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CONTENTS.

WHAT SHALL IT BE NAMED?

Pictures produced by the process discovered by Prof. Roentgen are called by various names. Several distinctive titles have been suggested, such as "Electrograph," "Skotograph," "Shadowgraph," etc. If there is any possible way to gain common consent for the adoption of a proper word it should be done. Above all do not let a name come into use that is not based on reason, and is meaningless in itself. A denizen of the Fort' Ward could coin a word, but don't let him.

THE BERLINER TELEPHONE PATENT.

A motion was made in the Supreme Court of the United States, Washington, on February 3, by Attorney-General Harmon, as special counsel for the United States, to advance the Berliner telephone patent case for an early argument in next term of the court, and Messrs. Fish and Storrow said they would not oppose it. The brief in support of the motion sets out that the suit is brought to obtain the repeal of the patent granted to the American Bell Telephone Company, as assignee of Emil Berliner, the alleged inventor, on the ground that the application for it filed in 1877 was not issued until 1891, it being unnecessarily delayed in the Patent Office, the assignee promoting said delay for its own interest and in fraud of the rights of the public and in violation of its duty to the public; that said Berliner patent practically controls the art of telephony, and having been thus delayed until 1891 (the patent of Alexander Graham Bell for the speaking telephone expiring in 1893), operates to prolong the control of the art of telephony for fifteen years beyond the time when, by the expiration of the said Bell patent, such control should rightfully cease; that said patent was granted by the Commissioner of Patents without authority of law, being for the same invention for which patent had been granted to the same applicant in November, 1880.

"If the United States," the brief says, "are right in their contention that the Berliner patent, for the reasons stated, ought to be repealed, it is of great importance to the public that the repeal should not be unnecessarily delayed."

PROF. ROENTGEN'S GREAT DISCOVERY.

One of the most remarkable features of Prof. Roentgen's discovery is the suddenness with which it revealed to our senses such great possibilities. How thin a veil hid these wonders from us, and how puny and insignificant man seems when we think what little things block his progress! Another interesting fact connected with the discovery is the ease with which it can be repeated; every one having the simple means at hand has already produced cathode pictures with more or less successful results, thus demonstrating the simplicity of the tremendously important fact that was for so long hidden from our senses. To give a detailed account of the work of the different experimenters throughout the United States would fill a book, but wonderful things are being done in the direction of practical application. Mr. Edison has taken up the subject in earnest for the purpose of determining the best degree of exhaustion of the tubes, the permeability of different substances to the rays, and other such important facts that will be necessary to know in order to premise results. Any one with the simple apparatus can make a picture by the new process, but what should be known is, what are the best conditions for the work under varying circumstances. Prof. M. I. Pupin is doing some excellent work, and took a picture a few days ago actually showing the curvature of the lens of an eyeglass, and proving the opacity of glass to the cathode rays. Mr. Edison proposes to photograph the brain of a person—at least he is going to try to do so. Other experimenters have photographed different portions of the human anatomy with sufficient success to promise wonderful results in this line. In a letter from Prof. H. S. Carhart, of the Ann Arbor University, that gentleman informs us that he had, at the date of writing—February 8—"succeeded in getting one pretty good photograph. Prof. Trowbridge, of Harvard; Prof. Magie, of Princeton; Prof. Wright, of Yale, and many others have experimented with the new rays and produced pictures, and the good work is being developed in numberless places. We look for some wonderful revelations and possibly other discoveries as a result of Prof. Roentgen's work, and it is simply useless to predict where the thing will end.

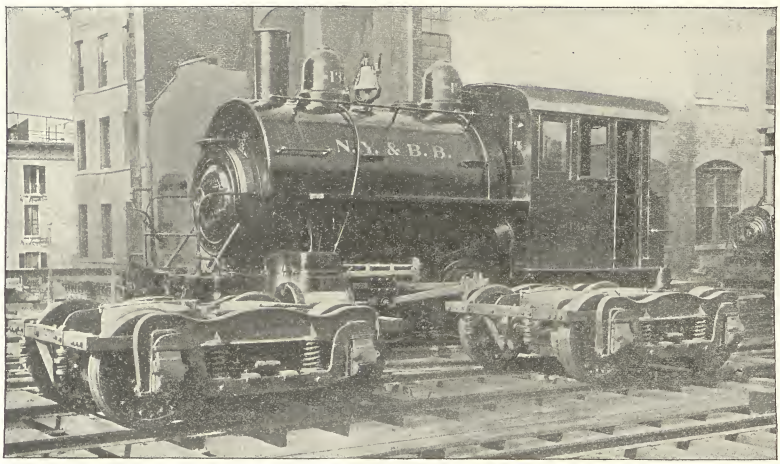
TEST OF MOTOR CARS ON THE BROOKLYN BRIDGE.

The first official exhibition of electricity as applied to the switching of the cars on the Brooklyn Bridge was made February 8, at 11 A. M., in the presence of President Howell, Vice-President J. Seaver Page and Trustees Keeney and Henriques. The motor car was coupled to three of the ordinary passenger cars, and the complete train of four cars was switched by the motors from the incoming to the outgoing platforms and thence to the cable sheaves several times. The car was then taken over the complete Bridge circuit twice. Complete satisfaction was expressed by the President and by Chief-engineer C. C. Martin at the manner in which the work was performed.

The use of electricity in place of steam for switching the cars at either end of the Brooklyn Bridge has been recognized as the only suitable method ever since the electric railway motor became a practical fact. But not until the motor had been adapted to heavy train service and had proved successful on the West Side Elevated Road at Chicago, the Nantasket Beach Division of the New York, New Haven & Hartford R. R., and on the Baltimore and Ohio into requisition and assist the trains over the summit. Moreover, during the early morning hours when traffic has become light and the cable is no longer running the trains can be operated by motor cars as they are now by the locomotives. The eventual outcome will probably be the exclusive operation of the Bridge Railroad by these motor cars. Meanwhile they will switch the trains, and as each train is equipped with its own switching power—the motor car— all the interference which the steam locomotives have hitherto placed in the way of the incoming and outgoing trains will be done away with and the complexity of the switching be greatly reduced.

Car No. 76, one of the regular passenger cars of the Brooklyn Bridge, has been selected to receive the first electrical equipment. All the apparatus, with the exception of the controlling handles and circuit breakers, will be placed out of sight beneath the floor of the car. The ordinary light Pullman trucks on which it has hitherto run and the cable grip mechanism have been removed. Heavier trucks were necessary to carry the motors. These were supplied by the McGuire Company of Chicago and combine the best features of the passenger and locomotive truck.

The general character of the motor equipment is similar



BROOKLYN BRIDGE MOTOR CARS—SIDE VIEW OF MOTOR TRUCKS.

main line, did its employment in the Bridge service become possible.

To enable the trustees and the engineer the better to judge of the advantages which electric power might offer over the steam power hitherto employed for switching service, bids were called for the proposed electrical equipment. Consideration was only given, however, to two propositions, that of the General Electric Company, which had already fully developed apparatus applicable to heavy electrical traction work, and which equipped the three roads above mentioned, and that of the Westinghouse Company. The latter concern declined, but the General Electric Company responded, offering to fully equip one car, operate it for thirty days and at the end of that time, if the result were not satisfactory, to restore the car to its original condition and bear the cost of the experiment.

If the general plan adopted at first prove economical as well as satisfactory, a certain number of cars will be equipped with four motors, one on each axle. These cars are to be known as motor cars, and each will remain with its own train at all times, switching it from the incoming to the outgoing tracks and pulling or pushing it over the tilting sheaves, when the grips will take up the cable and the motors cease work. Should the grips slip while the train is mounting the 3.73 grade, the motors can come again to that in use on the Chicago Elevated and Nantasket Beach roads above mentioned. The motors are known as the G. E. 1200, from the fact that under normal conditions each will exert a horizontal effort of 1200 lbs., when mounted on a 33-inch wheel. Four of those motors are employed, one to each axle, or two to each truck. They are completely incased and are water and dust-tight. The armatures are of the well-known iron-clad type, the windings being sunk into slots in the armature core. The Eickemeyer winding is used on the armature. By this method the crossing of two wires of large difference of potential is avoided.

