional has been graded. Surveys had been completed. It was the intention to extend the line ultimately to Indianapolis. The receiver's sale will be held in August. Thomas A. Bell of St. Louis is president.

Indianapolis Newcastle & Toledo Electric Railway, Newcastle, Ind.—It is now announced that this line will be in operation from Indianapolis to Newcastle, Ind., by September 15. The company expects to have the line completed east to Muncie by the first of the year.

Kenosha (Wis.) Electric Railway.—This company has begun the extension of its lines within the city and during the next three months about three miles of new track will be laid.

Kentucky & Ohio River Interurban Railroad, Paducah, Ky.—The directors met in Paducah last week to consider plans for building the proposed line from Paducah, Ky., to Cairo, Ill. It is stated that the right of way has been secured and that construction contracts will be let in a few weeks.

Lafayette & Chicago Electric Railway, Lafayette, Ind.—It is announced that work on this proposed electric line will be started within two months. G. W. Infield, president, has announced that a Chicago bonding company is ready to furnish 75 per cent of the capital required.

Lehigh Valley Transit Company, Allentown, Pa.—The directors have decided to proceed with the building of the proposed bridge to connect Allentown and South Allentown, Pa., which will be 1,820 feet long and will cost \$350,000.

Little Rock & Hot Springs Electric Railway, Little Rock, Ark.—A mass meeting was held at Little Rock, Ark., last week in the interests of the proposed electric line to Hot Springs, and \$20,000 was subscribed. Committees were appointed to secure additional subscriptions. L. Garrett is vice-president and general manager.

Louisville New Albany & Southern Traction Company, New Albany, Ind.—It is announced that this company, which proposes to build an electric railway from New Albany to French Lick, Ind., will soon ask for bids for the construction of its line.

Macon Americus & Albany Electric Railway, Macon, Ga.—It is reported that the Interurban Construction Company is preparing to let contracts about July 1 for the construction of this proposed line from Macon to Americus and Albany and from Macon to Griffin and Atlanta, Ga. Several bids have been received. N. J. Cruger of Albany, Ga., president.

Madison & Fond du Lac Electric Railroad, Madison, Wis.—This company, incorporated last October to build an electric third-rail line from Madison to Fond du Lac, Wis., is making preparations to begin construction at an early date. The route includes Windsor, Columbus, Beaver Dam and Waupun, with a branch from Beaver Dam to Fox Lake and Watertown. A power house at Beaver Dam has been purchased. The company also proposes to furnish power for lighting, and several franchises have been secured for both lighting and railway privileges. Seventy-pound rails will be used. David Howard of Madison, president; F. A. Umsted, chairman of the board of directors.

Metaline, Wash.—S. H. Anschell of Metaline is reported to be interested in a project to build a railway from Colville to Metaline, 40 miles.

Milwaukee Northern Railway, Port Washington, Wis.—The Wisconsin supreme court has decided in favor of this company in suits brought by the Milwaukee Light Heat & Traction Company to determine the title to a right of way claimed by both companies, from North Milwaukee to the northern line of Milwaukee county and beyond. The traction company claimed that it had adopted the route in question. The Milwaukee Northern is now building over the right of way on its line from Milwaukee to Port Washington.

Mt. Desert Transit Company, Bar Harbor, Me.—It is stated that construction contracts probably will be let this fall for building the proposed line from Ellsworth to Bar Harbor and Southwest Harbor, Me., about 40 miles. Surveys are now in progress. John S. Kennedy of New York, N. Y., is president, and W. E. Baker & Co. of New York are the engineers.

Nashville (Tenn.) Railway & Light Company.—A force of 100 men is at work on the grading for the extension of this company's line on the Lebanon turnpike beyond Mt. Olivet, its present terminus. The work of laying the rails will be started in the near future.

Naugatuck Valley Electric Railway.—It is announced that this road, which has been under construction from Naugatuck south to Seymour, Conn., by way of Beacon Falls, will be in operation some time in July. The line is controlled by the Connecticut Railway & Lighting Company and when completed will afford through service from Waterbury to Ansonia, Derby and Bridgeport.

New York & Queens County Railway, Long Island City, N. Y.—This company has made application to the board of estimate and apportionment for permission to build a line in Franconia avenue, from Twenty-second to Thirty-first street, on Thirty-first to Broadway and on Broadway to Bell avenue, affording direct connection with the Belmont tunnels, now under construction.

Northern Electric Railway, Chico, Cal.—Construction has been started on the line from Chico to Hamilton City, Cal.

Northern Traction Company, Hibbing, Minn.—Grading is now in progress between Chisholm and Hibbing, Minn., for the line which is to connect Hibbing with Blwahik and a number of other towns on the Mesaba range. R. F. Berdie, president.

Oklahoma City El Reno & Southwestern Interurban Railway.—G. N. Martin of Chicago, promoter of this company, which proposes to build an electric railway from El Reno to Shawnee, via Oklahoma City, 90 miles, was in Shawnee last week making arrangements for terminal facilities. The line from Oklahoma City to Shawnee is to be built first, according to Mr. Martin, and surveys are now being made.

Olean (N. Y.) Street Railway.—This company has let to the Groton Bridge Company, Groton, N. Y., a contract for bridge work amounting to \$40,000.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—The new Twenty-fourth street line to South Omaha was formally opened for traffic on Saturday, June 22. Shortage of labor is seriously interfering with the construction work in Omaha. Work on the Fortieth street line has been stopped and all of the men available are now working on the extension of the Ames avenue line, from Thirty-sixth street to Fortieth and Grand avenue. As soon as this work is completed the men will be put to work on Fortieth street, north of Dodge, to complete the eight blocks of line to Cumming street.

Pacific Electric Railway, Los Angeles, Cal.—Workmen are now putting in a tower and interlocking switch at the intersection of the Short Line and the Southern Pacific tracks at Oneonta, Cal., and it is announced that interlocking plants will be installed at all crossings in the suburbs.

Pasco, Idaho.—Gustave Harris of Walla Walla, Wash., has applied for a franchise to build a street railway system in Pasco.

Port Arthur (Ont.) Electric Street Railway.—The city council has decided to double-track the municipal electric street railway system at a cost of approximately \$55,000. Following are some of the materials required: Six hundred and twenty tons of 56-pound rails, 18 tons of spikes, four tons of bolts, 18,450 ties, 14,868 pounds of No. 00 trolley wire, 280 trolley hangers, 300 double pull-overs, 1,500 pounds of seven-strand No. 12 wire. J. McTeigue is clerk.

Richmond & Chesapeake Bay Railway, Richmond, Va.—The tracklaying on this line from Richmond to Ashland, Va., 15 miles, has been completed and a party of officials made an inspection trip over the line on a construction train last week. Ballasting is now nearly completed and a large number of men are engaged in erecting poles and stringing wire.

Rochester Scottsville & Caledonia Electric Railroad.—It is stated that this company has applied for a certificate of necessity to extend its line from its present terminus to Le Roy, Stafford and Batavia, 16 miles. Isaac W. Salyerds, president; Morton E. Lewis, secretary.

Rockford (Ill.) & Interurban Railway.—This company is now double-tracking the Seventh street line, from Charles street to Second avenue, and will soon begin the construction of a loop on Seventh avenue, from Railroad avenue to Eighteenth street, thence to Kishwaukee street, south to Harrison avenue and east to Eleventh street.

San Diego (Cal.) Electric Railway.—The trolley wire has been strung and work on the laying of the ties and rails of this company's Adams street line was started on June 17. The line extends eastward from the pavilion on University Heights, through University Heights and Normal Heights, to the eastern boundary of the latter subdivision. W. Clayton, vice-president and manager, San Diego, Cal.

Spokane-Pend d'Oreille Rapid Transit Company, Limited, Spokane, Wash.—J. Grier Long, treasurer, has announced that construction is to begin at once on the line from Spokane to Lake Pend d'Oreille, Idaho, 42 miles, the litigation which has delayed the work having been settled. J. J. Browne, one of the promoters, has purchased for \$35,000 a terminal site on Squaw Bay.

Springfield Clear Lake & Rochester Interurban Railway, Springfield, Ill.—Arrangements are being made for financing the construction of the line from Springfield to Hillsboro, Ill. A franchise in the latter town has been secured and it is stated that construction will begin at once. J. E. Melick, president.

