ELECTRICAL AGE

INDEX TO VOLUME XIII.

JANUARY 6 TO JUNE 30, 1894.

ELECTRICAL AGE PUBLISHING COMPANY,
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* Illustrations.

ELECTRICAL AGE

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NEW YORK, JANUARY 6, 1894.

CONTENTS.

THE LAMP BUSINESS.

A Chicago daily paper is responsible for the statement that an agreement has been entered into by several of the principal electric companies to cut the price on incandescent lamps in order to squeeze the smaller companies out of business. Prices on lamps have recently been cut 25 per cent. Lamps that were formerly sold at 44 cents are now reduced to 32½ cents. The larger companies, it is claimed, are losing money in their efforts to close up the small concerns, who are alleged to be infringing the Edison patents, and as the slow process of the law offers little protection against alleged infringers, the combination has decided to try to accomplish its end by underselling.

SPECIAL TRADE NUMBERS.

The first four numbers of the ELECTRICAL AGE for 1894 will devote the larger portion of the space in the reading columns to the description of the electrical and kindred industries of New York, Brooklyn and vicinity. These will be valuable numbers to the electrical trades. Other interests, of course, will receive proper attention; none will be neglected. It is our purpose to make the ELECTRICAL AGE valuable and interesting to all classes engaged in the electrical trades and profession, and to that end we earnestly invite correspondence on any subject of interest.

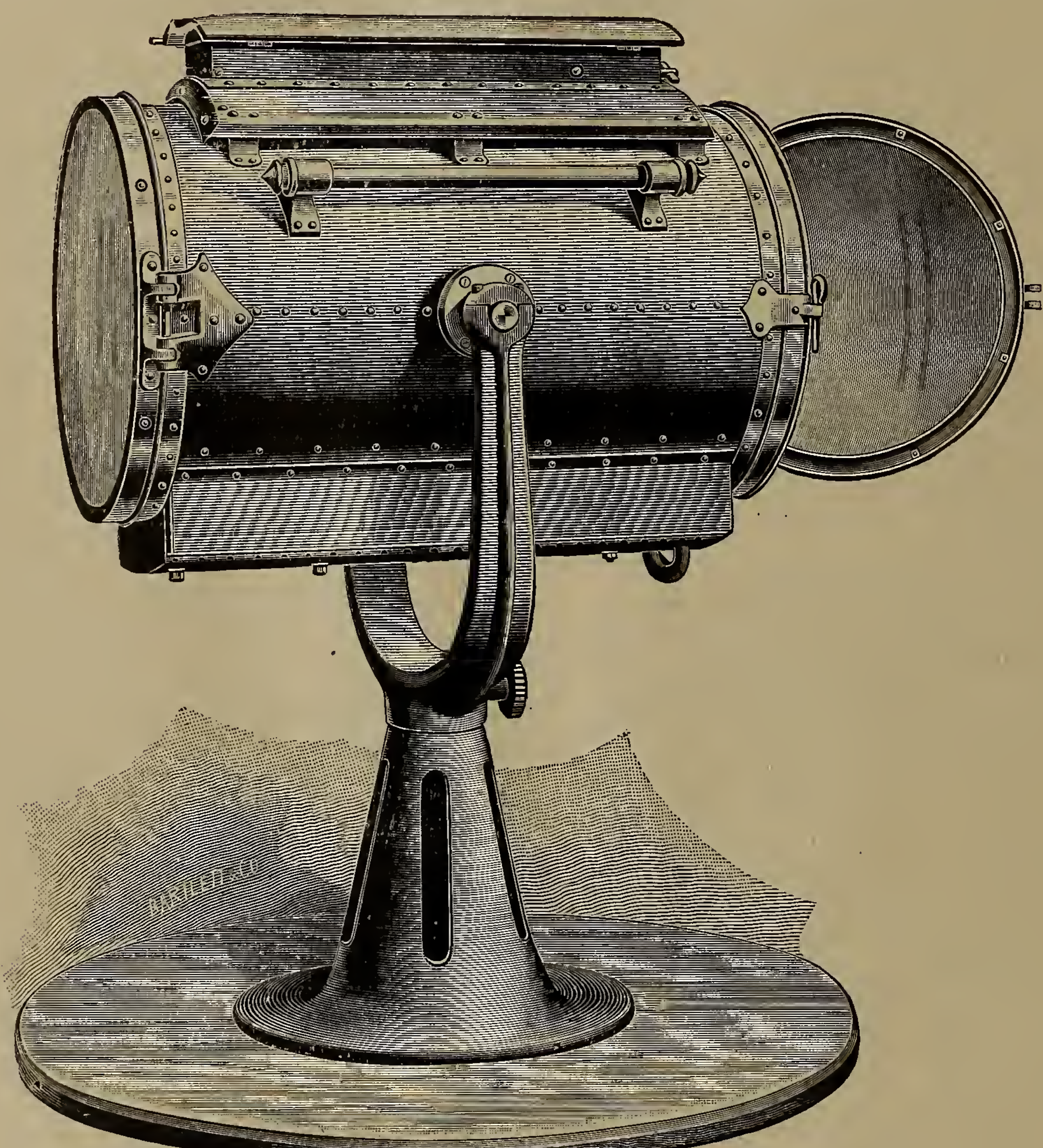
THE OUTLOOK.

The second half of the year 1893 has been a most trying one to business interests in the United States, and many a worthy concern has, by force of unavoidable circumstances, been compelled to go to the wall. Others have struggled along valiantly in their effort to tide over the extraordinary depression, with apparent success,—even the strongest have suffered from the shock. Yet, notwithstanding the severe trials that all have gone through with, the New Year brings with it an outlook that the business community is inclined to look upon as very favorable. This is especially true of the electrical interests and professions. Those engaged therein, being young men in the majority, greet the year 1894, with so much hope and confidence, that they are ready, with coats off and sleeves rolled up, so to speak, for the business which they are sure will soon come. They have obliterated from their minds, as far as possible, the experiences of the past, and are turning their earnest attention to the future. It is refreshing and encouraging to note the determination with which they are imbued, and it is this very spirit that is going to start the wheels of trade revolving with a fresh impetus. Determination to succeed will surely bring success. To go at a thing in a half-hearted way, invariably leads to failure, and to try to transact business with a lingering doubt in the mind that the outlook is uncertain, is an impossibility. But to deal with a man who is full of hope is inspiring. Such a man creates confidence in others, and they, in turn, inspire others; in this way the leaven does its work. We have taken the trouble and time in the past two or three weeks to sound the views of those engaged in the electrical trades with invariably the same result—confidence of returning prosperity. With restored confidence prosperity will certainly return, and, judging from the general feeling among electrical people, the year 1894, will likely be a prosperous one. The ELECTRICAL AGE will put its shoulder to the great wheel and push with extraordinary vigor. It will do its utmost to inspire a more hopeful feeling regarding the future, and help in every way in its power to hasten the return of the long hoped-for prosperity. In order that it shall succeed in its noble purpose, however, it must receive the support and encouragement of those who are thus benefitted. We feel sure of that, and it is that feeling alone that impels us to renewed efforts.

Electrical and Allied Industries of New York and Brooklyn.

THE "WARD" PROJECTOR.

The accompanying illustration is of the "Ward" Projector, manufactured by the Electric Construction and Supply Co., 18 Cortlandt street, New York City. This projector is said to be much more powerful than the ordinary search lamp with parabolic silvered reflectors. The difference between the two, however, as far as outward appearances go, is hardly noticeable. The real points of difference are in the arrangement of the feeding mechanism, and in the lenses. In the search-light the feeding mechanism is placed at the rear of the cylinder, and the light is reflected directly outward by the parabolic lens, while in the Projector the feeding apparatus is located near the front of the cylinder. By this arrangement the rays of light are directed against the ground glass lens situated at the back of the cylinder, the rays being reflected outwardly therefrom. In the Projector the focussing is accomplished outside of the lamp.



"WARD" PROJECTOR.

The lenses used in these Projectors are very carefully ground by hand by the most experienced workmen. On this account the cost of a Projector is necessarily greater than that of a search-light, but the efficiency of the former is said to be far superior to the latter.

The Electric Construction and Supply Company is the maker of the well-known "Ward" Arc Lamps for incandescent circuits, which are giving universal satisfaction. These lamps are made for various uses, such as for railways, photo-engraving, theatre stages, store, hall and house lighting, etc.

THE BISHOP GUTTA PERCHA CO.

Few wire houses attain the distinction acquired by the Bishop Gutta-Percha Company, of 420-426 East 25th street, New York City. Its record is a long and honorable one, and its name is as familiar among electrical people as that of Benjamin Franklin or any of the many other shining lights in the electrical history of the world.

The Bishop Gutta-Percha Company was established in 1847, when the telegraph was the only electrical industry in existence, and in its extensive factories are manufactured electric wires of all kinds, of the highest insulation. Aerial, underground and submarine cables are among the chief products of this concern, and their excellence in service are well-known. The insulation used by this company for its wires consists of gutta-percha, india-rubber, Balata and their compounds.

The Bishop White Core Wires are made of various thicknesses of insulation, according to the use for which they are intended. The heavily insulated wires have an insulation resistance of 1500 megohms and are warranted to stand the tension of 3000-volt currents, while the medium and thin insulation are for inside wiring and telephone and annunciator work.

The stranded conductor cables are also a feature of the business. The stranders used by the company are capable of stranding 127 strands without bunching. The heaviest insulation is good for 2000-volt currents, and the interstices are filled with an insulating cement leaving no place for air or moisture to find lodgment.

der, the stock on hand running up to 0000. For high-tension underground currents the lead-cased stranded cables are particularly recommended, and those designed for 2000-volt currents, or above, are warranted to stand 5000 volts, direct or alternating current.

Three coats of india-rubber are given to submarine cables for electric lighting, the inner one being of pure Para rubber, especially prepared, which gives a higher insulation, it is said, than gutta-percha. As an evidence of the merits of this insulation, it may be mentioned that the United States government uses it, with lead protection, for the electric light plants on its new cruisers. These submarine cables are intended for carrying heavy currents under rivers and bays.

The Balata flexible cords made by this company are renowned. Balata is said to be the only gum insulation used on flexible cords that is water and acid proof. It does not corrode the wire, and is said to have stood the usage of 8 years without a crack or a flaw. The Balata gum is the product of Guinea, and resembles gutta percha somewhat, but is said to stand exposure to air better, while losing none of its flexibility.

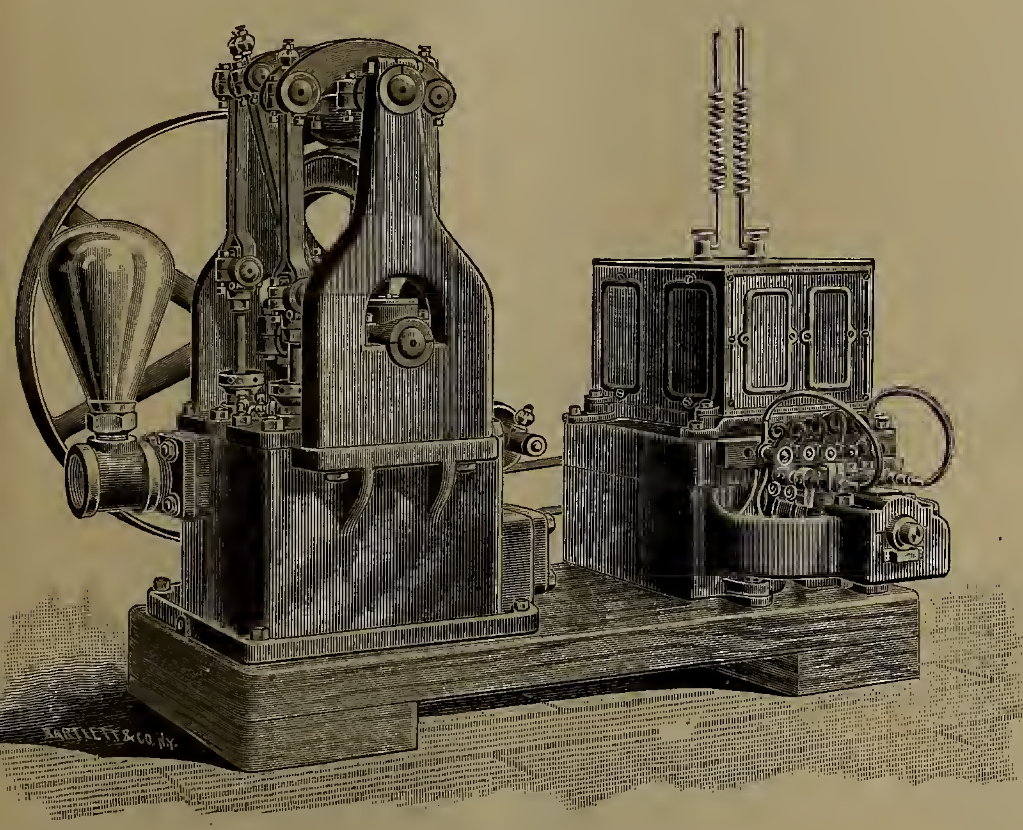


FIG. I.—OTIS ELECTRIC PUMP.

The Bishop Gutta-Percha Company is said to be the only maker of deep water submarine gutta-percha cables in the United States. This class of cables consist of the conductor, insulated with gutta percha, bedded with hempen yarn and protected with galvanized iron armor wires. An immense cable of this company's make is used for lighting the buoys off Sandy Hook, by the United States government. It has three copper conductors of stranded wire, insulated with gutta-percha, then a bedding of hempen yarn; next comes an inside iron wire armor, then another bedding and finally the outside iron-wire armor.

The officers of the company are A. Spadone, President; Henry A. Reed, Secretary and Manager, and W. W. Marks, Superintendent. Mr. Reed is an old and well-known telegraph man, and is an acknowledged authority on wires and cables.

OTIS ELECTRIC PUMPS.

One of the most interesting applications of electric power is to the operation of pumps, and such application emphasizes the fact of the displacement of steam power in many of the active industries. The duties of an electric pump are very exacting, and to be successful such a machine must be constructed on scientific principles. The electric pump described and illustrated below stands pre-eminent in this line, and has many very meritorious features, which, when developed cannot fail to command the attention and consideration of all those who use pumps. It is the latest improved machine of that well-known concern—the Otis Bros. & Co., of New York City.

This pump is constructed to operate on a novel principle, which secures a steady and uniform flow of water. There is an absolute freedom from shock, jar or water-hammer, which are disagreeable features of

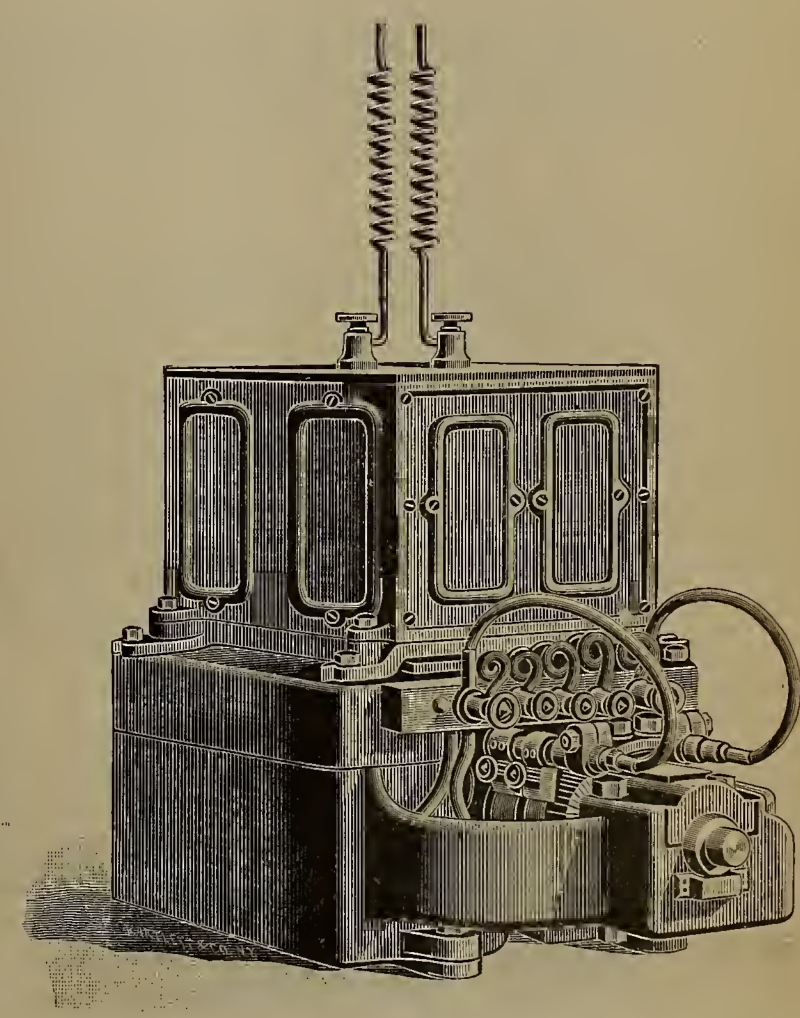


FIG. 2.—OTIS ELECTRIC MOTOR.

many pumps of other makes. This uniformity in the flow of water means to the practical man economy in power, as it is a fact well-known to engineers that it does not require as much power to keep a body in constant motion as it does to move it with an alternate starting and stopping motion. This principle, of course, applies to liquids as well as to solids.

In addition to the saving of power, resulting from this uniformity of flow of water, another advantage—and a very important one from the standpoint of an electrical engineer—is presented in this pump. Owing to the unvarying strain the work of the pump is evenly distributed at all points of the revolution, resulting in a uniform resistance to the action of the electric motor which drives the pump. The injurious effects of changing resistance to the action of an electric motor need hardly be emphasized here. Injury to the armature is the common result, and such break-downs mean loss of time and money.

The continuous-acting principle upon which these pumps are constructed avoid all the harsh, noisy and unsteady operation of pumping machinery in general, and this feature is one that will be appreciated by those who have the practical operation of pumps in charge.

The Otis Electric Pump is automatic in its action—that is, it is self-starting and self-stopping, and this feature commends the utility of this pump for elevating or moving water or other liquids. The starting and stopping is effected through the action of a float in the tank. When the water in the tank has reached the predetermined height the float causes the electric current to be cut off from the motor, thus stopping the pump and flow of water. As the water is drawn from the tank the float, in a similar manner, turns on the current, and the motor and pump at once begin operations.

The features possessed by the Otis Electric Pump which appeal most strongly to the business man are its durability, economy and noiselessness of operation. In addition to these may be mentioned cleanliness, freedom from explosions and constant readiness for operation. Little or no attention is required save the occational filling of the oil cups.

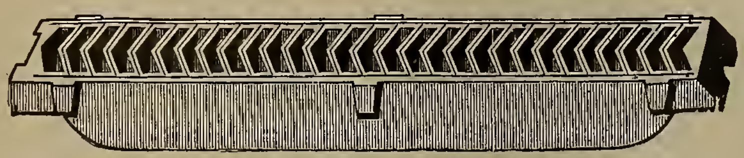


FIG. 1.—TOP VIEW OF LONG BAR.

In Fig. 1 is shown an Otis Electric Pump which is particularly adapted to furnishing water for domestic use, office buildings, irrigation, watering live stock, protection in case of fire, operating elevators, etc. This combination, on one base, of the pump and electric motor, it will be observed, is very compact.

The motor is shown in Fig. 2. This machine is constructed on the best mechanical and electrical designs, and is strongly built, there being no light or delicate parts to get out of order and cause trouble.

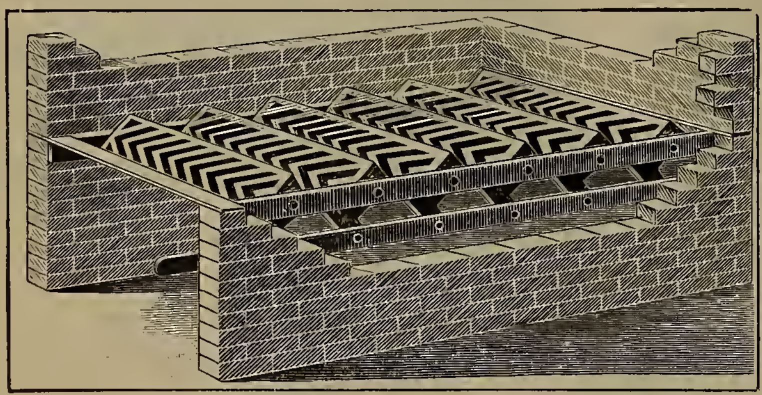


FIG. 2.—ROCKING GRATE.

The motor is properly balanced, electrically, and there is no sparking at the brushes. The armature shaft is provided with self-oiling bearings, and so well built and proportioned is this machine that, aside from the refilling of the oil cups at proper intervals, and an occasional inspection, it practically needs no attention whatever to give good service.

The Otis motor is designed for the operation of any other make of pump, also for any power purpose whatever. It is an efficient machine and well protected against mechanical injury.

Telephone in the Northwest.—Telephonic communication was recently established between Vancouver, B. C., and Ladner's Landing on the Fraser River, a distance of twenty miles. The system is to be ultimately extended to Blaine, Wash., where it will connect with that of the Sunset Telephone Company. Vancouver will then be connected telephonically with Seattle, Tacoma, Portland, Spokane and other Northwestern points.

W. W. TUPPER & CO.

Grate bars constitute a very important element in the use of steam boilers. A poor grate bar is sure to result in a waste of coal, insufficient steam and expense, therefore, a first-class grate under a boiler is of prime importance.

There are many makes of grate bars in the market, but none has a better record and name than those made by W. W. Tupper & Co., 39 and 41 Cortlandt street, New York City. This firm makes patent sectional grates and grate bars for stationary boilers, steamers and locomotives, for anthracite or bituminous coal, sawdust and shavings. These grates have had the test of eleven years of practical use, no less than 8,000 steamers, factories, etc., having being furnished with them in that time. They are constructed on scientific principles, combining the essential qualities of largest air opening and strength. It is said that they are the best and most economical grate in use They do not warp or break, and are interchangeable. The truss bars underneath are independent of the grate and are not affected by the heat, allowing the grates to expand and contract freely without strain.