The insulation is substantial and each segment of the commutator is of hard drawn copper. The armature is mounted on a sleeve keyed to the shaft, which may be withdrawn without interfering with the armature structure. The field frame is of cast steel. The ratio of reduction between the armature shaft pinion and the wheel gear is 3.5 to 1.

Each motor weighs about 3,000 lbs. With this equipment and the regular train a speed of about 15 miles an hour may be obtained. Each motor is suspended on the truck from two trunnions in the upper field set in two bars, the outer ends of the bar resting on elliptical springs. The axle is thus relieved of nearly all the weight of the motor.

At the base of each motor, facing the ends of the car, is a small roller which depresses the cable and allows it to pass the motor without injury, while a long iron bar runs beneath the truck and depresses the tilting sheaves, preventing them from striking the motor.

The operation of the motors is controlled by series-parallel controllers of the L 4 type, which have given such general satisfaction on the Chicago roads.

The indicating dial of the controller is placed at the top of the platform rail and is lettered "series," "multiple," and "off," showing exactly the position of the controller itself. The reversing handle is a jointed handle, which can be placed on or taken off the reversing switch spindle only when the controller handle points to the "off" position, showing that there is no current in the motors at that moment. The controller itself has no effect until the long arm of this jointed handle is dropped into the "forward" or "reversing" notches in the reversing handle plate. There are two controllers, each operated from its own platform and either controller will operate the four motors or any two of them, as may be desired.

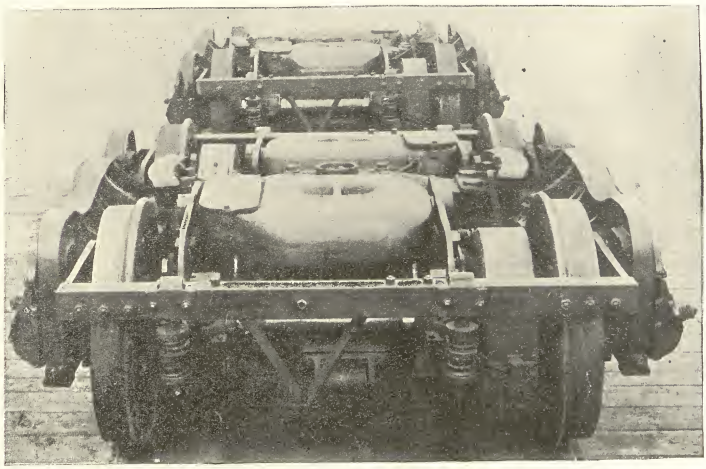
The resistances as well as the magnetic cut-outs are also placed beneath the car floor. Beneath each hood of the car is an automatic circuit breaker, placed within easy reach of the motorman. The operation of this device is instantaneous and is an effectual safeguard against any accident to the motor. These circuit breakers take the place of the main circuit hood switches, but are wired in multple with each other instead of in series. To guard against any possibility of one being closed while the motorman is at the other end of the car and desires to open his main circuit, only one handle is provided. The handle cannot be taken off without opening the circuit breaker, and when removed the circuit is locked open. As the motorman must take the controller and circuit breaker handles with him when changing ends, all danger of complication is avoided.

The car is equipped with 12 electric heaters, manufactured by the Consolidated Car Heating Company, of Albany, N. Y.

The collector which will take the current from the overhead wire is a diamond shaped frame of metal set longitudinally upon the roof of the car and carrying at right angles a bar, in the centre of which is a roller. The arms are wide enough to preclude any possibility of missing contact. The diamond frame is depressible and expansible on the principle of the pantograph, allowing a play up and down to conform to the varying heights of the overhead wire. With this collector the trouble of reversing is entirely done away with.

The power to run the car will be taken from the overhead wire already in position supplying current to the electric lights in the cars. The extra current, however, will be supplied from Fulton street feeder of the Kent avenue station of the Brooklyn City Railway, the return wire being connected to the rails of the surface road.

In addition to the president, the vice-president and the trustees of the Brooklyn Bridge, among the others were Ex-Mayor Chas. A. Schieren, H. M. Littell, president of Atlantic Avenue Electric Railway; Dennis Sullivan, president Coney Island and Brooklyn Steam Railroad; F. B. Scott and F. H. H. Sheppard, of the Baltimore and Ohio R. R; Major G. W. McNulty, A. C. Vosburg, Raw Hide Pinion Co., Syracuse. The General Electric Co. was represented by W. J. Clark, A. K. Baylor, C. B. Martin (in charge of the installation), R. H. Beach and F. Gilbert.



BROOKLYN BRIDGE MOTOR CARS—END VIEW OF TRUCK.

ELECTRICALLY OPERATED TURRETS ON THE BROOKLYN.

The new United States war ship Brooklyn will have half the number of her turrets operated by electric power and the other half by steam-power, in order to test the two methods by comparison. It is stated that the movements of a turret can be perfectly coutrolled by the electric power.

In a dispatch on the subject, from Washington, it is stated that the French turrets on the Canet electric system are said to work very well, and they have besides safety gear a system of counter weights to provide for the automatic return of lever handles. In order, also, to provide against accidents, they are supplied with a supplementary hand gear. It is said that about forty Canet turrets worked by electricity have been turned out for different ships, or are now in progress. The work has been perfected so that comparatively small powers are required for turning the turrets. England's Powerful and Terrible have electrically worked barbette mounts for their 9.2-inch guns.

One stimulus to the introduction of electrical instead of hydraulic machinery for turret turning has been the liability of the latter to suffer in winter from the freezing of the water.

Mr. F. H. Angell has again become associated with the C. & C. Electric Co., 143 Liberty street, New York.

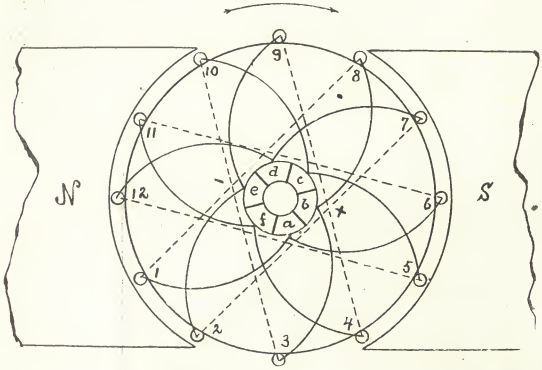
PRINCIPLES OF DYNAMO DESIGN.

BY

Wilton Hanson E.E.

(*Continued from page 41.*)

The two sketches with their appended tables show the characteristic types of winding for a bipolar drum armature.



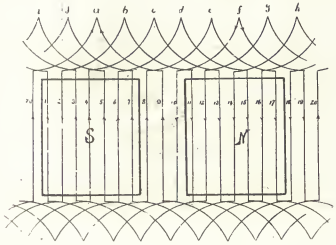


TABLE.

Spacing = 7
I = 12

F	B	F
	1	8
+ b	3	10
	5	12
	7	2
— e	9	4
	11	6

LAP WINDING.

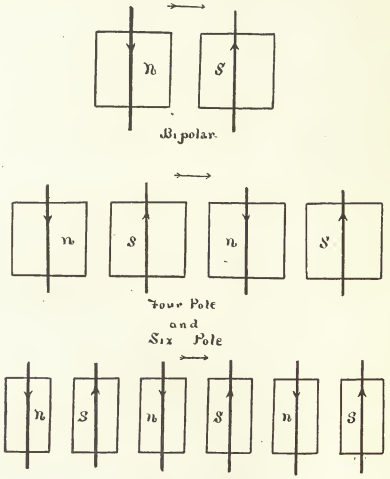
WINDING, DEVELOPMENT AND TABLE OF A 12-INDUCTOR DRUM ARMATURE.

