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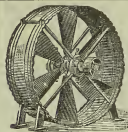
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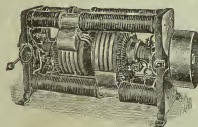
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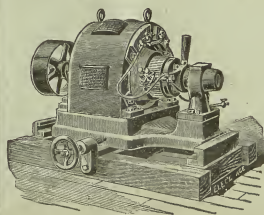
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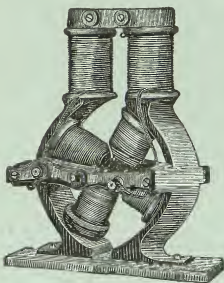
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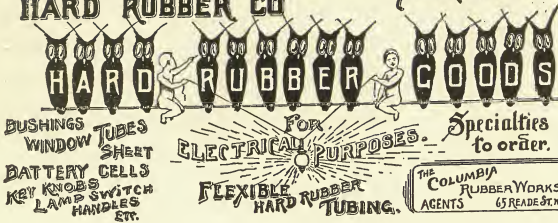
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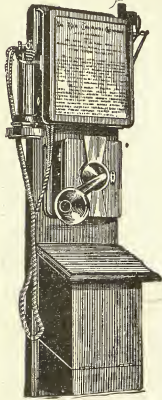
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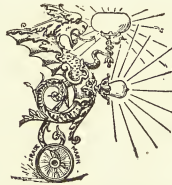
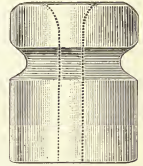
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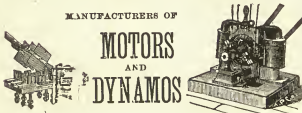
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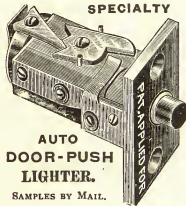
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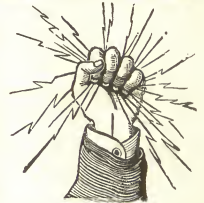
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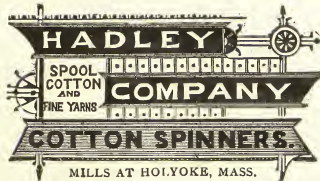


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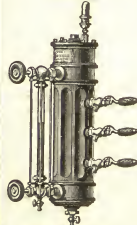
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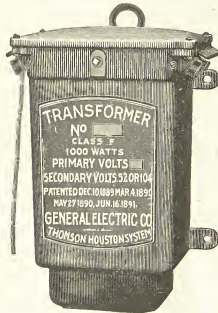
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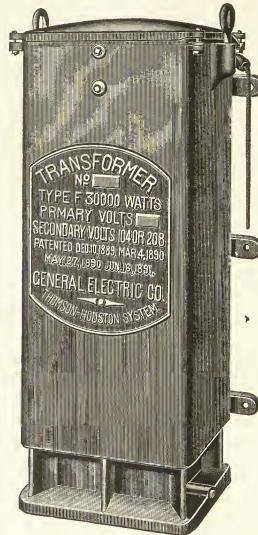
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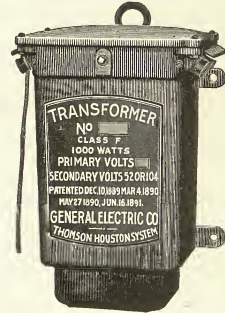
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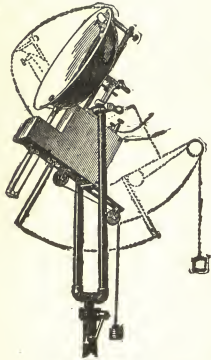
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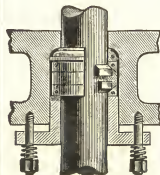
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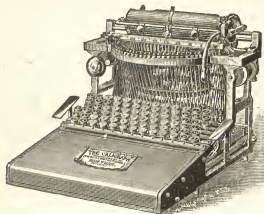
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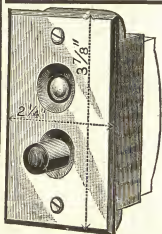
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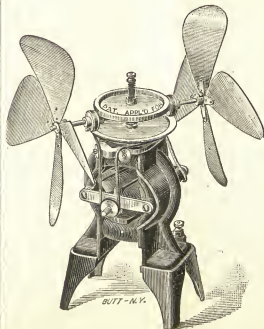
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No. 21

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NEW YORK, MAY 27, 1893.

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AN INTERESTING WEEK.

Last week was one of extraordinary interest to the members of the two principal electrical societies in this country, namely, the American Institute of Electrical Engineers and the New York Electrical Society. The former held its annual meeting on Tuesday and Wednesday, and its annual dinner on Tuesday evening. On Thursday, a large number of the members of both societies visited the works of the Crocker-Wheeler Electric Company at Ampere, N. J., and on Friday night, the

members of New York Electrical Society and their friends, to the number of 100, visited the performance of "The Seven Ages of our World," by special invitation from the management of the "Urania" theatre.

INCREASING INSURANCE RATES.

The Pittsburg Fire Underwriters, at a meeting in that city on May 5, decided to advance insurance rates, the advance to take effect at once. A heavy increase in the rates on buildings into which electric wires run is made, subject, however, to its being conditionally waived. An increase of 25 cents on the \$100 is made where electric light wires run into a building, and 15 cents for each additional wire. These extra charges will be waived, however, if the wires are "fused" at the point of their entrance to the building. The increase on telephone or electric call bell wires is 10 cents on the \$100 and 5 cents for each additional wire, the same provisions as to "fusing" applying to the latter class of wires. These increases in electrical risks do not seem to accord with actual conditions. It is a well-known fact that through the great improvements in methods of installing wires the dangers have been almost entirely removed, and it seems somewhat anomalous to increase the rates on risks in which the element of danger is constantly decreasing, through improvements in methods in wire installation. The electrical people of Pittsburg should use every endeavor to have this rule revoked, as it will naturally tend to frighten timid people, who would otherwise introduce electric lights and other electrical apparatus into their homes and places of business.

PERNICIOUS BILLS KILLED IN COMMITTEE.

In the issues of the ELECTRICAL AGE of April 22 and 29, last, were published articles from Mr. Allen R. Foote on the subject of State supervision and regulation of corporations. Mr. Foote referred specifically to two bills which had been introduced in the legislature of one of the largest and most enlightened States in the Union, for the purpose of regulating and supervising corporations employing natural or artificial gas or electricity for light, heat, or power, or all, to the public, and regulating the price of electric light.

Mr. Foote very ably and completely revealed the unfair and discriminating effects these bills would have upon operating electrical concerns should they become law, and the publicity thus given to these unjust measures has been largely instrumental in compassing their defeat in committee.

We are advised that these bills were thus disposed of, after considerable hard work on the part of those concerns which would have been seriously affected had the bills become law. The bills were very skillfully worded and deceiving on their face, but by reading between the lines and getting at their true inwardness it was seen that they were conceived in selfishness, with the object of crushing certain companies for the benefit of certain others.

PERCUSSION DRILL PLANT.

The electric percussion drill since it was first put into practical operation, has undergone many changes, each tending towards perfection, until today it can compete successfully either with the steam or compressed air drill.

One of the most interesting percussion drill plants is that in operation at the limestone quarries of the Solvay Process Company, near Syracuse, N. Y. This plant has now been working continuously for several months and the excellent results obtained, both in amount of work done by the drills, and the convenience and economy of their operation and maintenance have given



VIEW OF QUARRY.

thorough satisfaction to the company first undertaking their general employment. Installed by the General Electric Company at the commencement of the past winter, the drills have operated without any interruption from the intense cold, and have practically demonstrated the advantages derivable from the use of electricity in quarry work. Had steam been the only available power, the loss in transmission by condensation at 20° below zero would have been so great that the drills



DRILL AT WORK.

could not have been worked. The quarry, as will be seen from the illustration, is situated in a desolate spot on an elevated plateau, where the intense cold found full scope for action.

At the present time three "Type E," General Electric Company's drills, are in continuous operation ten hours per day, drilling holes from six to ten feet in depth, and 2 to 2½ inches in diameter at the top. The rate of drilling, according to the record kept by the superintendent, is from 45 to 75 feet per ten hours, averaging 50 feet per day, or 1,500 feet per month of 30 days. The average distance of the drills from the power sta-

tion is about 2,000 feet at the present time, the circuit, three lines of bare No. 0 copper wire, being extended to a distance of 3,000 to 3,500 feet from the power station in one direction.

The manipulation of the drill is in every respect as simple as that of the steam or air drill, stopping and starting being accomplished by merely throwing a handle to the right or to the left, making or breaking the contact between the cable and the terminals of the coils. Not the slightest difficulty is experienced in lubricating the wearing parts, or in handling the drill.

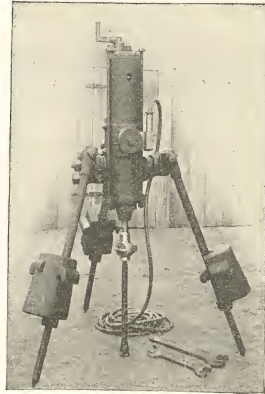
The general dimensions of the "Type E" drills, three of which are doing all the deep hole drilling for the quarry, are:

- Length over all.....49 inches
- Outside diameter, wrought iron tube 7½ "
- Length of stroke.....5 to 7 "
- Blows per minute.....380

The generator which supplies the power is of the bipolar type, running at normal speed, and is provided with a device for directing the current alternately into the upper and lower coils of the drills. The difference of potential at the fixed brushes of the generator is 240 to 250 volts.

The generator is belted to a 9' x 12' Straight Line engine, supplied with steam at 90 lbs. pressure from a horizontal tubular boiler, fuel for which is brought for three miles over the cable way in the buckets used to transport the lime rock from the quarry to the works. As yet no estimate of cost or repairs can be given, because up to date there have not been any. Should, however, any part break down, it can instantly be replaced as all the parts are interchangeable.

The plant has aroused widespread interest among quarry operators in general, and has been visited and carefully inspected by many less prone to reject the



ELECTRIC PERCUSSION DRILL.

good things which advanced science offers. That electricity is the ideal power for mine and quarry operation, only the most conservative refuse to believe.

Le Mars, Iowa.—The Northwestern Water and Light Company has been incorporated. The company will operate the electric-light and water-works before conducted by J. H. Winchel. The officers of the new company are J. H. Winchel, president; M. W. Richen, vice-president, and J. K. Alline, secretary and treasurer.

A CANINE ELECTRICIAN.

Messrs. Crompton & Co., the well-known electrical engineering firm of London, England, utilize a means of running wires through underground conduits that is novel. It consists of a live fox terrier, by the name of "Strip." Strip thoroughly understands her business, and when a wire or a cord is attached to her collar she knows she must crawl through a conduit and haul the line after her. When she arrives at the opposite end of the conduit workmen are ready to disengage her of her burden.



"STRIP" READY FOR WORK.

Strip, it is said, has laid many miles of underground wires in London, and she gets through the pipes in good time. She is known as "Strip, the Electrician."

A NOVEL APPLICATION OF THE C-S. AUTOMATIC.