Fig. 1 shows a top view of No. 2, or long bar grate. These bars are made in one or two lengths. They are provided with angular openings and are designed for the use of both hard and soft coal, where it is necessary to break up the coke or cinder. They are especially valuable in the use of small nut or pea coal, and in many furnaces where they have been placed the blowers have been dispensed with entirely, resulting in a material saving in expense. They are also made for upright boilers with circular furnaces.

Fig. 2 represents the No. 5 rocking grate, adapted for all kinds of fuel.

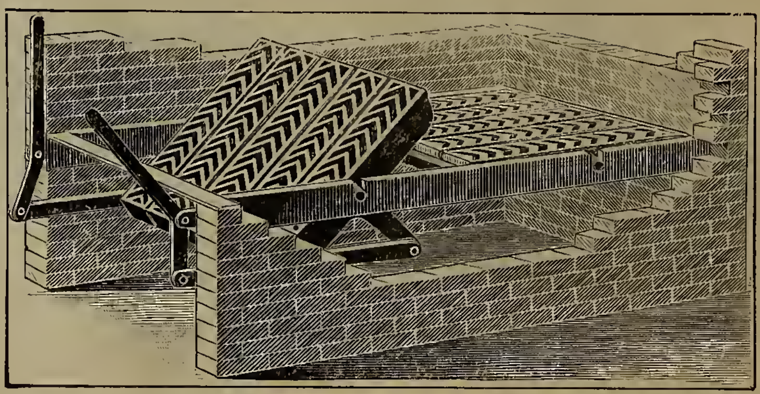


FIG. 3.—DUMPING GRATE.

Fig 3 is a view of No. 6 dumping grate, which is also adapted for all kinds of fuel. The mechanism for tilting the grate is clearly shown.

The advantages of these grates are a saving of fuel, owing to their uniform and proportionately large air openings, resulting in a more perfect combustion in all parts of the furnace alike, with no clinker, and the fires require little or no raking or slicing. Their great strength, with proportionately small weight of metal, great draft and slight liability to burn out are other advantages of first importance.

Besides these grates the firm makes grates for Corliss, Hazleton and Manning boilers.

A HAPPY NEW YEAR.

The Electrical Age wishes its many friends a happy and prosperous New Year.

TELEGRAPHY.

RECENT ENTIRELY NEW ADDITIONS TO THE REGULAR APPARATUS OF EVERY DAY USE IN MORSE TELEGRAPHY.

The telegraph systems are generally regarded as being incapable of further improvement. But this view of the matter is far from being correct, as an occasional visit among the various manufacturers of telegraph instruments reveals the fact that they are constantly at work making improvements here and there. To be sure, radical changes are few, but the perfecting of details goes on, and always will, as one improvement begets another.

The electrical supply house of J. H. Bunnell & Co., 76 Cortlandt st., New York City, is frequently putting new things on the market, which have more or less merit. Among the recent improvements of this house in telegraph apparatus are the devices known as "Adjustable Resonators," of which illustrations of two patterns are given herewith.

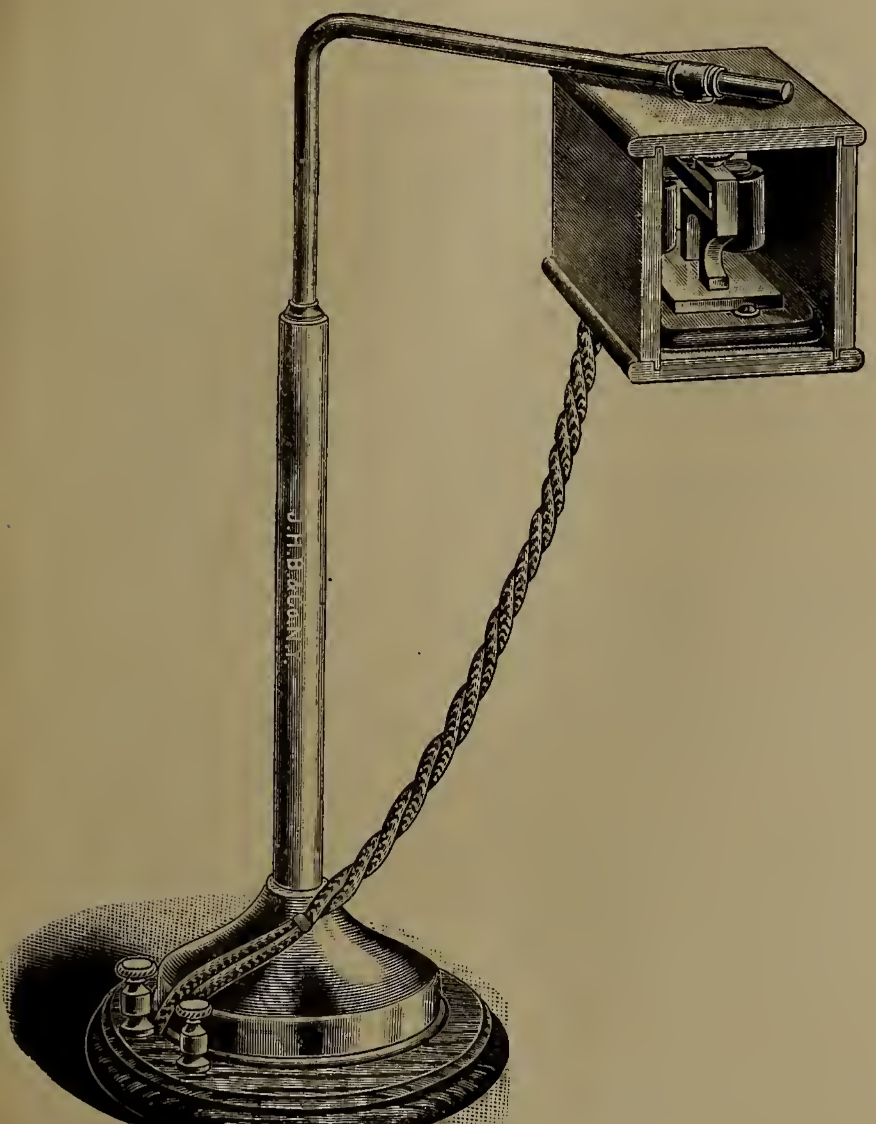


FIG I.—RESONATOR, AMERICAN PATTERN.

These Resonators consist of a box suspended from an adjustable arm, as shown in Fig. 1, and, in the case of Fig. 2, a box of slightly different shape, placed permanently on a standard, affixed to the desk. The local sounder is, in each case, placed in the box, the effect of the latter being to greatly amplify the sound of the instrument.

This device is especially adapted for receiving operators using typewriters. Ordinarily the sounder is screwed down to the desk, and immovable, but by the use of the Resonator the sounder can be moved about the desk at will, and placed in any position to best suit the operator.

For noisy situations, such as railway stations, etc., where the extraneous noises are liable to drown the sound of the telegraph instrument, the Resonator is a valuable adjunct, as it enables the operator to place the instrument close to his ear if necessity requires it.

The form of Resonator shown in Fig. 2, is known as the British Postoffice Pattern. English operators seem to like to have things a little different to what their American friends fancy, and to meet their divergent views in this line this particular pattern was designed. It reflects the English character in being stationary and solid, while the American spirit is shown in the style represented by Fig. 1, where the conditions can be changed when the operator tires of having the instrument in one position.

The Resonators are finished in a very neat manner, so as to harmonize with the fittings of a modern telegraph office.

J. H. Bunnell & Co. are not, however, limited in their industry to the telegraph field alone. The house is well known throughout the country as dealers in general electrical supplies, including those for telephone, electric lighting, electric railways, household fittings, etc.

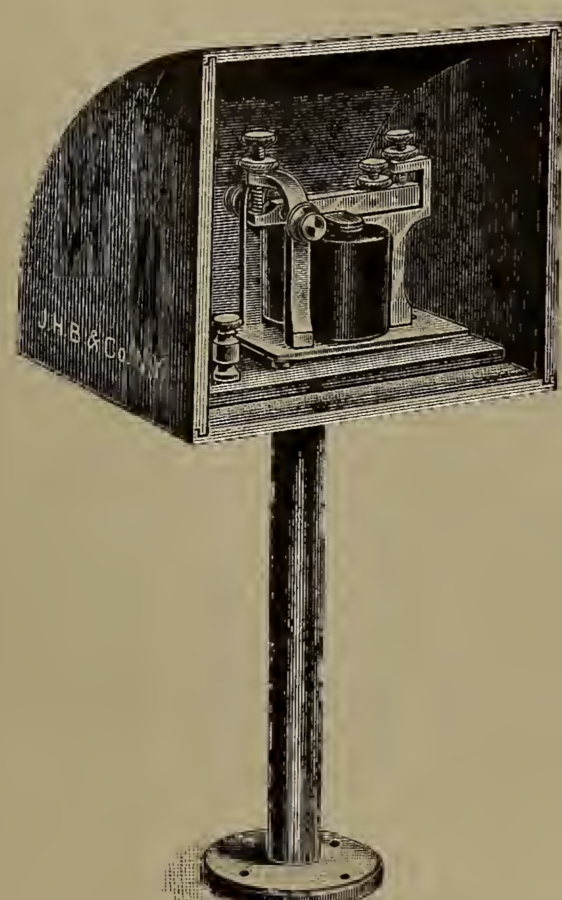


FIG. 2.—RESONATOR, BRITISH POST-OFFICE PATTERN.

The concern is an extensive one, and in the warerooms may be seen a line of goods that is astonishing for its variety. Everything produced by this firm is of the very best, both in workmanship and material.

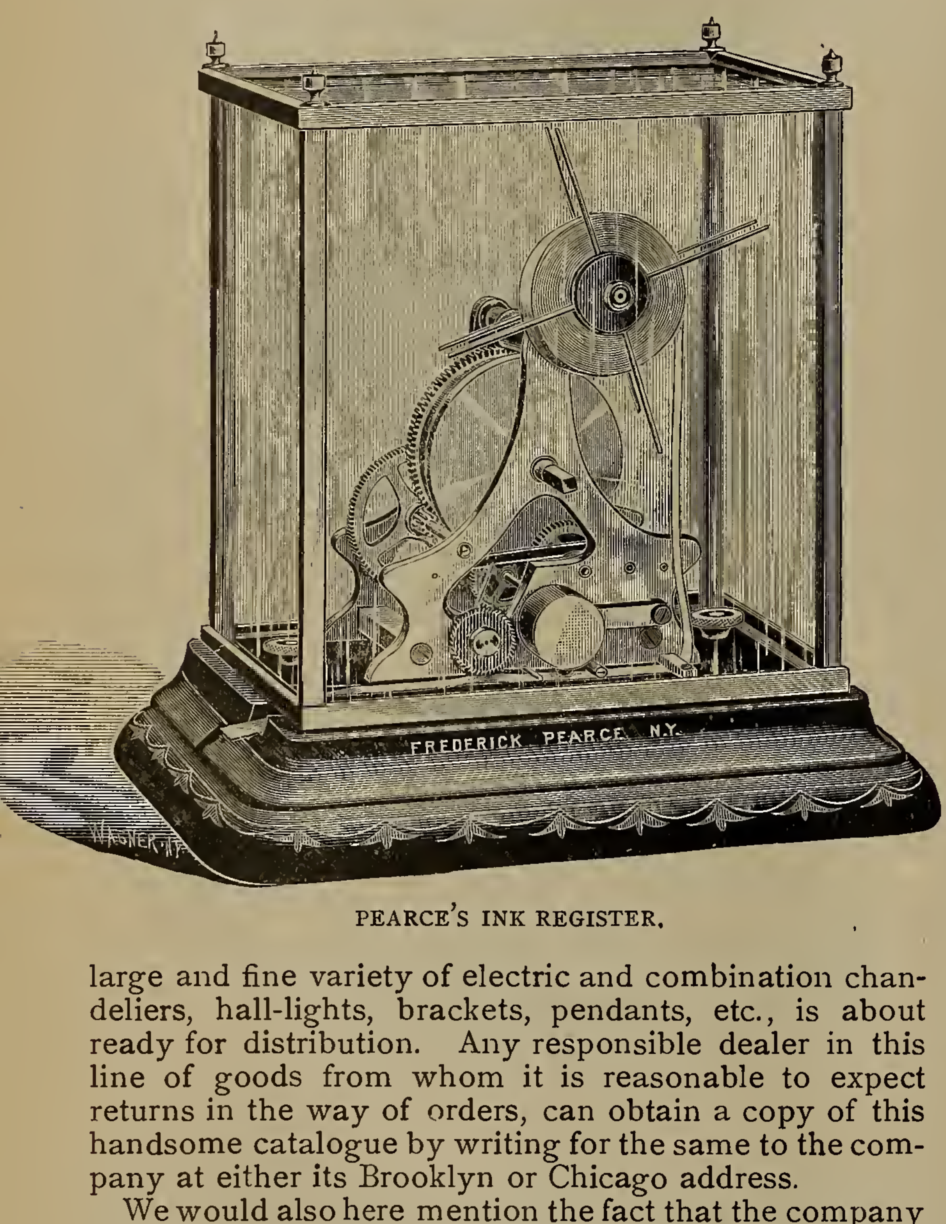
W. C. VOSBURGH MANUFACTURING COMPANY, LIMITED.

It gives us great pleasure to call the attention of the trade to the business of the W. C. Vosburgh Mfg. Co., Limited, whose extensive plant is located at Nos. 269 to 281 State street, Brooklyn, N. Y., with a Western Branch at 114 and 116 Wabash avenue, Chicago, Ill.

This company manufactures a great variety of gas and electric fixtures from its own original designs, employing for this purpose a corps of artists of the highest talent, who are constantly introducing novel features in all classes of fixtures.

Because of the great variety of designs made by this house, the high standard of its goods, and the low prices at which they are sold, as well as the careful and courteous attention given to all business matters, and the prompt filling of orders, is due the fact that, notwithstanding the general business depression during the last six months, the business of this company has equalled that of the same period of any preceding year. It is a source of much satisfaction to the management that the company is thus enabled to run on full time and give employment to the usual number of workmen.

In order to extend and hold this large trade throughout the country, this company is constantly at work producing new designs in fixtures that are from time to time published in illustrated catalogues and distributed to the trade. These catalogues are gotten up in the finest style of photo-gravure work. No. 15 catalogue, containing the latest styles of gas fixtures, has recently been issued. Their No. 16 catalogue, which will contain a



PEARCE'S INK REGISTER.

large and fine variety of electric and combination chandeliers, hall-lights, brackets, pendants, etc., is about ready for distribution. Any responsible dealer in this line of goods from whom it is reasonable to expect returns in the way of orders, can obtain a copy of this handsome catalogue by writing for the same to the company at either its Brooklyn or Chicago address.

We would also here mention the fact that the company is at this writing moving its Western Branch in Chicago into new and more spacious quarters, and will hereafter be found at 114 and 116 Wabash avenue. They have secured this fine property by lease for a term of years, and the salesrooms and offices are being fitted up with all the most modern appointments with a view of displaying their goods to the best advantage, and making a selection of fixtures both easy and pleasant. The salesrooms in Brooklyn, which were recently fitted up, have been arranged with the same object in view.

Every dealer is most cordially invited to visit the salesrooms in either city, and we do not hesitate to guarantee to all such the most courteous treatment and careful and prompt attention to all business entrusted to this company.

Ball.—The telegraphers of Boston will hold their ninth annual ball under the auspices of the Telegraphers' Mutual Aid Association, of Boston, on January 19 next.

FREDERICK PEARCE,

MANUFACTURING ELECTRICIAN.

The accompanying illustration is of an improved self-starting inking register that has several points of extraordinary merit. The first thing about it that attracts the attention is its neatness of design and simplicity. An instrument of simple construction means less liability to derangement, and in this particular instrument this feature is pre eminent.

It is made with one or two pens, and can be arranged for a wide or very narrow line.

Most registers emboss the characters, but in this one the latter are registered in ink, making them very distinct and readable at some distance. The inked characters have the additional advantage of being indelible, it being a comparatively easy matter to obliterate embossed characters. Therefore, for permanent record the ink register has no superior.

Mechanically, the ink pen is preferable to the embossing pen on account of its requiring less power for its operation, and can, consequently, be worked with greater rapidity and reliability.

These instruments are arranged to work on either open or closed circuit, and can be wound for main wires or local purposes. For private line work this instrument has no superior, and its neat appearance would be in harmony with the surroundings of the most elegant office. All the electrical parts are thoroughly insulated, and in order to avoid the annoyance due to warping, etc., the base is made of metal. The glass cover, it will be observed, is a radical departure from the old-style glass shade, and a great improvement as far as appearances go. Besides, it is less expensive to replace any of the plates of glass than it would be to get a new shade, in case of damage.

This improved register is claimed by the manufacturer, Mr. Frederick Pearce, the well-known manufacturing electrician, of 77 and 79 John street, New York City, to be the best in the market. It combines the latest improved principles, and is the result of long practical experience in manufacturing registers and other electrical apparatus of all kinds.

Mr. Pearce, as is well-known, is the successor of the old firm of Pearce & Jones, and manufactures telegraph and electrical instruments and supplies of every description. His district messenger and fire alarm apparatus are known all over the country, and in many foreign lands, for their simplicity of construction and reliability of action in actual service.

DAY'S KERITE.

Nothing is so vitally important in electrical work as insulation, especially of wires. Poorly insulated wires are very productive of annoyances and dangers of many kinds, and in large installations, tell very severely on the revenue. It does not require any argument to prove to a practical business man in the electrical trades the truth of the above assertion; his experience, in many cases costly, has taught him that the very best insulation is none too good. Therefore, when he places an order for wire he is very careful to get the best, as he knows it will be cheaper for him in the end.

It is true that there are many cheap grades of insulated wires on the market, but the man of experience never touches them. It is a regretable fact that such classes of goods do find sale, but it is safe to say that one experience with them is generally sufficient to turn the next order over to a reliable house where only the very best goods are handled.

In the matter of insulation, many patented compounds have been put upon the market which, no doubt, in many cases, do show a good record under tests when new. But the element of time is frequently unconsidered in the calculations, and the usual result is a total failure after the lapse of a reasonable period. A first class insulation that is good today and will be good after a reasonable length of time in service, is what is essential in first class work.

Day's Kerite certainly has stood the test of time if any insulation ever has. It has been on the market thirty years, and today its record is unsurpassed. Its qualities are everything that could be desired in goods of this class.

Wires and cables insulated with Kerite are proof against the corrosive action of earth, air or water, and its flexibility, firmness and insulating properties are unaffected by extreme heat or cold. It is said to be less affected by chemical reagents than any other insulation, in fact, it is said to be proof against almost every destructive agency to which electrical wires are subject. These very desirable qualities render Kerite one of the most valuable insulating materials known.

Kerite wires are used very largely by telephone, telegraph and electric light companies, and are spoken of in the highest terms of praise by those who use them. Kerite cables, both submarine and underground, are in extensive use by the telegraph and telephone companies in the United States, and are said to be giving perfect satisfaction.

Day's Kerite wires are weatherproof and are much sought after for aerial lines for arc lights, telegraph, telephone, district fire alarm and police circuits, and when wires are to run through foliage it is especially recommended.

In insulating electric light wires two separate layers of Kerite are wound spirally around the wire in opposite directions, well lapped and semi-vulcanized. This insulation is said to really improve by exposure to the weather. In wet weather leakage is prevented, and it is said that where it has been in use in exposed places for several years, the insulation is better than when the wire was first put up.

Lead encased Kerite wires for underground use are giving the best of service, and are in extensive use.

For battery connections Kerite wire is especially adaptable, for the reason that battery acids have no effect on the insulation. The largest manufacturers of galvanic batteries use it for this purpose, which is abundant evidence of its worth.

Another Kerite product of value is Kerite tape, which is invaluable for wrapping wire joints,. This tape vulcanizes by exposure, forming a watertight and weatherproof sleeve over the joint. It comes in standard widths but can be cut to any width, or order.

The sole manufacturer of Kerite is Mr. W. R. Brixey, 203 Broadway, New York City. Mr. Brixey's name is synonymous with Day's Kerite, and wherever one is known it is implied that the other is, equally as well. He is well-known all over the country, and the great business he controls could not be in worthier hands.

THE NORTHWESTERN ELECTRICAL ASSOCIATION.

We have received from Mr. Carroll Collins, president of the Northwestern Electrical Association, a very courteous invitation to be present at the meeting of that Association, to be held in Milwaukee, Wis., on Wednesday and Thursday, January 17 and 18, 1894.

The programme of the meeting is as follows:

WEDNESDAY, 2 P. M.

Organization and President's Address.

New Things in Electricity; W. W. Low, Pres. Electric Appliance Co., Chicago.

WEDNESDAY EVENING.

Essential Station Instruments; Prof. Jackson, Madison.

Economical Use of Transformers: Forman Collins, Vice-Pres. *Western Electrician*, Chicago; J. McFadden, of the General Electric Company, Chicago.

THURSDAY A. M.

Corliss Compound Engines; E. L. Debell, Sheboygan.

Advantages of Direct Connection; W. N. Stewart, Siemens & Halske Electric Co., Chicago.

THURSDAY P. M.

How Shall Members Buy Supplies; H. C. Thom, Madison.

Supply of Electrical Power from Central Stations.

THURSDAY EVENING.

Pleasure.

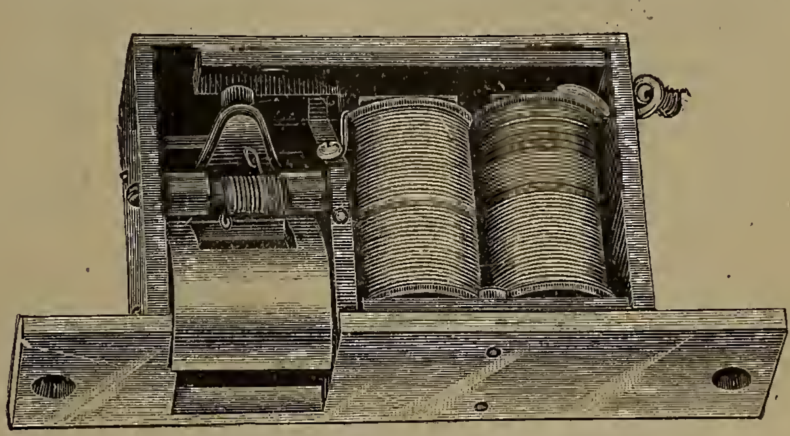
The meetings will be held at the Hotel Pfister, at which special rates have been made for those in attendance at the meeting.