With the sketch as shown, the position of the positive brush on the commutator is due to the direction of winding, that is to say, it is left handed. By reversing the direction of the end connectors the + brush would be at the other side.

The above sketch diagrammatically displays the typical wave winding of a bipolar drum. A turn moves in a manner characteristic of that special winding, and returns to the adjacent commutator segment from which it started.

Multipolar Armatures.—The most convenient way of considering a multipolar generator is to look upon it as a means of combining the frames of two or more machines around the armature of one. In other words, it is a condensed type of machine of more than two poles acting in unison upon a single armature, which, by its special winding and commutating device, enables it to effectively discharge its functions as a compound machine.

Thus a multipolar type would be one really composed

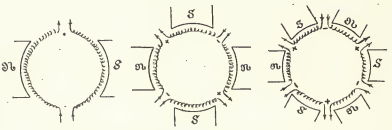


DEVELOPMENT ON FLAT SURFACE.

of either one, two or more pairs of poles, etc., whose field centralizes itself upon a unique armature, producing in it electromotive forces whose direction must be carefully guided for each purpose desired. As two or more dynamos can be thrown into multiple or series, so can the electromotive forces of a multipolar armature be similarly tested and a multiple or series flow produced. With a two-pole machine there are ordinarily two multiple circuits; with a four-pole, however, there are four and with a six-pole, six multiple circuits, which can be left in parallel, each supplying an equal E. M. F., or can be thrown into series, that is to say, multiple series, comprising in all cases only two complete circuits in multiple.

This can be, perhaps, better appreciated by examining the direction of flow when the winding and poles are developed on a flat surface.

The direction of the current is clearly indicated, and the



DIRECTION OF CURRENTS ON ARMATURES.

possibility of connecting up either in multiple or series as required.

With a Gramme armature the coils are grouped in four, six or eight sets of equal E. M. F. and may be thrown into series by cross-connecting, leaving but two branch circuits.

The general direction of the currents may be illustrated on a ring and drum armature by the ordinary spiral winding commonly used, and the lap and wave winding employed for multiple and series winding on a drum.

(*To be Continued.*)

DIELECTRIC STRENGTH OF OILS UNDER ALTERNATING POTENTIALS.

BY ELIHU THOMSON.

In the course of tests made under the direction of the writer some two or three years ago, the interesting fact was noticed that the striking distances of high potentials in insulating oils were in some way variable with the frequency of the current or potential waves, or upon the time during which electric stresses existed in a given direction through the medium.

This relation has been confirmed by other and later experiments. The general effect was found to be that discharges at low frequencies are capable of puncturing mineral oil layers up to from one-third to one-half the thickness of an air layer required to just resist puncture by the same discharges, while with high frequencies of equal striking distance in air, an oil layer of one-thirtieth to one-sixtieth of the thickness of the air layer was sufficient to prevent discharges. At frequencies such as 125 per second a potential which would give one-half inch spark in air may puncture from one-third to one-fourth inch of oil between the electrodes, while at frequencies of 50,000 to 100,000 a layer of oil of one-fourth inch may resist puncture when the spark in air is as much as eight inches. The high frequencies experimented with were such as are given by condenser discharges over an air gap including a primary of a few turns, with a secondary of a single layer of some hundreds of turns immersed in oil. The discharges, in such case, are not continuous waves, but a rapid succession of oscillatory discharges with dead intervals or periods of inactivity intervening.

The effect of carefully drying an oil was found to increase its insulating power. This was also true to a marked extent when careful filtering was resorted to, a decided decrease of striking distance through the oil with the lower frequencies being observed. It follows from this that all oil used in insulating for high potentials with low frequencies should be kept clean and homogeneous, and free from floating particles.

Variations of temperature of oil did not, in the experiments made, greatly affect the striking distances for a given potential. The general fact, however, that with high frequencies the insulating power of oil layers is, as measured by the striking distance in air relatively to that in the oil, far in excess of such insulating power for low frequencies, seems to be unaffected by the dryness, clearness or temperature of the oil used.

It appears probable, also, that with partially conducting liquids like alcohol and water the behavior with high frequencies is more like that of a true dielectric insulator than with low frequencies. As an interesting fact in this connection it may be noted that a high potential high frequency coil, capable of yielding spark torrents over thirty inches of air gap between its terminals, still maintains its discharges even when shunted by a glass tube one and a half inches in diameter containing ordinary water, and long enough to bridge the gap.

It is difficult to account for the differences in the effects obtained with high frequencies from those with low frequency alternating waves. A time lag in the establishment of the full dielectric stress or full electrostatic field in the oil might account for the phenomena According to this hypothesis if two electrodes under oil, separated a certain distance, instantly acquire a difference of potential, this potential would not with equal rapidity strain the oil to the full extent. It might be assumed that the polarization of the oil molecules requires time. Or, it may be that only such part of the electrostatic field as is due to the ether is first established after electrification and that the increase of such field due to the molecules of the substance, such as the interposed oil, is subsequent to the former.

If this were so the establishment of an electrostatic field at high rates in oils would present analogies with the case of magnetic fields in iron or metals.

It would also follow, if the supposition of a lag as above be true, that in condensers such as those using oil as a dielectric, the capacity would be less the higher the frequency. Again, if any such lag as is assumed exists, it would probably vary with different insulating media and it may depend upon the molecular state, as viscosity, for example. Observations of the oil space between the immersed electrodes by polarized light could probably be used with certain media to detect any differences in time of establishment of electrostatic stress with different frequencies, it being well known that under high stresses certain insulating liquids become strongly affected in their optical properties, with rotation of polarized beams of light traversing them. If the optical effect noticed should be less in the case of high frequencies than with low rates, it would indicate a probable lag of the kind assumed. Similar studies, using solid dielectrics like glass, mica, etc., would also be desirable. Should the results be negative it would be necessary to attack the problem in some other way.

M. P. Jaret, about a year or more ago, in a communication to the Paris Academy of Sciences, gave the results of his investigation of the properties of mica He found that it did possess, with rapid oscillations, what might be termed a dielectric hystersis. Such a property may exist to a more marked degree in oils.

In the tests of the power of oil layers to withstand puncturing by high potentials a curious effect was noticed, which was that discharges under oil passed far more readily between balls than between sharp points. In other words, with any given difference of potential between the immersed electrodes, as measured by the air spark obtainable, pointed electrodes could be brought much nearer than balls without provoking puncture. With balls of one-half inch diameter as terminals and with low frequency (125) potential differences, ranging from 100,000 to 150,000 volts, the space between the points could be one-quarter that between the balls. The ratio between the length of spark in air and between sharp points in oil was 10 to 1 at 10,000 volts and 8 to 1 at 15,000, while with balls these ratios fell to 2.4 to 1 and 2 to 1, respectively. When flat plates were substituted for the balls the striking distance in oil was still further increased as compared with the distance with points. The seemingly anomalous action of points under oil, so different from their action in gases or air, is certainly curious, and the usual injunction to avoid points and edges as conducive to electric discharge does not seem to apply in such media as oil, at least when the potentials are alternating and at ordinary frequencies.

In experimenting with discharges in oil uniform results are only to be obtained by using carefully filtered oil, as ordinarily they contain suspended particles, fibres, etc., which appear to bridge the space between the electrodes and provoke a break-down due to the non-homogenous character of the dielectric. It is also necessary to discard oil after arcing has once occurred through it, as it will have become much weaker, owing doubtless to the fine carbon particles set free and which remain floating ready to be drawn into the space between the electrodes, thus giving rise to loss of homogeneity of the medium.

LIGHTNING PROTECTION OF SHIPS.

Ships at sea are readily subject to lightning discharges unless thoroughly protected. The best system of protecting vessels is that invented by Harris. Lightning rods are connected with a series of copper plates and rods so placed on the masts as to readily yield to strains. These plates, or rods, are electrically connected with the copper sheathing of the vessel, and with all large masses of metal in the vessel. In the case of iron vessels they are connected with the hull itself.