Susquehanna Railway & Light Company, Lancaster, Pa.—This company made an agreement with W. J. Hayes & Co. of Philadelphia to purchase the Philadelphia Coatesville & Lancaster line, the line between Coatesville and Parkersburg and the partially constructed line between Parkersburg and Christiana, Pa. The executive committee has directed the officers to improve the line between Parkersburg and Coatesville, and to rebuild and complete the line between Parkersburg and Christiana. The line between Christiana and Coatesville is to be operated by the Conestoga Traction Company, in connection with the Lancaster & Eastern Railway.

Tacoma (Wash.) Railway & Power Company.—Men are now engaged in building a large loop at the terminus of the new American Lake line. The 18-acre tract inside of the loop at the lake is to be used as an amusement park.

Tampa (Fla.) Electric Company.—This company is reported to be taking steps to extend its line to Gary, Fla.

Temple, Tex.—It is stated that surveying for the line from Temple to Marlin and Waco, Tex., is to start on July 1. J. B. Coffinberry is one of the promoters.

Tennessee & Georgia Interurban Railway, Chattanooga, Tenn.—Surveys and estimates for this proposed 9 $\frac{1}{2}$ -mile road from Chattanooga through Rossville Gap to Ft. Oglethorpe and Chickamauga park are now completed, part of the right of way secured and financial arrangements for its construction practically assured. S. W. Divine, Dodge, Ga., is promoting the project.

Texas Traction Company, Dallas, Tex.—It is stated that very satisfactory progress is being made on the line from Sherman to Dallas, Tex. Material is being received in large quantities and the second shipment of 2,000 tons of 80-pound rails is expected by July 1 from the Carnegie Steel Company. Machinery for the power house at McKinney is now being installed, and the power will be ready to be turned on some time before the track is ready for cars. As originally announced, President Strickland believes the road will be ready to bring Christmas shoppers to Dallas. F. A. Jones, chief engineer.

Thomaston, Conn.—Work on the roadbed of the new electric line, which is to be built from Waterbury to Thomaston, Conn., is progressing so satisfactorily that it will soon be ready for laying the 15 carloads of rails which have recently arrived.

Torreon, Mex.—It is reported that Dr. J. W. Lim and others of Torreon have secured from the government the right to build and operate an electric railway from Torreon to Matamoros, Coahuila, Mex., about 10 kilometers. Machinery has been ordered from the United States and work is to begin at an early date.

United Railways & Electric Company, Baltimore, Md.—Announcement has been made that this company will make the following extensions to its present system: Orangeville to Highlandtown, by way of Eighth street; Lakeside to Cockeysville, on its own right of way; Towson to Timonium, and an extension of the Wilkins avenue line to Halethorpe and Elkridge. It also has been decided to extend the St. Paul street line to Boland Park.

Utica & Mohawk Valley Railway, Utica, N. Y.—This company has filed notice in the county clerk's office of the following proposed extensions: A second track, beginning on Whitesboro street at the westerly line of the city of Utica, and extending westerly along Whitesboro street about 1,546 feet. A single-track line extending from Deerfield Corners westerly along, in and upon the Marey road to the so-called Seymour road. A single-track line from Deerfield Corners along, in and upon the Trenton road or North Genesee street to the reservoir. A second track extending from Deerfield Corners on North Genesee street southerly in, along and upon North Genesee street to the old channel of the Mohawk river.

Warren Street Railway, Bisbee, Ariz.—It is announced that the construction work on this company's line between Upper Tombstone canyon and Warren is to be pushed as rapidly as possible. The rails have been ordered and are expected within a month. The cars, which will be built by the McGuire-Cummings Manufacturing Company of Chicago, have been promised by August and it is expected that the line will be in operation by October next. L. W. Powell, Bisbee, is president.

Western New York & Pennsylvania Traction Company, Olean, N. Y.—W. R. Page, president, recently told the board of trade of Bradford, Pa., that this company will construct a trolley line from Eldred to State Line, Pa., which would connect with the Bradford-Olean line, now under construction. Mr. Page also stated that it was the intention of the company to construct a line from Bradford to Carrollton to connect with the Olean and Salamanca lines. It was proposed, he said, to rebuild the entire system in the city of Bradford on paved streets, as well as rebuild and extend the Lewis Run line.

POWER HOUSES AND SUBSTATIONS

Wagner Lake Shore & Armour Railway, Wagner, S. D.—It is announced that this company has made arrangements to acquire the electric light and power plant at Wagner, S. D., and to build a new power house at Armour, S. D. It is expected that about \$25,000 will be spent for new electrical machinery and accessories.

Los Angeles (Cal.) Interurban Railway.—This company has begun work on a substation for transforming high-tension current for use on its lines. The current is generated by the Pacific Light & Power Company at its plant at the mouth of San Gabriel canyon. The new transformer station, which is to be located at Azusa, will be a brick building, located on the company's property on West Ninth street.

Kansas City-Western Railway.—It is announced that at a meeting of the board of directors of this company it was practically decided to purchase current for the operation of the cars from the Metropolitan Street Railway Company, provided that a long-time contract could be made at a lower rate than that for which the Kansas City-Western can generate its own power. It is stated that the Metropolitan Street Railway Company has agreed to erect a converter station at a cost of about \$25,000, provided that the Kansas City-Western will sign a long-time contract.

Ogden (Utah) Rapid Transit Company.—This company is installing a motor-generator set, having a capacity of 350 amperes, to be used in furnishing power for the operation of its cars. It is expected that the motor-generator set will be ready for operation in about ten days. The current will be furnished by the Utah Light & Power Company. It is expected that the installation of this unit will materially improve the service, as it will avoid the frequent shutdowns experienced when the company operated its own power house, which will now be held in reserve for use only in emergency.

Personal Mention

Mr. William J. Ager has resigned as superintendent of construction of the Spokane Traction Company, Spokane, Wash.

Mr. W. P. Brenning has been appointed assistant master mechanic of the Alton Granite & St. Louis Traction Company.

Mr. O. P. Sells has resigned as general superintendent of the Mattoon (Ill.) City Railway, to accept another position at Bloomington, Ill., effective on July 1.

Mr. P. L. Downs and Mr. A. F. Bentley of Temple, Tex., have been elected first and second vice-president, respectively, of the Belton & Temple Traction Company of Temple.

Mr. W. A. Comstock of Alpena, Mich., has been elected president of the Milwaukee Northern Railway of Port Washington, Wis., succeeding Mr. J. M. Saemann, resigned.

Mr. A. S. Swank has resigned as superintendent of the Cincinnati Northern Traction Company of Hamilton, O., to accept a position with the Western New York Construction Company of Buffalo, N. Y.

Mr. Herman E. La Breeque has been appointed assistant superintendent of the Jersey Central Traction Company at Keyport, N. J. He formerly was with the Portland (Ore.) Railway Light & Power Company.

Mr. George Dorn has resigned as assistant superintendent of the Louisville & Southern Indiana Traction Company, New Albany, Ind., to accept a position with the Indianapolis & Louisville Traction Company.

Mr. G. E. Peck has been appointed auditor and cashier of the Mason City & Clear Lake Railway, Mason City, Ia., and the People's Gas & Electric Company. Mr. Peck heretofore has been connected with the Waterloo Cedar Falls & Northern Railway at Waterloo, Ia.

Mr. Frank W. Arnold has resigned as manager of the Oswego (N. Y.) Traction Company to become connected with the Ft. Dodge Des Moines & Southern Railway of Des Moines, Ia. The employees of the Oswego Traction Company tendered Mr. Arnold a farewell banquet. Mr. George Wright has been appointed to succeed him.

Mr. E. H. Richards, formerly superintendent of the Newport division of the Old Colony Street Railway, has resigned to accept a similar position at New Bedford, Mass. For several years he was division superintendent of the Brockton division of the Old Colony company and was, at one time, manager of the Taunton-Attleboro-Providence line.

Mr. L. C. Bradley, whose resignation as superintendent of the Scioto Valley Traction Company, to become associated with J. G. White & Co. of New York City, was noted in a previous issue, has been appointed superintendent of the Eastern Pennsylvania Railway, one of the properties controlled by the White interests. Mr. Bradley's headquarters will be in Pottsville, Pa.