The accompanying illustration shows a novel application of the C-S automatic switch, described in a recent issue, wherein it is so arranged as to arbitrarily cut out the current from a hotel guest-chamber by process of locking the door from the outside.

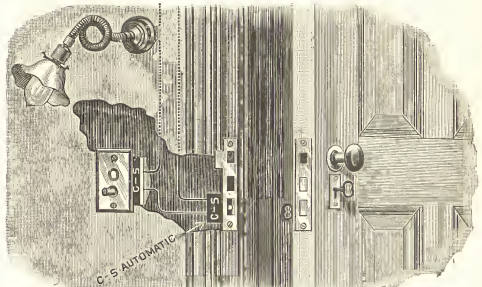
It is probable that no other hotel expense is so greatly augmented by the negligence of guests as is that attendant upon lighting the rooms, and this is particularly the case where the electric light is used. Indeed, it is estimated that ninety per cent. of all hotel guests invariably leave their lights burning upon vacating their rooms.

This evil has become so general, and has proved to be such an immense drain upon business revenue, that hotel managers are constantly trying to devise a remedy, but thus far the only safeguard seems to be to have a constant watch kept upon all the rooms; a method at once expensive and inconvenient. It is the province of this novel application of the "C-S Automatic" to compel the guest to turn off his light upon leaving his room whether it occurs to him to do so or not.

In the modern hotel it is the practice to fit the doors of all guest chambers with the "secret" or double-bolt locks, one bolt being operated from the inside, the other from the outside, and it is by taking advantage of this arrangement that the C-S switch is made to perform this service of economy in a most successful manner.

As is shown in the illustration a "C-S Automatic" is placed in the moulding of the door jamb, immediately back of the striker plate, in such a manner that the push of the switch is directly in line with the movement of the bolt that is operated from the outside of the door. With this arrangement, it will be understood that, when in the process of locking the door from the outside, the bolt is thrown, it engages with the switch-push, thus opening the switch and turning off the lights, while locking the door from the inside has no effect whatever upon the action of the switch.

However, to provide means whereby the occupant of the room may turn the light off from the inside when desired, an auxiliary switch is placed on the inside of the room, in circuit between the controlling door-lock switch and the lamps, in such manner that while the door remains unlocked upon the outside, the



AUTOMATIC SWITCH ADAPTED TO CUT OUT CURRENT FROM A HOTEL GUEST CHAMBER.

lamps may be turned on or off at will in the usual manner; but whatever the position of this auxiliary switch may be, as to whether the current is off or on; when the occupant locks his door from the outside upon leaving the room the lights are invariably turned off.

This unique and valuable device is a recent addition to the well-known line or C-S specialties manufactured by The Cutter Electrical & Mfg. Co., of Philadelphia, and, although comparatively new, they have already been placed in all the rooms of the Great Northern Hotel, Chicago, and other well-known hotels are now being fitted with them.

WORLD'S CONGRESS OF ELECTRICIANS.

We are advised by Prof. Elisha Gray, Chairman of the World's Electrical Congress Committee, that in accordance with the expressed wish of the American Branch of the Advisory Council of the World's Congress of Electricians, the Secretary of State has appointed Prof. H. A. Rowland, Johns Hopkins University, Prof. T. C. Mendenhall, Supt. Standard Weights and Measures, Prof. H. S. Carhart, Michigan University, Prof. Elihu Thomson, Lynn, Mass., and Prof. E. S. Nichols, Cornell University, to sit in the Chamber of Delegates as the duly authorized United States delegates.

While there are many electricians in the United States who could fill, with dignity and credit to the profession, this honorable and responsible position, yet the profes-

sion is to be especially congratulated that the United States is to be represented by men of such high standing both as gentlemen and members of the profession.

Prof. Gray also announces that the Royal Commission has named W. H. Preece, Prof. S. P. Thompson, Prof. W. E. Ayrton, Major Cardew and Alexander Siemens as delegates from Great Britain.

There is every reason to believe that the success of the Congress is now assured, and that all the important countries will be fairly represented.

GARTON LIGHTNING ARRESTERS.

The business of making and placing on the market lightning arresters is fast increasing. Electric light and power men consider that it is much better policy to expend a small amount of money and protect their valuable machines, than to save this small sum and to leave the property exposed to damage. The call for these useful appliances has brought forth a great variety of makes.

The Garton lightning arrester has passed successfully through two years of use, and it has been subjected to severe tests, but still holds the record of having never failed. Many roads throughout the country are wholly or partially equipped with this make of arrester. Re-

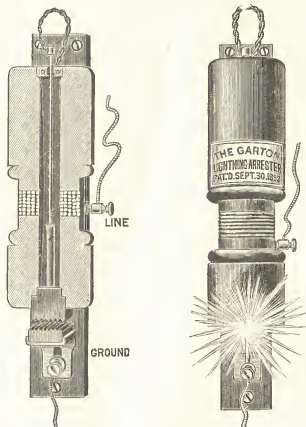


FIG. 1.

FIG. 2.

ports from these roads speak in the highest terms of their successful operation.

Fig. 1 illustrates a cross section view of the device showing the interior of the air chamber, locality of the carbons, armature and guide rods. The same type of arrester may be used for station, car and pole service. The pole arrester is made with a waterproof covering. In action it is instantaneous, reliable, very quiet, and makes no objectionable fire or smoke.

Jarring or being somewhat out of plumb does not prevent the action of this device.

Fig 2 illustrates the arrester in action.

On one electric road in Ohio, 284 Garton arresters are used, and all through a two days storm recently there was no interruption of traffic, nor was there a cent's worth of damage done by lightning. Another large and important road in the West, with an equipment of 50 arresters, continued in operation all through a recent storm,

Hitherto, under like circumstances, the road had been shut down, but this time not the slightest damage was suffered.

These arresters are used on very many of the Western and Southern roads and in no instance have they failed to arrest lightning discharges.

These excellent arresters are manufactured by the Garton-Daniels Electric Co., Keokuk, Iowa.

THE ACTION OF CONTINUOUS AND ALTERNATING CURRENTS ON FUSE METALS.*

By C. P. MATTHEWS.

For the protection of electric circuits from the passage and consequent heating effects of currents of abnormal intensities, no device is in more general use than the so-called safety-fuse. Commercially the fuse appears in a variety of connecting devices and inclosing boxes, classed as thermal "cut-outs," and familiar to all having to deal with the distribution of electric energy. The protective element in all such consists of a wire or strip of some easily fusible metal of such current carrying capacity that it will melt under the heat developed

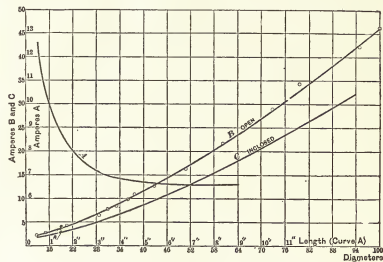


FIG. I.

by an excessive current. In points of simplicity, cheapness, ease of adjustment and low resistance, the safety-fuse possesses advantages over most, if not all, electromagnetic safety devices. Experience shows, however, that unless certain conditions for successful working are carefully observed, the safety-fuse may fall far short of furnishing satisfactory and reliable protection.

With a view of studying these conditions, and of obtaining at the same time reliable data on the fusion of conductors under circumstances closely approximating those of actual practice, a series of experiments, some of the results of which appear in this paper, were recently made in the Physical Laboratories at Cornell University.

This experimental work, which was undertaken by several persons, may with propriety be divided as follows:

Part I. On the behavior of various alloys under the action of direct currents, with special reference to their use in thermal cut-outs.

Part II. On the *disintegrating* effect of the alternate current on fuse metals.

PART I.

To determine to what extent the fusing current is influenced by the cooling effect of the terminals, pieces of

* An abstract of two theses, viz.: "Safety-fuses for Electric Circuits," by J. S. Peck and C. P. Matthews; and "The Action of Alternating Currents on Fuses," by W. S. Rugg and C. R. Sturdevant, read at the Tenth General Meeting of the American Institute of Electrical Engineers, New York, May 27, 1893.

wire of given diameter and composition, but of varying lengths were successfully tested. The marked variation in current is shown graphically in Fig 1, Curve A. It will be noted that while an 8 in. piece fused at 6.6 amperes, a 1/2 in. piece of the same wire carried 12.5 amperes, or an excess of nearly 100 per cent. before yielding. For lengths of this wire greater than 6 in. the conduction losses are practically nil in their influence on the value of the fusing current. The practical point to be observed at this juncture would seem to be this: manufacturers cannot accurately rate their fuse wire unless the length of the specimen to be used is specified. In the fuse-blocks in common use it is impracticable to use extreme lengths, yet if 3 inch pieces were used, the cooling effect would not be serious. Fuse-blocks are on the market employing from 1/2 inch to 3 inch lengths of wire and all the variation indicated by the curve may be expected.

There is an important *time element* to be considered in connection with the phenomena of fusion. A certain interval elapses before the wire reaches the permanent temperature corresponding to a definite current. The duration of the current in this portion of the work was 60 seconds, experience showing that if a wire of mode-

away so rapidly that the current reached the abnormal values shown, before rupture occurred. For example, a 7-ampere fuse did not "blow" until more than 35 amperes were flowing in the circuit. Curve A' B' and C' in Fig. 3 represent the behavior of the best sample of wire tested. The wire was quite uniform in diameter, and gave evidence of careful rating. The curve of rating should be of the same general equation as that of fusion, since both represent isothermal conditions.

The requirements for an efficient safety-fuse may be summed up as follows.

1. Promptness of action.
2. Low fusing point.
3. Permanency under normal conditions.
4. Moderately low resistance.
5. Firm and lasting contact.

Promptness of action requires that the temperature of fusion should not be too far removed from that attained when the wire is being worked at its rated capacity. Moreover, it is important that the metal should not undergo chemical changes produced by the action of the heat which may appreciably alter its melting point. The formation of oxides may or may not promote

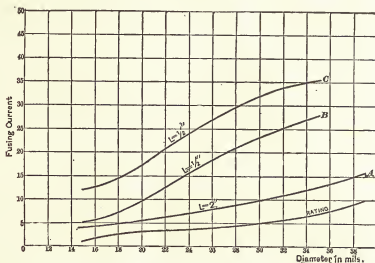


FIG. 2.

rate diameter did not fuse in that time under the action of a certain current it would not fuse at all. Curves A' and B' of Fig. 3 illustrate the magnitude of this effect in a particular case, the time intervals being as 1:2. The variation in fusing current exceeds 5 amperes for the larger sizes. It should be noted in this connection, that unless massive terminals are used they may themselves become heated, thereby checking the flow of heat through the ends of the wire, and tending to promote ultimate fusion.

Curve c, Fig. 1, illustrates the effect of enclosing the fusible wire in glass tubes. As would be expected, the convection is thereby checked, and the fusing current very appreciably lowered. This is a point which should not be overlooked in practice, that is to say, the nature of the fuse-block, whether closed or open, should be considered.