There was at first considerable opposition to Harris's method of protection, but its efficacy was finally proved and now serious effects of lightning on vessels are almost unknown. Harris, in 1845, was knighted by the English government for his services in this respect.

DEPARTMENT OF ELEMENTARY EDUCATION.

BY THE EDITOR.

[*Note.—Any one is invited to ask questions on any point that is not made clear in these articles. Suitable explanations will be cheerfully given under the head of "Answers to Inquiries."*]

(*Continued from Page* 68.)

Considerable time can often be saved by running a number of wires from one part of the building to another part, at the same time, whenever they happen to come together, but difficulty is usually experienced in keeping track of the individual wires. This trouble can, to a very large extent, be avoided by getting wire with insulation of as many different colors as possible, and dividing the building off in sections, using a different colored wire for each room in a section; or, each section may be wired in one color, and the annunciator connections in the following manner: Assuming that section No. 1 takes in rooms from No. 1 to No. 25. Connect these 25 wires at the bottom, or highest numbers on the annunciator. The buttons in the rooms should then be pressed, beginning with No. 1 and continuing up to No. 25, in regular order, an assistant making a note of the numbers in rotation as they fall. After all buttons have been pressed, the wires can then be changed to their proper places on the annunciator, using the memoranda of the test to guide us in the proper location of the wires, so that the numbers on the annunciator drops will correspond with those of the rooms.

In the diagram (Fig. 15) A represents the annunciator; B, the battery; P, the push-buttons. The wires, B W, are the battery wires above referred to. Five cells of battery are generally sufficient for an installation of not more than 100 rooms. For a greater number of connections more battery should be provided. The cells should be connected in series—that is, one after the other.

A combination of an annunciator and fire-alarm and return call system is shown in Fig. 16. This is a very valuable apparatus for a hotel, inasmuch as it sounds an

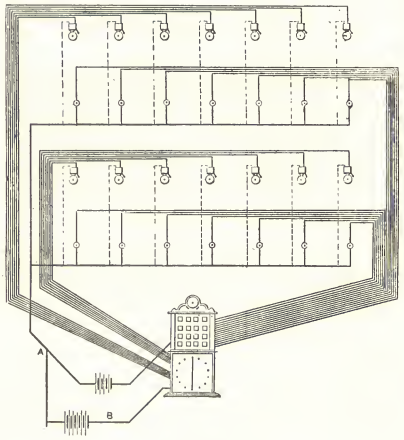


FIG. 16.

alarm all through the building in case of fire. The annunciator part of the system is precisely the same as that just described. The fire alarm feature is added to it, without altering the connections in any manner. After selecting the position for the alarm bell in each room, and the bell is placed, one wire is run from the bell and spliced to the battery wire of the annunciator system, as shown by the dotted lines, and the other wire from the bell is run direct to the annunciator as shown. For the fire alarm a separate battery is used. By tapping the annunciator battery wire at A and running this extra wire to the battery and thence to the annunciator dial, the work is finished. When a guest rings from his room the clerk can acknowledge the call by simply touching the button on the dial corresponding to the number of the room which will ring the room bell as an answer.

In case of fire the lever on the dial is released and, in revolving, causes every bell in the house to ring for a considerable length of time.

This apparatus is very simple and effective, and com-

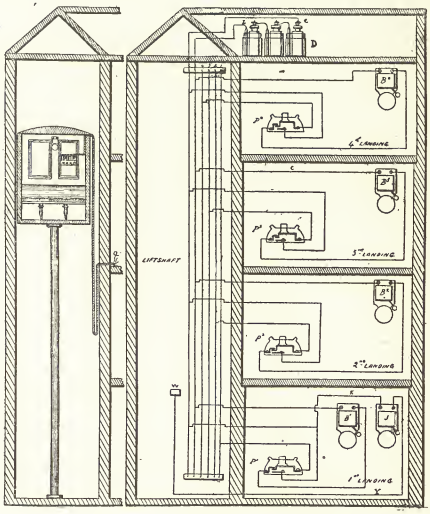


FIG. 17.

mends itself for its freedom from complicated mechanism and connections.

In closing this subject it remains for us to refer to the method of installing annunciators on elevators, or "lifts," as the Englishman calls them. The connections are the same as for stationary work, the difference in the systems being that for elevators the wires are constantly moving up and down A cable containing the required number of wires is provided, one end being securely fastened midway between the top and bottom of the shaft, and the wires from the different floors run to that point and connect with the conductors in the cable. The other end of the cable is fastened in a similar manner to the bottom of the elevator and thence to the annunciator in the car. The battery is usually placed on the lower floor or in the basement, or it may be placed on the top floor or any other more convenient location, outside of the elevator itself.

A diagram of an elevator circuit is shown in Fig. 17.

(*To be Continued.*)

HOW OUR ELEMENTARY DEPARTMENT IS APPRECIATED.

February 6th, 1896.

Dear Editor:—In looking over this week's edition I found that you had an annunciator burglar alarm system. It interested me very much, and now I am making a temporary one for myself, and if I prove successful I will write to you and let you know. I will close now, saying that the Electrical Age is the most interesting book I ever read or bought.

Yours truly,

Wm. Smith,
120A Court street, Brooklyn.

ANSWERS TO INQUIRIES.

[*Note.—This column is open to any of our readers who desire special information on any subject. In case we cannot give the desired information ourselves the inquiry will be published, in order to elicit a reply from some one of our readers. These answers will be published in due course.*

The full names of our correspondents will not be published, but for the purpose of identification their initials or other mark of identity will be substituted therefor.

Each question will be numbered for the purpose of ready reference.

All are invited to make free and liberal use of this column.]

23.—Kindly inform me how to go about it to get information in regard to the electrical probabilities and possibilities of a certain Southern city, with a view to bettering my condition as an electrician. W. A H., Harlem.

A.—If our correspondent means that he wishes to secure a position in the city referred to we think the best course for him to pursue would be to communicate with the president or general manager of the electric light or street-railway company in the place, if there are such enterprises there. If not, the mayor of the city might be able to give some information as to the "probabilities and possibilities."

24.—In case a man wished to light up his residence, or but a single room with electricity, in a neighborhood where there is no electric plant, what would be the requisites and approximate price of each? Answer in AGE. J. H. W., Lewisberry, Pa.

A.—For small lighting a primary battery plant would give good satisfaction. We give the price per unit of each article that would be required to install such a plant. To find the total cost simply multiply the number of articles of each kind by the unit price.

One 8-volt incandescent lamp	$1.00.
4 cells bichromate battery to light lamps	2.00.
1 socket	.50.
Cord	.50.
Shade	.25.
Total for one lamp outfit	$4.25.

Wire costs from 38 cents to 50 cents per pound in New York, according to size. We refer our correspondent to the article printed in THE ELECTRICAL AGE of February 1; headed "Primary Batteries for Domestic Lighting." This article gives a great deal of valuable information on this subject.

25.—Would it be practicable to place a small gasoline engine and dynamo in a two-horse wagon to be driven about from place to place, to be stationed beside a church or hall, and supply current for two arc lights for stereopticon exhibitions? About what would be the weight and cost of such engine and dynamo? M. A. M., Wevertown, N. Y.

A.—Yes, it would be quite practicable. One 1 h.-p. dynamo will give you two arc-lights. Such a dynamo will cost about $100, and weigh about 125 pounds. A gasoline engine would cost about $200 and weigh 250 pounds. Total cost, $300; total weight, 375 pounds. A gasoline tank should be provided, and the dynamo and engine should be direct-connected, if possible, to economize space. The wagon should have good, easy springs, to prevent sudden jars.

26.—What are bus bars? W. A., Johnstown, Pa.