Mr. H. C. Young, general passenger agent of the Lake Shore Electric Railway, has been granted a three months' leave of absence, effective on June 11, during which time all traffic matters will be looked after by Mr. A. C. Henry, auditor of the company. All communications, therefore, pertaining to matters in this department should be addressed to him at Norwalk, O. Mr. John Miller will act as traveling passenger agent, reporting to Mr. Henry.

We are officially advised that Mr. W. W. Street has been appointed superintendent of transportation of the St. Louis & Springfield Railway and the St. Louis & Northeastern Railway at Staunton, Ill., succeeding Mr. Thomas G. Wood, who has been appointed superintendent of the St. Louis Decatur & Champaign Railway, the new line which has just been opened between Decatur and Champaign. These lines are all divisions of the Illinois Traction System.

Mr. J. Jordan, heretofore superintendent of the Cleveland Painesville & Eastern and the Cleveland Painesville & Ashtabula railroads, Willoughby, O., has been appointed general manager of those roads, effective on June 1, as announced in last week's issue of the Electric Railway Review. Mr. Jordan entered railway service in 1885, at the age of 18, with the Grand Trunk Railway, in the locomotive department, remaining there until 1888. He was then for four years employed as conductor by the Saginaw Street Railway, Saginaw, Mich., and held a similar position with the Citizens' Street Railway of Detroit until 1895. When the Detroit Railway began operating in 1895 he was appointed division superintendent and two years later, on August 12, 1897, was made superintendent of the Cleveland Painesville & Eastern Railroad, which last year acquired the Cleveland Painesville & Ashtabula Railroad.

Mr. Samuel B. McLenagan, whose appointment as general manager of the Central California Traction Company was noted in our issue of June 15, was born on a farm in Wisconsin in 1861. In 1881 he obtained a position with the United States revenue cutter service, where he remained as assistant engineer for 11 years. From 1892 until the latter part of 1893, he was connected with the General Electric Company at San Francisco, resigning to become superintendent of the San Francisco-San Mateo Railway. After four years of service with this company he accepted a similar position with the Oakland San Leandro & Haywards Railway, where he remained until 1902, when he was appointed superintendent of the Los Angeles Inter-Urban Railway. This position he held until June of this year, when, as earlier noted, he resigned to become

general manager of the Central California Traction Company, which is now building a third-rail interurban line, to be operated at 1,200 volts direct current from Stockton north to Sacramento, and south to Modesto. His headquarters will be at Stockton.

We are officially advised that Mr. Harro Harrsen, general superintendent of the Mexico Electric Tramways Company, Limited, of Mexico City, Mex., has been appointed acting general manager of the company during the absence of Mr. R. C. Brown, general manager and managing director, who is visiting the United States. A new position has also been created, that of freight superintendent, and Mr. William J. Everett has been appointed to the office. More attention is to be paid to freight handling in the future and the department is to be put on a better working basis. Mr. Everett is an experienced street railway man and was formerly connected with the Mexico city lines when they were under the management of the Distrito Federal Company. He has been connected with the Indianapolis Street Railway, the Toledo Railways & Light Company, the Havana Electric Railway, and more recently with the Auburn & Syracuse Electric Railroad of Syracuse, N. Y.

Mr. Gus Muhlhausen, general manager of the Evansville Suburban & Newburg Railway, celebrated the eighteenth anniversary of his connection with this road on June 19, by inviting a party of about twenty personal friends to take a trolley ride to Newburg and Booneville, Ind. On the return trip in the evening a banquet was served to the guests in a large express car temporarily fitted up as a dining hall, followed by speech making and story telling. Mr. Muhlhausen was the recipient of hearty congratulations on his long and successful connection with the road and all expressed their appreciation of the enjoyable ride and the unique banquet on wheels. Among those present were: F. J. Scholz, W. B. McDonald, L. C. Shippard, C. A. Cunningham, Frank Schwegeman, A. J. Rutledge, C. P. White, Dr. W. A. Wheeler, Henry Cook, Capt. Lee Howell and others.

Obituary.

William Findlay Shunk, well known from his connection with the construction of the New York elevated roads, died at his home near Harrisburg, Pa., on June 22, aged 77 years. He was born near Harrisburg in 1830 and was a graduate of Dickinson College. His first engineering work was on the Pennsylvania Railroad in 1856, and from that time on he was engaged in engineering work on various roads. In 1874 he was appointed engineer in charge of the laying out and building of the elevated lines of New York and at the completion of this work was appointed chief engineer of the Manhattan Elevated Railway, the company formed to take over the elevated lines of the west side. He remained with this company until 1882, when he resigned to engage in various engineering enterprises, the best known of which is his successful work on the Guayaquil & Quito Railroad over the Andes, said to be the highest railroad in the world. Since the completion of this work in 1902 Mr. Shunk had retired from active business. In addition to the recognition attained by his successful engineering work, he was known to technical journalism as the author of a book on railroad curves and "The Field Engineer."

Financial News

Atlantic City & Shore Railroad, Atlantic City, N. J.—The report that control of this company is now owned by the West Jersey & Seashore Railroad is erroneous. In part consideration for a grant of trackage rights, the Atlantic City & Shore company has given the West Jersey company an option to purchase after 1913 a majority of the capital stock of the Atlantic City & Shore company, and to secure this option, 51 per cent of the capital stock of the Shore company has been deposited with a trustee.

Brooklyn Rapid Transit Company.—At the special meeting of stockholders of the Brooklyn Union Elevated Railroad on June 19 the creation of the proposed mortgage for \$20,000,000 was approved. Stockholders of the Nassau Electric Railroad approved on June 11 the proposed mortgage for \$5,000,000. The purpose of the creation of these mortgages was stated in the Electric Railway Review of May 23, 1907, page 696.

Chicago City Railway.—The \$3,000,000 of 5 per cent three-year notes, due in 1908, have been called for redemption on July 1 at 101 and interest.—The \$6,000,000 bonds which were purchased by the Harris Trust and Savings bank and the First Trust and Savings bank are offered for sale at 98 and interest.

Connecticut Railway & Lighting Company.—A block of 1 per cent guaranteed common stock is offered at \$75 a share by F. J. Lisman & Co. The property is leased for 999 years from December, 1906, to the New York New Haven & Hartford Railroad for a rental, which, with cash on deposit with a trustee, is sufficient to pay 4 per cent dividends on the common stock to 1914, and about 4 1/3 per cent thereafter.

Eastern Ohio Traction Company, Cleveland.—At the receivers' sale on June 25 the Chagrin Falls & Garrettsville line was bought by H. P. McIntosh at \$152,000, the upset price. There was no bidder for the property as a whole, or for the Cleveland & Chagrin Falls line, or the Cleveland & Eastern line, which extends to Chardon and Middlefield. The Cleveland & Chagrin Falls is subject to a first mortgage of \$200,000, and the Cleveland & Eastern

to a first mortgage of \$1,000,000. On the former the upset price had been fixed at \$106,000 and on the latter at \$50,000. The Chagrin Falls & Garrettsville division now passes from the control of the receiver. The other two portions of the line will remain under his supervision until a successful effort is made to dispose of them.

Evansville (Ind.) Railways Company.—This company has been incorporated with \$1,000,000 capital stock, to acquire the properties of the Evansville & Eastern Electric Railway and the Evansville & Mt. Vernon Electric Railway. The incorporators are: W. H. McCurdy, W. M. Ford, Fred W. Reitz, C. H. Battin, Edwin Walker, M. S. and W. L. Sonntag. The officers are: W. L. Sonntag, president; C. H. Battin, vice-president and general manager; M. S. Sonntag, treasurer; F. W. Reitz, secretary. William H. McCurdy is chairman of the board of directors, which is composed of the incorporators.

Hot Springs (Ark.) Street Railroad.—This company has changed its name to the Hot Springs Street Railway Company and the number of directors has been reduced to four, as follows: Samuel W. Fordyce, Charles H. McKee, William C. Fordyce and H. E. Martin.