The officers of this enterprising association are: Carroll Collins, president, Green Bay, Wis., and T. A. Pamperin, secretary, Oconto, Wis.

SEIB & STARKE,

MANUFACTURERS OF ELECTRICAL APPARATUS.

One of the enterprising firms manufacturing electrical apparatus of all kinds, in New York City, is Seib & Starke, 411 and 413 East 107th street. This house does a flourishing business in the manufacture of burglar alarms, hotel annunciators, medical batteries, electric bells, push buttons, door pulls, letter boxes, etc. Small



"POSITIVE" ELECTRIC DOOR OPENER.

battery motors, for turntables and revolving signs, constitute this firm's specialty.

Seib & Starke are manufacturers and patentees of the "Positive" electric door opener, an illustration of which is given herewith.

By the use of this device a door may be opened by simply pressing a button at any distance from the door. The apparatus cannot be tampered with from without, as the mechanism is tightly enclosed, and there is no danger from entrance by means of keys, as in the case of ordinary locks. It is valuable for front doors, and in all situations where it is desired to exclude those who have no right to enter. In offices, for instance, on the gate or door separating the general from the private sections, this device is especially effective. The push buttons operating the door opener can be placed on a desk, or in any other convenient position commanding a view of the entrance, thus securing immunity from undesirable intrusion. This valuable device is rapidly extending in use, and sells at once on its merits. It is substantially constructed, and cannot be easily rendered inoperative.

The members of this firm are George A. Seib and Otto E. Starke.

STREET RAILWAY DEPARTMENT.

OBITUARY.

WILLIAM RICHARDSON.

Mr. William Richardson, ex-President of the Atlantic Avenue Railroad Company, Brooklyn, N. Y., died at his home, in that city, at three o'clock in the morning of December 31, 1893. The cause of Mr. Richardson's death was heart-failure, the result of an attack of grip. His end was painless, and, surrounded by his family, he passed quietly away at the hour mentioned. He leaves a widow and four children, of the latter being Mr. William J. Richardson, well known to all street railway men throughout the country.

"Deacon" Richardson, as the deceased was familiarly called, was born in Berkhampstead, Hertfordshire, England, December 8, 1822. He came to this country when very young, and in 1834, with his father, went to Gambier, Ohio, where he worked on a newspaper in that place. In 1840 he removed to Albany, N. Y., where he resided for twenty-five years. Here he became interested in the temperance movement, and was one of the most active organizers of the Grand Division of Templars of Western New York. In 1858 he was clerk of the State Assembly, and also served temporarily as Speaker. In 1860 he was a member of the editorial staff of the Albany *Evening Journal.*

He was named by President Lincoln at the outbreak of the war as an additional paymaster in the United States army. Four years later he was appointed superintendent of the Dry Dock, East Broadway and Battery Railroad Company. He served in this position only a few weeks when he was made a director, and a short time later the president of the road.

He tendered his resignation in 1867, and became the sole lessee and proprietor of the Brooklyn and Jamaica Railroad Company.

Mr. Richardson was one of the bitterest foes the elevated railroads of Brooklyn ever had. He believed that they would diminish the receipts of the surface roads, and he persistently fought them step by step in the courts.

He distinguished himself as a fighter in the efforts he made to keep the Union Elevated Railroad Company off Fifth avenue. For many years one of his lines had a monopoly in that avenue. The Union Elevated, though, after years of litigation, succeeded in building its road.

One of the acts of Mr. Richardson which brought him into considerable prominence was the plan he adopted to get ahead of the courts when they were about to stop his laying tracks in Seventh avenue for a new line of his Atlantic avenue system. The property owners in Seventh avenue, one portion of which is very fashionable, were up in arms against the project. They held indignation meetings and sought legal aid to prevent it.

An injunction would have been granted but for the fact the moving papers were not ready until Saturday afternoon, and then no judge could be found.

Mr. Richardson got up early the following morning (Sunday), and before the people were on their way to church a big gang of Mr. Richardson's laborers had laid a series of tracks in the avenue, and the men were at work under the personal direction of Mr. Richardson.

The affair created much feeling in the Hanson Place Baptist Church, of which Mr. Richardson was a member, and he barely escaped expulsion by a very close vote.

The Atlantic Avenue Railroad, of which Mr. Richardson was president for many years, was sold, so far as Mr. Richardson's interest went, to the Brooklyn Traction Company's syndicate about one year ago. His son, William J. Richardson, continued as secretary and treasurer of the company.

In Brooklyn Mr. Richardson began his public life as a member of the Board of Aldermen in 1870, serving for two years. He got the nomination for Senator in 1878, but was defeated by a small vote. He was a member of the first Republican State Committee.

Mr. Richardson belonged to various organizations. He was a Free Mason, an Odd Fellow, a member of the Masonic Veteran Association and many civic societies. He was a director of the Baptist Home and one of its most prominent supporters.

Mr. Richardson was married in 1844 to Mary Freeman, a daughter of James and Ann Freeman, of Albany.

The funeral services were held on Wednesday afternoon.

NEW YORK AND PHILADELPHIA ELECTRIC RAILROAD.

What purports to be an authorized description of the proposed electric railway between Philadelphia and New York is published in the Trenton, N. J., *Times.* The company is to be named the New Jersey Railway Company, and Mr. Joseph H. Reall, of Bloomfield, N. J., is said to be the projector of the enterprise.

The route of line from Trenton to New York is through Princeton and Bound Brook Passing north from Bound Brook the line runs northeast to Westfield, passing through Dunellen, Plainfield and Fanwood. From Westfield a branch will run to Rahway, Elizabeth, Woodbridge, Boynton Beach and Perth Amboy, forming a short line from north Jersey and eastern Pennsylvania to the seashore.

The line continues northeast from Westfield, passing through Springfield, Millburn, Wyoming, South Orange, Orange, West Orange, East Orange, Bloomfield, Montclair, and thence to Paterson, with a branch from Millburn to Irvington and Newark on the east, and to Morristown on the west. Another branch extends from Montclair to Caldwell.

The entire line has been surveyed, it is said; the right of way has been secured, and the necessary franchises are assured.

This will be the largest and best electric road yet built. It will be laid with seventy and ninety-pound steel rails and equipped with thirty-four feet, double-motor cars of thirty horse-power each. The speed will be eight to ten miles per hour in cities and towns, and twenty-five to thirty miles in the country. The cars will be run from fifteen minutes to one hour headway, according to the amount of traffic, and where the trade demands it, five minutes headway. Five electric power plants, with 1,000 horse-power each, located at Trenton, Rocky Hill, Bound Brook, Westfield and Orange will supply the power.

The road will connect with Newark and Jersey City at South Orange, Orange and Bloomfield by electric roads now in operation, and thus form a through line from Trenton to New York, Paterson and Newark, and in connection with the proposed road in Pennsylvania, which runs along the Delaware River, from Trenton to Philadelphia via Bristol, will form a through line.

Mr. Reall's system comprises over one hundred miles of road and will be a standard road run by electricity.

The New Jersey Improvement Company has been incorporated to build and equip the north end of the road ready for operation and work will be commenced early in the spring. Its officers are J L. Stadelman, president; E. W. Hine, vice-president ; Chas. E. W. Smith, treasurer ; John Uhle Bethell, secretary. Another construction company will probably be organized by Mr. Reall to build the southern end and the branch lines.

THE PRACTICABILITY OF ELECTRIC CONDUIT RAILWAYS.*

BY ALBERT STETSON.

After referring in a general way to the advantages and disadvantages of the overhead trolley system, Mr. Stetson said of the storage battery system :

Secondary batteries have been used in nearly every large city of the civilized world, to supply the demands for electric traction, but have been given up as too costly. I know there are still people who are willing to spend their money on this *ignis fatuus*, but the number is growing beautifully less year by year The writer has spent much time in investigating the subject here and abroad, has examined everything in this line that Europe has offered, and he asserts, without fear of successful contradiction, that not one instance can be found in the world where a traction secondary battery has paid an honest dividend. The cars (if supplied with sufficient power) are too heavy for ordinary track construction, the heaviest ballasted steam track being scarcely good enough to insure them a commercial life. The conditions essential to the life of a secondary battery are large, thick and heavy plates. Such a battery can probably be commercially employed in lighting stations, but those are diametrically opposed to the conditions for a traction battery. In traction, the battery must be small (on account of the limited space at our disposal) and it must be light ; for every 150 pounds of lead carried means the cost of tranporting a passenger. To run successfully, we must be able to ascend such grades as exist in railway work, and when sufficient battery power for this is carried, the car becomes unwieldy. A sudden call for power from a small battery may tear it all to pieces, and the "self-contained" car then becomes anything but an "ideal" motive power. When, in 1881, Sir Wm. Thomson carried across the channel Faure's little box containing 1,200,000 foot-pounds of electrical energy, great hopes were excited, and those million foot-pounds of energy were soon changed into millions of shares, and that changing process has been going on ever since ! The average investor did not, of course, know that those large figures represented about the energy of 1½ ozs. of coal, and that, if Sir William had brought his pockets full of good cannel coal, the supply of energy in Old England would have been much increased, but investors did believe that there was the "ideal" system for electric traction. The best electrical, chemical, mechanical and engineering skill was employed, improvements were made on the original cell, millions upon millions of dollars were spent, and the results have been financially disastrous.

(*To be continued.*)

Too Many Passes.—The Consolidated Traction Company, and the South Orange and Newark Railroad Company, New Jersey, have agreed to issue no more passes on their respective lines. It is asserted that the two companies have out at least 1,000 free passes.

*Abstract of paper read at the eighty-second meeting of the American Institute of Electrical Engineers, New York, December 20, 1893.

After the $50,000 Prize.—It is reported that W. H. H. Peterson, of Milwaukee, Wis., has invented an electric railroad system, which he thinks will fullfil the requirements set forth in the recent offer of the Metropolitan Traction Company, of New York. That company offered a prize of $50,000 for an electric system, as efficient as the overhead trolley, but not requiring poles. and overhead wire. In Mr. Peterson's system these are done away with, and it is said that Chicago capitalists are desirous of becoming interested in the invention. Mr. Peterson intends to invite the Metropolitan Traction Company to examine his system.

Cable Road in Newcastle.—Steps have been taken in Newcastle, England, with the view of building a cable railroad in that city.

PERSONAL.

Mr. Ralph D. Colburn, an electrician well-known in Worcester, Mass., has opened an office in Holliston, Mass. He is now engaged in rewiring the shops of the C. D. Morse Mfg. Co., besides wiring several electric cars. He has had large experience in railway work.

Mr. F. R. Chinnock, who for the past two years has been the General Eastern Agent of the Ball Engine Co., of Erie, Pa., has resigned his agency of that company, and will again enter the electrical field, in which industry he was so long and successfully identified. While Mr. Chinnock has been very successful as the agent of the above named company, he feels that he will be still more successful in the larger and broader field of electricity, in which line he met with such flattering success as the agent of the Edison General Electric Co., with whom his many friends will remember he was associated for eight years.

NEW YORK NOTES.

Office of the Electrical Age,
World Building, New York,
December 30, 1893.

Mr. James H. Mason has opened an office on the first floor of the World Building, this city. He will act as manufacturers' agent, and will make a specialty of phonograph batteries.

Capt. Willard L. Candee, of the Okonite Company, arrived home on December 24, from Europe, where he spent several weeks on business. He got home in time to spend Christmas day with his family.

Mr. Edgar Peckham, the energetic president of the Peckham Motor Truck and Wheel Co., 1008 Havemeyer building, city, is recovering from a severe attack of the grip. His friends are glad to know of his convalescence.

Mr. A. E. Hall, manager of the Electric Pump department of Otis Brothers, this city, has the heartfelt sympathy of his many friends in the recent death of his wife. Mrs. Hall died of pneumonia at her home in Plainfield, N. J.

Mr. Norman Hubbard, 93 to 97 Pearl street, Brooklyn, N. Y., reports that he is doing a good business in making and selling Packard vacuum pumps, used in the manufacture of incandescent lamps. Several of these pumps have recently been shipped to such concerns.

The Manhattan Electrical Supply Co., of New York, has increased its capital from $20,000 to $250,000 in order to extend its manufacturing facilities. It is stated that the company intends to engage in the manufacture of telephones on an extensive scale on the expiration of the Bell patents.

The Staff of the New York office of the Commercial Cable Company send greeting to their friends this year in the shape of a card with an engraving of a horseshoe, in the central portion of which is a fine picture of the famous yacht "Vigilant."

Mr. W. H. Gillett, superintendent of the Grand View Beach Railway Company, Charlotte, N. Y., was in town last week getting estimates for a new power plant for his company. It will be remembered that the company's station was destroyed by fire last June. The new plant will include engines, etc.

Robertson's Lead Encasing Works, cor. Water and Washington streets, Brooklyn, have an interesting process of covering wires and cables with lead. Telephone, telegraph and electric light wires and cables are so covered without joints, and with any thickness and length of metal. This concern's business is simply to apply the lead casing, and not to make the wires or cables.

A decided novelty in the way of advertising is seen nightly on the streets. It consists of a handsome wagon, drawn by four horses, and brilliantly illuminated with electric lights. The edges of the wagon are outlined with lamps, and each horse is equipped with two lamps, one on the saddle and one on the top of his head. A storage battery is carried in the wagon, and the illumination is very brilliant and attractive.

A. A. McCreary, manager of the McCreary Electrical Specialty Co., 136 Liberty street, city, reports an extensive business in his line. A large quantity of his goods has been shipped on orders from Europe, Australia, and South American cities. The trade is extending the sale of his new combination portables and other new goods. The company is preparing to place some very valuable new specialties on the market that will be an interesting surprise.

The many friends of Mr. E. P. Hampson, of E. P. Hampson & Co., 36 Cortlandt street, city, the well-known engineers and contractors, will regret to learn of the bereavement of that gentleman in the recent death of his son, C. H. Hampson. The young man had a very promising future. He studied electrical engineering at the Lynn works of the General Electric Company, and recently took charge of the large electric light plant in the Vanderbilt building, in this city. His death was due to an attack of pneumonia.

The Peckham Motor Truck and Wheel Co., 1008 Havemeyer Building, city, has on exhibition in its office a very beautiful model of one of the company's celebrated trucks, made of aluminum. It is complete in every detail, and was made by the well-known model-maker, Wm. Gardam, of 98 John street. The model shows the 6a truck for ordinary cars, and has on one end the extension of the 6 d truck, the whole illustrating the special features of the 6 d x truck. This company's trucks continue to meet with great favor among electric railway companies, and in all cases they give the best of satisfaction in service.

The Automatic Phonograph Exhibition Co., of this city, has gone into the hands of a receiver. The assets are stated to be $1,000 and the liabilities $36,000. The principal creditors are the Gilliland Electric Co., $12,596; Chas. A. Cheever, $2,059; Felix Gottschalk, $2,292; Lewis Glass, of San Francisco, $2,500; Thomas A. Edison, $3,940; North American Phonograph Co., $5,479. The company was incorporated in February 1890, and had a capital stock of $2,500,000. Among the stockholders of record are Thomas A. Edison, Thos. Butler, trustee, Charles A. Cheever, Wm. Holzer, Elizabeth N. J., Exploiting Company of San Francisco. The machines were operated by a nickel-in-the-slot device.

Mr. Henry G. Issertel, 39 Cortlandt street, the enterprising dealer in electric light and electric railway supplies, represents three large firms—the H. W. Johns Mfg. Co., of New York City, the Bernstein Electric Co. and the Iona Mfg. Co., of Boston. Mr. Issertel shows samples of fine cut and imported glass shades which he is disposing of at low figures. He is also carrying a complete line of the moulded mica electric railway supplies made by the H. W. Johns Mfg. Co., which are so well and favorably known. These include insulators, trolley hangers, strain insulators, etc. A full line of samples of Iona electrical specialties in sockets, cut-outs, etc., and of the Bernstein series and multiple incandescent lamps are displayed in his office. Mr. Issertel says he is doing a very good business. Early in January he will start on an extended business trip through the South and Southwest. He has a large number of friends in the trade who are glad to see him succeed. It will be remembered that Mr. Issertel was formerly with the A. B. C. Company. W. T. H.

ELECTRICAL BOOKS.

Every one engaged in the electrical trades and profession should have at hand for ready reference standard electrical works. A book that covers the entire electrical field is Sloane's Dictionary of Electricity. This is the latest work of its character and brings everything up to date. Copies can be had at the office of the Electrical Age on receipt of price, $3.

ELECTRIC LIGHT EQUIPMENT WANTED.

Beare Brothers, Humboldt, Tenn., are about to start an electric light plant. They want a 12 arc and a 200 incandescent light machine.

QUEEN & CO.'S TACHOMETERS.

Queen & Co., Philadelphia, have a very excellent portable tachometer, by means of which the speed of engines, dynamos and motors can be quickly and accurately determined. It is compact, convenient to handle and will indicate revolutions up to 3,000 turns per minute. They also have stationary types for permanent attachment. In the economical operation of a lighting or power plant it is highly necessary to run a dynamo very close to schedule speed, which can only be determined by an instrument such as the above.

TRADE NOTES.

Working full time and full capacity, and behind on their deliveries, is the gratifying report furnished by the Clayton Air Compressor Works of 43 Dey street, New York, as to their shops in Brooklyn. In the prevailing business depression, this speaks volumes for the excellence of the Air Compressors built by this company. They have recently taken out several valuable patents on a new triple compound high pressure air or gas compressor, used largely by manufacturers of carbonic acid gas.

During the past few months, Mr. F. R. Chinnock, general eastern agent of the Ball Engine Co., of Erie, Pa., has made the following sales of Ball engines: J. M. Iver & Co., Danbury, Conn., one engine; Ridgewood Electric Light and Power Co., Ridgewood, N. J., one boiler; Brooklyn Navy Yard, one 100 H. P. heavy duty engine, for running saw mill; General Electric Co., for Hot Springs, Va., increase, two engines, one boiler; Imperial Hotel, New York City, one 150 H. P. engine; Messrs. Schwarzenbach, Huber & Co., Union Hill, N. J., one boiler; for export to Cuba, three engines; Big Four R. R. Co., Indianapolis, Ind., complete steam plant, including two engines and three boilers; John Goode Rope Cordage and Machine Co., Ravenswood, L. I., one 600 H. P. cross-compound engine.

Electrical and Street Railway Patents.

Issued December 26, 1893.

511,328. Method of Electric Commutation and a Fluid Electric Commutator. Charles E. Emery, Brooklyn, N. Y. Filed Dec. 28, 1892.

511,342. Conduit-Railway Trolley. John C. Love, Chicago, Ill., assignor to the Love Electric Traction Company, same place. Filed May 17, 1892.

511,343. Trolley for Conduit Railways. John C. Love, Chicago, Ill., assignor to the Love Electric Traction Company, same place. Filed May 17, 1892.

511,344. Support for Electrical Conductors. John C. Love, Philadelphia, Pa., assignor to the Love Electric Traction Company, Chicago, Ill. Filed Jan. 21, 1893.

511,345. Tension Device for Electric Conductors. John C. Love, Philadelphia, Pa., assignor to the Love Electric Traction Company, Chicago, Ill. Filed Jan. 21, 1893.

511,346. Trolley-Bar Carrier for Cars. John C. Love, Philadelphia, Pa., assignor to the Love Electric Traction Company, Chicago, Ill. Filed Jan. 21, 1893. Renewed Nov. 11, 1893.

511,347. Governor for Electric Motors. John Marty, Jr., Cleveland, Ohio. Filed Oct. 10, 1892.

511,358. Telephone. Barton Pickering, Dayton, Ohio. Filed, Jan. 29, 1881.

511,375. Method of and Means for Compounding Dynamo-Electric Machines. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company, of New York. Filed Nov. 23, 1892.

511,376. Electric Measuring-Instrument. Elihu Thomson, Swampscott, assignor to the General Electric Company, Boston, Mass. Filed Mar. 2, 1893.

511,401. Electric Meter. Lucien Brillié, Paris, France. Filed Nov. 22, 1893. Patented in France, July 13, 1891, No. 214,851, and in England Oct. 23, 1893, No. 19,934.

511,407. Process of Making Resistance-Plates. Charles E. Carpenter, Bridgeport, Conn., assignor to the Carpenter Enamel Rheostat Company, same place. Filed Feb. 7, 1893.

511,419. Trolley-Wire Crossing. Henry Geise, Philadelphia, Pa., assignor of one-half to Edwin Jaquett Sellers and Horace Pettit, same place. Filed June 26, 1893.

511,425. Automatic Railway-Switch. Charles S. Hoenes, Milwaukee, Wis. Filed Dec. 17, 1892.

511,428. Life-Guard for Street Cars. Charles W. Howe, Waltham, Mass. Filed Feb. 20, 1893.

511,432. Life-Guard or Fender for Cars. James F. Ingraham, West Peabody, Mass. Filed Oct. 29, 1892.

511,434. Galvanic Battery. Harry T. Johnson, New York, N. Y. Filed Apr. 21, 1893.

511,442. Rotary Fan. Robert Lundell, Brooklyn, assignor of two-thirds to Edward H. Johnson, New York, N. Y. Filed Jan. 4, 1893.

511,448. Electric Locomotive. John G. McCormick, Louisville, Ky. Filed Apr. 1, 1892.

511,451. Electric Bell. Augustus J. Oehring, Chicago, Ill., assignor to the Western Electric Co. same place. Filed Apr. 25, 1891.

511,452. Conduit for Electric Railways. Henry D. Oler, Paterson, N. J. Filed Aug. 23, 1892.

511,456. Telephone Instrument. Parnell Rabbidge, Sidney, New South Wales. Filed Apr. 22, 1893.