In order to ascertain the status of marketable fuse-wire, a number of samples were obtained from different manufacturers and tested under conditions similar to those already described. The results were represented graphically by curves, only two sets of which are here reproduced. In Fig. 2 curve A is that obtained where 2 inch specimens were tested, and, as will be seen, is not far from a 3/4 power curve. When, however, 1/2 in. pieces of the same wire were tested, curve B, much higher and distorted, was obtained. The marked cooling effect of the terminals is here apparent. Curve C is the most remarkable of all. One-half inch lengths of the same sizes of wire were successively fused in a porcelain ceiling cut-out block. This block was so constructed that the wire came in contact throughout its length with the cooling surface of the porcelain. The heat was conducted

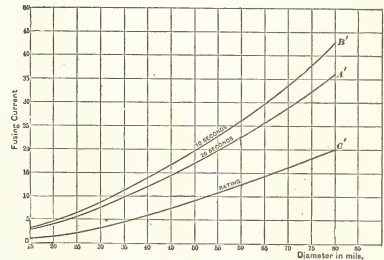


FIG. 3.

prompt fusion. In the case of pure tin and some of its alloys, a coating of oxide is often formed which retains the molten metal some time after the temperature of fusion has been passed, ultimate rupture usually occurring with considerable violence. On the contrary, the rapid oxidation of iron and copper wires seems to favor prompt fusion.

The question of low fusing point is one with which the fire underwriters are concerned, since wires fusing at high temperatures introduce an element of danger from fire. With fuses enclosed in properly constructed blocks, the danger from this source is not great, and the necessity of employing a metal of low melting point is not so important as might be imagined. Experience shows that fuses made of nearly all the metals available for such purpose, will melt without dangerous scattering of particles or liberation of hot gases, when the current is gradually increased until the break occurs. This, however, is a condition which rarely obtains in practice. (To be Continued.)

The General Electric Company reports the following western contracts: Mission street road, San Francisco, forty cars, twenty equipped with two 25-H. P. motors each and the others with single truck and two 20-H. P. motors each; also six 200-K. W. generators for the power station; four cars for the San Jose and Santa Clara railroad; three double 15-H. P. motor equipments and one single 15-H. P. motor; also five cars, double 25-H. P. equipments for the Metropolitan road, of San Francisco; two double equipment cars for the Telegraph avenue line, of Oakland; five large double equipment cars for the Haywards road.

OFFICIAL BADGE OF THE A. I. E. E.



The accompanying illustration shows the design of the official badge adopted by the American Institute of Electrical Engineers. The badge embodies the following characteristics:

Franklin's kite which demonstrated the identity between lightning and electricity and represents static electricity. It is a

recognition of America's first electrician and philosopher, Benjamin Franklin.

A diagrammatic representation of Wheatstone's Bridge, one of the most important pieces of electrical testing apparatus.

The galvanometer, another equally important piece of testing apparatus and which represents magnetism and induction.

The amber of which the galvanometer is made represents the first conception of electricity dating back to 600 years B. C., when Thales, the Greek philosopher, recorded the fact that amber, when rubbed, attracted light particles to it, and the Greeks worshipped it, believing the Gods had endowed it with life and that it possessed a soul.

In 1600 A. D., Dr. Gilbert, court physician to Queen Elizabeth, coined the word electricity from the word *electron*, the Greek name for amber.

A. I. E. E. represent the initials of the American Institute of Electrical Engineers.

E

C = — represents Ohm's law—a fundamental law in electrical work.

The pin is made of white enamel with the lettering and front portions in 18 karat gold and the back in 14 karat gold.

Members desiring to secure one of these pins should apply to the secretary, Mr. Ralph W. Pope, 12 West 37th street, New York city.

ELECTRICAL STANDARD-UNITS.

INTERNATIONALLY PROPOSED AND CONTOVERTED FROM A SCIENTIFIC AND PRACTICAL STANDPOINT.

By F. M. F. CAZIN.

In August, 1892, the British Association for the Advancement of Science, held a meeting at Edinburg, Scotland, and under its patronage there was held an international consultation on the subject of electrical measurement, in which the following savants took part:

Dr. von Helmholtz, president of the "Physikalisch-Technische Reichsaustalt" at Berlin, Germany.

Dr. Lindeck, and Dr. Kahle, his assistants.
Major Cardew, representing the British Board of Trade.

All the members of the committee on electrical standards of the British Association for the Advancement of Science.

Dr. Guillaume, member of the "French Bureau International des poids et mesures," of Paris.

Prof. Carhart, of the University of Ann Arbor, Mich., U. S. A.

In this consultation all previous propositions for electrical standards were revised, mainly on propositions made by Dr. Helmholtz, and standards modified in sundry points from those previously recommended, were unanimously accepted, with a view of prevailing on the governments of the several nations represented to issue laws for an obligatory introduction of the standards thus

accepted, the same as these nations had made laws to establish a yard, a foot, a metre, a pound, and a gram.

The issue of May 5, 1893, of the *Electrotechnische Zeitschrift* has published in an official report of the "Kuratorium der Physikalisch-Technischen Reichsaustalt on the consultation as heretofore mentioned and a German version of the propositions as they are intended to be sanctioned by law.

In relation to the theoretical units—

- (1) for distance of 10^9 cm.
- (2) for mass of 10^{-11} gm.
- (3) for time of 1 second.

The report says:

"These theoretical definitions of fundamental electrical units have been omitted in the propositions for a determination by law of electrical units, because it was assumed, that they only belonged to the reasoning out of the selection made of the practical units;" and further, "the same as the law declares the length of a stated rod as the unit of measuring distance without referring to the assumption of its representing the ten-millionth part of the quadrant of the earth, a precise definition of practical electrical units only has been proposed, without referring to their theoretical deduction;" and further, "the practical establishment of these (theoretical) units on the basis of their theoretical definitions causes difficulties."

It all amounts to this, that for the measurement of electrical potential energy these savants accepted from mechanics the unit of time only—the second, while for distance and weight, they propose a multiple for the one and a fraction for the other of the metre and of the therefrom deduced volume of water and its weight. But they omit altogether to make connection with the measurement of other modifications of energy, such as gravitation, heat and chemical affinity. And yet in their definitions of the electric current unit, the ampere, they draw on the sciences of chemistry, and indirectly of heat, as elements in such definition, thus abandoning their own theoretical and fundamental definitions entirely in the practical definition of the ampere, which more properly might be called the transverse dimension of the potential electric jet.

Unconcerned as to the fact, whether nature in her fundamental laws works in numbers, that present themselves as a product of two in three or two in five, that is, whether the decimal, the Latin arithmetical system, or the duo-decimal, the almost forgotten Saxon system, complies more closely with the phenomena of nature, these savants cause decimals to be fundamental to their values. If faults there be in this, the position taken by me in my essay headed: "Mechanical power the only true standard to measure electric energy by," of considering 100,000 amperes as equivalent inversely to the combustion with one-half of a chemical equivalent of oxygen, is sharing in this fault or defect in common with all scientists of this age. And as long as the metre remains the unit of distance for all scientists of progressive tendencies, and as long as neither the value $g/2$, nor the length of a lightray-wave has become the unit for measuring distance and as long as public schools teach arithmetic in the decimal and not in the duo-decimal system, so long will such a use of decimals remain justified.

In all of the resolutions passed the definition of the

watt as $1 \text{ watt} = \frac{1}{g} \text{ kilogram-meter second}$ is ignored,

and yet is the watt or volt-ampere acknowledged as the unit of mechanical work performed by electrical energy.

1
—kgm-m second is a unit of measuring the equivalent of
 g
mechanical work without reference to local gravitation,

or as universal unit of work, and as such is accepted more universally at this date, by scientists of all tribes and schools, than as yet any one of those units as proposed by the learned savants above named. By it alone connection may be made for measuring equivalents of electric, chemical, mechanical and heat modifications, which again is rendered impossible almost, by the employment and experimental results of such arbitrary fundamental assumptions as 10⁹ cm. and 10¹¹ gms. from which an experimental chemical or mechanical effect has been evolved in a manner not intelligible to the common mortal though otherwise able to conceive the features of scientific determination, by which dia-chemical effect is represented by the energy equation of

$$Q (+) = 111.8 \times 0.00001 \text{ of silver}$$

for the cathion quantity per second in a single case, as proposed to be made a law, and against the general energy equation as by me proposed relative to all matters elementary and to all of their compounds as known in science, viz:

$$Q (+) = \frac{A W P \times C^P}{2 \times C^N} \times 0.00001$$

(Compare the ELECTRICAL AGE of May 20, and the *Electrical World* "Electro-Metallurgy," June 4, and July 28, 1892). Although, aside from my own proposition thus made, no other expressed in definite terms and values, has so far been made on the part of any other scientist, I do not at this time stand alone in opposition to the regulation by law at the present date of electric units under the proposition made by the parties so far consulted.

Hospitalier in the issue of April 25, of "L' Ingenieur Electric" takes the same position; and the London *Electrical Review*, April 28, states that Prof. Ostwald, in a communication to the Munich Academy, recommends the substitution of the unit of energy for the unit of mass as one of the three fundamental units of an absolute system, in which case all physical magnitudes would be expressed in energy, length and time. Energy is the only magnitude which is common to all branches of physics, and it forms the single bond which unites the theories of heat, electricity, chemistry and dynamics.

Such a recommendation is carried out in accepting as by me proposed the equation

$$\frac{1}{g} \text{ Kgm-m} = 1 \text{ Watt}$$

as fundamental.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

The annual meeting and election of the American Institute of Electrical Engineers took place at the Institute headquarters, Tuesday, May 16, 1893, at four o'clock. Prof. Edwin J. Houston was unanimously elected president for the ensuing year. The other officers elected to fill the vacancies caused by the retirement of some of last year's officials are: Vice Presidents, H. Ward Leonard, P. B. Delany and William Wallace; Managers, Charles Hewitt, W. J. Hammer, Harris J. Ryan, J. J. Carty; Treasurer, Geo. M. Phelps.

The report of Council for the year ending April 30, 1893, was read and approved. At the meetings held during the last year thirty papers and reports were read and discussed and have since been printed and distributed to the members. The volume of transactions for 1892 was one-third larger than that of the previous year. It contained 858 pages. Two rooms in the Electricity Building at the World's Fair have been assigned to the Institute for use as headquarters, and satisfactory progress is being made in the suitable equipment of

these rooms. The Institute has done much in assisting in the preparation for the World's Electrical Congress of 1893. The various papers and discussions are now published at an earlier date than in previous years. A badge and certificate of membership have been approved. A description of the badge will be found on another page. The loss in membership of the Institute by death has been unusually large, the total being 9. The present membership is 671 (a net gain of 56) classified as follows:

Honorary Members	3
Members	206
Associate Members	462

671

The Treasurer's report shows a balance on hand, General Fund, May 1, 1893, of \$90.90. Building Fund, \$850.00.

After the business meeting the members attended the annual banquet held at "The Arena" 41 West 31st street. Members and friends to the number of seventy-five sat around the board and enjoyed the following menu.

MENU		
	Little Neck Clams	
	Clear Green Turtle Soup	
Olives		Radishes
	Salmon à la Hollandaise	
	Potatoes à la Duchesse	
	Filet de Bœuf piqué aux champignons	
Green Peas		Haricots Verts
	Coquilles of Sweetbreads, Lucullus	
	Roman Punch	
	Roast Squab	
	Lettuce and Tomato Salad	
	Tutti Frutti Ice Cream	
	Assorted Fruit	
	Cheese	
	Café Noir.	