Kansas City Railway & Light Company.—The preliminary income account for the fiscal year ended May 31, 1907, compares as follows:

Year ended May 31—	1907.	1906.	1905.
Gross earnings	\$5,715,339	\$5,153,168	\$4,449,174
Operating expenses	2,909,136	2,596,539	2,235,260
Net earnings	\$2,806,203	\$2,556,629	\$2,213,871
Other income	9,440	9,671	16,588
Total income	\$2,815,643	\$2,566,300	\$2,230,462
Interest charges, etc.	1,765,870	1,644,524	1,501,862
Surplus for dividends	\$1,049,773	\$ 921,776	\$ 728,600
Preferred dividends	476,105	476,105	476,105
Surplus	\$ 573,668	\$ 445,671	\$ 252,495

At the annual meeting of stockholders in Jersey City on June 24 H. O. Coughlin was elected a director to succeed S. R. Knott.

Northern Ohio Traction & Light Company, Akron, O.—Application has been made to the New York stock exchange to list \$7,938,000 capital stock.

Pawcatuck Valley Street Railway, Westerly, R. I.—Boston papers state that a reorganization has been effected by a committee of bondholders, which is composed of E. P. Shaw, Jr., of the Boston & Worcester Street Railway and others. The company defaulted in its bond interest on November 1, 1906. A majority of the bonds and stock was held by W. L. Mauran and by an arrangement with the committee the outstanding \$100,000 first mortgage and \$40,000 second mortgage bonds were canceled, and a new mortgage of \$50,000 has been placed upon the property and \$14,000 contributed by the bondholders.

Poughkeepsie City & Wappinger Falls Electric Railway, Poughkeepsie, N. Y.—The New York railroad commission has approved the issue by this company of \$250,000 bonds for the purchase of cars and other equipment.

Spokane & Inland Empire Railroad, Spokane, Wash.—At the annual meeting of stockholders on June 15 the directors were re-elected. The directors re-elected the officers, as follows: F. A. Blackwell, chairman of the board; Jay P. Graves, president; F. Lewis Clark, first vice-president; A. L. White, second vice-president; W. G. Davidson, secretary; H. B. Ferris, treasurer. The foregoing, together with Aaron Kuhn, W. G. Graves and Waldo G. Paine, constitute the board of directors.

Tri-City Railway & Light Company, Davenport, Ia.—The capital stock will be increased from \$1,500,000 to \$2,500,000, in order to provide for the acquisition of the Davenport & Suburban Railway.

United Railways Company, St. Louis.—An issue of \$1,200,000 of two-year 5 1/2 per cent notes will be made. The proceeds will be devoted toward the retirement of \$1,500,000 of 6 per cent first mortgage bonds of the Citizens' Railway, due on July 1. The additional funds needed will be supplied from the treasury.

Utica & Mohawk Valley Railway, Utica, N. Y.—The New York railroad commission has given approval to an increase in the stock of this company from \$6,250,000 to \$7,500,000.

Dividends Declared.

- Aurora Elgin & Chicago Railway, Chicago, preferred, quarterly, 1 1/4 per cent.
- Boston & Worcester Electric Companies, Boston, preferred, \$2.00.
- Capitol Traction Company, Washington, D. C., quarterly, 1 1/2 per cent.
- Holyoke (Mass.) Street Railway, 1 per cent
- Johnstown (Pa.) Passenger Railway, quarterly, three-fourths of 1 per cent.
- New Orleans Railway & Light Company, preferred, quarterly, 1 1/4 per cent.
- Rochester (N. Y.) Railway, preferred, quarterly, 1 1/4 per cent
- Syracuse (N. Y.) Rapid Transit Company, preferred, quarterly, 1 1/2 per cent.
- Tri-City Railway & Light Company, Davenport Ia., preferred quarterly, 1 1/2 per cent.
- Washington Water Power Company, Spokane, Wash., quarterly, 1 3/4 per cent.
- West End Street Railway, Boston, preferred, 1 per cent

Manufactures and Supplies

ROLLING STOCK.

United Railroads of San Francisco, San Francisco, Cal., it is reported, is in the market for 50 cars.

Tampa & Sulphur Springs Traction Company, Tampa, Fla., placed an order a few days ago for six cars.

Galveston-Houston Electric Railway, Houston, Tex., under construction, is in the market, it is reported, for 20 cars.

Cleveland Southwestern & Columbus Railway, Cleveland, O., it is reported, has purchased a few large interurban passenger cars.

Hays Brothers Company, Arkansas National Bank building, Hot Springs, Ark., will be in the market for six cars soon. W. E. Mitchell, manager.

New York City Railway, New York, N. Y., has ordered 154 cars from The J. G. Brill Company and is also asking figures on all-steel cars for surface use.

Canadian Development Company, El Reno, Okla., is in the market for a complete street railway equipment. Harry Schafer, El Reno, Okla., manager.

The J. G. Brill Company, Philadelphia, Pa., has recently shipped 25 cars to the Lisbon (Portugal) street railway. The Brill company has supplied this road with over 200 cars.

Penn & Franklin Street Railway, now under construction from Wilksburg, Pa., to Pittsburg, it is reported has placed an order with the St. Louis Car Company for 10 closed cars.

Willamette Construction Company, which is building the Oregon Electric Railway, Portland, Ore., has placed an order with the American Locomotive Company for two electric locomotives.

New Orleans Railway & Light Company, New Orleans, La., which was reported to be in the market for a number of new cars, officially advises us that it has not yet definitely decided on the matter.

Utah Light & Railway Company, Salt Lake City, Utah, which is in the market for 62 cars, as reported in the Electric Railway Review of June 15, will place the contract for these cars on June 27.

Washington Railway & Power Company, Portland, Ore., which is building a street railway in Vancouver, Wash., is in the market, we are officially advised, for four passenger cars for city service, equipped with standard-gauge double trucks and good motors.

Buffalo & Lake Erie Traction Company, Buffalo, N. Y., as reported in the Electric Railway Review of June 15, has placed an order with the Cincinnati Car Company for 25 combination passenger and baggage cars. The specifications call for the following details:

Weight	\$6,000 lb.	Height, over all.....	13 ft.
Length	56 ft. 7 in.	Body	Wood
Width	9 ft. 4 in.	Underframe	Steel

Special Equipment.

Brakes	Westinghouse	Journal boxes	Symington
Couplers	Tomlinson	Lighting system.....	.....
Curtain material.....	Pantasote	.....	Holophane globes
Curtain fixtures.....	Protected groove	Springs	Triple elliptic
Heating system.....	Hot water	Trucks	Baldwin
Draft rigging.....	Tomlinson		

Birmingham Railway Light & Power Company, Birmingham, Ala., as reported in the Electric Railway Review of June 8, has placed an order for four closed passenger cars with the St. Louis Car Company. Delivery is to be made about September 1. The specifications call for the following details:

Seating capacity.....	40 passengers	Width, inside	7 ft. 4 in.
Weight	45,000 lb.	Over all	8 ft. 6 in.
Wheel base.....	6 ft. 6 in.	Height, track to trolley base..	.....
Length of body.....	29 ft. 7¼ in.	.....	12 ft. 3 in.
Over vestibule	39 ft. 1¼ in.	Body	Wood and steel
Over all	40 ft. 7¼ in.	Underframe	Steel

Special Equipment.

Air brakes	National	Safety tread	Q & C
Brakeshoes	M. C. B. type	Sanders	St. Louis
Center bearings.....	.....	Seats	Heywood Bros.
.....	Symington ball bearing	Side bearings	Baldwin
Couplers	St. Louis	Trucks	Baldwin
Curtain fixtures.....	Forsyth cable	Gongs	Brill Dedenda
Curtain materials	Pantasote	Hand brakes	Wheel
Destination signs	Hunter's	Heating system.....	Consolidated
Fenders	Emery	Headlights .....	.....
Gears and pinions.....	.....	.....	Combination Frisco type
.....	E. W. Bliss & Co.	Interior finish.....	Mahogany
Journal boxes	M. C. B. type	Journal bearings.....	M. C. B. type
Markers	Lintern	Varnish	Hildreth
Motors.....	4 GE-57	Vestibule	Full
Paint.....	Olive green		

Scioto Valley Traction Company, Columbus, O., which was reported in the Electric Railway Review of June 22 to have ordered four express trail cars, officially advises us that these are second-hand 50,000-pound capacity railroad box cars. They are being over-

hauled, repainted and equipped with Standard rolled and forged steel wheels, Van Dorn automatic couplers and standard Westinghouse automatic air brakes.