A.—Bus bars are heavy copper bars employed in a central or distributing station, to which all of the terminals of the generating dynamos are connected, and from which the current passes to the different points of the distribution system over the feeders.

PERSONAL.—Mr. J. M. Duncan has just taken the management of the New York office of the Campbell & Zell Company, manufacturers of the Campbell & Zell water-tube safety boiler. Mr. Duncan's office is in the Havemeyer building.

ELECTRO-PLATING.

Electro-plating is the process of covering a surface with a metal by the aid of a current of electricity—the surface to be plated must, however, possess some electric conductivity.

By the aid of electro-plating it is possible to coat the baser metals, such as iron, etc., with a film or layer of silver, gold or platinum, or with any other metal, such as copper, nickel, etc. The carbons of arc lights furnish an example of copper-plating on a non-metallic surface.

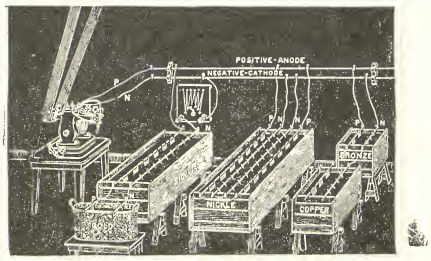
The process of electro-plating is conducted in the following manner: The object to be plated is connected with the negative terminal of a battery and placed in a solution of the metal with which it is to be plated, opposite a plate of the same metal connected to the positive terminal of

ELECTRO-PLATING BY BATTERY.

the battery. If, for example, the object is to be plated with copper it is placed in a solution of copper sulphate (blue vitriol) opposite a plate of metal copper. By this arrangement the object to be plated forms the *kathode* of the plating bath, and the plate of copper constitutes the *anode.*

The electric current generated by the battery decomposes the solution of copper sulphate, metallic copper being deposited on the articles attached to the kathode. The copper plate maintains the strength of the solution of the bath by giving up to the solution as much of its substance as is taken from the solution and deposited upon the articles. Therefore the copper plate is gradually consumed.

When any other metals, such as gold, silver, nickel, platinum, etc., are to be deposited, suitable solutions of



ELECTRO-PLATING BY MACHINE CURRENT.

their salts are placed in the bath and plates of the same metal suspended at the anode, as was the copper plate.

Electro-plating on a large scale is now accomplished by means of a direct-current dynamo machine, which is specially wound for the purpose. These machines generate the current instead of the troublesome batteries, and do not require the attention that batteries do.

DIGEST OF PHYSICAL TESTS.

We have received a copy of the first number of *The Digest of Physical Tests and Laboratory Practice*, which will be published quarterly by Frederick A. Richlé, of Philadelphia. The purpose of this new magazine is to give a résumé of practical tests made in the laboratories of the world.

LIABILITY OF STOCKHOLDERS.

Justice Beach, sitting in Supreme Court Chambers, on January 30, decided that the courts of this state will not recognize the modes of procedure prescribed in the statutes of another state for the enforced collection of personal liabilities to a bankrupt corporation.

The case upon which this decision was based was a suit brought by the Sprague Electric Railway and Motor Company, the Edison General Electric Company and Harry B. Thompson, receiver of the Steubenville (Ohio) Street Railway Company, against the Steubenville Street Railway Company, Gilbert M. Speir, Jr., and others.

The Steubenville Street Railway Company was organized by the late Maurice B. Flynn. The articles of incorporation were filed in May, 1889, and the charter was obtained under the laws of the State of Ohio.

The capital stock of the company is $70,000, divided into seven hundred shares of $100 each. The total amount was subscribed for by the defendants. There was besides an issue of $75,000 in bonds, most of which were disposed of to outside parties. These bonds were registered by the Atlantic Trust Company of this city.

Shortly after procuring the proper franchises the equipment was changed from horses to electricity. The cars and other appliances were furnished by the Sprague Electric Railway Company and the General Electric Company.

The Court of Common Pleas of Jefferson county, Ohio, declared the street railway company to be insolvent, and on June 25, 1894, appointed Harry B. Thompson receiver. The financial condition of the company was deplorable. There were general liabilities approximating $50,000, with no assets save the property and franchises of the street railway, which, upon appraisement, were valued at $12,375. As this was pledged to meet the bond issue of $70,000 there was actually nothing with which to pay the other creditors.

The receiver discovered upon going over the books that the stockholders had paid but ten per cent. of their subscriptions. Under the laws of Ohio shareholders are liable for twice the face value of their holdings. Suit was then instituted to recover not only twice the face value of the stock, but also for the original ninety per cent. on the unpaid subscriptions.

As none of the holders of stock resided in Ohio or were within the jurisdiction of the courts of that state, the suit was transferred to the Supreme Court in this city. D. M. Porter, as attorney for several of the defendants, made the point that the law respecting the liabilities of stockholders mentioned in the suit was not according to the statutes of this State, and that therefore the courts of this state should not recognize it. Justice Beach rendered his decision in favor of the defendants.

RESIGNATION OF MR. LITTLE.

We have been officially informed of the resignation of Mr. E. W. Little as vice-president and general manager of the Interior Conduit and Insulation Co., of New York.

Mr. Little was associated with the company from the time of its incorporation, and what he proposes to do in the future has not yet been divulged. It is understood, however, that the electrical industry will not lose him. Mr. Little has a great many friends in the trade, all of whom wish him success in whatever he may undertake.

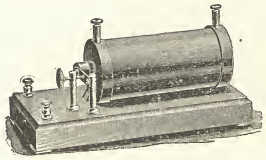
THE WAGES OF SIN IS DEATH.

A man by the name of J. V. Gove was cutting electric light wires on poles in Newark, N. J., on the night of February 3, when he received a shock which threw him to the ground. The fall fractured his skull and he died from the injury. It is supposed that Gove was stealing wire when he met his death. One of the light circuits had been cut.

INDUCTION COILS FOR CATHODE RAY PICTURES.

The experimental and practical application of the discovery of Prof. Roentgen in making pictures of objects screened by opaque substances has given an immense impetus to the induction coil business, and makers of these instruments are kept busy in their effort to supply the demand.

There is no limit to the practical application of this valuable process of picture-making, and as the induction coil is an indispensable piece of apparatus in producing the interesting results, it is likely that induction coils will at once find a rapidly and permanently expanding market.



INDUCTION COIL FOR CATHODE RAYS.

To get the best results, of course, the best apparatus should be used. Among the best induction coils made are those of the International Electric Co., 76 Beekman Street, New York. These instruments are made with great care and precision, and of the best materials obtainable.

The International Electric Co. has made induction coils for the foremost institutions of learning in this country, and these instruments are highly spoken of.

SHEEHY AUTOMATIC RAILROAD SIGNAL.

Mr. Robert J. Sheehy, the well-known electrical engineer and inventor, has on exhibition in Room 74 of the Drexel Building, in this city, a model of an automatic railroad signal system of his own invention, which is remarkable for its simplicity and effectiveness.

In this system the rails of the tracks are used as electrical conductors, and all signal appliances are placed in the cabs of the locomotives. These signals are actuated by electricity from currents carried on the locomotives and instantly notify the engineer (by striking gongs and displaying colored lights and semaphores) if there is any obstruction on the section ahead (the road being divided into proper blocks), and designate whether the obstruction is that of a train or car on the section, or if a misplaced switch, broken rail, or open drawbridge.

To accomplish these results two signals are provided, one giving notice of an incomplete track and the other showing if there is a train on the section. In the cab, in connection with these signals, is an automatic time-recording device, which records the hour, minute and second at which the signal was given, and also designates whether it was the train or track signal, again making a record when the section is cleared.

An examination of this record at the end of the run will show the length of time the train was delayed by obstructions.

The system possesses many novel and valuable features, and in design is practically a reversal of the methods of operation adopted in the usual railroad signals. All the current used in its operation is carried on the locomotive—there are no batteries along the railway line to freeze, run down or otherwise get out of order. Everything is under the eye of the engineer.