Informal speaking followed the banquet. President Houston made a short address and called upon Mr. Frank J. Sprague to act as toastmaster. The electrical history and progress of the past seventeen years was ably outlined by Mr. T. D. Lockwood. A telegram was sent to Prof. Elisha Gray, Highland Park, Ill., expressing the appreciation of the members present of the earnest work done by this gentleman in establishing the World's Electrical Congress and promising hearty co-operation. Mr. Frankland Jannus gave a short humorous account of early electric railway installations, and was followed by Dr. C. E. Emery, who called attention to the vast field for exploration in the study and investigation of the force known as gravitation.

The subject of measuring instruments was well discussed by Mr. E. G. Willyoung. He stated that the electrical measuring instruments made in this country had reached a high state of perfection. Mr. T. C. Martin, the last speaker, made an enthusiastic speech on "The Society." He gave some of the early history of the Institute and spoke of its hopes with regard to the future.

NEW YORK ELECTRICAL SOCIETY.

The society held its 153rd meeting at Columbia College, on the evening of Wednesday, May 17, 1893. Dr. William J. Morton delivered an extremely interesting and instructive lecture entitled "A Brief Glance at Electricity in Medicine." The subject was treated under the following heads: Section I. The various currents used in medicine. Section II. The properties and applications of the respective currents. Section III. High frequency; high potential currents; electro-statics or Franklinism. 4. Tesla currents, from alternators,

air-gap, and condensers and induction coil; *B.* Morton currents from influence machine, air-gap and condensers; *C.* D'Arsonval currents; Sinusoidal currents from alternating dynamo machines. The lecture was illustrated by experiments with a large static machine, and a large modern medical electrical battery and coil were also shown. The lecturer stated that the human tissue was affected in several ways by the electric current. One of the chief effects is of a chemical nature, the action being allied to that set up in a voltaic cell. The physiological effects are very noticeable and seem to depend on the high potential and instantaneousness of the electric shock. The light, vibratory and heating properties of the electric currents are used in electro-therapeutics. The conductivity of the body is largely caused by the salts which are contained in it and the different tissues of the body vary widely as to their conducting power. The human body may be used as a storage battery. A person can be highly charged by electricity, and on removing the wires, and the terminals of an incandescent lamp placed on the body, the lamp becomes illuminated. The action of the current on animal tissue seems to have a lasting effect. To one leg of a frog an electric current was applied; some time afterward currents were applied to both of the legs; the leg first operated on was found to be much less susceptible to the action of the current, than the leg not previously charged. Needles suitably connected up are placed in the human body to gather or scatter chemical or metallic matter, in relation to the point of application. The property of an electric current in carrying liquid from the $+$ pole to the $-$ pole is of great service in the practice of medicine.

Medicines can thus be applied to special localities of the body; for instance, a person may place one foot in a positive bath and with the hands grasp the negative pole. The physiological effects are contraction of the muscles, rigidity and heating. The heart contracts by a steady continuous current, and most of the other muscles, such as the biceps, triceps, etc., contract to an intermittent current. In applying the poles of the medical apparatus, the $+$ pole is presented if a passive effect is desired, the $-$ pole if an active.

Modern electro-therapeutics is much different from the old, inexact method of medical electricity. A person can now take a very severe shock, and yet at the same time feel little or no pain. When the patient is on an insulated stool, the positive lead is usually attached to the body.

"Electrocution" is supposed by an eminent authority on electro-therapeutics to be an unconscious but not a lifeless state, and that with proper restoratives the person "electrocuted" may be brought to life. With 2,500 to 5,000 vibrations or impulses of electric current the physiological effects are at their maximum; at 5,000 and above the effect is much less apparent and the pain is greatly decreased.

The lecturer in closing showed the similar paths in which the science of medical electricity and electrical engineering run harmoniously together.

MINERAL RESOURCES OF THE U. S.

According to "Mineral Resources of the United States" for the calendar year 1891, just issued by the United States Geological Survey, Department of the Interior, the total production of copper during that period was 295,810,076 pounds, against 265,115,133 pounds the previous year. Its value in New York is placed at \$38,455,300. This is the largest production on record, the increase coming from Lake Superior, Arizona and California. The stock of copper in the United States declined.

The total product of zinc during 1891 was 80,337 short tons against 63,683 short tons in 1890. Its value was \$8,033,700. Nearly every important producer shows an increased output. The output of quicksilver was practically the same as that in 1890, California being the only producing State.

In 1891, 100,000 pounds of aluminum were produced against 47,881 in 1890. The demand for this metal for experimental purposes increases. The value of the product for 1891 is fixed at \$100,000. The chapter on aluminum was written by Mr. R. L. Packard and contains some interesting facts and figures. The American product of this metal was far surpassed in quantity by foreign output. In Germany it is put to a great variety of practical uses, while in this country its application to every day purposes is rapidly extending. Sections of the chapter are devoted to the consideration of the metallurgical uses of the metal, soldering and alloys.

ANNUAL REPORT OF THE WESTINGHOUSE COMPANY.

The following is a copy of the annual report of the Westinghouse Electric and Manufacturing Company, which was received too late for our last issue:

OFFICE OF WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY.

PITTSBURG, PA., May 17, 1893.

To the Stockholders of the Westinghouse Electric and Manufacturing Co.:

Your Board presents herewith its financial statement for the year ending March 31, 1893.

It will be seen that there has been a profit from manufacturing of \$1,491,817.13, and from other sources of \$112,766.60, making a total for the year of \$1,604,583.73. This is after charging to operating expenses the following amounts: \$84,747.31 for alterations and additions to buildings; \$155,481.87 for maintaining the machinery and tools in the highest order, and \$58,188.86 for interest and discount.

The year began with large orders, but with only a moderate manufacturing capacity and a proportionate stock of material on hand, so that the above earnings were made under unfavorable circumstances due to the fact that the capacity of the works and the material in stock and in process had to be more than doubled during a steadily increasing press of business.

During the year the Company has manufactured and installed, at the World's Fair in Chicago, an electric lighting and power plant, consisting of twelve generators of 15,000 lights capacity each—two of 4,000 lights capacity each; one 750 horse-power generator, and several small ones. Six of the large generators are driven by engines having their shafts connected directly to those of the generators. This plant is the largest ever installed.

These generators mark a new era in electric light and power distribution. They are of the "two-phase" type, designed to drive Tesla motors, and at the same time to operate both arc and incandescent lamps, thus making the one form of generator useful for three purposes.

The total capacity of the plant exceeds the contract requirements sufficiently to meet the demands that may be made by exhibitors for extra lights.

The Company will also have at the Fair an extensive exhibit of its other forms of apparatus.

The stopper lamps now being manufactured in the company's Allegheny City works are being used exclusively in connection with the apparatus at the World's Fair. It is gratifying to be able to announce that in the manufacture of the Sawyer-Man stopper lamps, all of

the advantages anticipated have been fully realized. The low cost of manufacture, and the high efficiency of these lamps, together with the ability to renew their carbon burners, enables the company to sell lamps at lower prices than can be afforded by any other manufacturer. To meet the demand, a new factory has been equipped with special machinery designed for the purpose, and already has a daily capacity of 5,000 lamps, which is being rapidly increased, and will be shortly quadrupled. The expenses incident to the establishment of this new lamp factory have been charged to the business of the past year. This branch will hereafter add materially to the volume and profit of the company's business.

The success of the stopper lamp, its low cost of manufacture, and the fact that it is the discovery, prior to Edison's patents of inventors whose patents belong to our company, have turned a temporary check into a great business advantage.

Our competitors have copied our plans and infringed many of our patents, notably those relating to power-transmission, and many important details essential to the successful operation of alternating current apparatus for the distribution of electricity for light and power purposes, for which we have brought suits for infringement.

The confidence expressed in the last annual report, in the superior merit of the apparatus of the Company, and in the strength and value of its patents, has been fully justified by the results of the year's operation; and we feel no apprehension as to the outcome of suits now pending or which may be brought by its competitors.

Your directors have been brought face to face with the fact that the business of the Company has outgrown the present capacity of its factories, and that large savings could be effected if the manufacture were carried on in new works equipped with the latest devices for handling its product by machinery.

In view of the favorable result of the past year's business, and of the volume of orders in hand, and the future outlook, your directors have not hesitated to accept a proposition from the East Pittsburg Improvement Company to sell to your Company a site of 23 acres most favorably located with reference to railway facilities. The Improvement Company has agreed to erect on this site buildings and works according to the plans and under the supervision of the officers of your Company, and to sell them to the Company at their actual cost, not, however, to exceed \$500,000 above the price of the land and have agreed to take pay therefor in quarterly payments of \$25,000 and interest beginning January 1st, 1894. Your officers have estimated that the savings to be effected by the manufacture of its products in the new works, will, on a most conservative basis, be more than double the amount of the quarterly payments. Thus, these new and complete works will be acquired without the expenditure of fresh capital, leaving the proceeds from the sale of the Company's present property, as working capital, without taking into account the manifold business advantages that will arise from the centralization of its manufacturing operations.

The results of the past year's business have shown that our apparatus can be sold for cash to responsible parties, and that the prevailing belief that long credits must be given, or that stocks and bonds must necessarily be taken in order to secure business, is not correct. Your officers and agents have found that low cash prices and good apparatus are sufficient inducements to secure all the trade the Company can care for.

Although the profits of the business might have justified the payment of dividends on all of the stock of the Company, the directors have thought it wise to pursue a very conservative policy, especially in view of the large expenditures required during the past year for ma-

chinery and material, and of similar expenditures which the present prosperous condition of the Company's business may make necessary in the near future. Both the results and the prospects are so encouraging that the directors believe the stockholders will uphold them in a course which places the Company in a position of undoubted financial strength, and which will assure the permanent continuance of dividends when once begun.

It will interest the stockholders to know that there has been a large increase in the orders for electric lighting machinery. The orders on hand, with those received since April 1, the beginning of our fiscal year, aggregate \$3,028,048.32, about double the figures at the same date last year. The orders in hand, the current business, and the outlook justify the expectation that the business for the present year will be largely in excess of last year. The company has turned out its products during the past three months at the rate of over \$8,000,000 per annum, and now has on its pay rolls 3,942 operatives.

For the Board,

GEORGE WESTINGHOUSE, JR.,
President.

BALANCE SHEET, MARCH 31, 1893.