Elkins Electric Railway, Elkins, W. Va., which was reported in the Electric Railway Review of June 22 to be in the market for a few electric motor passenger cars, officially advises us that it will also be in the market for regular passenger and freight equipment in the near future.

Chicago City Railway, Chicago, Ill., was reported in the Electric Railway Review of April 13 to have placed an order for 300 cars with The J. G. Brill Company. This order has been divided among the Brill plants, as follows: G. C. Kuhlman Car Company, 150; The J. G. Brill Company, 100, and the American Car Company, 50.

SHOPS AND BUILDINGS.

Augusta & Columbia Railway, Augusta, Ga.—This company has purchased a site on which it proposes to erect terminals to cost about \$250,000.

Cleveland Southwestern & Columbus Railway, Cleveland, O.—It is reported that this company has purchased property at Wellington, O., on which to build car houses and a station. The station will consist of a ticket office and waiting, baggage and express rooms.

Consolidated Railway, New Haven, Conn.—This company will immediately start the erection of a station at Luna Park and Charter Oak Park. The plans call for a platform, with a granolithic surface, 25 feet wide by 125 feet long. Over it will be a roof supported by turned wood pillars. It will be built on the company's private property.

Fresno (Cal.) Traction Company.—This company received bids on June 25 for the construction of the car houses and machine shops that have been under consideration for some time, as reported in the Electric Railway Review of April 20.

Lima & Toledo Traction Company, Lima, O.—This company, it is reported, has made a proposition for property in Toledo, O., on which it will erect a large passenger and freight station and also a car house.

Nashville (Tenn.) Railway & Light Company.—This company has appropriated \$10,000 to remodel its transfer station building. Work has been under way for some time and will require four months.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—This company has decided not to erect a new car house on the site recently bought for that purpose, as reported in the Electric Railway Review of May 11. At a meeting of the directors it was decided to sell the property to the St. Joseph hospital, which was anxious to prevent the erection of the car house because of its proximity.

Paris (Ill.) Traction Company.—This company will build a car house, 50 by 120 feet, on a lot donated by the Commercial Club.

Pittsburg Harmony Butler & New Castle Street Railway, New Castle, Pa.—This company has closed a long-time lease on property in Butler, where it will erect a car house, 30 by 80 feet, to accommodate 10 cars. The second story of the building will be devoted to the offices of the company.

Rockford & Interurban Railway, Rockford, Ill.—It is reported that this company will erect a machine shop on First avenue, opposite its car houses.

Springfield (Ill.) Consolidated Street Railway.—This company has awarded the Culver Construction Company the contract for erecting a car house in Springfield.

Springfield (Mass.) Street Railway.—The construction of a modern electric car house will be started by this company this year, on its property at North Main and Hooker streets. The building will have a capacity of 100 cars and will cost from \$150,000 to \$200,000. It will be built of brick, one story high, and set well back on the property owned by the company. In connection with the storage part of the building there will be repair shops, equipped with the newest machinery. Outside there will be plenty of room for a yard, with track space for a large number of cars.

Utah Light & Railway Company, Salt Lake City, Utah.—Plans for this company's new car houses and repair shops have been practically completed and work on them will commence early in July.

TRADE NOTES.

Westinghouse Machine Company, Pittsburg, Pa., has declared its regular quarterly dividend of 2½ per cent, payable on July 10.

Manning, Maxwell & Moore, Incorporated, New York, has declared a regular quarterly dividend of 1½ per cent, payable on July 1.

Barrett Manufacturing Company, New York and Chicago, whose Chicago plant was burned recently, will rebuild at West Twenty-fifth and Fuller streets, Chicago.

United States Graphite Company, Saginaw, Mich., is successfully exploiting its lubricating graphited oil. It is based upon this principle: Amorphous graphite, when reduced to an impalpably fine powder, and when mixed with oil in the proportion of about one teaspoonful to the pint of oil, will remain in perfect suspension long enough to feed through lubricator tubes without clogging.

Thus every drop of oil carries its mite of graphite to the bearing surface.

Westinghouse Air Brake Company, Pittsburg, Pa., has declared a quarterly dividend of 2½ per cent, and an extra dividend of 2½ per cent, both payable on July 10.

E. D. Edmonston, recently chief engineer of the American Construction Company, New Orleans, La., has joined the engineering staff of W. S. Barstow & Co., New York and Portland, Ore.

Sturtevant Engineering Company, 147 Queen Victoria street, London, Eng., European representative of B. F. Sturtevant Company, Boston, Mass., has recently opened an office at 2 Rue Lebeau, Brussels.

F. W. Rowe has been made assistant purchasing agent of the General Electric Company, Schenectady, N. Y. Mr. Rowe has been purchasing agent of the Aultman & Taylor Machinery Company, Mansfield, O.

W. W. Adams has been appointed manager of the Pittsburg and Buffalo offices of the Browning Engineering Company, Cleveland, O. The Pittsburg office is in the House building and the Buffalo office in the Erie County Bank building.

The J. G. Brill Company, Philadelphia, Pa., is offering, through Edward B. Smith & Co., bankers, Philadelphia and New York, a \$5,000,000 issue of its 7 per cent cumulative preferred stock. This stock is offered at par and accrued dividends.

Ridgway Dynamo & Engine Company, Ridgway, Pa., manufacturer of engines and dynamos, has appointed Samuel W. Hays' Sons, 302 Farmers' Bank building, Pittsburg, Pa., as its sales agents in the Pittsburg district, northern West Virginia and southeastern Ohio.

Harrington Signal Company, New York, N. Y., has been organized with \$50,000 capital stock to manufacture railway materials and devices. Those interested are: George W. Sweeney, Victoria hotel; Edward M. Tierney, Marlborough hotel, and Samuel H. Harrington, 120 Liberty street, all of New York.

Wallace Supply Company, Chicago, on account of fire at its old address, 18 West Washington street, has recently removed its offices and works to 19 South Jefferson street, where it has installed increased facilities for handling its double-door fixtures and other railway specialties.

I. R. Nelson & Co., Newark, N. J., on account of increasing business, have leased a small factory, 43 Lawrence street, Newark, where they will handle their electrical repair work. They are specialists in street railway shop work and economical maintenance of rolling equipment.

Lewis Motor & Crane Company, Camden, Me., has been incorporated with a capital stock of \$10,000 for the purpose of manufacturing electric motors, cranes, etc. The officers of the company are: President, G. E. Allen; treasurer and clerk, R. Robinson, both of Camden, Me.

New York Air Brake Company, New York, re-elected all of its retiring directors at the annual meeting of stockholders. President Starbuck announced that the company's business established a new record for the month of March, and that enough business has been booked to keep its plants busy for six months.

Allis-Chalmers Company, Milwaukee, Wis., reports that during the month of May it shipped from its works 553 cars of machinery—a gain of 20 cars over the record established for April. In April the aggregate weight of shipments was 21,680,847 pounds, while in May the figure had risen to 23,772,242 pounds, making a total weight for the two months of 45,463,089 pounds.

Crocker-Wheeler Company, Amper, N. J., announces that in order to handle its mass of business in electric generators and motors in southern Ohio, the Cleveland office of the company has found it advisable to open a sub office in the Columbus Savings & Trust Company building, Columbus, O., which will be in charge of Charles W. Cross, formerly of the Cleveland office of the company.

National Railway Signal Manufacturing Company, Wheaton, Ill., announces the recent installation of its positive block signal on the Aurora division of the Aurora Elgin & Chicago Railway, and the company is also installing several of its highway crossing signals on the third-rail division of this road. The Chicago & Milwaukee Electric Railroad Company has recently placed an order with it for highway crossing signals.

Northern Engineering Works, Detroit, Mich., reports the following recent shipments of cranes for power station service: A 24-ton capacity 62-inch span crane for the Buffalo & Susquehanna Coal Mining Company, Sagamore, Pa.; a 6-ton capacity 36-inch span crane for the Winchester & Washington City Railway, and a 5-ton capacity 36-inch span crane for the Watertown Electric Light Company.