511,461. Safety Device for Electric Circuits. Chas. H. Rudd, Evanston, assignor to the Western Electric Co., Chicago, Ill. Filed Dec. 10, 1888.

511,462. Fire-Alarm Telegraph. Chas. H. Rudd, Chicago, Ill., assignor to the Western Electric Co., same place. Filed May 19, 1892. Renewed May 15, 1893.

511,464. Multiple Switchboard System for Telephone Exchanges. Chas. E. Scribner, Chicago, Ill., assignor to the Western Electric Co., same place. Filed Apr. 26, 1893.

511,495. Electric-Arc Lamp. Reginald Belfield, London, England, assignor to Geo. Westinghouse, Jr., Pittsburg, Pa. Filed Apr. 5, 1893. Patented in England, Apr. 2, 1892. No. 7,037.

511,503. Electric Measuring Apparatus. Theodore Bruger, Bockenheim, near Frankfort-on-the-Main, Germany, assignor to Hartman & Brun, same place. Filed Aug. 19, 1893. Patented in Germany, Sept. 12, 1885, No. 36,554, and June 21, 1887, No. 39,869.

511,512. Machine for Separating Magnetic from Non-Magnetic Substances. Geo. G. Crosby, New York, N. Y., assignor to the Magnetic Iron Milling Co., of Tennessee. Filed Jan. 11, 1893.

511,514. Process of and Composition for the Manufacture of Porous Cups for Electrical Batteries. Frank G. Curtis, Philadelphia, Pa. Filed Feb. 13. 1893.

511,523. Current-Regulator for Dynamo-Electric Machines. Chas. D. Haskins, Brooklyn, N. Y., assignor to the Western Electric Co., Chicago, Ill. Filed Nov. 12, 1892.

511,524. Converter System for Electric Railways. Gustaf E. Hesse, Brooklyn, N. Y., assignor of five-eighths to Wm. W. Share and Valdemar F. Lässoe, same place. Filed Nov. 21, 1892.

511,527. Automatic-Electric Light Extinguisher. Geo. M. Hughes and Geo. T. Reed, Baltimore, Md., assignors to the Automatic Electric Light Extinguisher Co., of Baltimore City. Filed Mar. 17, 1893.

511,547. Electric-Wire Covering. Franklin S. Randall, Philadelphia, Pa. Filed June 2, 1893.

511,559. Electrical Transmission of Power. Nikola Tesla, New York, N. Y., assignor to the Tesla Electric Co., same place. Filed Dec. 8, 1888.

511,560. System of Electrical Power Transmission. Nikola Tesla, New York, N. Y., assignor to the Tesla Electric Co., same place. Filed Dec. 8, 1888.

511,562. Cloth Cutting Machine. Arthur K. Thyll, New York, N. Y., assignor to the Electric Cutter Co., same place. Filed Mar. 14, 1893.

511,563. Cloth Cutting Machine. Arthur K. Thyll, New York, N. Y., assignor to the Electric Cutter Co., same place. Filed Mar. 27, 1893.

511,570. Rotary Electro-Magnetic Engine. Henry P. White, Kalamazoo, Mich. Filed Feb. 15, 1893.

511,574. Electric Transformer. James J. Wood, Fort Wayne, Ind. Filed May 19, 1893.

511,589. Telephone System. Frank R. Colvin, New York. Filed June 26, 1893.

511,596. Cable Railway. Chas. I. Earll, New York, N. Y. Filed Apr. 11, 1893.

511,597. Cable Railway. Chas. I. Earll, New York, N. Y. Filed Sept. 13, 1893.

511,604. Fender for Street Cars. David Flanders, Watertown, Mass. Filed June 30, 1893.

511,611. Insulator. Chas. N. Hammond, Boston, Mass., assignor, by direct and mesne assignments, to the Hammond Cleat and Insulator Co., same place. Filed Sept. 1, 1892.

511,612. Insulator. Chas. N. Hammond, Boston, Mass., assignor to the Hammond Cleat and Insulator Co., same place. Filed Apr. 12, 1893.

511,613. Rosette for Electric Lights. Chas. N. Hammond, Boston, Mass., assignor to the Hammond Cleat and Insulator Co., same place. Filed June 30, 1893.

511,621. Electric Motor Apparatus. Wm. A. Johnston, Arthur W. Browne and John C. Davidson, Prince's Bay, N. Y., assignors to the S. S. White Dental Manufacturing Co., Philadelphia, Pa. Filed Apr. 25, 1893.

511,627 Electric Railway Switching Mechanism. Chas. J. Kintner, New York, N. Y. Filed June 24, 1893.

511,634. Trolley Base. James L. Mauldin, Cleveland, Ohio, assignor of one-half to Frank J. Lewis, same place. Filed Mar. 20, 1893.

511,640. Car-Fender. James W. McKinnon, New York, N. Y., assignor of two-thirds to Sarah B. McLeod and Ann M. Downs, same place. Filed Aug. 4, 1893.

511,647. Electric Grain-Weighing Scale. John Outcalt and David De P. A. Outcalt, Spotswood, N. J. Filed July 8, 1893.

511,680. Truck-Frame for Motor-Cars. Charles E. Canfield, Chester, Pa., assignor of one-half to Henry Cochran, same place. Filed June 21, 1893.

511,682. Electrolyzing Apparatus. Antoine J. O. Chalandre, Paris, France, assignor to the Society Outhenin Chalandre Fils et-Cie, same place. Filed Sept. 13, 1893.

511,720. Fire-Guard for Lamp-Cords. Edwin E. Angell, Somerville, and Stephen Porter, Boston, Mass. Filed Apr. 20, 1893.

511,731. Electric Signaling Apparatus. Thomas B. Doolittle: Bridgeport, Conn. Filed Feb. 13, 1893.

511,739. Telephone System. John J. McNally, California, Mo. Filed Aug. 31, 1893.

511,742. Electric Cautery Apparatus. James A. Wotton and Earnest A. Bostrom, Atlanta, Ga. Filed June 26, 1893.

REISSUE.

11,396. Street Railway Car. George Moore, Boston, Mass., assignor of one-half to G. Waldon Smith, same place. Filed Sept. 15, 1893. Original No. 498,071, dated May 23, 1893

ELECTRICAL AGE

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CONTENTS.

ELECTRICITY ON THE CANALS.

Governor Flower, of New York, is a strong advocate of the use of electric power for the propulsion of boats on the Erie canal, and he urges the legislature, in his annual message, to enact the necessary measures in order that the system be given a fair trial. The recent tests in this direction, he reports, were entirely satisfactory, and it only remains to determine the comparative cost of this method of propulsion. Careful estimates, however, place the saving as at least 25 per cent. as compared with steam power, and in increase of travel over 30 per cent. The advantages of electricity over horse or mule power, he asserts, would be still greater. The people of New York have a progressive man at the "helm of state," and if the legislature will properly regard the interests of the people the day of the coming of electric power on the canal will soon dawn.

FROM 1876 TO 1893.

Some idea of the wonderful results of electrical development since the year of the Centennial, 1876, up to the present time, is given by Prof. Elihu Thomson in the *Engineering Magazine* for January. It is difficult for the finite mind to realize what has been accomplished in this short space of time by the utilization of electricity; yet we are surrounded by the facts. It is the grandest achievement in the world's history, and those engaged in electrical pursuits have a right to be proud of their calling.

LONG DISTANCE ELECTRIC RAILROADS.

Notable examples of long-distance electric railroading are those now being constructed between Washington and Baltimore, and Philadelphia and New York. Work on both lines has recently been commenced, and there seems to be reason for the belief that it will be pushed to completion. The line between New York and Philadelphia, we think, should be a paying one after it begins operations. It passes through many industrial and thickly settled communities, and it will undoubtedly command a business that the regular steam roads cannot well meet. The traffic between Baltimore and Washington is always heavy, and no doubt the line now being built between those cities will help to build up the sparsely settled intermediate districts.

THE NEW TELEPHONE EXCHANGE.

The Metropolitan Telephone Company opened its new exchange, on Broad street, this city, a few days ago. It is probably the most complete exchange in existence at this time, and embodies every latest improvement and appliance in telephone apparatus. Telephone business is essentially of a hurried nature, and every improvement is, necessarily, with the object of facilitating the quick transaction of business. Everything that human foresight could suggest has been adopted in this new exchange for the purpose named. The downtown district will no doubt appreciate the efforts of the telephone company to provide quick telephone service, and the company did a wise thing in admitting the general public to the new exchange one day last week. This enabled the users of telephones to get a glimpse of the business "behind the scenes," and they now have a better idea of what is done by the telephone company to insure prompt service. Monopolies are not always unmitigated evils.

Electrical and Allied Industries of New York and Brooklyn.—Part II.

THE McCREARY ELECTRICAL SPECIALTY COMPANY.

No electrical house is better known in the trade than the McCreary Electrical Specialty Co., 136 Liberty st., New York city. Its goods are met with wherever one may go, and the fact that they are so generally used is unquestionable evidence of their high character.

The company is known mainly through its patented reflectors. These reflectors consist of an all-glass shade for incandescent lamps. The sides of the shade are silvered so as to reflect the light inwardly, and the bot-

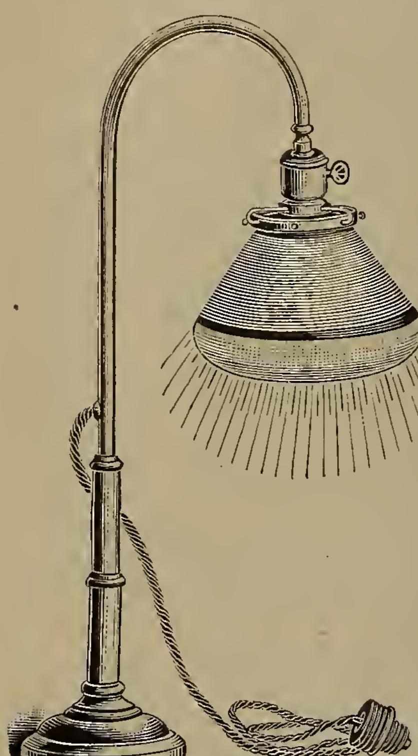


FIG. 1.

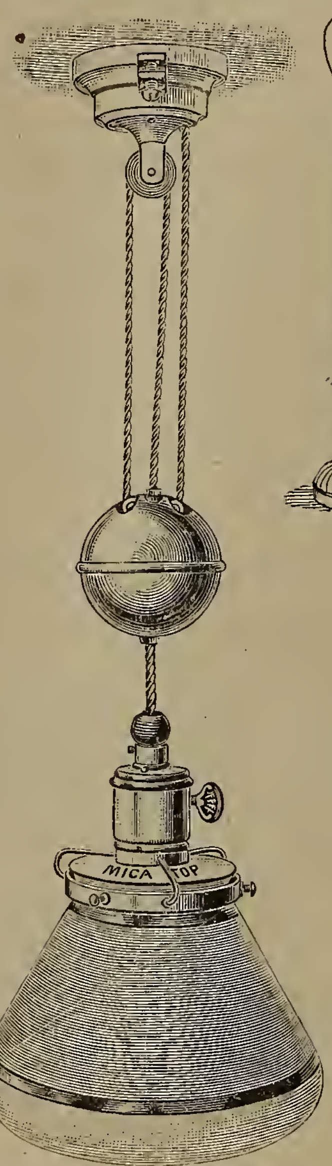


FIG. 2.

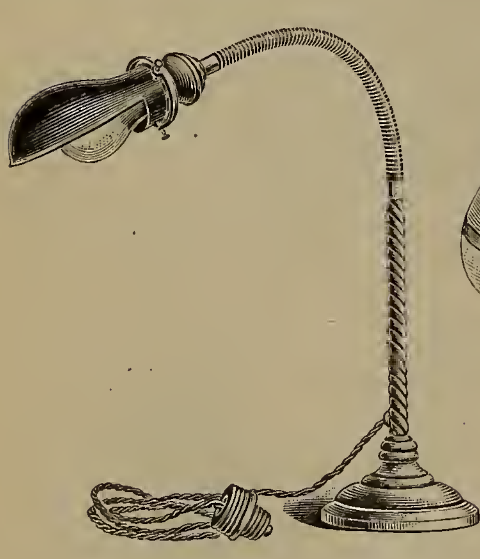


FIG. 3.

tom part is of ground glass. The effect of this form is to concentrate the light on the ground glass producing a brilliant glow of soft light, which is thrown entirely downward upon the desk or table. There is no glare whatever, and the light is restful to the eye.

Fig. 1 shows the McCreary Standard Reflector. It is made in five sizes for lamps from 16 to 100 candle power, and some idea of its great popularity may be gained from the fact that over 300,000 of them are now in use. The government is also a large user.

Fig. 2 is an illustration of the McCreary Suspended Adjustable Lamp. This is the latest, and said to be the best, device for raising and lowering lamps. The lamp will remain at any height placed. The "Hanger" is known as the Columbian Hanger and gives uniform satisfaction in use.

The McCreary Portable Lamp Stand with Flexible Arm is a very convenient device. As will be seen in Fig. 3 it is adjustable to any position whatever as well as being portable, and is withal very durable. The flexible arm will remain in any position, and the half-reflector, attached to the lamp, can be moved around the lamp in any direction. The half-reflector is made of aluminum, and consequently very light. The standards are made of brass and of nickel. This lamp commends itself for desk or other uses, where it is desi able to change the position of the light at will.

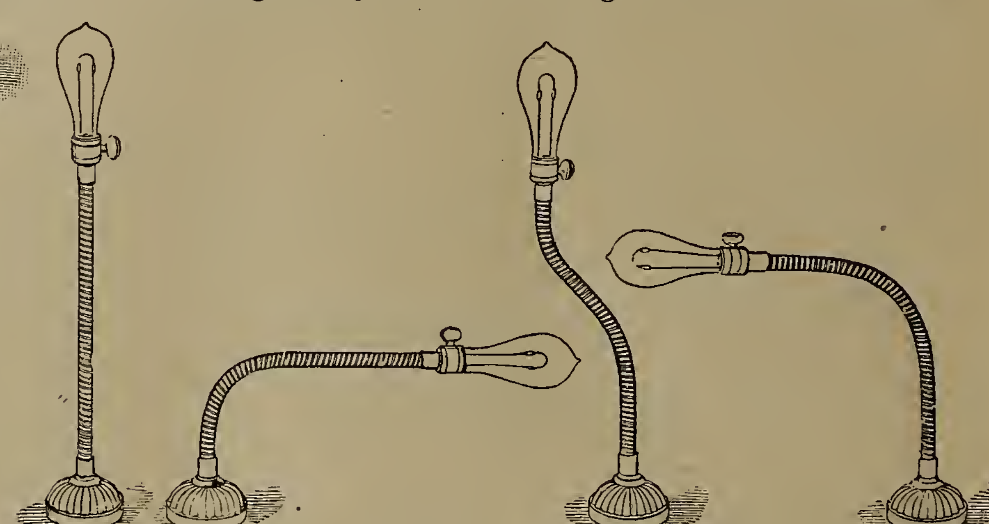


FIG. 4.

Fig. 4 illustrates some of the various forms into which this flexible tubing can be bent.

A modification of the portable stand is seen in Fig. 5. It is called the Perfection Desk or Music Rack Clamp, and is designed to clamp on to the partitions of pigeonholes in roll-top desks or on music stands.

It has the advantage of taking up none of the space on the desk, while the light can be disposed with almost as much ease as in the case of a stand. Opal, red, blue, green or yellow glass, or aluminum half shades come with this style. The metal parts are finished in nickel and are very neat in appearance.

The McCreary Complete Standard Portable, Fig. 6,

FIG. 5.

has an inflexible tube, and is provided with the McCreary standard reflector, which throws all the light downward. This is a handsome device to stand on the desk or table, and it is finished in brass, plain or fancy, and in nickel.

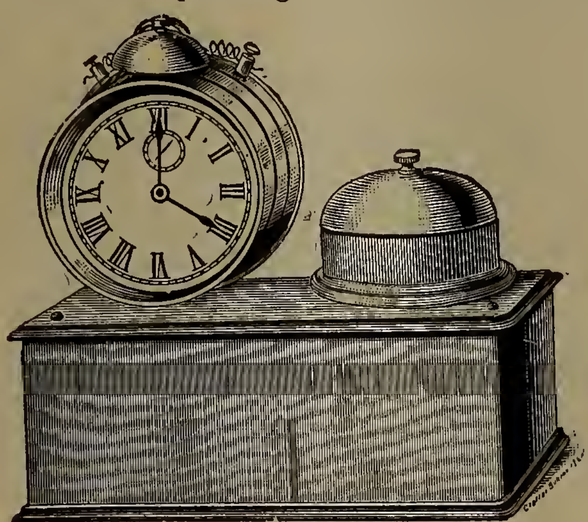
The half-shades, it will be noticed, are especially adapted for use in connection with flexible tubes, which permits of placing the lamp at any angle.

The McCreary Electrical Specialty Company is always on the alert to provide conveniences for the comfort and welfare of those who use electric light on the desk, in the library, or in the reading room, and the popularity which its goods enjoy is well merited.

FAME. — An English contemporary refers to Mr. T. Lockwood as O D. Lockwood.

W. R. OSTRANDER & CO.

Of the electrical manufacturers and supply houses none is better known in the trade than W. R. Ostrander & Co., 204 Fulton street, New York city. This house, which is one of the oldest in the trade, manufactures complete lines of speaking tubes, electric call bells,



ELECTRIC ALARM CLOCK.

burglar alarms, gas lighting apparatus, etc , etc. It has a very large manufacturing plant in Brooklyn, which is probably the most complete of the kind to be found anywhere. It is in every particular an up-to-date plant, as are the goods manufactured there.

The factory has been enlarged several times in late years in order to meet the increasing demand for this firm's goods. Skilled mechanics are employed in every department, and the best of material enters into the manufacture of the various articles turned out here.

The Ostrander Electric Annunciators are well known for their reliability of action and freedom from many of the troubles annunciators in general are heir to. The accompanying illustration is of style No. 1.

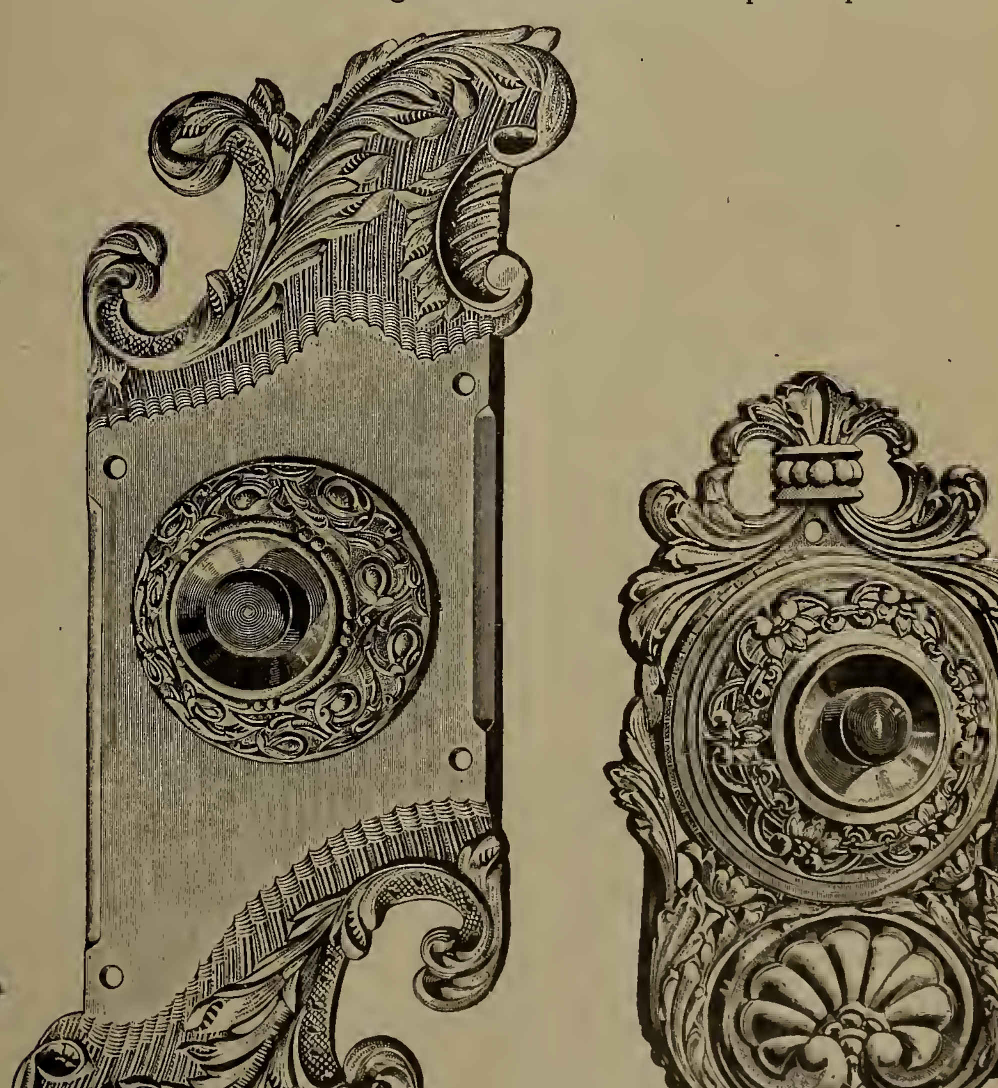
In constructive details these annunciators differ from all others in important respects. The attraction of the armature of each magnet causes the indicator to drop by gravity, the indicator being restored to its normal position by pushing the arm into an upright position. There are no catches or springs to fail to act, and in every respect the annunciator is a first-class piece of apparatus. These annunciators are adapted for hotels, residences, elevators and factories, and are finished in any desired wood. They have been lately improved and the firm takes considerable pride in them.

Another serviceable device made by this firm is the Electric Alarm Clock, illustrated herewith, It is a combined mechanical and electric alarm, while either can be used independent of the other. One or more electric bells in different parts of the house can be rung at any time by being connected with this clock. The clock is of the usual mechanical alarm type, with certain attachments added for the electrical purposes, the contacts being made on the inside. The electric alarm will ring until it is stopped by means of a switch and there is no danger of any early riser oversleeping with one of these around. It is a reliable time piece, and very compact.