ASSETS.		
Cash in Banks.....		\$212,573 85
Bills receivable.....		366,228 47
Accounts receivable.....		2,289,982 70
Material in stock and in process of manufacture (at a cost of labor and material).....		1,414,662 31
Advances to leased companies.....		138,573 06
Bonds (par value \$369,100).....		358,197 15
Stocks (par value \$6,469,257).....		4,069,439 96
Real Estate and Buildings.....		453,037 98
Machinery and Tools.....		710,023 61
Miscellaneous.....		60,955 54
Charters, Franchises, Patents, etc.....		4,378,031 69
Total Assets.....		\$14,450,806 32
LIABILITIES.		
Accounts payable.....		\$569,660 48
Bills payable, issued for Merchandise.....		376,003 64
Discounted with collateral.....		931,884 51
CONTRACT AND CONTINGENT LIABILITIES.		
Scrip Dividend.....		194,562 00
Stock Subscriptions.....		13,125 00
U. S. E. Ltg. Co.'s 6 per cent. 15 year bonds, \$50,000 payable annually.....		600,000 00
(Bills receivable under discount, \$482,054 49)		
CAPITAL STOCK.		
Preferred, 37,378 shares.....		\$3,658,940 50
Assenting, 103,146 shares.....		5,157,311 00
Common, 3,633 shares.....		181,650 00
(In Treasury, 6,621 shares Preferred; 13,220 shares Assenting.)		9,007,921 50
SURPLUS.		
Balance, March 31, 1892.....		\$1,880,445 20
Twelve months' net earnings from business.....	\$1,491,817 13	
From other sources.....	112,766 60	1,604,583 73
		\$3,485,028 93
Less amount written off in adjustment of matters pending in 1890 and 1891.....	\$321,228 05	
Ditto in current year.....	98,869 65	\$420,097 70
		\$3,064,931 23
Interest on Bonds.....	39,000 00	
Interest on Scrip.....	11,673 72	
Dividends.....	256,608 32	307,282 04
		2,757,649 19
		\$14,450,806 32

The old board of directors was re-elected.

PERSONAL.

Mr. Horatio A. Foster, the well-known electrical expert, is now engaged on the editorial staff of *Electrical Industries*, Chicago.

COMBINATION STREET CARS.

When a system, as a whole, makes rapid strides in advancement, the individual and dependent parts have to keep up the pace. In fact the improvement of the parts raises the value of the whole system. The street railway business of today is very much sub-divided. On one railroad may be gathered material and appliances that were manufactured in widely separated portions of the country. It is by the independent advancement of these allied industries that the street railroad of today

THE LOVE UNDERGROUND SYSTEM.

The Love Electric Traction Company is meeting with success in the operation of the Love underground trolley system. Cars can be equipped for use with both the overhead trolley and the Love system, the necessary operations for transferring from one system to another, takes but a few seconds. The system is in very successful operation by the Rock Creek Railway Company, Washington, D. C.

Under date of May 17, Mr. M. D. Law, the electrical

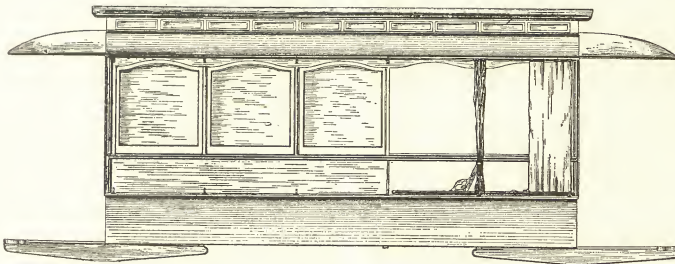


FIG. 1.—SIDE VIEW OF COMBINATION CAR BODY.

has reached its present condition and it will be due to the same movement that the more perfect railroad of the future will be brought forth. Along this line of progress is the increasing beauty and comfort of the modern street car.

A new combination street-car has recently been invented by J. P. Sjöberg & Co., 155 and 157 Eleventh ave., New York city. This car is one that is so constructed that it may with ease be transformed from a summer to a winter car or vice-versa. It is of reliable and convenient construction, so arranged that it will seat 24 people facing forward in a car body 16 feet long. An aisle

engineer of the Love Company, who is supervising the work on this road, writes us from Washington as follows :

"I must say that in all of my experience in starting electric plants I have never started one that went off as smoothly as this. We have had no trouble of any kind. Last Saturday we had a very severe rain, or rather cloud burst, which at two points completely submerged our tracks, but the cars kept on through it all without any delay, nor could any loss of current be detected. There is no question but that in large cities the underground trolley will have to be used and so far the Love system has the lead, and I don't think it will have any trouble in keeping it."

The company's headquarters are 817 Rookery, Chicago.

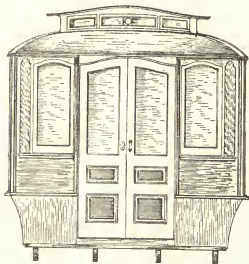


FIG. 2.—END VIEW OF CAR BODY.

passes through the centre of the car. By the use of combination cars the cost of car storage and fire risks on idle rolling stock is done away with. As the cars are used throughout the year the change of motors twice a year from one set of trucks to another is rendered unnecessary. A less number of cars is needed for a given population and therefore the interest on the rolling stock is low.

Figs. 1 and 2 illustrate the side and end views of this car.

J. P. Sjöberg & Co., have every facility for handling their work, the latest wood-working machinery being used in their factory.

MILITARY MORSE CODE OF SIGNALS.

On the night of May 10 the New York First Brigade Signal Corps and the Brooklyn Second Brigade Signal Corps held a contest in military signaling, at the 13th Regiment Armory in Brooklyn.

The message on which the test was made consisted of one hundred letters. It was transmitted from the first to the second station by wire, from the second to third by flags, and from the third to the fourth by flash light. Twelve men were selected from each corps for the competition.

Brooklyn began the contest. At the first telegraph instrument were two signal men. One of them read the message that had been selected and the other telegraphed it to the second, where there were three men waiting for it. One man received it from the wire and the other two wigwagged it to station 3. Wigwagging is simply indicating the dots and dashes by a code of flag signals. At station 3 were three more signal men. Two of them received the message and transmitted it to the third man, who sent it to station 4 by flash light. At this last station one signal man read the flash light message and repeated it to another signal man, who wrote it down. Then the message as received was compared with the

message as sent from station 1. Accuracy and time were the points considered.

The Brooklyn men won on time, the work of each of contesting corps being perfect. Mr. Charles A. Tinker, general superintendent of the Western Union Telegraph Company acted as referee. The time of the Brooklyn men was 4 minutes and 23 seconds and that of the New York corps 4 minutes 58 seconds.

VISIT TO THE CROCKER-WHEELER NEW WORKS.

About eighty members of the American Institute of Electrical Engineers and New York Electrical Society, on the afternoon of Thursday last, May 18, on the invitation of the Crocker-Wheeler Electric Company, visited the extensive works of that company, at Ampere, N. J. Two special cars were attached to the 2.10 P. M. train on the Delaware, Lackawanna and Western Railroad, for the accommodation of the guests, and the run of eleven miles was a pleasant one. Arriving at Ampere, which station, by the way, is directly opposite the Crocker-Wheeler works, on the west side of the tracks, the party were at once taken through the various buildings and very carefully inspected the system of power distribution. They also watched the work on the different parts of the motors and generators with evident deep interest, and the general sentiment seemed to be that the Crocker-Wheeler Company had taken a large stride forward in the matter of the practical application of electric power for manufacturing purposes, and that the initiative having been taken this method of applying power would come into general use.

The works are full of interest to the mechanical engineer as well as to the electrical engineer. The most prominent feature of the plant is the almost entire absence of shafting and belting, the various machines being operated directly by electric motors. In place of shafting we find bare copper conductors stretched along the roof beams, which are readily accessible for connection at any point wherever it is desired to place a machine tool. A lathe, drill or any other like piece of machinery may be placed anywhere about the shop, and the power to operate the same supplied by simply connecting the machine with the main conductors by two wires. This method of applying power, it will be readily seen, is remarkable for its flexibility. No expensive shafting is necessary, and the machines may be placed anywhere without reference to shafting. At any point in the shops electric power is always on tap. The power is distributed on the three wire system.

In the testing department a large number of motors of all sizes are seen, some idle, awaiting shipment, and others being subjected to the thorough tests which are applied to all the motors made by this company. There were also a large number of direct current transformers, or dynamotors. Some of them are intended to transform direct currents from one voltage to another, while others are designed to convert direct currents into alternating currents. These latter machines are for use in telephone exchanges, for bell ringing purposes. The company is now at work filling orders for machines of this description for the telephone exchange at the World's Fair. Arc motors in large numbers were also being tested.

For obvious reasons the temperature of the testing room is kept as nearly as possible at 70°. This is accomplished by the use of Sturtevant heaters. The fresh air from out doors is brought into contact with large steam pipe radiators and the air thus heated is forced through galvanized iron ducts having outlets at various points along their length. These ducts or pipes are placed along the overhead rafters of the room. The machine room is heated in a similar manner.

An interesting department is that where the winding of armatures and fields is carried on. Here armatures of all sizes are seen in the various stages of manufacture and it was noticed that every winder exercised the greatest care in doing his work properly, which is largely the secret of the success attained by the Crocker-Wheeler machines. A dynamo armature was being wound for a 10,000 volt current. This machine was designed for the use of Prof. Crocker at Columbia College, for experimental work. The wire used for the coils is very fine, and double silk insulated.

In the machine shop and assembling department a large number of hands were at work on the various machines, but the absence of shafting, usually found in abundance in similar shops elsewhere, was very noticeable. Huge drills, die presses, punches, etc., received their power from motors connected either directly or through gearing.

The design of these machines is such that the motor frame and parts are made practically a part of the machine to which they supply the power. In the power lathe, for instance, the electric motor is placed in the head stock and is so compact in design that it is hardly noticeable to the casual observer.

A radial drill of extraordinary dimensions is operated by a 1 H. P. motor placed on the top of the central column, the power being transmitted to the drill by bevel gearing. Ferracute and Bliss punches are used in this department for punching out armature core discs.

An electric crane in this room attracted much attention. A 5 H. P. motor is used for hoisting, and a 2 H. P. machine for moving the machine. The motors are controlled from the floor by the operator.

The machine and assembly room is 400 feet long and 80 feet wide at its widest part, and receives a great abundance of light through a large number of windows.

In the engine room are located an 80 H. P. Buckeye engine and several generators; two of these generators supply the power current for the machine department and two are used for the testing current, 30 H. P. being required for the shop, and from 15 to 60 H. P. for the testing department.

The company intends to put a new Corliss engine in soon, of about 200 H. P.

In a building by itself is the draughting department, where nine draughtsmen are employed, and the office and engineering department occupy another separate building. In the office telegraph and telephone wires are worked directly with New York, and in this way the company's headquarters are in constant communication with the factory, eleven miles away.

About three tons of copper bars are used in the factory for the distribution of current.

The company is also extensively engaged in the manufacture of its well-known multipolar generator, and many of these machines were seen in all stages of construction. They are used altogether throughout the plant for the generation of currents. The Crocker-Wheeler generator is very symmetrical in form and said to be highly efficient in operation.

The party returned to New York about five o'clock, and every one was evidently well pleased with the visit.

While the visitors were waiting for the arrival of the return train Mr. H. Ward Leonard proposed that a vote of thanks be extended to Messrs. Crocker and Wheeler for their hospitality, and a resolution to this effect was heartily passed.

Among those present were Prof. F. B. Crocker, Dr. S. S. Wheeler, Frank J. Sprague, H. Mc. L. Harding, H. Ward Leonard, H. L. Lufkin, W. J. Hammer, Prof. W. A. Anthony, C. O. Mailloux, Geo. A. Hamilton, Ralph W. Pope, T. C. Martin, W. J. Johnston, Thos. R. Taltavall, M. C. Sullivan, Geo. R. Metcalfe, A. A. Knudson, Dr. Chas. E. Emery, and many others.

QUESTIONS AND ANSWERS.

Correspondence from practical men upon topics of interest relating to electricity and kindred subjects, will find a place in this department.