Rushmore Dynamo Works, Plainfield, N. J., has let contracts and is breaking ground for a new factory and power house. The main building, which is to be used exclusively for the manufacture of lighting apparatus and generators, will be 50 by 250 feet, and two stories high. The offices and lens grinding department will occupy the upper floor, while the lower floor will accommodate the stamping and drawing presses and other machine tool equipment.

Los Angeles Switch & Signal Company, Los Angeles, Cal., has been incorporated in California with a capital stock of \$500,000, to manufacture electro-fluid-hydraulic automatic switches, circuit-closers, crossing appliances, audible signal devices and other railway appliances. Its offices are at 315 Union Trust building,

Los Angeles, Cal. R. B. Sumner is secretary and general manager. The other incorporators are: Dr. W. J. Bell, Oliver C. Bryant, Roger S. Page and W. E. McVay. The company's factory is expected to be in operation in about thirty days.

Elastic Metallic Packing Company, Camden, N. J., has recently been incorporated in the state of New Jersey with a capital stock of \$30,000, to manufacture packing for engines, etc. The incorporators are: Charles E. Paul, 655 North Forty-fourth street, Philadelphia; Paul F. Quinlan, 91 South Wycombe avenue, Lansdowne, N. J.; James M. Meade, 5411 Haverford avenue, Lansdowne, N. J.

Cowling Engineering Company, Cleveland, O., is making rapid progress in the erection of its structural iron plant at Collinwood, O., which is near Cleveland. The plant will consist of three buildings, 100 by 450 feet, of brick and steel construction, and will have an annual capacity of 100,000 tons. One of the buildings and the template shop will be completed by the first of August. The office building, two stories high, has been completed, and the office force is now moving in. The Cowling Engineering Company is just finishing its work on a building for the Cleveland hippodrome, which contains 5,300 tons of structural steel.

Independent Pneumatic Tool Company, Chicago, states that its business since the first of January has shown a remarkable increase over the corresponding period last year. The company is operating its plant day and night in order to meet the demands for its products. Sufficient orders have been booked by the company to keep the plant running for several months, notwithstanding the fact that recently the manufacturing facilities of the plant were increased 50 per cent. Before the end of the present year the company expects to double the present capacity of the plant. While the domestic business has shown the greater increase, a large number of orders for export have also been received.

Blake Signal & Manufacturing Company, 246 Summer street, Boston, Mass., reports that its tube flux is finding ready sales among all classes of consumers. In addition to quantities of small orders from numerous telephone companies, some recent and large orders have been received from the following: Union Switch & Signal Company, Pennsylvania Steel Company, Long Island Railroad, Boston & Maine Railroad, Milford & Uxbridge Street Railway, Kny-Scheerer Company, Johns-Pratt Company, Electro-Dynamic Company and the Emerson Electric & Manufacturing Company. All of these orders materialized after a trial of samples.

Miller Anchor Company, Norwalk, O., has just received notice that the Washington Baltimore & Annapolis Electric Railway will use 2,800 of the Miller Safety anchors along its right of way between Baltimore and Washington. About two months ago the Roberts & Abbott Company, Cleveland, O., engineers in charge of the construction of this electric railway, made a very thorough test of four different makes of anchors in the sand and clay ground along this line, and after careful consideration of all the anchors tested, decided to use the Miller safety anchor. The Chicago & Milwaukee Electric Railroad has just placed orders for 2,000 of the Miller No. 3 anchors.

A. A. Lane, engineer, for some years past with the Taylor-Wilson Manufacturing Company, Pittsburg, Pa., has been engaged by the General Fireproofing Company as office manager in the reinforced concrete department, at Youngstown, O. Mr. Lane has enjoyed a wide experience in construction engineering, having been in charge of extensive operations with a number of companies, among them being the H. B. Camp Company, Akron, O., and the National Fire Proofing Company. During his connection with the Taylor-Wilson Company Mr. Lane was instrumental in the design and supervised the construction of its new plant at McKees Rocks, Pa., including its reinforced concrete machine shop.

Preston Player has opened an engineering office at 15 State street, Boston, Mass., with the object of electric railway, light and power examinations and reports. Mr. Player is a graduate of Harvard and the Massachusetts Institute of Technology, with a broad experience in the operating, executive and analytical features of public service corporation work. Several years ago he was associated with the Walker Company of Cleveland, and later he took a course at Cornell University. Mr. Player spent about four years with the Stone & Webster interests of Boston, including the superintendency of the Brockton Edison Company and the managership of the Blue Hill Street Railway. For about two years he was associated with Messrs. Jackson & Curtis, bankers, of New York and Boston.

Western Wire Sales Company, 324 Dearborn street, Chicago, announces that it has been made western sales agent for the Bay State Insulated Wire & Cable Company, Hyde Park, Mass. This company has recently been organized and has a promising future. Besides having a large capital and an up-to-date factory it has at its head Andrew J. Conlin, who for the past 17 years has been associated with the Simplex Electric Company as general superintendent. Mr. Conlin in these years developed the product of this company to its present high standard until the Simplex wires and cables are favorably known everywhere, and his knowledge and vast experience will doubtless put the products of this company on the highest basis. J. H. H. McNamee, the treasurer and general manager of the new company, who is well known throughout New England, is one of the prominent men of that section of the country. Among his other public offices he has been the mayor of Cambridge, Mass. Outside of the regular lines of rubber and lead covered insulated wires and cables, this company is making a specialty of railroad signal wire, to meet any specifications, 30 per cent pure para rubber insulated wires and cables, mining cables, flame-proof wires, telephone wires, etc.

ELECTRIC LOCOMOTIVES FOR INDUSTRIAL HAULAGE.

The advantages resulting from the use of electric locomotives for surface and industrial haulage are being generally recognized. This is evidenced by the increasing demand for this class of locomotive. The absence of smoke and cinders and of coaling and watering stations, together with the comparatively small amount of attention required by electric locomotives, are only a few reasons for the success of this class of motor in light industrial service.

The Baldwin Locomotive Works makes a specialty of building electric locomotives for all classes of surface haulage, the electrical equipment being furnished by the Westinghouse Electric & Manufacturing Company. These engines are frequently required to operate under special conditions, and designs must be modified



Electric Industrial Locomotive—Narrow Gauge.

accordingly. The electric locomotive can readily be adapted to operate on lines where the clearance limits are restricted, or where there are few facilities for maintaining the power.

The accompanying photographs illustrate two Baldwin-Westinghouse locomotives recently built for industrial haulage. The locomotive for the Carpenter Steel Company is of the single-end mining type, with a cab at the operating end. As the track gauge of this engine is only two feet, the frames are placed outside the wheels. The frames are supported directly on the journal boxes, through coiled springs. Four sand boxes are provided; they are cast in one piece with the frames and have spouts to all the wheels. The bumpers are of cast iron, with suitable draw pockets. Hand-brake equipment is provided, with brakeshoes on all the



Electric Industrial Locomotive—Standard Gauge.

wheels. The cab is substantial in construction. It has sliding doors and drop windows, and is so arranged that the motorman has an unobstructed view when running in either direction. The motor at the front or cab end of the locomotive is hung between the wheels, while the rear motor is outside-hung. The equipment includes a gong and two headlights, which are placed under the eaves of the cab.

General Dimensions.

Service	Surface haulage	Journals	3¼ by 5½ in.
Gauge	2 ft.	Width	3 ft. 8 in.
Motors ..	Two, No. 61, 250 volts	Height	6 ft.
Diameter of drivers.....	24 in.	Length	9 ft. 7 in.
Wheel base	3 ft. 2 in.	Weight	9,500 lb.

The locomotive built for the J. L. Mott Company differs materially in design from the one previously described. As this locomotive operates on standard-gauge track, the frames are conveniently placed inside the wheels. The bumpers are of cast iron,

equipped with M. C. B. automatic couplers. The wheels are of solid rolled steel, manufactured by the Standard Steel Works. Hand-brake equipment is provided, also four sand boxes, with spouts for all the wheels. The cab is of wood; it is centrally located, thus leaving a platform at each end of the locomotive. Convenient steps and handrails are provided. The motors are outside-hung, thus leaving space between the wheels for other equipment.

General Dimensions.