By this system the flagging of trains, approaching from the rear, is dispensed with; the fact of the train being on the track blocking that section to the rear train through the train signal in the cab of its locomotive. This positively prevents the rear end collisions.

This system is simple, costs less for equipment and

maintenance than any other, and is endorsed by over three thousand practical railroad men in New England.

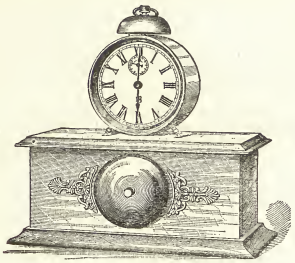
The office of the Sheehy Automatic Railroad Signal Company is at 122 Pearl street, Boston, Mass.

WAKE UP THERE.

An ingenious method of making an electric alarm clock out of any ordinary mechanical alarm clock is shown in the accompanying illustrations.

The two rear views of the apparatus show the manner in which the electrical attachment is operated.

The ordinary clock is set on top of the box, which con-



JONES ELECTRIC ALARM CLOCK.

tains a cell of dry battery. It is wound and set in the usual way, the alarm-winder being left in a perpendicular position, however. After placing the clock on the box a ring is hooked over the upper part of the alarm-winder in such a manner that it will slip off when the winder turns around (see Fig. 1).

Fig. 2 shows the hook having slipped off, and as the tension is thus released the alarm rings, and will continue

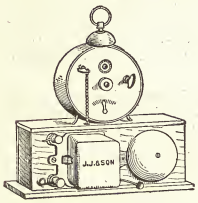


FIG. 1.

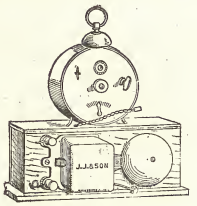


FIG. 2.

to ring until the chain is again hooked on the winder as before.

This apparatus does not permit of any one turning over to take another snooze after it begins operation, because it compels the person to get up to stop the alarm.

This outfit is manufactured by J. Jones & Son, 67 Cortlandt street, New York.

ROENTGEN PICTURES.

EDITOR ELECTRICAL AGE.—European and American scientists are at the present time predominantly occupied with research in the matter of producing so-called negatives of objects, when opaque or non-transparent matter is directly intermediate between the object and the negative. The medium producing impressions on the negative in this case is called by the name of "x-rays,"—rays that nobody knows anything about—and the pictures are spoken of as photographs. Apparently there is as yet much confusion in the brain of the learned and skilled ones in this matter. They have, so it seems, forgotten that light is that which affects the human eye by leaving on its nerve a picture of what is focussed on it.

The sun spreads such light, but it spreads something different besides light, namely, chemical rays. They, and not the light, have made the pictures that have been improperly called light pictures or photographs.

That the electric current effects chemical reaction is well known and old, the reaction being known as *electrolysis*. Nor is electrolysis stopped by any opaque object in its way. What then is the new- angled picture-making but electrolysis?

Photographs (light-prints) should be called "heliographs" (sun-prints), and the new pictures are properly named—"electrographs." C.

A. B. SEE MFG. CO.'S NEW BUILDING.

We are informed that the A. B. See Manufacturing Company, of Brooklyn, has bought a plot of ground fronting on Pearl street, and extending through the block from Front street to Water street, Brooklyn. The company will at once begin the erection of a large building of at least six stories in height, for the manufacture of their electric elevators. The building will have a frontage of 200 feet and a depth of 100 feet. Architect M. J. Morrill, of the National City Bank Building, Brooklyn, is preparing the plans of the new building.

FINANCIAL.

The report of the Brooklyn Heights Railroad Company for the quarter ending December 31, 1895, shows gross earnings of $1,048,858, a decrease of $87,324 as compared with the same period of the previous year; operating expenses, $676,000, a decrease of $68,560; net earnings, $372,857; decrease, $18,764. For the six months ending December 31 the gross earnings were $2,232,472, a decrease of $175,497 as compared with the last half of 1894; operating expenses $1,348,254; decrease $156,953; net earnings, 884,218; decrease $18,544. Other income and charges make the deficit for the six months $44,151.

IN AND ABOUT NEW YORK.

The Delany Heater and Rheostat Co., 463 Greenwich street, New York, has gone into the hands of a receiver. The company's assets are $3,000 and liabilities $2,650.

Robert Edwards & Co.'s Electrical Works in 144th street, New York, were almost entirely burned one night last week. All of the floors were burned through, and the machinery and stock, which were valued at $25,000, were destroyed. The fire was probably caused by spontaneous combustion in the varnish room, where several hundred gallons of oil and varnish were stored.

The Vance Electric Co., 136 Liberty street, New York, has just completed the installation in the St. Nicholas Rink, New York, of 1,100 16-c. p. incandescent lamps; 10 incandescent arc lamps, and one, two and four H. P. Lundell motors. They are also wiring the residence of Mr. Schieffelin, on 76th street, for electric light, burglar alarm and electric bells.

The Gluth & Muenster Motor and Novelty Co. has just opened an establishment at 61 Cortlandt street, New York. They manufacture all kinds of electrical supplies; perform experimental work of all kinds, and install electric bells, burglar alarms, door openers, etc., etc. Neat repairing is a specialty of the company.

Dr. J. B. DeLery, 56 Pine street, New York, is interesting capital for the introduction of the Barriere system of incandescent gas-lighting. The Barriere light is similar to the Welsbach and is pure white. It is much simpler in its mechanical parts than the Welsbach.

The Emerson alternating current motor, of which Mr. N. M. Garland, 114 Liberty street, New York, is the sole agent for the Eastern States, is rapidly increasing in popularity. Mr. Garland is selling large numbers of these machines for driving fans and for power work.

THE ELECTRICAL EXPOSITION.

One of the most attractive and instructive exhibits at the forthcoming Electrical Exposition will be that of the Edison Electric Illuminating Company of New York. This display will occupy a space of over one thousand square feet, and will comprise a complete demonstration of the applications of electricity for domestic purposes. The most improved methods of house lighting will be shown in detail, also electric heating and cooking by electricity. This will be the first time that such a practical exhibition has been made of the many uses to which electricity can be applied in the home, and the understanding of the visitor will be further enlightened by a well arranged display of the various kinds of apparatus employed, all of which will be explained by those in charge of the exhibit.

Telephone Notes.

Dysart, Ia.—There is talk of the Commercial Telephone Company extending their line to this place.

Elizabeth, N. J.—The New Jersey Trunk Line Telephone & Telegraph Co. has been incorporated by Wm. A. Topping, George H. Bruce, of New York city; Benjamin A. Lawrence, of Elizabeth, N. J., and others; to build and operate lines in Essex, Passaic, Hudson and Union Counties. Capital stock, $50,000.

Livingston Manor, N. Y. — The Beaverkill Telephone Co. has voted to extend its line to Livingston Manor, where it will connect with the Sullivan County System. It was also voted to look over the route with a view to extending the line of Margaretville to a connection with the West Shore system.

Southampton, L. I., N. Y.—A telephone line via North Sea to Rose's Grove and Noyac is being arranged for and will probably be constructed before summer.

La Grange, Ind.—A paper is being circulated for the purpose of raising money to put a telephone line from Lima to Longo, by the way of Ontario and to La Grange.

Utica, N. Y.—A new telephone company is being organized, to be known as the Utica Telephone & Telegraph Co., with a capital of $25,000.

Dyersburg, Tenn.—The lines of the A. M. Stevens Lumber Co. will be extended to Heloise.

Davis, W. Va.—It is intended by the St. George & Parsons Telegraph Co. to extend its lines to Harman, Davis and other points.

Parsons, Kan.—An ordinance has been passed by the Council that an electric fire alarm be provided for at the expense of the telephone company.

Columbia City, Ind.—An incorporated company was organized in Columbia City to put in a first-class telephone. A. Adams is president.

Tecumseh, Neb.—The business men of Tecumseh are agitating the formation of a new telephone company.