The publishers, while not holding themselves responsible for the opinions expressed, will gladly put the letters into proper shape for publication should it be found necessary to do so.

Our readers are invited to avail themselves of this department when desirous of seeking or imparting information on questions of general interest.

DEATH OF MR. DE SAUTY.

Mr. Charles Victor de Sauty, well-known through his connection with the laying of the first Atlantic cable in 1865, died at Gibraltar on April 11 last, at the age of 63 years. At the time of his death Mr. de Sauty was acting as superintendent of the Eastern Telegraph Company's station at that place. Besides participation in the laying of the cable above referred to, Mr. de Sauty took part in many other cable expeditions. His method of cable testing was used for many years by telegraph engineers, particularly that relating to electro-static capacity.

PLANKED SHAD FOR MR. AYER.

Arrangements are being made by John A. Seely, of the Complete Electric Construction Co., of this city, Cyrus O. Baker, Jr., of Newark, N. J., and Charles A. Bragg, of Philadelphia, to entertain Mr. James I. Ayer, of St. Louis, ex-president of the National Electric Light Association, when that gentleman visits New York again. The generous hospitality of Mr. Ayer, during the recent convention in St. Louis, has not been forgotten and when he comes East again, which he expects to do about the first of June, a number of his friends, headed by the gentlemen above named, will convey the person of the aforesaid Ayer to a hamlet in New Jersey, by the name of Gloucester, where the entire party will indulge in a planked shad dinner. It will be a very enjoyable affair.

NEW PROCESS OF ELECTRO-PLATING.

Dr. Otto, the well-known electrician of New York city is now connected with the Cramps, the shipbuilders on the Delaware. He is engaged in electro plating the interior of the cruisers and iron steamships built by that firm. The plating is accomplished by the use of a metallic brush in applying the liquid solution, the brush being connected with a dynamo by a flexible cord. Dr. Otto states that the soluble salts of any metal can be deposited in this way.

Some of the cruisers have been plated with nickel by this process, which Dr. Otto is patenting.

KERITE FIREWORKS.

The Day's Kerite people have been so long dealing with good things that they are very quick to see other good things. They are always striving, of course, to impress upon the minds of electrical people that Day's Kerite wires and cables are the best made, and they have hit on a very unique plan of producing such an impression; they actually burn it in. Messrs. Cushing & Morse, of Chicago, the western agents for Kerite, have hit on a happy idea of advertising their wires and cables. On a small sheet of tissue paper are represented two station managers, each lighting a cigar. On the paper is also printed a dialogue between the two men, to the effect that it always pays to use the best

wire. One of the managers who has had bad luck with his circuits, asks what reliable wire there is. The other says, "give me a light and I will tell you." Printed directions are then given to apply the lighted end of a cigar or cigarette to the cigars in the picture, and watch the result. The result is that the word "Kerite" is burned out of the paper, the flame following out the letters exactly.

CONTRACT AWARDED FOR NIAGARA FALLS POWER.

Advices from Niagara Falls are to the effect that the Niagara Falls Power Company has made a contract with the Cataract Electric Companies of Rochester and Jamestown to furnish power. The right to furnish electrical power all over the State, has been granted the Power Company in the amendment to its charter passed by the last Legislature and approved by Gov. Flower on April 25. Section 2 of this amendment gives the Power Company the right "to conduct, convey, and furnish the water of the Niagara River, but not in excess of the amount heretofore expressly authorized by law, or any power, heat, or light developed therefrom, to, in, and through any civil division of this State, and to sell, furnish and deliver the same to any and all bodies or persons, public or private, wherever situated." This gives the Niagara Falls Power Company the entire State as its field to operate in. In the original charter its field of operation was confined to Erie and Niagara counties.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL AGE,
FIRST FLOOR, WORLD BUILDING,
NEW YORK, May 20, 1893.

We are in receipt of a copy of a neat little pamphlet gotten up by the Commercial Cable Company, for distribution at the World's Fair. It contains a brief history of the Atlantic Cable and the Commercial Cable Company, and among the illustrations given is one of the Great Eastern as she appeared while grappling for the lost cable in mid ocean, on August 12, 1865. Views of the cable signaling apparatus and the Commercial Cable Company's office in various cities throughout the world are given. The facts contained in the pamphlet are worth preserving, as they have been carefully collected.

MR. MERRILL the New York agent for the Underwood Cotton Leather Belting Company, 38 Cortlandt street, city, is having excellent success. He is shipping these belts to electric light and power companies almost daily. These belts have stood the tests of years and command the highest testimonials.

THE "WARD" arc lamp is the standard for incandescent circuits, over 20,000 of them being in use all over North America. Many thousands are used in cities of Mexico, South America, Australia and Europe. The lamps are made for any voltage. The ornamental lamp is finished up in an extremely artistic manner, and is adapted for elegant surroundings.

THE J. G. FOWLER COMPANY of Elizabeth, N. J., is getting its factory in condition to carry on the business of building street cars. The company hopes to move into the new factory in June. The office is in the Havemeyer building, city.

THE MEDBURY insulation railway specialities for overhead work for electric railroads are made by the New York Electrical Works, 161 Washington street, city. The goods are meeting with a ready sale among buyers of

first-class articles. The strain insulators and trolley hangers, stand the severest tests without the least ill effect. They are said to be sold at the closest margin of profit commensurate with first-class work.

The De Mott "Turret" motors are quite the rage at present. Call and see them at the De Mott Motor Company's Works, 171 Greenwich street, corner Cortlandt.

J. H. BUNNELL & Co., 76 Cortlandt street, city, the well-known manufacturers of electrical supplies, have added to their stock new electric railway specialties in overhead line appliances.

J. L. LUDWIG has located in the Havemeyer building, city. He is carrying a full line of electric overhead line railway materials, and has secured the agency of the Green engines made by the Altoona, Mfg. Co. of Altoona, Pa. Mr. Ludwig has had years of experience with one of the largest manufacturers of electric railway motors and appliances in North America, and is thoroughly capable to equip a road in a perfect manner.

THE GENETT AIR BRAKE COMPANY has removed its offices to 33 Wall street, city.

THE DALE MANUFACTURING COMPANY, 90 Fulton street, will move next week to 22 Cortlandt street. A new line of goods will be added to its present large stock. The company will increase its facilities for the manufacture of electrical goods for supply houses, electricians and inventors, in quantities under contract. This will enable it to fill much larger orders. It is putting in a Crocker-Wheeler motor from which the necessary power will be derived.

C. E. CHAPIN, 136 Liberty street, is a buyer for local and out of town companies, firms and individuals. He is having unusual success in his business. He has a large line of samples of electrical appliances on exhibition. For a small commission Mr. Chapin will buy for any reputable house, goods in large or small quantities. He has added to his samples lately many electric railway appliances, also the Chamberlain raw hide pinion.

PECKHAM'S standard "Elliptic" spring cantilever extension trucks are used extensively on many of the electric roads of the country. Hundreds of cars are fitted with these trucks on the electric roads of Jersey City, Hoboken, Brooklyn and New York. Mr. Edgar Peckham, the president of the Peckham Motor Truck and Wheel Company, makers of these trucks, has moved his office to 1,006 Havemeyer building, Church, Cortlandt and Dey streets. Mr. Peckham has spent many years experimenting with his trucks and he has brought them to a standard of perfection. They are constructed of the best iron for frame work and put together with hot rivets. All parts are machine fitted. The trucks are strong, easy-riding and have a long spring base. Mr. Peckham guarantees to prevent the oscillation of 30-foot electric cars.

MCLEOD, WARD & Co., 95 Liberty street, are installing a Billberg dynamo in Fisher's shoe house, on Duane street, with a White & Middleton gas engine. McLeod, Ward & Co. make a specialty of electrical installations for light and power and the ventilation of buildings, offices, etc.

MR. F. C. TIMSON is taking orders for all goods manufactured by the Electrical Engineering and Supply Company, of Syracuse, N. Y. He has samples of all sizes of that company's incandescent switches, porcelain cut-outs and other parts that go to make up a complete incandescent plant.

BUYERS of the Wing exhaust and ventilating fans, blowers, etc., all testify to their excellent qualities. These goods are made and sold by L. J. Wing & Co., 26 Liberty street, city. The fans and blowers are also

combined with steam engines, electric motors or gas engines to suit the purchaser. They manufacture all their own goods.

C. D. SHAIN, 136 Liberty street, city, reports a big demand for Cutter electrical specialties. Mr. Shain secured the general agency for these goods a short time ago. The C-S. flush switches are taking extremely well with all architects, and hundreds are being placed in various buildings in this vicinity. The new system of lighting lamps from one floor and turning them off from other floors is meeting with high approval among all who understand Mr. Cutter's multiple system of electric lighting.

H. WARD LEONARD & Co., 136 Liberty street, city, are installing incandescent electric light plants in the power house of the Broadway Cable Co., at Houston street and Broadway, and 56th street and 7th avenue. Each dynamo is of 80 kilo-watts capacity, directly coupled to Armington & Sims vertical engines. The dynamos are used in lighting the power-houses and tunnels. C. D. Shain, furnished the dynamos. He is also placing three dynamos in the new Betz building, Broad street and Market street, Philadelphia, for 4000 lamp plant.

THE WRIGHT UNIVERSAL ELECTRIC COMPANY has moved to 126 Liberty street, where it occupies a suite of fine offices on the main floor. It is preparing to exhibit a large statue of liberty, holding an incandescent lamp, the current for which is supplied by the Wright Company's batteries placed in the base, with the intention of enlightening the throngs of people passing the sales-rooms, on the usefulness, strength and life of this make of battery.

MR. JAMES H. MASON, of Mason Battery fame, delivered a lecture on electricity at one of the Brooklyn churches a few nights ago, before a large audience. Mr. Mason's lecture was extremely interesting and well composed.

CHAS. M. RUMRILL and G. B. Rumrill are doing business under the name of Chas. M. Rumrill, electric railway supplies, 109 Liberty street, city. These gentlemen are widely known in the electric railway business. They took the agency a short time ago for New York New Jersey and Pennsylvania for the Medbury insulation electric railway appliances made by the Fibrite Company, of Mechanicsville, N. Y., for which the New York Electrical Works, city, are sole agents. Messrs. Rumrill carry a full line of these electric railway appliances. They have lately secured the contract for all the appliances for the New Paltz and Highland Ry., New Paltz, N. Y. W. T. H.

BROOKLYN NOTES.

THE J. G. BRILL Co. of Philadelphia, fitted out the De Kalb avenue line of electric cars in Brooklyn. These cars are remarkable for their easy riding and fine workmanship, and no better equipped car can be found anywhere.

THE new Riker motor propeller and rudder combination for small boats is meeting with deserved praise by everyone who has seen it. The Riker Electric Motor Company, 45 and 47 York street, Brooklyn, manufacturer of Riker dynamos and motors for all purposes is receiving numerous orders for the above named outfit. A person can easily fit his own boat with these motor propellers. The motor is secured to the top of the rudder and connected to the propeller by a chain belt, the propeller being fastened to the bottom of the rudder. The rudder can be shipped or unshipped with ease. With a few cells of primary or storage battery a small boat may be driven at a good speed. The combination is made for all sizes of boats.