Service	Industrial	Journals	4 by 6 in.
Gauge	4 ft. 8½ in.	Width	6 ft. 4 in.
Motors ..	Two, No. 131, 220 volts	Height	9 ft. 6 in.
Diameter of drivers.....	30 in.	Length	11 ft. 4 in.
Wheel base	5 ft.	Weight	17,000 lb.

These are but two representatives of a large number of Baldwin-Westinghouse electric locomotives recently constructed for special service. Other designs have been built and are successfully operating under the various and difficult conditions so frequently encountered in mine or industrial haulage.

MALLEABLE IRON TIE PLATES.

As the weight and speed of interurban cars increase the desirability and necessity of maintaining the track in true surface and alignment are daily becoming of more importance. The volume of traffic handled by interurban railways depends to a great extent upon the safety and comfort of travel. From a financial standpoint the maintenance of track is important. Good track also reduces accident losses. A large proportion of the total operating expenses of a railway is spent in maintaining track and roadway, therefore any improvement in the track structure which can be made at moderate cost and will tend to lessen the expense of maintenance should well repay for the money invested in it.

The cost of ties is rapidly increasing as the supply of wood suitable for this purpose diminishes and any device that will increase the life of the ties and lessen the labor required to keep

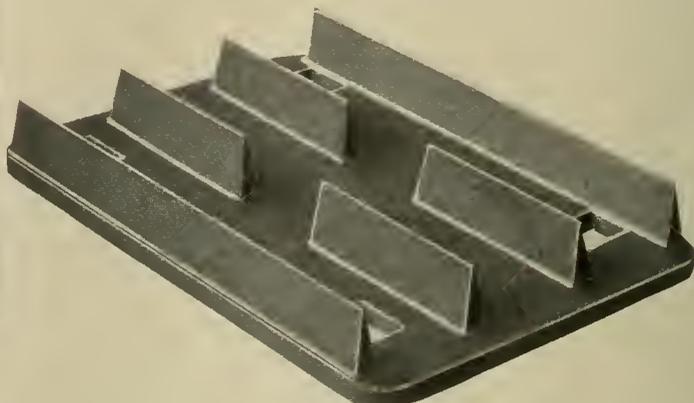


Malleable Iron Tie Plates—Top View of Plates for Tangents (Right) and for Curves (Left).

track in surface should not be overlooked. By adzing the surface of worn-out ties under the rails and inserting tie plates the cost of new ties frequently can be saved.

Several years' experience has demonstrated that the malleable iron tie plate affords the properties of an efficient track fastening. It is effective in preventing the rail flanges from cutting into soft wood ties, also oak ties and frog and switch timbers subjected to the severest traffic. It is an under-support holding the rails in a perpendicular position and prevents the rolling or canting, especially on curves.

Tie plates, properly settled in the tie and spiked, prevent the



Malleable Iron Tie Plates—Under View, Showing Ribs.

spreading of gauge by securing the help of the inside, as well as the outside spikes, because the outside spikes cannot be crowded without drawing the inside spikes with them.

By preventing the cutting-in of ties the undulations of the rails are reduced and the creeping of track thereby minimized. The plates provide a uniform support to the rail on every tie without reference to its age.

Because of the rapid destruction of steel tie plates, caused by the effect of corrosion from the action of the atmosphere, and also from the fact that in a steel plate it has been impossible to roll a shoulder and flange on the plate, a number of large railroads have experimented with malleable iron tie plates, with the result that a number of the larger systems have adopted the malleable iron plate as a standard. This is because the malleable iron plates

mit the commutator to wear down evenly and prevent sparking. The brush holders on these motors are two in number, having from two to four carbon brushes each, depending upon the size of the motor. The brushes slide in finished ways and are pressed against the commutator by independent fingers, which give a practically uniform pressure throughout the working range of the brushes. A pig tail shunt is provided between the fingers and the brush-holder body to prevent the current passing through the spring or pivoting pins. The brush holders are adjustable to allow for wear of the commutator, and are securely clamped in the proper position. They can be readily removed through the opening in the frame over the commutator.

Ventilation and Pinions.

Particular attention has been given to the ventilation of these motors. Free circulation of air between the interior and the exterior of the motor can be obtained. The armatures are so constructed that when running a large volume of air is drawn into the interior of the core and expelled through ducts opening along the exterior. Good ventilation with the small mechanical and electrical losses obtained in these motors keeps them cool. This greatly adds to their service capacity. The gears for these motors are made of cast steel of special quality, extra hammered to improve the quality of the metal. The gear teeth are accurately cut, and the width of face and pitch is such as to insure ample strength. The gear cases are made of malleable iron and are suspended at three points from the magnet frame to prevent vibration. Strengthening ribs radiate from the supporting points to prevent the case from cracking.

Suspension.

In the box frame type of motors, the front of the frame is provided with a lug which rests on a bracket secured to the truck transom. The motor is prevented from rising by a forged strap bolted over the top of the lug. When the truck is out from under the car, motors can be mounted on or taken off the truck from above, no pit being required. In the case of the split frame motors, lugs are cast on the upper half of the frame, to which a suspension bar is bolted. The lower half of the motor frame can be swung down for inspection and repairs without disturbing the rest of the motor.

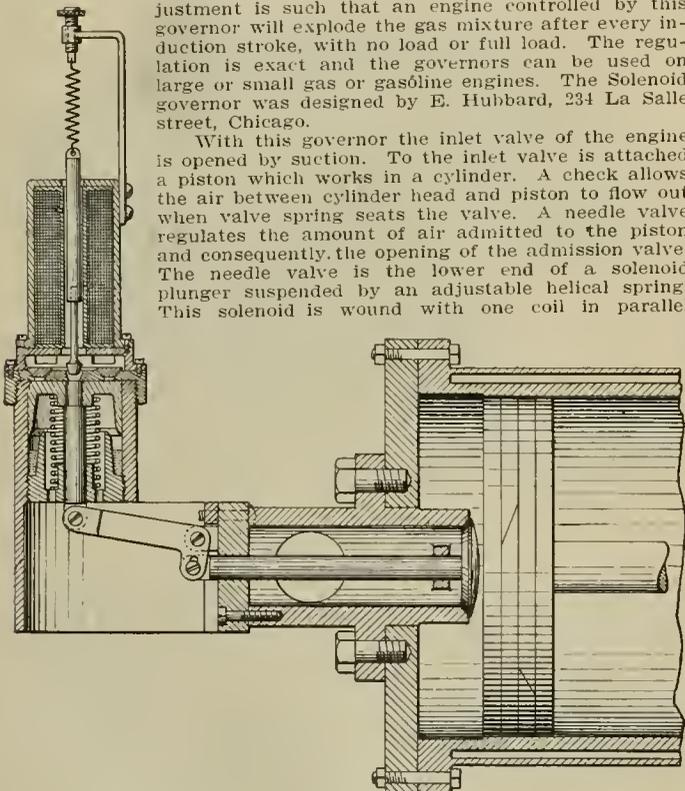
Rating.

The capacities of these motors for continuous service are high, owing to their good electrical efficiency and ventilation. The ratings of the motors are based on a temperature rise by thermometer of not more than 75 degrees C. above the surrounding air taken at 25 degrees C. after an hour's run at rated load and voltage. Motors are wound for operation at 600 volts as standard and have a liberal margin of safety at this voltage, as good commutation is a special characteristic of this type of motor.

THE SOLENOID GAS ENGINE GOVERNOR.

A new governor has been perfected that is said to absolutely control the regulation of a gas engine automatically, and keep the engine at the required and a steady speed. The "solenoid governor" is a development along new lines. Its adjustment is such that an engine controlled by this governor will explode the gas mixture after every induction stroke, with no load or full load. The regulation is exact and the governors can be used on large or small gas or gasoline engines. The Solenoid governor was designed by E. Hubbard, 234 La Salle street, Chicago.

With this governor the inlet valve of the engine is opened by suction. To the inlet valve is attached a piston which works in a cylinder. A check allows the air between cylinder head and piston to flow out when valve spring seats the valve. A needle valve regulates the amount of air admitted to the piston and consequently the opening of the admission valve. The needle valve is the lower end of a solenoid plunger suspended by an adjustable helical spring. This solenoid is wound with one coil in parallel



Application of Solenoid Gas Engine Governor.

with generator field and one in series. The relation of the series to the parallel coil can be varied to get a drop in speed when load goes off, to get the same speed with a change of load or to get a rise in speed when load goes off, or vice versa.