Hicksville, O.—Judge Snook, W. H. Phipps and J. P. Gasser are said to be organizing a company to build a telephone line connecting Van Wert, Paulding, Payne, Antwerp, Hicksville and other towns.

Gastonia, N. C.—A company will be organized by J. D. Moore and others to construct telephone systems, etc.

TELEPHONE PATENTS ISSUED FEBRUARY 4, 1896.

Telephone. Samuel A. Dinsmore, Chicago, Ill. (No. 553,843)

Registering Apparatus for Telephones. Frank Quatram, Pankow, Germany. (No. 553,964.)

Adjusting Attachment for Telephone Signal-Bells. Cleaveland F. Dunderdale, Chicago, Ill. (No. 553,977.)

Telephone Apparatus. Carl J. Schwarze, Adrian, Mich. (No. 554,036)

Telephone System. Wallace A. Houts, Parker, S. D. (No. 554,125.)

Telephony. Charles A. Randall, London, England. (No. 554,141)

New Corporations.

Washington, D. C.—The Mount Pleasant and Zoo Gravity Railway is to have a capital of $1,000,000. A bill has been introduced in Congress allowing it to build a road in the suburbs. Among those interested are E. Bair, W. B. Hilk and L. D. Wine.

Houston, Tex.—The Fredericksburg Electric Light Co. has been incorporated by Charles H. Winistz, Jr., Ad Gold, Franz Stein and Alfred Vanderstucken. Capital stock, $7,000.

Plattsburg, N. Y.—Plattsburg and Au Sable Telegraph Co. to maintain a line of telegraph from Plattsburg to Keeseville and intermediate stations. Capital, $1,500; Directors: George E. Lynch, M. J. O'Brien, James R. Lynch, George L. Fitzpatrick and Dennis Callahan, all of Plattsburg.

Manistee, Mich.—The Manistee Electrical Supply Co. has been incorporated by J. O. Nessen and J. S. Mundy. Some specialties will be long-distance magnetic-telephones, electro-magnetic chairs, etc. Fifty men will be employed. Capital stock, $50,000.

Milwaukee, Wis.—The Milwaukee, Racine and Kenosha Street Railway Co. has been incorporated by Thomas M. Kearney, Charles M. Dietrich and Richard T. Robinson; to build and operate a street railway system, to be propelled by electricity or other power, from South Milwaukee, northerly through the village of Cudahy and the towns of Lake and Oak Creek, and the city of Kenosha. Capital stock, $100,000.

New Rochelle, N. Y.—Birdsall Electric Manufacturing Co.; capital, $10,000; Directors, Theodore Birdsall, of New Rochelle; S. K. Johnson, Criminal Court Building, and Bryce Marr, both of New York City.

Richmond, Va —The Fairmount Traction Co. has asked a franchise from the legislature to construct an electric road in Richmond and Henrico County. William T. Hechler and William J. Westwood are among those interested.

Possible Contracts.

Albany, N. Y.—The State Railroad Commissioners approved an application of the Binghamton, Lestershire and Union Street Railway Co., for an increase of its capital stock from $100,000 to $250,000. The company is to put in new equipment.

Springfield, Ill —Plans have been prepared by Architect J. I. Rinaker for the erection of a seven-story office I. O. O. F. building, which will have electric lights, etc.

Yonkers, N. Y.—The Yonkers Electric Railroad Co. is having plans prepared by Edward A. Quick & Son for a two story brick power-house, repair shop and car house in Buena Vista avenue near Main street, to cost $40,000.

Plattsburgh, N. Y.—The Plattsburgh Village Trustees granted a franchise to the Plattsburgh Traction Co. giving the company the right to build, maintain and operate an

electric street railroad in the village. The company expects to have the road in operation between Plattsburgh and Bluff Point by July.

KENSINGTON, N. Y.—Ground has been purchased, adjacent to Kensington, on which a power-house will be erected for a proposed system of electric railways to connect with Kensington, Arnold, Parnassus and extend to Pittsburgh.

PITTSBURGH, PA.—The Second Avenue Traction Co. is perfecting arrangements to connect McKeesport with Pittsburgh, via. Brinton Station, thus completing a circle beginning and ending at 4th avenue and Market street, Pittsburgh.

TRENTON, N. J.—John A. Roebling Sons' Co. will put in their works a new electric light plant of greater capacity.

NEW YORK CITY.—A fifteen-story office building is to be erected by the Cass Realty Corporation, 503 5th avenue, at 43 and 45 West 32d street, at a cost of $150,000.

—A six-story brick store is to be erected by Harry Chaffee, 365 West 23d street, at 43–49 Bleecker street, at a cost of $160,000.

BROCKTON, MASS.—Several well-known residents of this city, including Hon. W. L. Douglas, Ex-Mayor Whipple and Ex-Alderman Merritt and others, have organized the Brockton, Bridgewater and Taunton Street Railway Co., to construct a railway from the Montello Railroad station through Brockton, West Bridgewater, Raynham and Taunton. The road will be 18 miles long. The capital stock is $100,000.

MIDDLEBORO, MASS.—A movement has been started for the erection of a new hotel on the site now occupied by the American Building at Middleboro. It is the intention of the promoters to erect a five-story brick block with a frontage of 80 feet on Main street, and 100 feet on Water street. It is hoped to organize a stock company with a capital of $75,000.

POTTSTOWN, PA.—The Pottstown and Westchester Electric Railway Co. will begin the construction of its electric road in the spring, and they are now making arrangements for same.

NEW YORK CITY.—Messrs. Weil & Mayer are to put up a seven-story store and loft building at 50 Bond street.

BOSTON, MASS.—Architects are at work on the plans, and by April 1 the work of tearing down the old buildings for the new hotel at Tremont and Boylston streets will be begun. Landlord Whipple, of the Parker House.

PORTLAND, ME.—It is understood that the tracks of the electric road, on Spring and Vaughan streets, are not heavy enough and will be relaid in the spring.

GLEN COVE, L. I., N. Y.—General James R. Pearsall has announced that the Hempstead Harbor Hotel and Casino Co. has been formed to build a hotel with all modern improvements. Architect Gilbert of New York is already at work on the plans.

KENOSHA, WIS.—The Bell City Street Railway Co. has applied for a franchise to construct and operate an electric road.

NEW YORK.—Architect M. J. Morrill, National City Bank Building, Brooklyn, N. Y., is preparing plans for a large factory for the A. B. See Manufacturing Co., Brooklyn. The building will be erected on Pearl street, between Front and Water.

Trade Notes.

The Partridge Carbon Co., of Sandusky, Ohio, has had phenomenal success with its carbon-motor brushes. Street railway companies appreciate these brushes to such an extent that they will have no other. In their estimation there is no other "equally as good." This they have learned by experience.

ELECTRICAL and STREET RAILWAY PATENTS

Issued February 4, 1896.

553,831. Secondary Battery. Anthelme E. W. Boucher, Prilly, Switzerland, assignor to the Societe d'Electro-Chimie, Paris, France. Filed August 13, 1895.

553,838. Successive Non-Interference Signal-Box. Frederick W. Cole, Newton, Mass., assignor, by mesne assignments, to The United States Fire and Police Telegraph Company, Portland, Me., and Boston, Mass. Filed April 21, 1890.

553,839. Non-Interference Signal-Box. Frederick W. Cole, Newton, Mass., assignor, by mesne assignments, to The United States Fire and Police Telegraph Company, Portland, Me., and Boston, Mass. Filed March 7, 1891.

553,840. Successive Non-Interference Signal-Box. Frederick W. Cole, Newton, Mass., assignor, by mesne assignments, to The United States Fire and Police Telegraph Company, Portland, Me., and Boston, Mass. Filed May 3, 1890. Renewed June 29, 1891.

553,843. Telephone. Samuel A. Dinsmore, Chicago, Ill. Filed March 8, 1895.