W. R. Ostrander & Co. produce a large variety of designs in push buttons for all purposes, from the common wooden device to the most elegant bronze affairs for rich surroundings. We illustrate a couple of push buttons, which will at once command the attention of those of fastidious tastes. The push-buttons are made of cast bronze and finely finished in gold bronze, antique copper or rust proof, as desired.

All goods made by this firm receive the best care in

OSTRANDER ANNUNCIATOR.



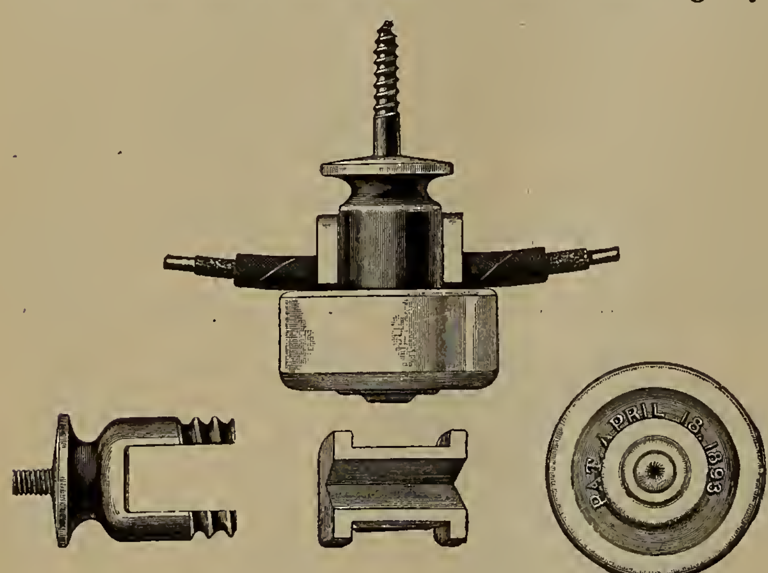
BRONZE PUSH BUTTONS.

their manufacture, and this fact alone probably more than any other is the secret of the firm's large success and standing. The great variety of the different lines of goods is sufficient to satisfy extreme tastes, and if no one can find what he wants in the stock carried by this firm, it is safe to say, that he cannot anywhere else.

THE "SAFETY" INSULATOR.

This insulator has many features that commend it to contractors and wiremen. By reference to the accompanying illustration its construction will be readily understood. The part that is screwed into the support has two jaws, the ends of which are threaded. In the channel thus provided the saddle which holds the wire is slid and tightly held by the porcelain screw nut being screwed in place. No screw driver or other tool is necessary to place the insulator in position, and no staples or other devices whatever are required to hold the wire.

When the wire is in the saddle it is bound tightly so



SAFETY INSULATOR.

that it cannot be pulled through in either direction. The locking is accomplished by a slight bending of the wire when the head is screwed into place. The insulation, however, is not injured at all in the operation.

These insulators are made in three sizes, according to the size of the wires, and are furnished with screws for different classes of work. The screws are made for wood work, for plastering and for iron work.

A special tap and drill is furnished for use in connection with the machine screws for iron work.

The "Safety" Insulator is handled by McLeod, Ward & Co., of 91 Liberty street, New York city.

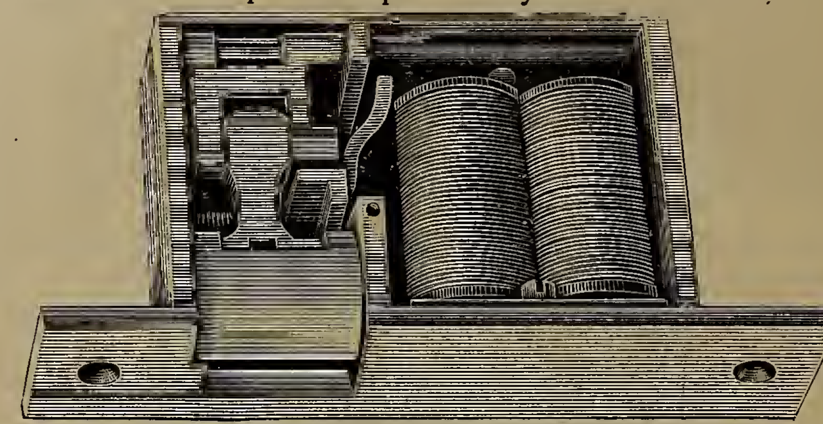
THE MANHATTAN ELECTRICAL SUPPLY COMPANY.

A live concern in a live city is the Manhattan Electrical Supply Co., of 36 Cortlandt street, New York. This company is an extensive manufacturer and dealer in electrical novelties, house furnishings and standard supplies. It stands high in the trade and its goods are met with in all parts of the country. It would require a great deal of space to name the articles this company deals in. In a general way, however, it can be stated that everything in the way of electrical supplies of all descriptions are found here.

One of the specialties this company is manufacturing is the electric door-opener an illustration of which is given herewith.

This device, which is patented, is very simple in its design, constructed of strong materials, and is consequently not easily dis-arranged in its operation.

Electrically, there is a combination of an electro magnet and a permanent magnet, and the feature of the lock is that when the push button is pressed the permanent magnet holds the latch-block mechanism out of locking position until released by the movement of the opening door. In other words, it is not necessary to hold the finger on the push until the door is opened, as is ordinarily the case; by pressing the button for an instant the door can be pushed open at any time thereafter, but



ELECTRIC DOOR OPENER.

after it has been opened and closed again it becomes locked until again released by pressing on the button. It is a very satisfactory lock in its operation, and is meeting with a large demand.

REWARDS FOR MERITORIOUS DISCOVERIES AND INVENTIONS.

HALL OF THE FRANKLIN INSTITUTE,
PHILADELPHIA, December 21, 1893.

EDITOR ELECTRICAL AGE:

Dear Sir: The Committee on Science and the Arts, of the Franklin Institute of the State of Pennsylvania respectfully requests your co-operation in furthering the purpose for which it has been constituted, by bringing to the notice of the readers of your estimable journal the facts set forth in the accompanying announcement.

Respectfully yours,
WM. H. WAHL,
Secretary.

"The attention of ingenious men and women is hereby directed to the fact that the Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts may grant, or recommend the grant of, certain medals for meritorious discoveries and inventions which contribute to the promotion of the arts and manufactures.

"The character and conditions of these awards are briefly stated in the following:

"The Elliott Cresson Medal, founded in 1848 by the gift of the late Elliott Cresson. This medal is of gold, and by the terms of the deed of trust may be granted for some discovery in the arts and sciences, or for the invention or improvement of some useful machine, or for some new process, or combination of materials in manufactures, or for ingenuity, skill or perfection in workmanship.

"The John Scott Legacy Premium and Medal (twenty dollars and a medal of bronze), awarded by the City of Philadelphia. This medal was founded in 1816 by John Scott, a merchant of Edinburgh, Scotland, who bequeathed to the City of Philadelphia a considerable sum of money, the interest of which should be devoted to rewarding ingenious men and women who make useful inventions. The premium is not to exceed twenty dollars, and the medal is to be of copper, and inscribed 'To the most deserving.'

"The control of the Scott Legacy Premium and Medal (by Act of the Ordinance of Councils in 1869) passed to the Board of Directors of City Trusts, and has been referred by the Board to its Committee on Minor Trusts, and that committee has resolved that it will receive favorably the name of any person whom the Franklin Institute may from time to time report to the Committee on Minor Trusts as worthy to receive the Scott Legacy Premium and Medal.

"The Edward Longstreth Medal of Merit, founded in 1889, by Edward Longstreth, Machinist, and late member of the Baldwin Locomotive Works. This medal is of silver, and may be awarded for useful invention, important discovery, and meritorious work in, or contributions to, science or the industrial arts.

"Full directions as to the manner and form in which applications for the investigation of inventions and discoveries should properly be made will be sent to interested parties on application to

William H. Wahl,
Secretary Franklin Institute, Philadelphia, Pa."

CHEAP FUEL.

At the Brooklyn Navy Yard is now progressing a series of experiments, which Chief Engineer W. W. Dungan, lately President of the Naval Board of Experimental Engineers, said at the outset, promised to be the most interesting ever carried on, in relation to combustion, under the auspices of the Government.

Everyone who has visited the coal regions of Pennsylvania has noticed the mountains of coal dust rising on every hand, disfiguring the landscape and poisoning the earth, air and water with their sulphurous fumes and leachings. And yet everyone in those regions knows that those mountains of culm contain the most valuable part of the coal, being the richest in carbon. Chemical analyses show that culm averages 93 per cent. of pure carbon, 2 per cent. of hydrogen and 1 per cent. of oxygen—in all, 96 per cent. of combustible matter to 4 per cent. of ash, proving that culm, now a waste, would be far more valuable than the best merchantable coal if the carbon in it could be converted into heat units.

So great was the loss of material wealth to the State of Pennsylvania, and so great was the nuisance caused by these culm banks, that the Legislature by special act, authorized the appointment of the "Coal Waste Commission," with Col. J. A. Price, of Scranton, at its head. In a recent report to the Legislature, this commission estimated the amount of waste at the enormous sum of 317,000,000 tons. If all this could be utilized, its value should be not less than $600,000,000.

In a report to the Scranton Board of Trade, Col. Price, then the President of that Board, said:

"We are increasing the amount yearly by a volume of two million tons, an aggregate of natural substance going to waste unheard of, and unparalleled," and he termed it a squandering of our inheritance. The culm above ground and the annual increase are then reduced to a gas equivalent, reaching the conclusion that "we have a total of 2,000,000,000,000 or 2,000,000 million cubic feet of gas, or a quantity greater than that computed by Mr. H. M. Chance, of the Geological Survey, to exist in the gas territory of the West. The volume of waste is going on at the present rate of 200,000,000,000, or 200,000 million cubic feet of gas. No natural gas territory can ever hope to equal this."

These stupendous figures are almost incomprehensible to the finite mind, and the deductions drawn from them by Col. Price, who may be said to speak *ex cathedra* on the subject of culm, are startling. This is what he says:

"The contemplation of the gas subject in the anthracite coal fields is almost like an Aladdin Story." Then, after careful calculation, he proves that artificial gas, superior to natural gas, should be produced for less than two cents per thousand cubic feet, and, to emphasize his statement, adds: "Incredible as may seem these figures, yet they are certainly approximately true, and will, undoubtedly, in time, be fully verified." While Col. Price was writing this remarkable statement, a certain inventor, to him unknown, was working along the same line of thought, and the gassification of culm, which was to Col. Price a dream of the future, is today an accomplished fact proved, beyond peradventure, by the experiments to which Chief Engineer Dungan referred.

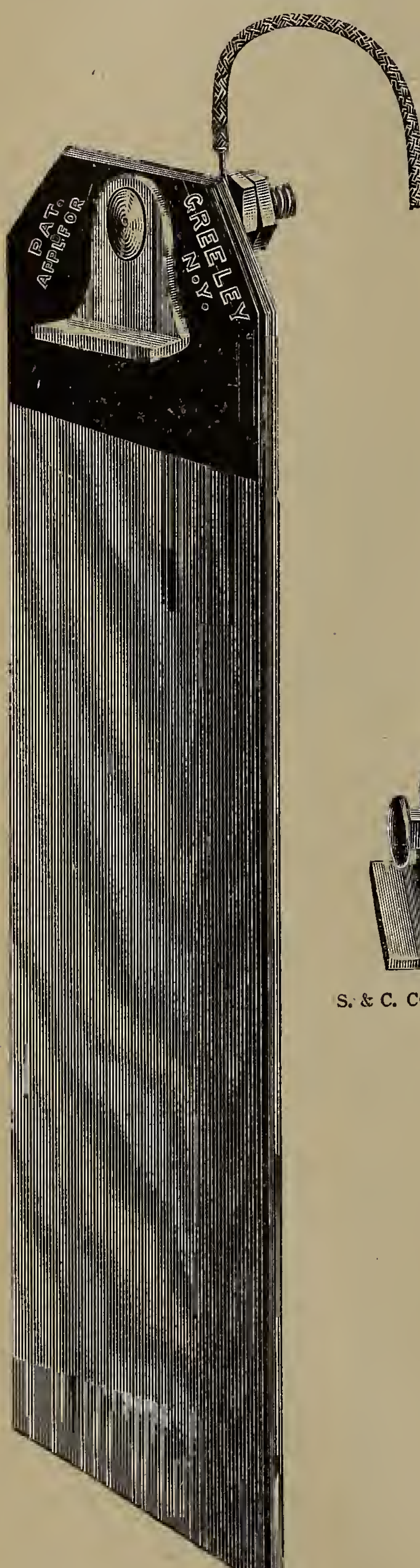
Coal dust is the base of the fuel and is passed with steam and air through heated conduits. Into one of these a fine thread of petroleum is fed, it instantly ignites; and through this flame the steam and air carry the coal dust suspended in the current. Partial combustion follows; the steam is decomposed in the presence of the carbon, the oxygen of the steam and air unites with the carbon of the coal and petroleum; carbon monoxide (CO) is formed; the hydrogen is liberated from the oxygen of the steam; the two gases pass through conduits to the combustion chamber where the second, or perfect, combustion is consummated. Nothing can be simpler. Mr. Arthur Trevor-Hill Little, M. E., in charge, has just rendered a report to the Acme Gas Fuel Company, of Washington, which owns the Letters Patent. He says the culm was speedily, perfectly and continuously gasified, the furnace making its own gas automatically; the flame was diaphanous, of a reddish yellow hue, with a faint blue tint, showing that heated carbonic oxide was burning with hydrogen, producing one of the highest heats known to science, not one spark was seen in the pellucid flame, proving that the gasification of the culm was perfect; the culm certainly passed into the combustion chamber as gas—not as coal dust; the volume of gas was large, and the calorific energy was so intense he had to shut down to save the grate bars from destruction; this is done by simply turning a valve. When certain alterations shall admit the air above rather than below the bars the difficulty will be obviated; the culm question, solved; the vast mountains of coal waste will yield their calorific and potential energy, and a revolution in the art of combustion will follow; that change can easily be made. He adds that he was more than pleased, he was surprised; and the experiment was the most interesting he ever witnessed. The correctness of the method has been clearly proved; anthracite culm is now converted into anthracite gas—a conversion which many able minds have been attempting ever since the discovery of anthracite.

The Acme Gas Fuel Company has upon its list of shareholders names which stand high in the realms of science, including Prof. Emmons, U. S. Geologist; ex-Gov. Hoyt, L.L.D., of Wyoming, who has occupied the chair of chemistry in two colleges, and has received the honors of knighthood from the Emperor of Austria for his services in the cause of education, literature and science, and others. Hon. Edwin Willits, Assistant Secretary of Agriculture and ex-President of Michigan State College, is to act as President of the Company; and General Halbert E. Paine, some-time law partner of Hon. Carl Schurz, and afterward Commissioner of Patents, is to act as Vice-President. Both gentlemen have served many terms in Congress.

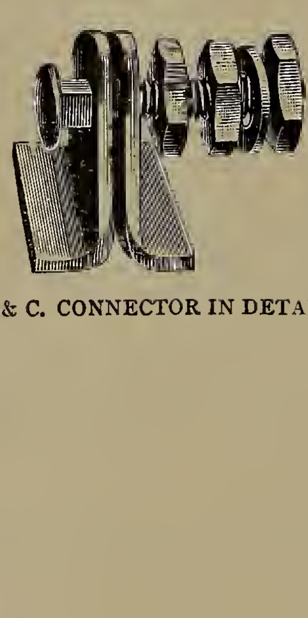
The inventor of the method and apparatus has spent the last fourteen years in studying and experiments of the fuel question, and has succeeded in solving a great problem. He is a man of great intellectual versatility, and those best acquainted with him are not surprised that he has succeeded in a great scientific achievement.

THE S. & C. INTERLOCKING CARBON CONNECTOR.

Since the introduction of carbon batteries for telephone service by the telephone companies, much trouble and annoyance has been caused by a carbon connector which did not insure a tight and rigid connection with the carbon. There was no means of securely locking the wire in place, and loose connections would occur often through the handling of the battery and not be noticed until considerable expense had been resorted to, to locate the difficulty.



TELEPHONE STANDARD CARBON.



S. & C. CONNECTOR IN DETAIL.

The E. S. Greeley & Co., who were among the first to notice the fault of the old style, have produced a carbon connector called the S. & C. Interlocking, which, they claim, gives a perfectly rigid grip upon the carbon and connecting-wire, and will not turn or work loose after once having been locked in position. It is said that the S. & C. overcomes the faults found with the old-style connector and is destined to replace all those of the old style now in use on the carbons of the telephone batteries.

We present two views of the S. & C. Connector herewith; one showing it in detail and the other as it appears on the telephone standard carbon.

The principal features of the S. & C., are its interlocking qualities, the large contact surface and the means of supporting the carbon on the battery cover.

It will be noticed in the detailed illustration that the bolt has a square neck and that it fits into square holes in the contact plates, thus interlocking, and prevents the bolt from turning when the nuts are screwed up.

Fire.—A large fire in Toledo, Ohio, destroyed the Western Union Telegraph Office, and damaged the Postal Telegraph Company's office so badly that the company was unable to accept messages for the time being. The long-distance telephone wires to Detroit were called into requisition by the telegraph companies to help out in the emergency.

Lecture.—Mr. A. W. K. Pierce, of the Crocker-Wheeler Electrical Company, of New York, delivered a lecture before the Department of Electricity, Brooklyn Institute, Friday evening, January 5, on the subject of "The Dynamo; Its Construction and Principles of Operation." The lecture was illustrated by apparatus and lantern photographs.

NEW TELEPHONE EXCHANGE.

The new Broad street exchange of the Metropolitan Telephone and Telegraph Company, was opened for service on Saturday, December 30, last, and on Wednesday, January 3, it was opened to the press and public for inspection. A large number of people availed themselves of the opportunity to see the practical operation of a large exchange, a chance which the public is rarely, if ever, given.

The new exchange is in the building No. 95 Broad street, and is one of the four larger offices that the company has established in this city in fire-proof buildings constructed, especially for the service.

The district to be served by this exchange is bounded by Wall street and Broadway to the Battery. The new exchange at present supplies service to about 1,000 subscribers, but has an ultimate capacity for 3,000. The switchboard is of the latest metallic circuit multiple type, and is equipped with self-restoring indicators. These indicators are restored to their normal position automatically when the conversations on their respective wires have ceased, thus relieving the operator of considerable effort, and quickening the service.

All the subscribers' lines are brought into the building through the basement in lead covered cables, each containing 50 metallic circuits. At the ends of the cables lightning arresters are connected. The conductors then pass through a special switchboard or connecting rack where they are joined to the wires of the operating switchboard. The object of the connecting rack is to permit of easy interchange of connections between the switchboard and subscribers' lines, when necessary. This new feature greatly increases the flexibility of the system.

The current for the switchboard transmitters and for ringing up subscribers is generated by motor-dynamos, or transformers. The desk of the "wire chief" is provided with apparatus for testing for trouble on the wires, and the desk of the Exchange manager is connected with all sections of the switchboard to enable proper supervision of the service. The new Exchange building is a handsome structure of yellow brick. Yellow brick has come to be known as "Telephone brick" for the reason that the telephone company was about the first to use it in New York for business structures.

The telephone system of New York city, consists at present of eight exchanges, equipped with metallic circuit multiple switchboards, having a total accommodation for 15,000 subscribers, upwards of 9,600 subscribers' stations, 800 private line stations, and 30,000 miles of underground wire. The entire system is constructed on a basis of exclusive metallic circuit working. About sixty per cent. of the subscribers now have metallic circuit lines and equipment, and the conversion from the old style grounded lines to metallic circuits is progressing with great rapidity. For the entire system over 400 lady operators are employed, about 250 being on duty at the switchboards at the same time. The average number of connections made daily by each operator is nearly 400.

ELECTRICITY IN 1876 AND IN 1893.

In the January number of *The Engineering Magazine*, which, by the way, is one of the finest productions of the kind ever issued, Prof. Elihu Thomson, has an article under the above named title.

Telegraphic apparatus and systems of signaling, electric clocks, burglar alarms, etc., were practically the only electrical exhibits at the Centennial Exposition, he says.

There were some Weston dynamo machines for electro-plating, and they were novelties at that time. Two exhibits in Machinery Hall, however, were looked upon by far-seeing ones as types of electrical machinery which in various modified forms were soon to work revolutions in lighting and transmission of power. These were the Gramme and Wallace machines. They were almost unnoticeable among the other exhibits with which they were surrounded. The Gramme machine up to that time had been known in the United States through European scientific publications, and two or three machines had been imported into this country. One of the Gramme machines at the Centennial was built at Cornell University and was probably the first dynamo of the kind built in the United States.

Gramme machines were used at the Exhibition for lighting a single arc lamp, and for running a similar machine as a motor, the latter operating a pump. Gramme machines for electro-plating were also exhibited.

The Wallace machines furnished current for single arc lamps, for plating baths and were reversed and run as motors. This exhibit was unique in showing different types of dynamos.

The Bell telephone was just brought out. "It spoke in a small voice, it is true," says Prof. Thomson, "but the echo of that voice was heard over the civilized world."

"With the advent of the speaking telephone," continues the writer, "there seemed to come about a general awakening to the capabilities of electricity in practical work. It prepared the public mind for the coming of new wonders."

The whole art of lighting by electric incandescence has come into existence since 1876, and the storage battery was then practically unknown.

Prof. Thomson gives a brief review of the part electricity took in the World's Fair, and of the most prominent exhibits there, and then administers a severe rap at the exhibits of so-called electric belts, hair brushes, insoles, etc., which he characterizes as naked imposture and quackery.

After discussing the development and perfection of the incandescent lamp and electrical apparatus, he continues: "We can hardly expect, therefore, to make any radical gain in the operation of electric plant unless by the utilization of new principles in unexplored fields. A substantial gain in the economy of the development of power from fuel is of much greater moment than any possible gain in the efficiency of the electric plant." Cheaper power alone means cheaper electricity. He thinks that the early future will witness further application of electricity to chemical and metallurgical work. There is also a wide field for the application of electricity to mining, for hoists, for pumping, drilling, mine haulage, etc.