MR. ANDREWS, the machinery manufacturer, of 286 Graham street, Brooklyn, is making a special upright double spindle tapping machine of great merit. One main shaft runs two spindle shafts, each at a different speed. The spindles are adjusted by hand and are always in a central position. A good table for the work is provided. The General Electric Company uses eight or ten of these tapping machines at its Lynn factory, and a number are in use by other prominent manufacturers of electrical apparatus. The machine will take up to a 3-8 inch hole. The standard two-spindle machine is always in stock. The taps are forced down by a hand lever; raising this, reverses the direction of rotation of the tap. The machine is made with any number of spindles desired and all the spindles may be run at the same speed or each at different speeds, to suit the requirements of the work.

HUBEL & MANGER, 286-289 Graham street, Brooklyn, are manufacturers of household electrical goods such as bells, pushes, etc. They are constantly adding new lines of goods. A number of very handsome pushes and letter boxes were shown by them the past week. The firm is very busy filling orders for out of town supply houses and contractors. They have just brought out a new bell with many improved features.

THE CITIZENS ELECTRIC LIGHT CO., has, it is reported, signed a contract with the Electric Wiremen's Union granting the men all their demands.

THE striking linemen of the New York and New Jersey Telephone Company are still out. Linemen brought from distant points refused to take the places of the strikers when they were told of the situation, and they returned whence they came. The men are sanguine of success.

NOTES FROM NEW JERSEY.

WILLIAMS & Co., Plymouth street, Jersey City, report a good business in their tempered copper commutator sections, fuse wire, cast gongs of special bell metal and other electrical goods.

THE DIXON CRUCIBLE COMPANY, of Jersey City, N. J., is doing a large business in its specialties. The belting

compound sold by this company is meeting with great favor. It preserves and renders more flexible all kinds of belting. The compound is used with great success to remedy the slipping of belts. The company's graphite and plumbago is also meeting with great demand among the trade.

MR. RANDELL, of Hoboken, the manufacturer of wood moldings for electric wires, is very busy. Several large New York contractors have lately placed all their orders for moldings with him.

JOEL H. WOODMAN, of Hoboken, N. J., is the largest manufacturer of car seating, complete car seats and perforated wood for car ceilings. He is having unusual success and is hardly able to keep up with his orders. Mr. Woodman has purchased several lots in the rear of his works and intends to enlarge his factory, adding men and machines necessary to meet his growing trade.

CATALOGUES.

The Canton Electrical Co., Canton, Ohio, has just issued a neat catalogue of the Keller dynamos, motors and power generators manufactured by that company. These machines are noted for their simplicity of construction and efficiency. The motors range from $\frac{1}{2}$ to 30 H. P. and a large stock of $\frac{1}{12}$ H. P. motors is kept on hand.

The Manhattan Electrical Supply Co., 36 Cortlandt street, city, has just issued a pocket edition of its catalogue. It contains 96 pages and is profusely illustrated. The pocket edition consists of no less than 50,000 copies.

We are in receipt of a copy of the neat catalogue issued by H. H. Harrison, railway supplies, 29 Broadway, New York city, representing the W. T. C. Macallen Company, manufacturer of solid sheet mica insulation, 416 Atlantic avenue, Boston, Mass. The catalogue illustrates the latest and most improved forms of overhead railway insulations as well as a complete line of insulating joints for gas and electrolier fixtures, brought out by the Macallen Company. Sheet mica does not deteriorate when subjected to climatic effects. It is fireproof and impervious to chemical action, thus it is very valuable as an insulator.

OPEN CONTRACTS FOR ELECTRICAL BUSINESS.

OFFICIALLY ANNOUNCED.

Recorded for the benefit of subscribers to **ELECTRICAL AGE**.

All further available information can be obtained by our subscribers in applying by letter directed to **ELECTRICAL AGE**, Dept. C, First Floor, World Building, New York. Reference must be made in each case of such application to the number in the following table and postage for answer must accompany the inquiry.

No.	Description of Work, or Contract.	Party to whom proposals must be directed.	Time up to which proposals must be handed in, 1894.			Further information and specification obtainable through ELECTRICAL AGE from	Amount, if any, to be deposited with bid in certified check.	Right to reject any bid received.	Special Remarks.
			Month	Day	Hour				
1*	To light the streets of a village (suburb).	Board of Trustees of the village, at their rooms in the Town Hall.	June	6	8 p.m.	The Village Engineer.	\$2,000	Reserved.	
2*	Lighting the streets of the city with electric lights, for a term of five years, from July 1, 1894.	Common Council of the City.	Sept.	1	12 m.	Chairman of Committee.			
3*	50,000 El. Inc. all solid Lamps.	Company controlling the patent.	July	1	12 m.	Secretary of Co.		Reserved.	Option on exclusive license part of consideration.

THE ROSE POLYTECHNIC INSTITUTE, an advertisement of which appears in this issue, is one of our leading Engineering Colleges, and is especially fortunate in its thoroughly modern equipment and plan of instruction. It lays special emphasis on the practical side of technical education, which it is enabled to do throughout the whole course of four years by its ample shops and labor-

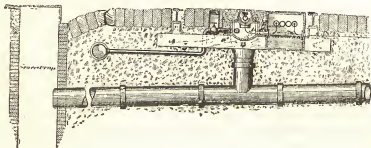
atories and exceptionally complete outfit, especially in electricity.

On May 15, the Edison Light and Power Co., of San Francisco, Cal., began paying to the New York stockholders, through the New York Guaranty and Indemnity Co., a monthly dividend at the rate of 8 per cent. per annum.

The Electrical Age's Illustrated Record of Patents.

Issued May 16, 1893.

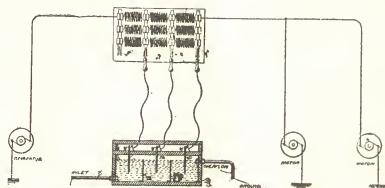
- 497,310. Automatic Disconnecter. William A. Cullen, Paterson, N. J., assignor to the Johnston Safe Automatic Electric Company, Richmond, Va. Filed Jan. 28, 1893.
- 497,331. Automatic Time Stamp. Warren B. Martindale, Rochester, Ind. Filed June 30, 1892.
- 497,335. Manufacture of Telephone Cables. William R. Patterson, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Aug. 24, 1891.
- 497,336. Insulating Tape. William R. Patterson, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Aug. 24, 1891.
- 497,337. Overhead Electric Railway. William D. Paterson, Keokuk, Iowa. Filed Nov. 1, 1892.
- 497,356. Electric Car Truck. George S. Strong, New York, N. Y., assignor to James N. Gamble, Cincinnati, Ohio. Filed Jan. 25, 1892.
- 497,361. Commutator Brush-Holder for Dynamo-Electric Machines. Elihu Thomson, Swampscott, Mass.,
- 497,439. Wire-Hanger. Arthur J. Wylie, Rome, N. Y. Filed Oct. 14, 1892.
- 497,448. Galvanometer. Adrian H. Hoyt, Manchester, N. H., assignor to the Whitney Electrical Instrument Company, same place. Filed May 9, 1892.
- 497,449. Galvanometer. Adrian H. Hoyt, Manchester, N. H., assignor to the Whitney Electrical Instrument Company, same place. Filed May 9, 1892.
- 497,450. Electrical Lamp. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Sept. 22, 1892.
- 497,468. Dynamo-Electric Machine or Motor. Walter K. Freeman, Boston, Mass. Filed Nov. 3, 1892.
- 497,482. Shunt for Electric Light and Power Stations. Edward Weston, Newark, N. J. Filed Nov. 28, 1892.
- 497,489. Circuit-Controlling Device. John P. Buchanan, Boston, Mass., assignor to the Hall Signal Company of Maine. Filed Oct. 15, 1891. Renewed Oct. 22, 1892.
- 497,491. Automatic Cut-Out for Electric Light Circuits. Charles Cuno, Wauwatosa, Wis. Filed Apr. 16, 1892.



497,394—CONDUIT ELECTRIC RAILWAY.

assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Nov. 2, 1891.

- 497,366. Rheostat. Parvin Wright, Denver, Colo. Original application filed Jan. 16, 1892. Divided and this application filed Aug. 8, 1892.
- 497,377. Trolley for Conduit-Railways. Paul C. Just, Chicago, Ill. Filed April 20, 1892.
- 497,394. Conduit Electric Railway. George Westinghouse, Jr., Pittsburg, Pa. Filed April 8, 1892.
- 497,397. Lightning-Arrester. Alexander Wurts and Charles F. Scott, Pittsburg, Pa., assignors to the Westinghouse Electric and Manufacturing Company, same place. Filed Oct. 26, 1892.
- 497,404. Electric Cigar-Lighter. William P. Carstarphen, Jr., Denver, Colo., assignor of two-thirds to James E. Gregg, same place, and Richard W. Webb, Santa Fé, N. Mex. Filed Aug. 17, 1892.
- 497,408. Electric Railway Signal. William H. Jordan, Brooklyn, N. Y. Filed Sept. 10, 1892.
- 497,430. Circuit Protector. Harry W. Leland, Jersey City, N. J. Filed Aug. 6, 1892.
- 497,436. Sectional Contact-Conductor for Electric Railways. George Westinghouse, Jr., Pittsburg, Pa. Filed April 11, 1892.
- 497,438. Arc Electric Lamp. John C. Wray, Peoria, Ill. Filed March 21, 1892.
- 497,494. Electric-Arc Lamp. James Einstein, Munich, Germany, assignor to Paul Lemaire, New York, N. Y. Filed Nov. 23, 1892. Patented in Germany, July 22, 1890.
- 497,495. Electric Rink. Midbury W. Hassan, Rochester, N. Y. Filed May 28, 1891.
- 497,504. Armature-Core for Electric Motors. James E. Stuart and Ulysses S. James, Helena, Mon. Filed Oct. 24, 1892.
- 497,508. Lightning-Arrester. Alexander Wurts, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, same place. Filed Dec. 22, 1892.
- 497,509. Lightning-Arrester. Alexander Wurts, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, same place. Filed Dec. 22, 1892.
- 497,515. Insulator. Thomas H. Brady, New Britain, Conn. Filed Jan. 16, 1893.
- 497,521. Electric Measuring Instrument. Adrian H. Hoyt, Manchester, N. H., assignor to the Whitney Electrical Instrument Company, Saco, Me. Filed Nov. 14, 1891.



497,397.—LIGHTNING ARRESTER.