553,844. Insulating-Joint. William O. Duntley, St. Louis, Mo. Filed March 25, 1895.

553,847. Electric Transformer. Walter K. Freeman, Fort Wayne, Ind. Filed July 5, 1895.

553,849. Car-Fender. Thomas F. Gardner and Michael J. Carney, Pittston, Pa. Filed June 27, 1895.

553,857. Electric Light Switch. Harry W. Lawrence, Denver, Colo., assignor of one-half to William A. Blakeney, same place. Filed April 1, 1895.

553,858. Spring Supporting-Ear for Trolley Wires. Charles A Lieb, New York, N. Y., assignor to the General Electric Company, of New York. Filed June 23. 1894.

553,873. Non-Interfering Signal Apparatus. John J. Ruddick, Richmond, Ind., assignor, by mesne assignments, to The United States Fire and Police Telegraph Company, Portland, Me., and Boston, Mass. Filed June 28, 1890.

553,890. Electric Programme-Clock. Herman T. R. Zeidler, Berlin, Germany. Filed June 29, 1895.

553,900. Electrical Whistle-Controlling Device. Arthur E. Colgate, New York, N. Y., assignor to George J. Schoeffel, Brooklyn, N. Y. Filed November 24, 1894.

553,901. Automatic Current-Regulator. Stanley C. C. Currie, New York, N. Y., assignor of seven-twentieths to Edward N. Dickerson, same place. Filed February 20, 1895.

553,911. Regulating-Socket for Incandescent Lamps. Alvin B. Hendricks, St. Mary's, Ill. Filed June 19, 1895.

553,919. Electric-Arc Lighting. George R. Lean, Cleveland, Ohio, assignor to the Jandus Electric Company, same place. Filed September 26, 1895.

553,920. Electric Arc-Lighting System. George R. Lean, Cleveland, Ohio, assignor to the Jandus Electric Company, same place. Filed September 27, 1895.

553,921. Electric-Arc Lighting. George R. Lean, Cleveland, Ohio, assignor to the Jandus Electric Company, same place. Filed September 27, 1895.

553,923. Apparatus for Electric Welding. Hermann Lemp, Lynn, Mass., assignor to the Thomson Electric Welding Company, of Maine. Filed June 17, 1891.

553,927. Electric Trolley. Nelson Muslar, West Boylston, assignor to Henry F. Harris, Worcester, Mass. Filed April 9, 1894.

553,952. Electric Railway. Augost Casazza, Hoboken, N. J. Filed December 13, 1894.

553,957. Telegraphy. Patrick B. Delany, South Orange, N. J. Filed July 25, 1891.

553,960. Electrical Igniting Device. Wilhelm Kaiser, Vienna, Austria-Hungary. Filed September 6, 1895.

553,964. Registering Apparatus for Telephones. Franz Quatram, Pankow, Germany. Filed July 26, 1895.

553,965. Electrician's Screw-Driver. Joseph Reece, Pulaski, N. Y. Filed May 31, 1895.

553,977. Adjusting Attachment for Telephone Signal-Bells. Cleaveland F. Dunderdale, Chicago, Ill., assignor to the Automatic Long Distance Telephone Company of Chicago, Ill., of Illinois. Filed June 27, 1895.

553,979. Electric Railway. Frederick C. Esmond, Brooklyn, N. Y., assignor to the Esmond Electric Traction Company, of West Virginia. Filed April 19, 1893.

553,980. Electric Railway. Frederick C. Esmond, Brooklyn, N. Y., and Harding F. Gray, Passaic, N. J. Filed May 4, 1893.

553,981. Circuit-Controlling Device for Electric Railway Systems. Frederick C. Esmond, Brooklyn, N. Y., assignor to the Esmond Electric Traction Company, of West Virginia. Filed July 1, 1893.

554,016. Pressure-Alarm for Gas-Supply Pipes to Furnaces. Francis S. Baker, Chicago, Ill. Filed July 22, 1895.

554,018. Combined Car Brake and Fender. Arthur K. Bonta, Hoboken, N. J., assignor to the Bonta Manufacturing Company, same place. Filed May 22, 1895.

554,036. Telephone Apparatus. Carl J. Schwarze, Adrian, Mich. Filed September 17, 1895.

554,042. Fuse-Box. Jay S. Strouse, Baltimore, Md. Filed October 5, 1895.

554,043. Electric Battery. David S. Williams and Harry M. Hamrick, Philadelphia, Pa., assignors to the North American Electric Storage Company, same place. Filed May 15, 1895.

554,063. Commutator for Magneto-Electric Machines. John C. Henry, Westfield, N. J. Original application filed December 16, 1891. Divided and this application filed March 31, 1893.

554,064. Car-Fender. William H. H. Heydrick, Philadelphia, Pa., assignor of one-half to Christopher R. Blackall, same place. Filed August 15, 1895.

554,074. Electrical Circuit-Closer. Lebbeus B. Miller, Elizabeth, N. J. Filed August 3, 1895.

554,080. Automatic Switch. James F. McElroy, Albany, N. Y., assignor to the Consolidated Car Heating Company, same place. Filed January 2, 1982.

554,083. Electric Time and Signal Recorder. Charles E. Ongley, New York, N. Y., assignor to George J. Schoeffel, same place. Filed December 8, 1893.

554,089. Electric Carriage-Lamp. Patrick H. Quinn, New York, N. Y., assignor of one-half to Allan Lexow, Hoboken, N. J. Filed December 3, 1895.

554,097. Apparatus for Railway Signaling and Switching. John D. Taylor, Chillicothe, Ohio. Filed October 29, 1894.

554,102. Underground System for Electric Railways. William P. Allen, Chicago, Ill., assignor, by direct and mesne assignments, of two-thirds to Oliver S. Kelly and Alvaro S. Krotz, Springfield, Ohio. Filed June 22, 1895.

554,103. Electric Conductor and Contact Device Therefor. William P. Allen, Chicago, Ill., assignor, by direct and mesne assignments, of two-thirds to O. S Kelly and Alvaro S. Krotz, Springfield, Ohio. Filed July 15, 1895.

554,104. Underground System for Electric Railways. William P. Allen, Chicago, Ill., and Alvaro S. Krotz, Springfield, Ohio, assignors of one-third to Oliver S. Kelly, Springfield, Ohio. Filed August 23, 1895.

554,112. Telegraph-Key. William Deats, Amawalk, N.Y. Filed June 16, 1894.

554,119. Car-Fender. John F. Girtler, Brooklyn, N. Y., assignor to John F. Girtler, Gaston E. Constantin, Adolf Glaus and Friedrich Heinemann, same place. Filed July 24, 1895.

554,124. Electric Battery. Charles J. Hirlimann, Fort Lee, N. J. Filed October 25, 1895.

554,125. Telephone System. Wallace A. Houts, Parker, S. D. Filed December 24, 1894.

554,130. Fuse-Holder and Lightning-Arrester. Harry A. Lewis, Norristown, assignor of nine-twentieths to James C. Yerkes, Reading, Pa. Filed January 17, 1895.

554,138. Mechanical and Electrical Development and Storage of Wind-Power. Walter L. Negbaur, Brookline, and Joseph J. Feely, Walpole, Mass. Filed October 9, 1895.

554,141. Telephony. Charles A. Randall, London, England. Filed December 31, 1894.

554,149. Car-Fender. Luke E. Sicard and John Frazee, New Orleans, La. Filed September 5, 1895.

554,158. Car-Fender. Charles Welsh, Ilchester, Md., assignor of one-half to Milton W. Welsh, same place. Filed August 29, 1895.

554,167. Car Fender and Brake. George W. Beard, Baltimore, Md., assignor of two-thirds to John W. Erdman and Charles F. Schweizer, same place. Filed December 2, 1893.

554,221. Electric Snap-Switch. Gerald W. Hart, Hartford, Conn., assignor to the Hart & Hegeman Manufacturing Company, same place. Filed September 27, 1894.