He believes that the trolley system of railways is admirably adapted as feeders for trunk steam roads, for both passengers and freight, but does not believe that steam locomotives will be soon supplanted by electric locomotives on large roads.

The propulsion of road vehicles by storage batteries is, in his opinion, a promising field for invention and application of thought.

In conclusion, Prof. Thomson says: "While it may be reasonable to look forward to the ability to telephone through an ocean cable under the Atlantic, it is hardly likely that we shall ever travel over it in ships propelled by electricity. It would indeed be possible to construct electric motors able to turn screws and propel our largest ships, but the supply of current energy to them at the rate of 10.000 to 20,000 horse power for five days continuously would require a storage battery to be carried such as would be enormously costly, and so heavy that it could not be placed aboard without sinking the ship, It should, however, be borne constantly in mind, in dealing with the subject of electrical applications, that a new discovery might at any time change the aspect of every prophecy based on present knowledge and conditions."

THE NEW YORK ELECTRICAL SOCIETY.

The next meeting of the New York Electrical Society will be held at Columbia College, on Tuesday, January 16, at 8 P. M. Prof. M. I. Pupin will deliver a lecture on "Electrical Resonance," accompanied by experiments showing the properties and influence of self-induction and capacity on electric circuits.

FINANCIAL NOTES.

THE NATIONAL SWITCH AND SIGNAL COMPANY, of South Easton, Pa., is in financial difficulties, according to a despatch from Easton. The Easton Trust Co., as trustee for the holders of $50,000 in bonds of the first named company, foreclosed the mortgage on January 2, because the National Switch and Signal Company defaulted on the payment of $1,500 interest due October 1 last. The company was organized three years ago with a capital of $400,000.

THE FIRE AT JACKSON PARK.

It was with profound regret that the American people heard of the destruction by fire on January 8, of some of the noble models of architecture at the World's Fair grounds. It was, indeed, a great pity that these beautiful works of art were doomed to destruction at all, but to let the "fiery demon" loose among them, was all the more regretable.

GOVERNOR FLOWER ON ELECTRIC CANAL BOATS.

Governor Flower, of New York, in his annual message to the Legislature, just convened, is quite enthusiastic on the subject of electric propulsion of boats on the Erie Canal. He thinks the most practical plan to increase the tonnage of the canal is to supply speedier and more economical power than mules and horses, and it seems to him that electric power will meet these requirements.

He then refers to the recent tests as demonstrating the feasibility of using electric power, the only question yet undetermined being that of cost. The estimates, however, show that a considerable reduction on the cost of steam power would result. Conservative estimates, he states, place the saving in cost of transportation at least 25 per cent. and the increase in speed at least thirty per cent. The adoption of electric power would not, however, oblige boat owners who wish to retain animal power to make the change. There will be no compulsion to use electric power, whether the plant is operated by the State or individuals. He thinks that electric power can be supplied at a sufficiently low cost that boatmen will find it advantageous to adopt it in the interest of economy. He favors giving the electric system of propulsion a fair trial.

A New Danger.—The startling information comes from Jamestown, N. Y., that a recent fire in that place was caused by "the explosion of an electric lamp."

STREET RAILWAY DEPARTMENT.

MOTORMEN.

Within the last few years a large number of men have found employment in running electric street cars. Members of this body have been given the name of motormen, and in some parts of the country they are known as motorneers. The motormen were, at first, recruited from the ranks of the horse-car drivers, but the demand for them has been so great that men knowing nothing about street car work have, after a little practice, been placed on the front platform of an electric car. Street car companies have, as a rule, selected for this position, men who possess intelligence and are not easily confused The position of a motorman in a crowded city is not an enviable one. He has a great deal of responsibility resting upon him and is in a position to receive much blame and but little commendation.

There has been much discussion among street railroad engineers as to the advisability of giving the conductors and motormen instructions about the electrical mechanism, which propel their cars. Some companies hold that a simple knowledge of the method of operating the switches, rheostat handle and brake is sufficient, and that by keeping the operator in ignorance of the electrical principles involved, a proper respect for, and dread of, the system would be installed in his mind and thus cause him to keep strictly to the running rules and not make any experiments on his own account. In case of trouble with the motor or connections the car has to be delayed till the arrival of an inspector. It is hardly necessary to say that the policy is not a good one, either to the company or to its employees. An ignorant man handling electrical apparatus is very much more likely to cause damage than a man well informed on the subject, although the latter may make a few experiments. If the experiments are made by one not conversant with electrical principles the results are usully disastrous. The writer knows of a case, where a man who, having in charge the running of several motors, wished to see what would be the effect of placing a short copper wire across the terminals of a 250 volt switch. He found out. He does not do it now. The practice of most railroad companies is to instruct their car employees in elementary electric principles, so that they are able to remedy any of the minor troubles occuring *en route*. In case of any serious defect the car is sent to the repair shop. If possible the motorman should be instructed in the "whys" as well as the "hows," of the machinery under his control. Being thus equipped he will be a more efficient motorman and will be better fitted to cope with any emergency.

THE PRACTICABILITY OF ELECTRIC CONDUIT RAILWAYS.

BY ALBERT STETSON.

(*Continued from page 9.*)

In large cities the cable is a real rival of electric traction, and in many places has proved commercially successful. But there are some things that may give the electrician hope. The cable roads of St. Louis have to a very great extent given up their cable and are using the trolley, while those of Kansas City and Denver, are said to be in bad condition financially. City railroads in the future will, no doubt, be electric, and it is questionable whether any more cable roads will be built. The cost of the powerful machinery required, the wear and tear upon the cable and the grip, the large amount of real estate required for their buildings constitute serious "first charges" upon the earnings of cable companies, and confine their operations to very large cities where traffic is enormous. Electric traction demands only a portion of the expense necessary for a cable road, and capital is seeking this method for investment, while "fighting shy" of cable roads. When a car is on the track, ready to be moved, it is a question of veracity between the electrician and the cable man as to which motive power can move it more economically. Perhaps the advantage lies a little in favor of the cable man, but when interest on capital invested in buildings, real estate, machinery and the natural deterioration are taken into account, the electrician appears to have much the better of the argument. It is, of course, true that the cable traction has greatly increased the revenue of the Broadway line, but so would electricity have done. It is a well known fact that the better the facilities offered for travel, the more people will avail themselves of them, to the increased profit of the company supplying the need.

There is one other class of motors that may be mentioned in passing, viz., those employing mechanical motors on the separate cars. Many different motors have been proposed, such as carbonic acid gas, ammonia, gas engines, hydraulic motors, and compressed air. None of these have, to my knowledge demonstrated their commercial utility, though I think the future outlook in this direction is promising. Some years ago, in company with Mr. Stauffer of this city, I rode over the road from Vincennes to Paris, on a line operated by the McClosky compressed air system. Its operation was all that could be desired from a spectator's standpoint; but I mistrust it had the same trouble as many others; good enough to spend money on for experiments, but unprofitable from a financial point of view.

We now come to a consideration of conduit roads, their excellences and their defects.

For years electricians have worked to develop a practicable conduit system of electric railway, and many attempts have come near to success. The most extensive and, until recently, the most successful one was the Bentley-Knight system. An immense amount of money was spent, the best talent was employed, and extensive lines were built at Cleveland and Allegheny City. Experiments were made in New York and Boston, and with the withdrawal from the field of the Bentley-Knight system, disappeared the last hope of our being able to place bare wires in a slotted conduit exposed to the severe conditions of our American climate. There is not a city in America today where a bare conductor laid in a conduit can earn a dividend on the capital invested. No matter what the system may be, no matter how carefully the insulators may be protected, unless the conduit is made air-tight and water-tight (which, of course, no slotted conduit can be), mud and dirt will get into the conduit and settle on the conductors. Leakage takes place from a conductor in proportion to the length exposed, and glass, porcelain, ebonite or any other of the so-called insulators, when covered with dirt, conduct the current as well as a similar layer of dirt elsewhere would do.

Mr. Stetson then described in more or less detail the Bentley-Knight, the Gordon, the Lineff and the Pollak systems, making liberal use of quotations from standard works on electric railways.

Regarding closed conduit systems Mr. Stetson said:

The idea of a closed conduit has had charms for many inventors, and much midnight oil has been consumed over this problem. The same difficulty is met with in all of them, viz, the continuous grounding of the live wire. Where magnets are used to switch in short sections of the line, they have proved a constant source of trouble. Such things often show up well in the office model, but railroads do not run in offices! All of us who have had any experience with automatic electro-magnetic switching devices know that the less number we have of them the better they work, and that we avoid them wherever it is possible. In the closed conduit, or surface contact systems, there is necessarily a momentary grounding. On a dry day, with one car, the loss might be hardly noticeable. But, wet and muddy days will come in spite of the prayers of the electrician, and I always picture to myself Broadway on a muddy winter's day, with a jam of cars reaching from the Battery to the Post-office. Perhaps there might be 50 or 75 cars in the line, and any system grounded in 75 places will certainly break down.

Among those who have worked most in this field may be mentioned—Pollak, Lineff, Gordon, Wheless, Schuckert, Edison and Van Depoele. Their systems have all very much in common, and the fundamental idea is the same.

THE WRIGHT FENDER.

The Atlantic Avenue Railroad Company, Brooklyn, N. Y., is introducing on its trolley cars a life-saving fender that is said to be as near perfection in its operation as human ingenuity can make it. It is the invention of Mr. Sylvanus D. Wright, of New York.

The fender is a wrought iron frame, covered with a strong wire netting. It is attached to a board in front of the wheels, and when in use extends down to the track at an angle of forty-five degrees from the floor of the car. There are wire flaps on either side which cover the wheels. When not in use these flaps are turned in, and the cradle, as it is called, is secured to the bottom of the car. Hanging downward from the front of the platform is a wrought iron bar, extending the whole width of the car, at a distance of six inches from the ground. It is called the trigger. It is attached to the platform by iron side pieces which swing on hinges.

When anything strikes the trigger it swings backward, releasing the catch which holds the front of the cradle to the platform. Two heavy springs force the cradle down to the track, and hold it there. The flaps swing out automatically, and the person who has been knocked down rolls into the cradle and is carried along until the car comes to a standstill. It is impossible for anything to get beneath the wheels.

It is stated that the officials of the Coney Island and Brooklyn Railroad Company look upon the fender with considerable favor, and if it works well on the Atlantic Avenue line they will adopt it on theirs.

BALTIMORE AND WASHINGTON ELECTRIC ROAD.

Work has been started on the Baltimore and Washington Boulevard Electric Railway, and will be carried on through the winter as fast as the weather will permit. The first ground was broken at Laurel, Md., between the two cities named. The line will be about thirty-two miles in length. It will be stone ballasted, and steel railed. For the present, but one track will be laid, with turn-outs. The estimated cost of the line is $3,000,000. T. Edward Hambleton, of Baltimore, and P. B. Widener, W. S. Elkins and others, of Philadelphia, are at the head of the enterprise.

HERE AND THERE.

Sandbagged and Robbed.—Mr. S. C. Fiske, superintendent of the Buffalo and Williamsville Electric road, was sandbagged and robbed of $160 and his watch, on the night of December 29 last. The assault took place near the power-house of the company. The assailants escaped.

Receiver Appointed.—Judge Bank, of the Supreme Court, at Keokuk, Ia., on January 2 appointed Mr. H. C. Reiner receiver of the Gate City Electric Railway, on the application of the Central Trust Co, of New York. The Trust Company held first mortgage bonds for $85,000, on which the railway company defaulted interest.

Interest Defaulted.—A dispatch from Atlanta, Ga., states that the Consolidated Street Railway Co., of that city, defaulted the interest on its bonds on January 2. The bondholders agreed not to apply for a receiver if the Atlanta shareholders would raise $17 per share to pay off the floating debt. The bonded indebtedness of the company is said to be $2,000,000.

Power Plant at Elizabeth.—The Suburban Electric Co.'s plant at Elizabeth, N. J., is fully equipped with counter-shafting, friction-clutch pulleys and quills, cut-off couplings, etc., installed by Gifford Bros., iron founders and machinists, Hudson, N. Y. The work is of the best possible character, and the plant is doing duty in a very satisfactory manner.

Power Station Burned.—The power station at Farmers, Mass., of the Inter-State & Attleboro and North Attleboro & Wrentham Electric Street Railways, was destroyed by fire on the morning of January 2. All of the machinery was damaged. The loss amounts to $75,000, which is partly covered by insurance.

PERSONAL.

Mr. Howard A. MacLean, the head of the contract department of the New York Electric Equipment Co., Duane and Elm streets, New York city, was, on the evening of January 10, married to Mrs. Pauline Hazard Anderson. The happy event took place in St. Stephen's Church, 46th street, New York city, and a reception was given from 9 until 11 o'clock the same evening, at The Gerlach. Mr. and Mrs. MacLean were heartily congratulated and many good wishes were tendered for the future happiness of the couple. Mr. MacLean is well-known to a large majority of electrical people in this city. He is one of the original Edison electric light contractors in this city, and was very successful in the interest of the old Edison Electric Light Co., of 65 Fifth avenue.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, January 6, 1894.

Mr. O. Loomis, of the American Engine Co., Bound Brook, N. J., is bringing out a new slow-speed dynamo for which great expectations are entertained.

Mr. Maybin W. Brown, secretary and general manager of the Brown Electric Co., Summer and Federal streets, Boston, was in the city this week. He reports that last year was a very successful one for his company.

Mr. O. Moran, No. 34 Broadway, has quite an establishment as manufacturer and dealer in general electrical supplies. He carries a large stock of electric bells, burglar alarms, batteries, etc., and does repairing of all kinds. He also builds telephone and telegraph lines.

Three men were arrested uptown a few days ago, charged with having tapped Western Union telegraph wires, presumably for the purpose of beating pool-room operators. It is not so easy to tap a wire as it seems, even by experts, as the prisoners evidently are.

The Ferryboat "Netherlands," of the Hoboken line, is lighted throughout by electricity, and has a very complete electrical plant. There are two dynamos, one of 225 volts, driven by a MacIntosh and Seymour engine, and the other, of 50 volts, driven by an Armington and Sims engine. The whistle is operated by electricity.

The scores of uses of the handsome ornamental arc lamps for incandescent circuits made by the Clark Electric Co., of New York, express the utmost satisfaction with them. B. Altman & Co. and Macy's; two of the biggest dry-goods houses in New York, have a large number of the Clark lamps in use and after two years' experience with them, report that they get 25 per cent. more light from them than they did from other lamps under the same conditions, and that the lamps are giving the best of satisfaction in every other way. The light from these lamps is pure white; is remarkably steady, and free from hissing and sputtering.

Mr. Charles A. Schieren, who is well known in the electrical trade as the head of the leather belt firm of C. A. Schieren & Co., of this city, was inaugurated as Mayor of the City of Churches, on January 1. Mr. Schieren was elected last fall by a handsome majority, and it is safe to predict that Brooklyn's interests will be managed during Mr. Schieren's term, in a way that will command popular approval. Mayor Schieren was called upon on January 3 to perform his first marriage ceremony. We congratulate the citizens of Brooklyn on having as their chief magistrate a man of high integrity and unquestionable fitness for the important office.

Mr. A. M. Johnston, Mail and Express Building, the New York agent for the Frisbie Elevator and Mfg. Co., of New Haven, Conn., has great confidence in the outlook for future business. He has closed several contracts for direct and belt-driven electric elevators. Among these are plants for the new building going up at 141 West Broadway, and the one at 39th street and Fifth avenue. He has also secured several orders recently for electric hoisting machines made by his company. Mr. Johnston has just completed the installation of a 7½ h. p. electric passenger elevator in the new apartment house, corner of Clinton and Pacific streets, Brooklyn, and it is rendering good service.

Mr. Geo. L. Colgate, E. E., 136 Liberty street, manufacturers' agent, electrical machinery and supplies, is the representative in this country of Joseph Sankey and Sons, Bilston, England. This firm makes stampings for all electrical purposes, such as armature discs and washers; transformer, motor, field magnet and other apparatus. These goods are made of the best charcoal iron, carefully annealed, are free from burrs, and perfectly flat. A uniform high standard of magnetic permeability can be relied on it is asserted. By this firm's process of manufacture these discs are assembled without any mica or other insulating substance between them, the finish of the iron being of such a nature as to consist in itself a perfect insulator. These goods are extensively used in this country, the Westinghouse and other large electrical concerns being liberal buyers. The fact that American manufacturers purchase them is sufficient evidence that they are possessed of some extraordinary merit. Mr. Colgate also represents the Commercial Electric Co., of Indianapolis, Ind., the Whitney Instrument Co., and other first-class concerns. It is said that the Commercial Electric Co. will soon place some large multipolar machines on the market.

Mr. George H. Almon, 136 Liberty street, selling agent for the Belknap Motor Co., of Portland, Me., is doing a satisfactory business, notwithstanding the hard times. The Belknap Company's composite graphite and copper woven wire brushes for dynamos and motors are increasing in demand as their merits are becoming recognized. These brushes are made up of a combination of copper and carbon, combining, of course, the advantages these substances are well known to possess. The carbon acts as the lubricant and the copper as the conductor. It is said that the use of these brushes avoids all sparking. They are flexible, thus insuring good contact. These brushes are now being furnished to electric railway companies, electric light and electric power stations in all parts of the country; and from all, it is said, come none but favorable reports concerning them. The Belknap Motor Co. is the manufacturer of the well-known B. C. standard dynamos and motors for arc and incandescent lighting and power purposes. These machines are said to be first-class in every particular—both electrically and mechanically. The company had an elegant exhibit of machines of its make at the World's Fair, which attracted deserved attention from those professionally interested, as well as the thousands of casual visitors.

W. T. H.

LORD'S BOILER COMPOUND.

As showing the value of Lord's Boiler Compound, made by Mr. George W. Lord, 316 Union street, Philadelphia, the following extract from the *Steam Engine and Indicator*, by Le Van, will be of interest:

"The Boiler Compound of George W. Lord, of Philadelphia, Pa., has a high reputation as a scale preventer and acid neutralizer, and is recommended by a large number of manufacturers and others using it. Messrs. Booth & Garrett, chemists of the United States Mint, at Philadelphia, who stand at the head of their profession, make a statement over their signature that 'it is free from any substance that could prove injurious to the boiler.'"

TRADE NOTES.

The Consolidated Car Heating Co., Albany, N. Y., has received a second order from England for direct steam storage heating equipments. These equipments are so arranged that the temperature in each compartment can be separately regulated.

The Chicago Electric Wire Co., of Wilmington, Del., has been awarded a contract by the United States Government for 84 miles of seven conductor submarine cables for the torpedo service. This is said to be the first order given in this country by the government, for this particular service, and it is stated that the contract will keep the company's works busy a year. Mr. Henry B. Cobb, the manager of the works, regards the securing of this contract as a great victory over foreign competitors.

Benj. F. Kelley & Son, 91 Liberty street, New York, continue to do a large business with their Berryman feed-water heater and purifier. This heater has a world-wide reputation for efficiency and it has taken numerous awards. As an evidence of the favor with which it is regarded it may be stated that it is now used by most all governments of the world. Over three million horse power have been sold, and many of the best firms in the country have duplicated their orders. The Berryman heater is very largely used in Europe, from the largest to the smallest manufacturer. It is said to be the most perfect device in use for heating and purifying the feed-water for steam boilers with exhaust steam. It heats the water to the highest degree attainable with exhaust steam and frees it from impurities. It is also excellent for heating water for public buildings, manufactories of all kinds, hotels, hospitals, etc., etc., in fact, in all places where pure hot water is needed. It furnishes boilers with pure hot water and keeps them clean and free from scale.

"ACME" PORTABLE TESTING SET.

Queen & Co., incorporated, Philadelphia, are making a renewed push of their "Acme" portable testing set which was temporarily withdrawn from the market because of certain small defects which have now been overcome in a throughly satisfactory manner. For testing the resistance of dynamos, motors, lamp filaments, line wire and in fact whenever "ohms" are to be measured, an engineer or expert will find it an apparatus that can be relied upon to work well. After a careful test the U. S. Government has informed the makers that the set will be accepted for service on shipboard in the Navy, where the requirements are extremely exacting. In addition to this a World's Fair diploma was awarded Queen & Co. for "Testing Sets and Standard Resistances," so that they feel well pleased with the deserved commendation which has been accorded to their resistance measuring apparatus. Circular No. 445 will be mailed upon application.

Electrical and Street Railway Patents.

Issued January 2, 1894.

511,758. Electric Motor. Walter A. Crowdus, Chicago, Ill. Filed Oct. 11, 1892.

511,763. Trolley. William F. Duncker, Steelton, Pa Filed Aug. 26, 1893.

511,787. Self-Closing Telegraph-Key. Henry E. Moss, Kansas City, Mo. Filed Aug. 21, 1893.

511,791. Ammeter and Voltmeter. John Perry and Charles E. Holland. London, England. Filed Apr. 6, 1893 Patented in England May 19, 1892, No. 9,515.

511,821. Storage-Battery System of Distribution. Jakob Trumpy, Hagen, Germany. Filed Aug. 1, 1893. Patented in Germany July 1, 1892, No. 62,998.

511,822. Storage-Battery System of Distribution. Jakob Trumpy, Hagen, Germany. Filed Aug. 1, 1893. Patented in Germany Oct. 31, 1890, No. 53,870, and July 21, 1892, No. 62,722.

511,824. Trolley Mechanism for Electrically-Propelled Vehicles. Curtis H. Veeder, Lynn, Mass., assignor to the General Electric Company, of New York. Filed Nov. 23, 1892.

511,831. Street Railway Special Work. William C. Wood, Brooklyn, N. Y., assignor to The Lewis & Fowler Girder-Rail Company, same place. Filed Apr. 8, 1893.

511,853. Trolley-Wire Support. Charles T. Lee, Boston, Mass., assignor to the Johns-Pratt Co., Hartford, Conn. Filed April 15, 1893.