- 497,522. Galvanometer. Adrian H. Hoyt, Manchester, N. H., assignor to the Whitney Electrical Instrument Company, Saco, Me. Filed Nov. 14, 1891.
- 497,535. Process of Manufacturing Electric-Conduit Sections. James F. Cummings, Detroit, Mich. Filed July 12, 1892.
- 497,536. Underground Conduit for Electrical conductors. James F. Cummings, Detroit, Mich. Filed July 28, 1892.
- 497,539. Electrical Measuring-Instrument. Oscar Frolich, Berlin, Germany, assignor to Siemens & Halske, same place. Filed Oct. 25, 1892. Patented in Germany, Aug. 18, 1888.
- 497,552. System of Conductors for Electric Fire Engines. Joseph Sachs, New York, N. Y. Filed May 26, 1892.
- 497,558. Electric-Arc Lamp. Frank H. Thompson, Philadelphia, Pa. Filed Jan. 19, 1892.
- 497,563. Electric Pump-Governor. Charles R. Whittier, New York, N. Y. Filed Aug. 8, 1892.
- 497,621. Process of Electric-Tin-Plating. Louis Aronson, New York, N. Y., assignor of one-half to James H. Hoffman, same place. Filed Jan. 31, 1893.
- 497,649. Magneto-Telephone. James P. Freeman, Washington, D. C., assignor to Marvin C. Stone, same place. Filed May 16, 1892.
- 497,732. Binding-Post Fuse. Simon H. Stupakoff, Pittsburg, assignor to the Union Switch and Signal Company, Swissvale, Pa. Filed Sept. 5, 1892.
- 497,755. System of Electrical Distribution. Waldemar Meissner, Konigsberg, Germany, assignor to Siemens & Halske, Berlin, Germany. Filed Oct. 23, 1889. Patented in Germany, May 23, 1889, and Nov. 18, 1889; in Austria-Hungary Sept. 19, 1889; in Switzerland Sept. 19, 1889; in Norway Sept. 19, 1889; in England Sept. 19, 1889; in France Sept. 19, 1889; in Belgium Sept. 19, 1889; in Sweden Sept. 19, 1889, and in Italy Sept. 19, 1889.
- 497,756. Circuit Switch. Ernest Woltman and Harry A. Triggs, Denver, Colo., assignors to the Electrical Specialty Company, same place. Filed Jan. 17, 1893.

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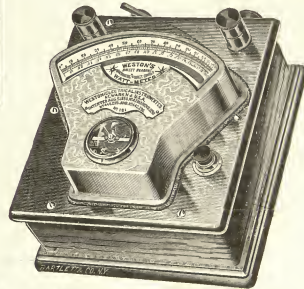
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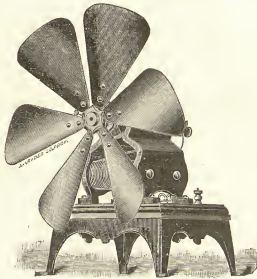
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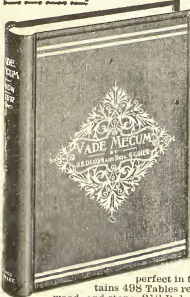
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Electrical Age publishes this complete record of vacant positions in the Engineering, Electrical, Metal and Hardware Trade lines for the benefit of its subscribers. We request those in need of a position to inform us of the fact at their very earliest convenience, and as new advertisements meeting their case will appear, we shall mail advance copies to them. For this service we make no extra charge, but we expect remittance of postage with the request of the subscriber for these advance sheets. All communications in relation to vacancies should be directed in writing, not personally, to Electrical Age, Department C, World Building, New York, and the number of the advertisement should also be stated. As all advertisements under this heading will be consecutively numbered, reference to such number is required, where applications have to pass our hands.

6. WANTED—An armature winder familiar with Thomson-Houston arc dynamos; pleasant shop and nice place for the proper party. Address as above requested.

99. WANTED—Engravers to letter on metal work; good wages given. Wm. H. Wilson, 793 Broad St., Newark, N. J.

93. WANTED—Armature winders. First-class men only. Reply by letter stating experience and giving references. Address, Electrical Age, Department C, 23.

94. WANTED—Immediately, two assistant engineers accustomed to accurate city lot surveying and general work. Graduate C. E. of one or more years' experience preferred. Work permanent. Address, Electrical Age, Department C, 24.

95. WANTED—A first class machinist, one who can work up parts of machinery from plans. Address, Electrical Age, Department C, 25.

96. WANTED—Wheelwright, a first-class wheelwright on wagon work; good wages. Address, Electrical Age, Department C, 26.

97. WANTED—Wire worker, a competent wire worker; one who can take charge of large establishment, lay out work and supervise the same; none but the best need apply; state age, former position and salary. Address application in writing with postage added to Electrical Age, Department C, 27.

98. WANTED—Wire weaver, only experienced men need apply. Address, Electrical Age, Department C, 28.

99. ENGRAVER WANTED—Experienced on solid silver and silver deposit work. Address as hereabove requested.

30. WANTED—First-class armature winders and field winders, also first-class draughtsman. Address as hereabove requested.

31. WIREMEN—Two experienced electric-light wiremen. Address as hereabove requested.

99. MACHINIST—Wanted, practical machinist and file hand; an all 'round man. Address as hereabove requested.

93. WANTED—50 screw-machine men and 25 night fitters and drill-press hands on bicycle work (lathe and drill-press); also ten good metal polishers; good pay and steady work to reliable men. Address as hereabove requested.

34. MOULDERS—We have steady work for good union men who desire permanent situation. Address as above requested.

35. A PRACTICAL METALLURGIST—Experienced in amalgamation, roasting, leaching and lead smelting; is also an experienced chemist, desires a position as superintendent or assistant superintendent. Address as above requested.

36. TURNER—Wanted, turner and band sawyer, six good bench men, one general work hand. Address as above requested.

37. TERRA COTTA—Wanted, good model-makers. Address as above requested.

38. DRAUGHTSMAN—Have desirable position for mechanical draughtsman; must speak German. Address as above requested.

39. WANTED—A thoroughly competent foreman to manage a large stove-pattern shop; must be a man capable of taking entire charge, from the draughting table to the mould boarding of patterns; salary commensurate. Address as hereabove directed.

40. WANTED—A few first-class molders; steady work. Milwaukee, Wis. Address as hereabove directed.

41. WANTED—Armature winders; state experience and wages expected; also, machinists or carpenters; a young man to learn electric business. Address as hereabove directed.

42. WANTED—Wiremen experienced on tube work. Address as hereabove directed.

43. ELECTRIC LIGHT WIREMEN WANTED—Experienced on tube work. Address as hereabove directed.

44. WANTED—Superintendent for water-works in a good Illinois county seat with 4,000 inhabitants. Applicant should be a plumber and pipefitter. Address, with references, as above requested.

45. WANTED—Instrument or model-maker accustomed to brass work or light machinery; wages \$12. Address as above requested.

46. WANTED—Polisher and buffer on brass work, cornice poles and rings. Address as above requested.

47. ENGRAVERS—A first-class engraver wanted on half-tone copper and zinc plates; good wages to the right man. Address as above requested.

48. MACHINISTS—Wanted, 25 first-class machinists, lathe and planer hands, must be familiar with working from drawings. Also three first-class wood pattern makers. Apply, stating experience and wages expected, as above requested.

49. VISE HANDS ON Spelter castings. Address as above requested.

50. WOVEN WIRE mattress weaver wanted at Myers, 282 9th Ave.

51. YOUNG MAN accustomed to turning steel wanted. Address as above requested.

52. CHANDELIERS—Lathe hands, fitters, polishers, filers and spinners; steady work for right men. Address as above requested.

53. MOULD AND PATTERN CHASER wanted on brass work. Address as above requested.

54. ENAMELER—Good enameleur on jewelry; capable in charging and firing. Address as above requested.

55. MAN WANTED to run moulding machine. Address as above requested.

56. WANTED—A good pattern maker. Address as above requested.

57. ELECTRICIAN and machinist, first-class; manufacturing motors. Address as above requested.

58. DYNAMO MAN—Young man to take charge of two dynamos, plater and power, and to attend to a storeroom in a manufacturing concern. Also instrument makers, used to general experimental work; must be first-class workmen. Address with references, as above requested.

59. WANTED—An expert meter repairer. To a thoroughly efficient man good wages will be paid. Address with testimonials, as above requested.

60. ELECTRICAL and mathematical instrument makers wanted. Apply in person or by letter as above requested.

61. ELECTRICIANS—A few good electric light wiremen and helpers. Address as above requested.

62. BRASS TURNER WANTED on chandelier work; steady employment; references required. Address as above requested.

63. STEEL LETTER CUTTER—First-class, sober man, capable of cutting small punches and who understands tempering. Address as above requested.

64. BRASS FINISHERS and coremakers on plumbers' brass work. Address as above requested.

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1. POSITION WANTED—Electrician open to engagement, experience in fitting, armature building and winding shops, power house and wiring; draughtsman; excellent testimonials; manual work not objected to. Communicate as hereabove directed.

2. POSITION WANTED—By a young man who thoroughly understands electricity and its applications, and who is a good mathematician and draughtsman, and is not afraid of work; electric railway or central station work preferred. Communicate as hereabove directed.

3. POSITION WANTED—As armature winder; thoroughly competent magnet winding, rheostats and car wiring; T.-H. and E. systems. Address as hereabove requested.

4. POSITION WANTED—Young man wants situation as field magnet winder and armature repairer in repair shop; well up. Address as hereabove requested.

5. POSITION WANTED—Electrical engineer, with doctor's degree in physics from University of Strassburg, and for a long time student of electrical engineering with practical work in Zürich, desires situation either in laboratory or manufactory. Refer to Prof. Dr. Kohlrusch, Strassburg; Prof. Dr. Weber, Zürich; Prof. L. C. Stevens, Troy, Poly, N. Y. Address as hereabove requested.

6. POSITION WANTED—By a young German electrician, who speaks English, for installation work. Address as hereabove requested.

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OF CORPORATIONS

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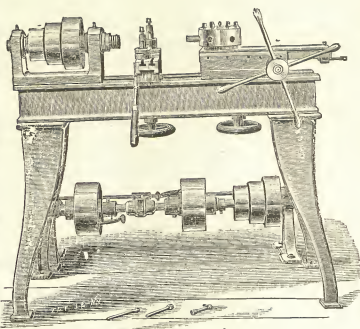
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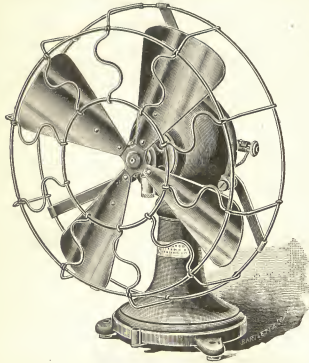
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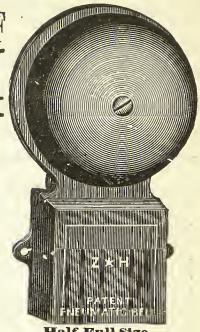
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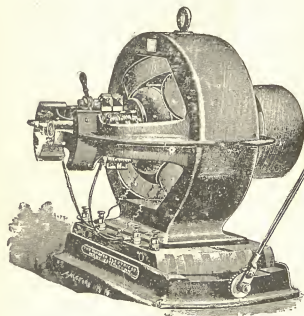
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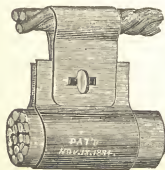
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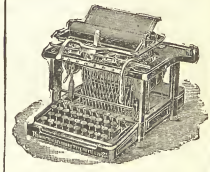
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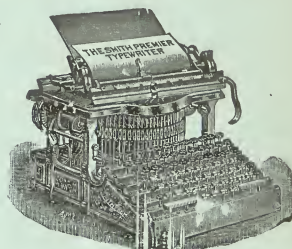
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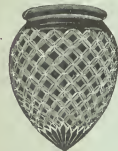
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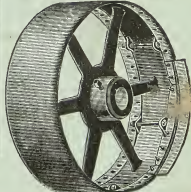
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