From the results of actual tests it appears that any regulation can be obtained, either slower with no load than with full load, or constant speed with or without load. The device is simple, not liable to get out of order and controls the speed of the engine within any predetermined limits.

Atlantic City Convention Bulletin.

George B. Keegan, secretary of the American Street and Interurban Railway Manufacturers' Association, has issued a bulletin in regard to the arrangements for exhibits at the Atlantic City convention, October 14-18. The steel pier, on which the exhibits are to be located, extends into the ocean about 1,600 feet. It has recently been widened and reinforced and under arrangements made by the Manufacturers' association, there will be available on the steel pier about \$3,000 square feet of exhibit space, exclusive of aisles, which is the largest area the association ever had. Nearly 60,000 square feet will be provided with the same plant of inside and outside booths installed for the M. M. and M. C. B. conventions in June. On account of having made very favorable arrangements, the Manufacturers' association announces that this space provided with booths can be had for the low rate of 20 cents per square foot, this charge being made for the erection and use of booths, with no charge for floor space.

The remaining space, on which no booths are erected, will be given free of cost, but, of course, it will be necessary for the exhibitors using this space to erect their own booths. There will also be track space for track exhibits in close proximity to the steel pier.

Electric current, both alternating and direct, will be available, as well as steam and compressed air.

Atlantic City is easily accessible for the shipment of materials and arrangements have been made whereby it can be guaranteed that there shall be no exorbitant charges for cartage or labor, skilled or unskilled, and that the regular rates prevailing in Atlantic City shall obtain.

The membership fee has again been fixed by the executive committee at \$35 for the current year, and each membership entitles the member, without charge, to four badges, each entitling holder and lady to all the privileges of the convention and to such entertainments as may be provided.

The Marlborough-Blenheim hotel will be the headquarters hotel for the Manufacturers' association.

The flattering reports from a large number of the members at Columbus last year as to results obtained through the convention prove conclusively the value of this association, and with the organization on its present businesslike basis and the favorable outlook for Atlantic City the next convention promises to surpass every street railway convention ever held.

Correspondence regarding exhibits and applications for space should be addressed to Mr. George Keegan, secretary, 13-21 Park Row building, New York City.

ADVERTISING LITERATURE.

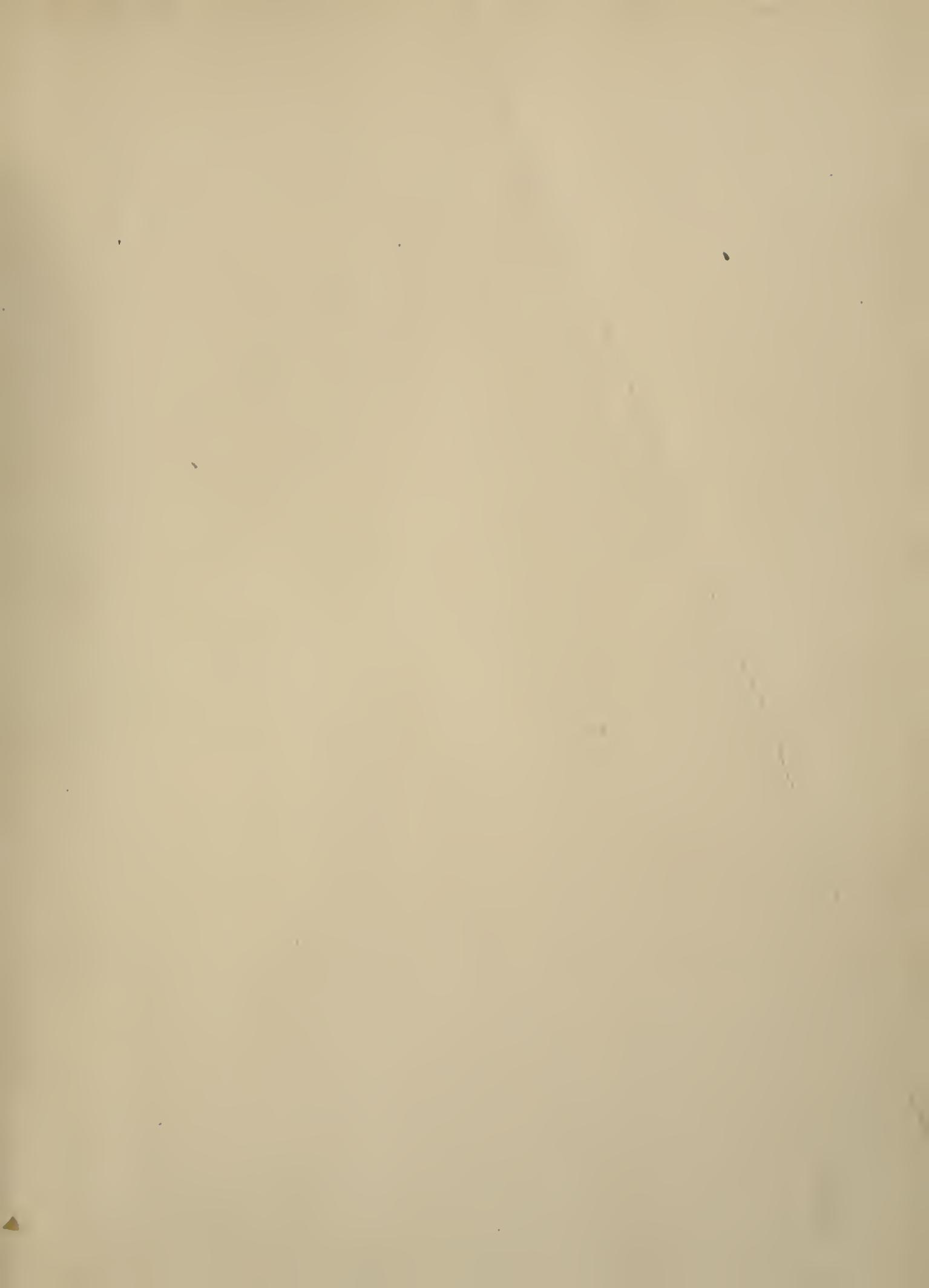
Allis-Chalmers Company, Milwaukee, Wis.—Leaflet No. 4006 describes the Allis-Chalmers belted generators, type AB alternator, which are especially adapted for lighting and power plants in small towns, factories, public and private institutions, office buildings, etc.

General Electric Company, Schenectady, N. Y.—Electrically operated ratchet driven rheostat switches have several advantages over other remote control means of operating rheostats. In Bulletin 4510 recently issued by the transformer department of this company, these advantages are pointed out, and a description is given of a simple, compact and efficient form of rheostat switch now being placed by it on the market.

Drummond's Detective Agency, 1 Ann Street, New York City.—A somewhat novel advertising idea is a couple of index cards of standard library size, which are being sent by the Drummond's Detective Agency to corporations throughout the country. The card, entitled "Strike-Breakers," contains on the face the address of this agency; on the back information regarding the plan pursued in strike breaking, and the cost and advantages thereof. The card entitled "Detective Work" also contains on the face the name and address of the agency and on the back a statement regarding the class of work handled by it.

Russell Car & Snow Plow Company, Ridgway, Pa.—The company's catalogue just issued illustrates and describes the Russell combination car and snow plow, as also the several other styles of Russell snow plows for use on electric railways. Inclosed with the catalogue is a set of four winter scenes showing snow conditions and the Russell railroad plow in action on the Sarles branch of the Great Northern Railroad in January, 1907. The scenes indicate the severity of the snow conditions and the efficiency of the Russell plow. The company's plows for use on electric railways are designed on the same general lines as its steam railway snow plows and it therefore feels justified in making the claim that it manufactures also the best snow-fighting equipment on the market for the use of electric railways.

London Underground Railway Completed.—The last link of the late Charles T. Yerkes' tube system of underground railroads for London was opened on June 22. The new line, which connects the northern suburbs with the heart of London, is eight miles long. It was begun in 1903, runs on an average 60 feet below the surface and cost \$25,000,000. A party of financiers and officials attended the opening ceremony, which was followed by a luncheon. The public were permitted to travel free during the afternoon and evening and were given souvenirs of the opening of the road.









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