511,862. Electric Locomotive for Elevated Tracks. Charles H. Roberts, Hartwell, Ohio. Filed Oct. 29, 1891.

511,866. Electric Alarm for Cane-Feeders. August F. Slangerup, New Orleans, La. Filed Apr. 28, 1893.

511,869. Mining-Drill. Ernest P. Warner, Chicago, Ill., assignor to the Western Electric Co., same place. Filed Feb. 16, 1891.

511,873. Electric-Circuit Controller. Romaine Callender, Brantford, Canada. Filed Apr. 24, 1893.

511,874. Telephone-Exchange System. Romaine Callender, Brantford, Canada. Filed May 12, 1893.

511,875. Telephone-Exchange System. Romaine Callender, Brantford, Canada. Filed Aug. 13, 1892.

511,882. Telephone-Transmitter. Stephen C. Drew, Boston, Mass., assignor of three-tenths to Charles E. Jackson, same place. Filed Jan 23, 1893.

511,883. Registering Apparatus for Telephones. Angelo R. Duperu, San Francisco, Cal. Filed Nov. 17, 1892.

511,889. Electric Switch. Jesse L. Hinds, Syracuse, N. Y., assignor of one-half to the Electric Engineering and Supply Co., same place. Filed May 16, 1892.

511,915. Electrical Transmission of Power. Nikola Tesla, New York, N. Y., assignor to the Tesla Electric Co., same place. Original application filed May 15, 1888. Divided and this application filed Dec. 3, 1888.

511,916. Electric Generator. Nikola Tesla, New York, N. Y. Filed Aug. 19, 1893.

511,928. Section-Insulator. Henry M. Brockbank, Brooklyn, N. Y. Filed Aug. 21, 1893.

511,941. Trolley-Catcher. Geo E. Gay and John H. Parsons, Augusta, Me. Filed Feb. 28, 1893

511,946. Electric Clock. Fred. L. Gregory, Niagara Falls, N. Y. Filed Apr. 19, 1892.

511,961. Heating and Ventilating Apparatus for Street Railway Cars. Joseph A. Long, Brooklyn, N. Y., assignor to Aaron H. Eastmond, same place. Filed Sept. 29, 1893.

511,988. Electric Locomotive. Edward M. Bentley, Boston, Mass. Filed Oct. 24, 1891.

512,013. Electric Stop-Motion for Warping-Machine. Clayton Denn, John Crucker, and Chas. Denn, Philadelphia, Pa Filed Feb. 6, 1893.

512,027. Regulator for Continuous-Current Arc-light Circuits. Daniel Higham, Boston, Mass., assignor by mesne assignments to the Higham Electric Co., Portland, Me. Filed May 14, 1892.

512,050. Electrically-Controlled Railway Signal. Frank McBrien, Newark, N. J. Filed July 27, 1893.

512,051. Electrically Controlled Railway-Signal. Frank McBrien, Newark, N. J. Filed Sept. 25, 1893.

512,057. Fare Register. Charles E. Pratt, Chicago, Ill., assignor to the International Register Co., same place. Filed Jan. 5, 1893.

512,077. Electrically-Controlled Railway Signal. James Wayland, Newark, N J. Filed Oct. 5, 1893.

512,102. Transmission of Rapidly-Alternating Electric Currents. William H. Eckert, New York, N. Y. Filed Oct. 11, 1893.

512,112. Cable rip. Alfred N. Humphreys, Irwin, Pa. Filed Oct. 31, 1892.

512,115. Electric-Current Regulator. Ansel B. Jones, Cleveland, Ohio, assignor of one-half to William P. Horton, Jr., same place. Filed June 10, 1891.

512,181. Safety-Guard for Railway-Cars. William J. Foster, Hoboken, N. J. Filed Oct. 20, 1893.

512,201. Overhead Trolley-Wire Switch. George W. Mackenzie, Moses B. Sloan and Thomas C. Sloane, Beaver, Pa. Filed Dec. 30, 1892.

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CONTENTS.

BLOCK SIGNALS.

The awful accident on the Delaware, Lackawanna and Western Railroad, on the Hackensack Meadows, in a dense fog on January 15, would undoubtedly have been avoided had the company a block signal system on its lines. This sad affair affords a positive argument in favor of such a system on railroads. There is no doubt that had a block system been in operation on this line, the two trains could not have followed each other so closely. In foggy and thick weather these signals are especially valuable, and had the rear train been blocked, the accident certainly would not have occurred, unless the signals happened to be disarranged. Failures to operate, however, are, happily, very rare.

THE TELEPHONE SITUATION.

Great interest is manifested in the telephone business as the time approaches for the expiration of the patent on the Bell receiver. The date of the expiration is the 30th of the present month, and that there are scores of concerns ready to launch into the telephone business as soon as it is safe to do so, is evident from the number of inquiries received by us touching upon this subject. It does not seem to us, however, that the purpose of these enterprising inquirers is as much to start new telephone companies as to manufacture and buy apparatus and sell the same. The telephone receiver is a very important part of a telephone set, and when the patent bars have been removed therefrom, a hitherto insurmountable obstacle will have been displaced, and the field will be much clearer for those who wish to engage in the business of manufacturing, buying and selling. In any event, it would be well for those intending to go into the business, to first investigate the subject carefully. It may be all right after January 30, and it may not be.

THE WASHINGTON CONVENTION.

It is likely that the Washington Convention of the National Electric Light Association, on February 28, March 1 and 2, next, will be a largely attended and interesting one. Washington is, at that time, at its best. Congress being in session, and the usual large crowds at the capital at such times, will conduce to make the meeting a lively one. The business of the convention itself will be important, and with the attendance of some of the country's lawmakers, considerable good should result to the interests of the association. On the other hand, delegates will probably have an opportunity to see how laws are made for this great country of ours, and altogether the benefits derived on both sides should be of incalculable value.

ANOTHER VICTORY FOR THE EDISON LAMP.

By a recent decision of Judge Shipman, in the United States Circuit Court for Connecticut, the introduction of an inert gas into the bulb of an incandescent lamp does not avoid the Edison lamp patent. The specific point ai issue was the asking for an injunction by the Edison Company against the manufacturers of the "Novak" lamp, which was thought by many to not infringe the Edison patent, for the reason that bromine gas was introduced into the bulb. The court holds that the "Novak" lamp embodies the entire invention of Edison, and the manufacturer thereof should be enjoined. This is an important victory for the Edison lamp interests. Lamps with their bulbs filled with inert gas promised to become a very important factor in the situation, and if this injunction is sustained it will give a black eye to what seemed to be a promising industry.

Electrical and Allied Industries of New York and Brooklyn.—Part III.

LUNDELL DYNAMOS AND MOTORS.

We give herewith some illustrations of the Lundell direct-current dynamos and motors, and parts thereof, manufactured by the Interior Conduit and Insulation Company, of 44 Broad street, New York city.

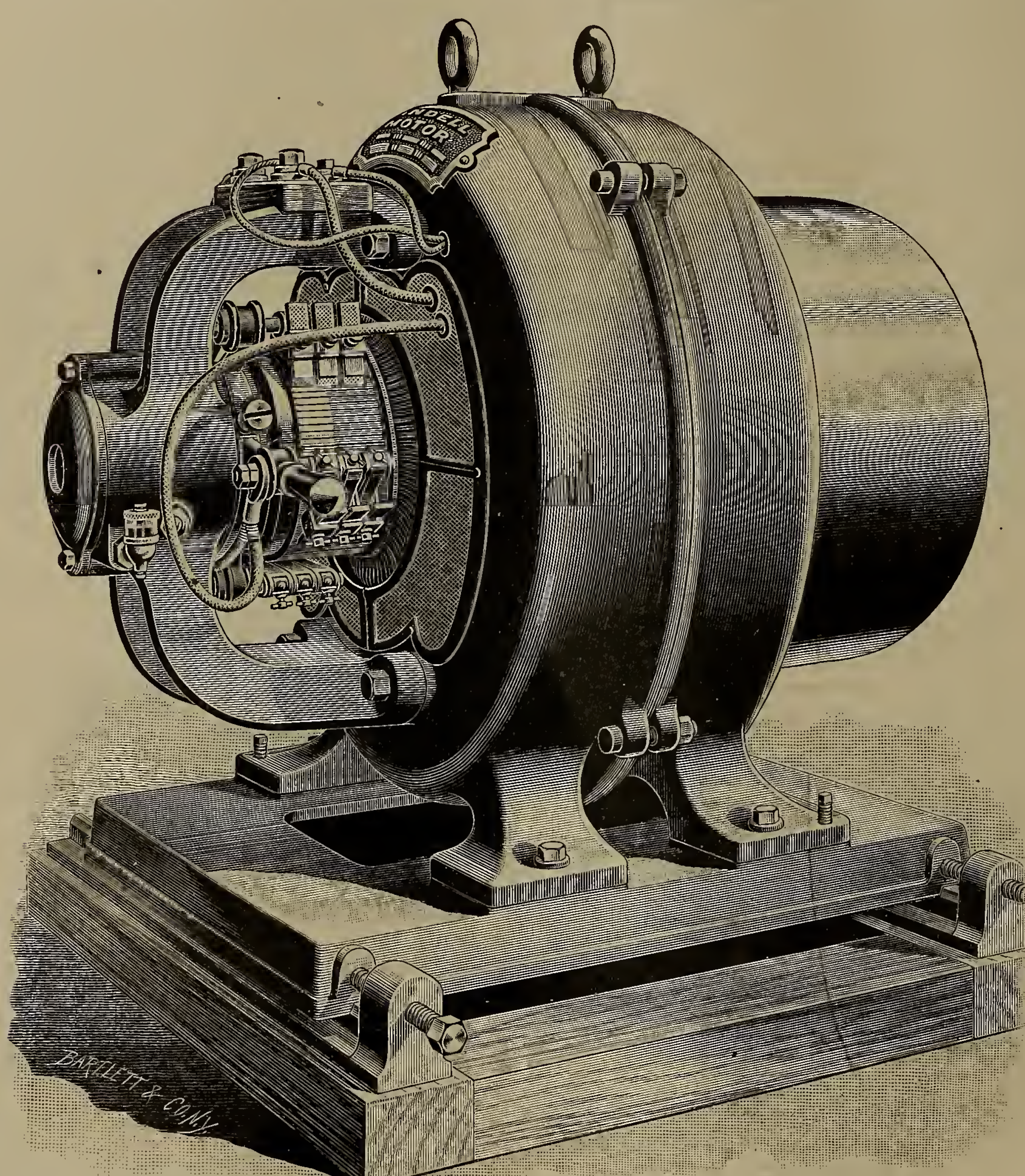
These machines have very rapidly grown in favor since their appearance in the market, and their efficiency and other prominent features, give an unquestionable basis for the high reputation in which they are held.

The chief physical characteristic of the machine is the form of the field magnets. The pole-pieces are magnetized by only one coil, and the heavy protecting shell forms the magnetic circuit, besides protecting the armature and field windings. The two field-magnet halves, when bolted together form the shell which completely encloses the armature and field magnet coil.

The mass of metal is so distributed that there can be no choking of lines of force at any point. The pole-pieces being magnetized directly, the resistance in the magnetic circuit is reduced to the lowest possible limit. This renders it practicable to effect considerable economy in the ampere-turns of the field coil.

The Pacinotti type of armature is used in the Lundell machines. It is so designed that Foucault currents in the pole-pieces are almost entirely avoided, and practical experience with these machines has proven the efficiency of this form of armature as constructed by the Interior Conduit and Insulation Company. The slots in this armature are deep and narrow to which design is due the almost entire absence of Foucault currents, as above referred to.

From this form of machine it is evident that the armature can be withdrawn from its position and replaced without disturbing the pole-pieces or field-coil, and in this particular the machine is unique.



LUNDELL DYNAMO.

Openings are provided on the field-magnets, around the armature shaft, for the purpose of ventilation, and in the larger machines, these openings are covered with metal screens to protect the working parts.

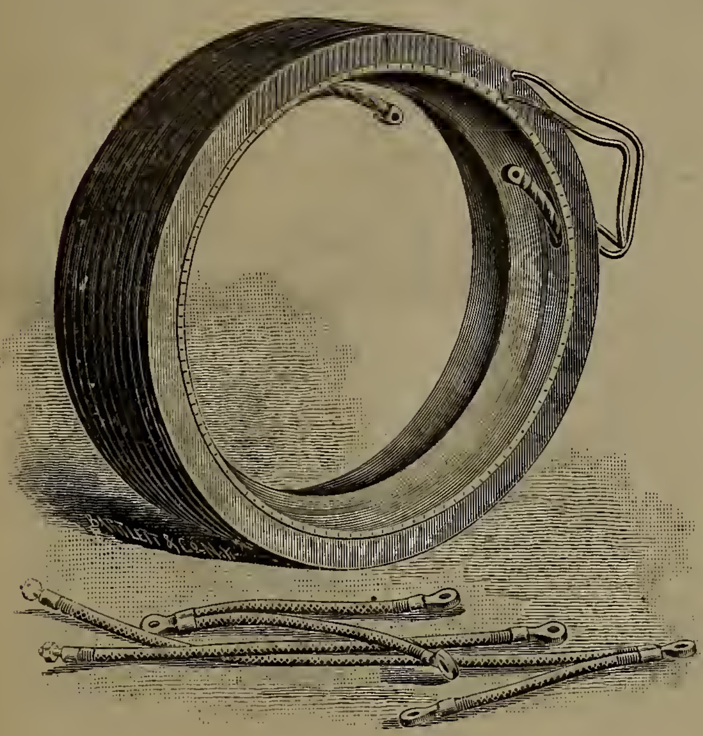
The brushes are arranged around the commutator diametrically and in the four pole machines opposite brushes are connected together. The brushes of the bipolar machines have a unique arrangement for pressing the carbon brushes against the commutator, which, while being simple is very effective, and their removal is a simple matter with this device.

The bearings are self-oiling, and provided with a vision gauge; and the bushings are so arranged as to be easily removed and renewed when worn out.

These dynamos and motors are guaranteed by their makers to be highly efficient, and in every respect superior machines.

ANOTHER LAMP DECISION.

Judge Shipman of the United States Circuit Court for the District of Connecticut has granted a preliminary injunction against the Waring Electric Company, manufacturers of the "Novak" incandescent lamp, holding that that lamp is an infringement of the Edison lamp patent, and restraining the Waring Company from continuing the manufacture of the lamp.



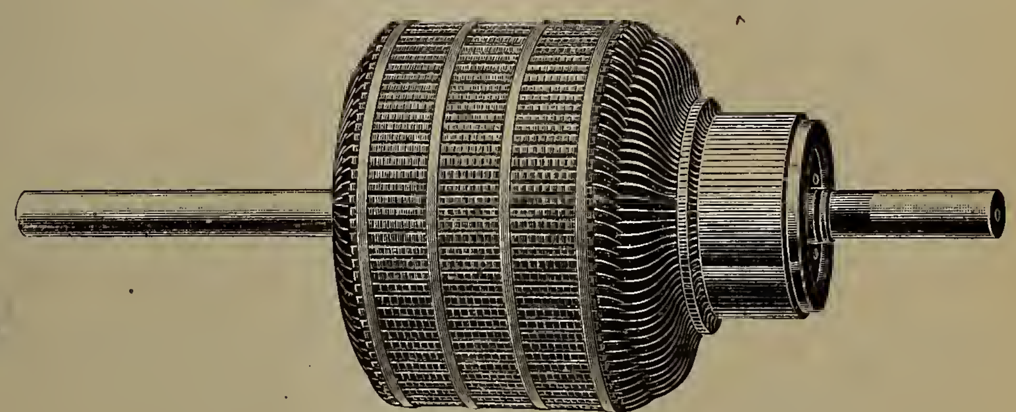
FIELD MAGNET COIL.

The company claimed that the "Novak" lamp was outside the Edison patent because it had a small amount of bromine gas in it in place of higher vacuum of the Edison lamp. Judge Shipman finds that although the rarefied atmosphere of bromine gas in the "Novak" lamp is more dense than the rarefied atmosphere of air in the Edison lamp, being about 1-600 of an atmosphere in the "Novak" and perhaps 1,30,000 in the commercial Edison lamp, yet the "Novak" embodies the entire Edison invention and should be enjoined. It is asserted from Judge Shipman's decision that incandescent lamp manufacturers cannot avoid the Edison patent by introducing an inert gas into the interior of the bulb of the lamp. This victory would seem to be quite important for the Edison Company, as a lamp like the Edison lamp, but with a small amount of gas in it, would undoubtedly have been to some extent commercial.

A NEW ELECTRICAL COMPANY.

The Atlantic Electrical Manufacturing Co. of New York has just been organized under the laws of New York with a capital of $100,000.

The company will manufacture dynamos, motors, arc lamps for direct and alternating currents and other electrical devices, under letters-patent granted to Warren P. Freeman.

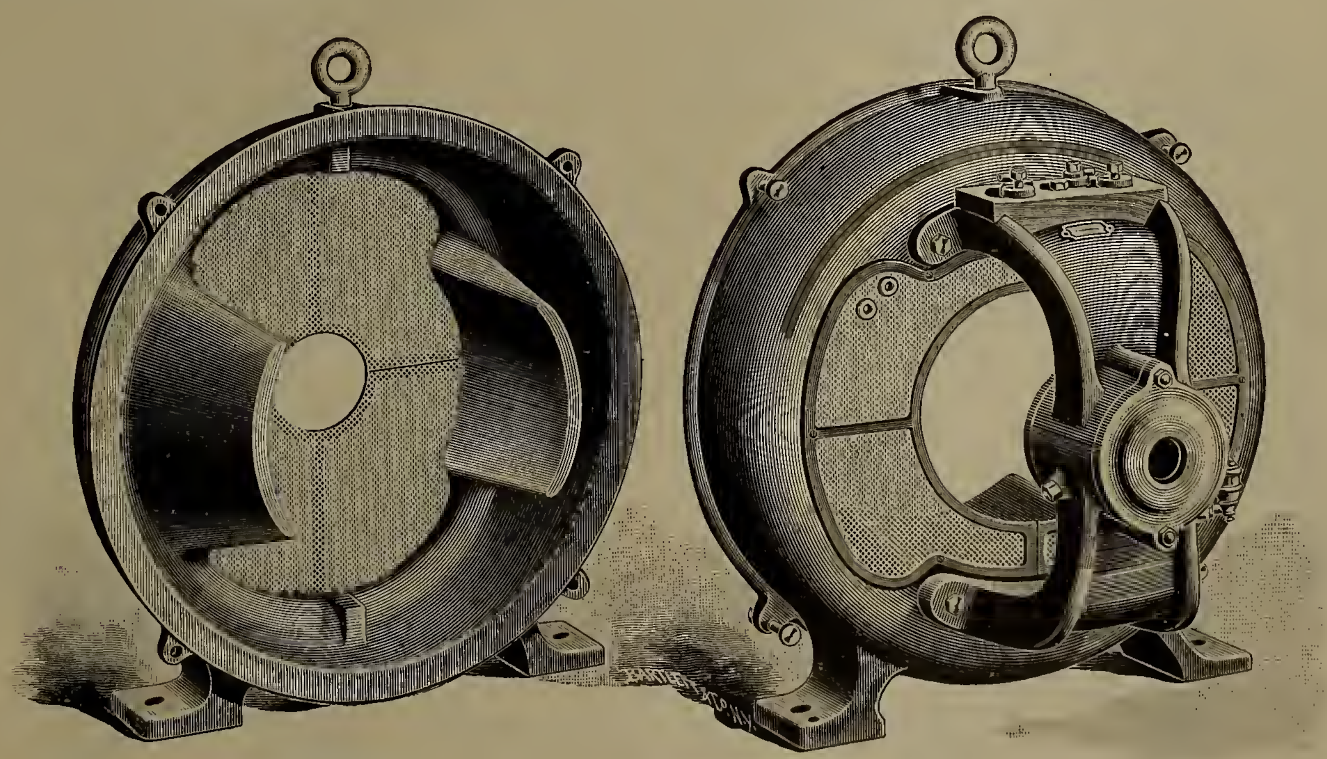


ARMATURE OF LUNDELL DYNAMO.

The dynamos and motors of the company are of an entirely different type to any machines on the market, and it is said, by the peculiar method of winding, the efficiency of the machine is increased from 15 to 20 per cent.

The Atlantic motor is said to be very simple in construction, and also durable, while it is highly efficient. It is also adapted to the driving of ventilating fans, printing presses, dental lathes, sewing machines, polishing wheels, church organs, pumps of all kinds, pleasure yachts, street cars and any purpose whatever where power is required.

Words of commendation come from many of the best known electrical houses regarding the performance of the motor.



FIELD MAGNET HALVES LUNDELL DYNAMOS, FOUR-POLE TYPE.

Mr. Warren P. Freeman who has an office at 136 Liberty street, is the electrician of the company and all of its electrical interests will be confided to his care. He is known to be a prominent electrician and has been in the electrical business for the past twenty-six years. He has taken out a large number of patents. He says the Atlantic motor is the most practical machine ever invented, and eventually all car builders will adopt the system by which the motor can be connected direct with the axles of the car, without any gearing, and still retain its efficiency which is not affected by slow speed or a heavy load in starting.

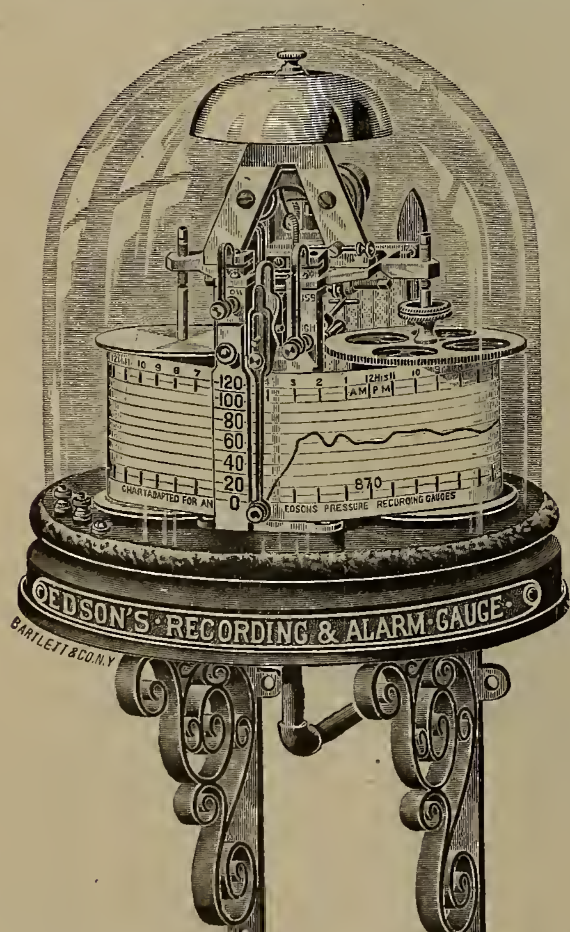
EDSON'S PRESSURE-RECORDING AND ALARM GAUGE.

In steam plants the boiler is the heart of the system. If that does not receive proper attention injurious results will occur, if not entire destruction of the plant. Much, therefore, depends upon proper care of the boilers. If insufficient steam is generated the engine cannot develop its rated power, and if there is too much it means a waste of fuel.

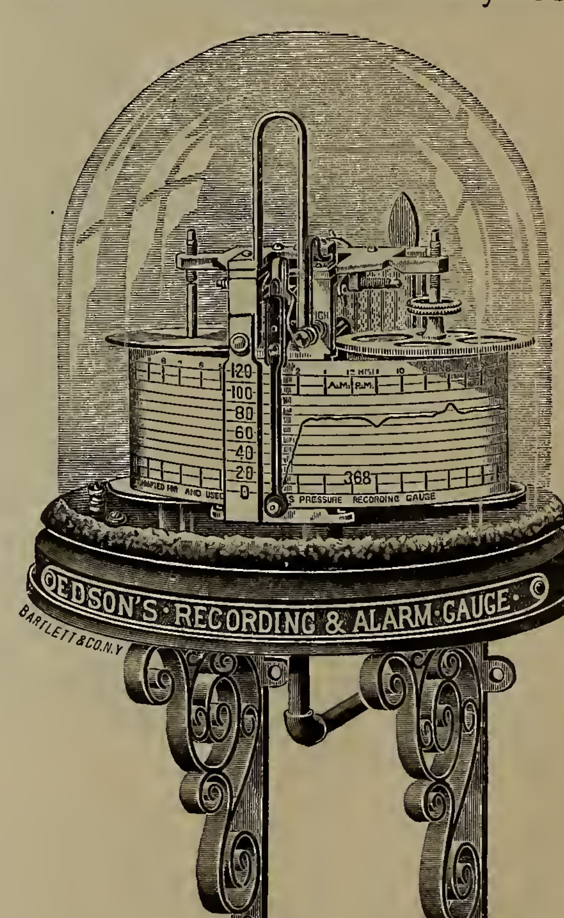
The Edson Pressure-Recording and Alarm Gauge is designed expressly for the regulation of these factors in a steam plant, and that it fulfills its object is abundantly evident, as indicated by the long list of users of the same.

The instrument may be placed in the office, or any other convenient position, away from the boiler room, and it is unerring at all times in its record of what is going on in the boiler room. If the fires do not receive the proper attention it tells the fact; and if the boilers are overfed the fact is likewise made known.

Three patterns of the instrument are made. No. 1 Pressure Recording Gauge, is provided with an adjustable circuit closer for high pressure, operating an electric



NO. 1 PRESSURE-RECORDING AND ALARM GAUGE.



NO. 2 PRESSURE-RECORDING AND ALARM GAUGE.

bell placed on the instrument; No. 2 has similar attachments but designed to ring an electric bell at a distance; and No. 3 has no alarm.

The use of these recording gauges insures careful attention to the boilers, the firemen knowing that the result of their work is being continually recorded at headquarters in a way that cannot be questioned. Uniformity in steam pressure necessarily results in obtaining service of the highest efficiency from a given plant; the

INSTRUMENT IN OFFICE.

boiler is not subjected to varying strains, as it is when the firing is done unsystematically, and its life and that of the entire plant is materially prolonged.

The illustrations given herewith represent styles No. 1 and No. 2. With each instrument a year's supply of charts is provided, also an album for the purpose of preserving the records. The charts are numbered consecutively for each day in the year, and ruled to the special scale of the instrument.

The recorders can be arranged to sound separate bells for high and low alarm, when the pressure goes above or falls below prescribed limits. They are used in a large number of prominent hotels throughout the country, manufacturing establishments of all kinds wherever steam is used, on many of the largest transatlantic steamships running out of New York, and in several of the New York newspaper offices.

Mr. Jarvis B. Edson, 87 Liberty street, New York city, is the patentee of this valuable device for recording steam, water, gas, air, oil, blast-furnace and ammonia pressures, and is the sole manufacturer and proprietor of the same.

THE EUREKA ELECTRIC COMPANY.

The Loomis system of arc and incandescent lighting, owned by the Eureka Electric Co., is widely known in this and foreign countries. It is a complete system in every detail.

The dynamo is a very efficient machine, and is constructed on strictly scientific principles. It is very sensitive to a change in load, at once adjusting itself to such changes, and it is so constructed that it is said to be impossible to burn the armature out. No external devices whatever are required for the regulation of current. The bearings are self-oiling.

The Eureka Company manufactures all of the appliances needed for a complete system. The switches have large contact surface, and effect an instantaneous break in the current. These, with cut-outs and other safety appliances, are mounted on incombustible supports, and fulfill the standard requirements.

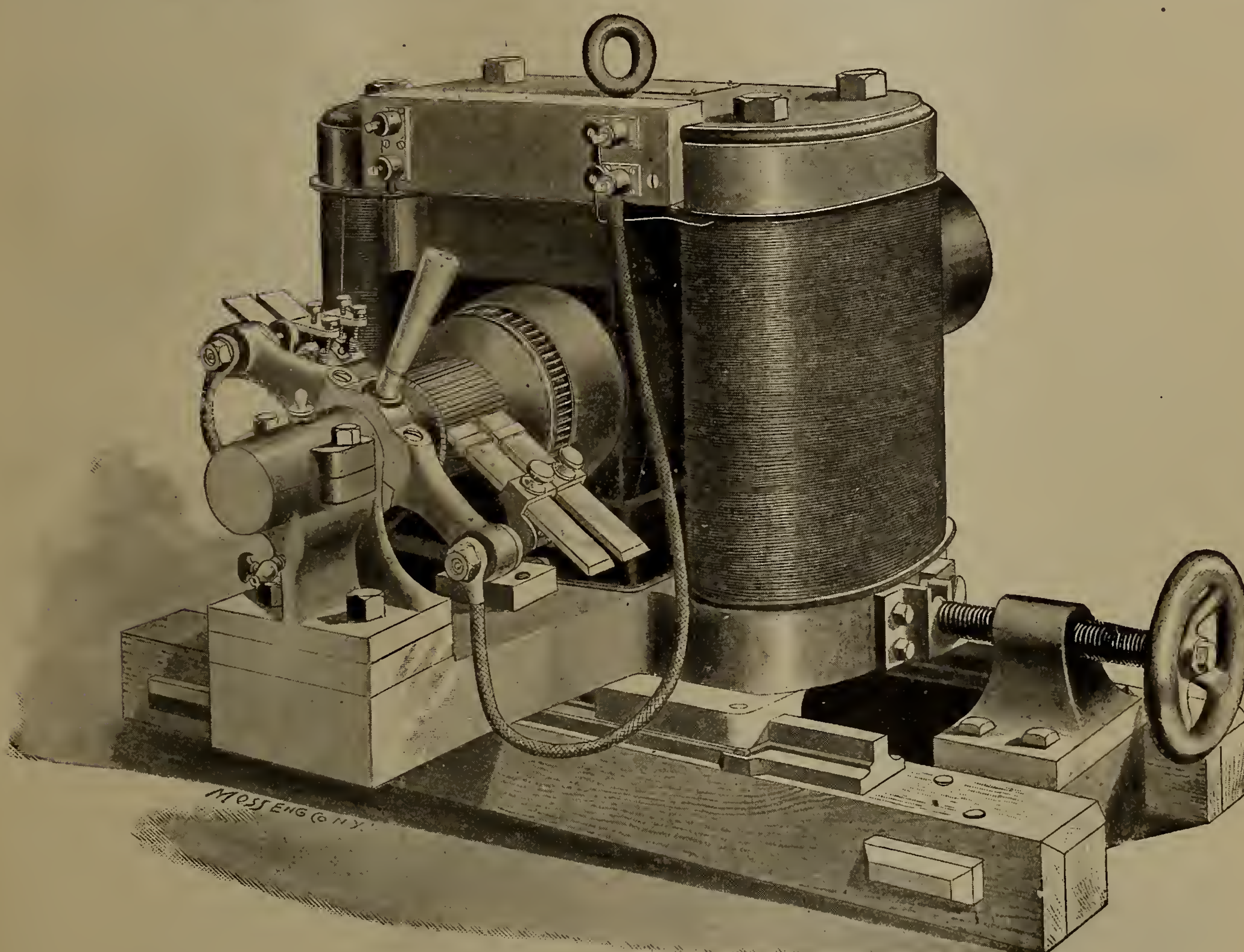
The arc and incandescent lamps are superior devices; they are thoroughly reliable, and in the case of the arc lamp, the mechanism is of the simplest character, consistent with reliability of action. The arc lamp is designed to run on incandescent circuits, and are arranged in two in series. It is free from flickering and hissing and is satisfactory in every way. It can be used on high tension circuits in series.

The Ground Detector is automatic in its action, and gives immediate indication of the presence of a ground on the circuit.

The ammeter and voltmeter are first-class instruments, and are accurately calibrated.

The company claims that its system gives more light per horse-power than any other, and maintains the lights at full candle-power. The lamps are said to be the most durable and efficient, resulting in minimum expense for renewals, etc.

Any number of lights can be turned on or off without affecting the brilliancy of those remaining, or causing sparking at the dynamo brushes. It is also claimed to be the only system in which the power required varies in proportion to the number of lamps in actual circuit.



LOOMIS DIRECT CURRENT DYNAMO.

For central station lighting, it is claimed that the Loomis system yields a larger margin of profit than any other. The system is also especially adapted to train lighting.

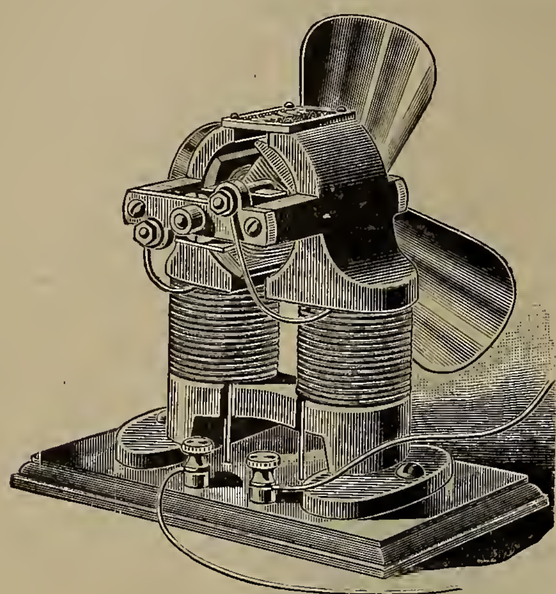
The offices of the Eureka Electric Company are at 18 Broadway, Welles Building, New York City. Mr. F. E. Southard is the general manager.

Suit.—It is reported that Prof. Henry A. Rowland, of Johns Hopkins University, Baltimore, Md., has brought suit against the Cataract Construction Co., for $30,000, for services as electrical expert in planning a system to utilize the water power of Niagara for the generation of electricity.

KNAPP ELECTRIC MOTORS.

The illustrations given herewith show two sizes of the Knapp electric motors, manufactured by the Knapp Electric and Novelty Co., 34 Warren street, New York city. These motors have a wide reputation, and are very satisfactory in operation.

Motor No. 1 is wound to run by battery current and will run from one to two hours from one cell of battery. It is only four inches high, and is fitted with a



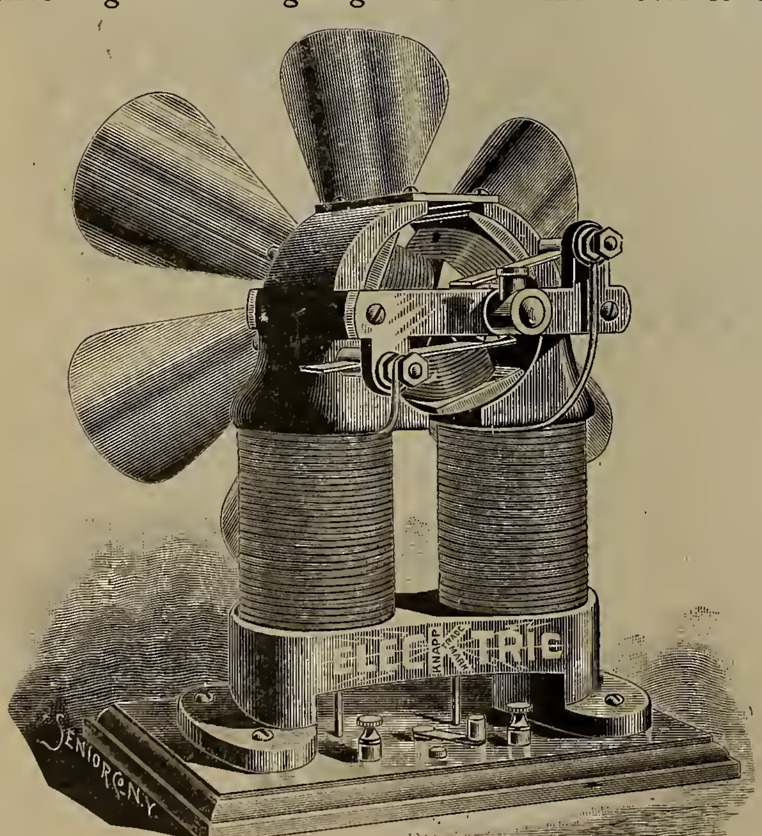
KNAPP MOTOR, NO. 1.

pulley so as to transmit power to toys and small machinery. This little motor is of the same design and finish as the larger motors made by this company, and, it is said, develops greater power than any other motor, size for size.

The outfit complete, including motor and battery, weighs but 2½ lbs., and it is very convenient for experimental work.

The motor is mounted on a mahogany base and presents a very attractive appearance.

Motor No. 3 is twice as large as No. 1, being eight inches high and weighing 12 lbs. This motor is de-



KNAPP MOTOR, NO. 3.

signed to run small machinery, lathes, fans, etc., and the company claims that it will give better results on from four to ten volts than any other $\frac{1}{12}$ horse-power motor in the market.

A 4-volt current gives a good speed for fan-work, while a storage battery may be used if desired.

If a primary battery is to be used the size of the same is regulated by the amount of work that the motor will be required to perform.

In construction and finish this machine compares very favorably with the higher-priced machines, and is equal to them in efficiency. They are economical to maintain, and from the fact that a large number of them are in use for various purposes, it is evident that their merits are appreciated.

CLARK ALTERNATING CURRENT ARC LAMP.

The Clark alternating current arc lamp, which has been in use for nearly a year in New York, has the reputation of being one of the most reliable electric arc lamps ever made. At the present time there are over one hundred different business firms using them in this vicinity. The company has a broad patent on it. The mechanism is very similar to the Clark Company's

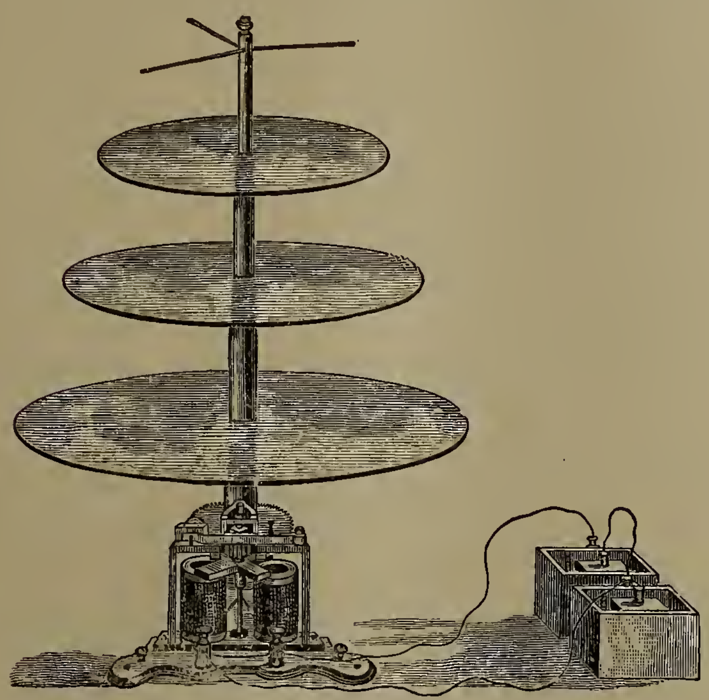
CLARK LAMP.

regular arc lamp, with the exception of the elements that are added, necessary for an arc lamp on alternating current. The Clark Company's arc lamps have the highest reputation for steadiness, reliability and durability. It claims to have had arc lamps running 23,000 hours without any repairs on them whatever, and are still running, and in perfect order. The company takes great pride in referring to its customers as to the merits of its arc lighting apparatus.

ELECTRICAL TURNTABLE.

For the effective display of goods in show windows and cases, nothing is better than an electrical turn-table. It is a compact and convenient device, and requires practically no attention outside of that occasionally needed to keep the battery in condition.

These turn-tables are not limited to the display of a certain kind of goods. They will take anything that can be accommodated on the shelves.



PEARCE'S ELECTRICAL TURNTABLE.

The electric motor is constructed expressly for this work and is a first-class machine in workmanship and design. The vertical support for the tables is strong and well-balanced, and is revolved by means of gearing operated by the armature shaft of the motor.

The turn-table will carry fifty pounds, with two cells of battery, and by increasing the battery power, a proportionately larger load can be carried. It runs steadily and smoothly, and is very economical to maintain.

The shaft can be made of any height.

These turn-tables, which are manufactured by Frederick Pearce, 79 John street, New York city, have been awarded medals from different exhibitions in late years, and they give the best of satisfaction to those who use them.

—Never test an electric light current with your tongue. Your tongue is to talk with.

THE KINSMAN DESK LIGHT.

This handy device, of which an illustration is given, is designed for use on desks, and has many advantages over portable lights, shades and reflectors. It is clamped to the desk and has an adjustable arm which permits of pushing the cylinder back or drawing it forward, as desired.

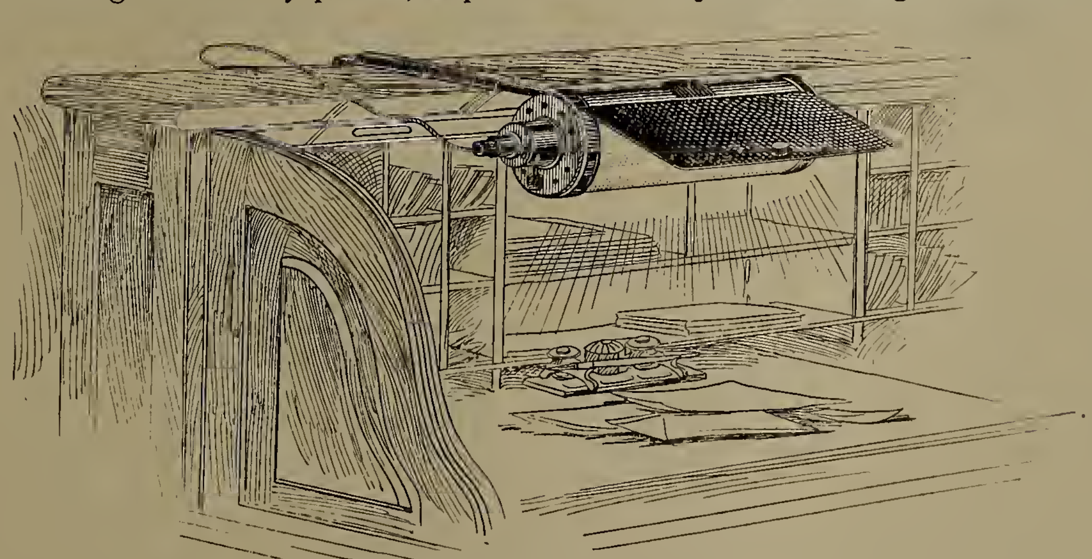
The inner cylinder is so arranged that it will give a bright light, and by a slight touch the light can be modified to suit. The whole operation of the light can be controlled without rising from the chair.

The light is all reflected down upon the desk, thus relieving the eyes of strain.

These lamps are as well adapted for lighting music stands or pianos, paintings, etc., and can be arranged for special uses.

It is a very convenient device, and no doubt, will meet with a large sale.

The Kinsman Desk Light has just been put upon the market by McLeod, Ward & Co., 91 Liberty street, New York city.



KINSMAN'S DESK LIGHT.

OVER THE THRESHOLD.

The season of "stock taking" and inventories, is about over now, and we trust that our friends have come out of the old year into the new in the pink of condition.

FOREIGN NOTES OF INTEREST.

ELECTRIC RAILWAY.—A double-track electric railway is to be built between Dublin and Blackrock, Ireland, in March.

LONG DISTANCE TELEPHONE.—It is expected that the telephone line between Dublin and Belfast, Ireland, will be opened during the present month. The line will be about 105 miles in length, and solid copper wire weighing 800 pounds to the mile is used. The line between Belfast and Glasgow is 150 miles long, and the tariff is one shilling per minute.

WIND POWER.—It is suggested by M. de Nansouty that users of wind power might find it an advantage to surround the "atmospheric turbines" by strong towers, directing the wind to the vanes by nozzles, in much the same way as water is led to a Pelton wheel.

WATER POWER.—Water power to the extent of 1,200 h. p., of the river Aar, is to be utilized in the operation of a proposed electric railroad at Sernfthal, Switzerland, and for electricity works at Sernft.

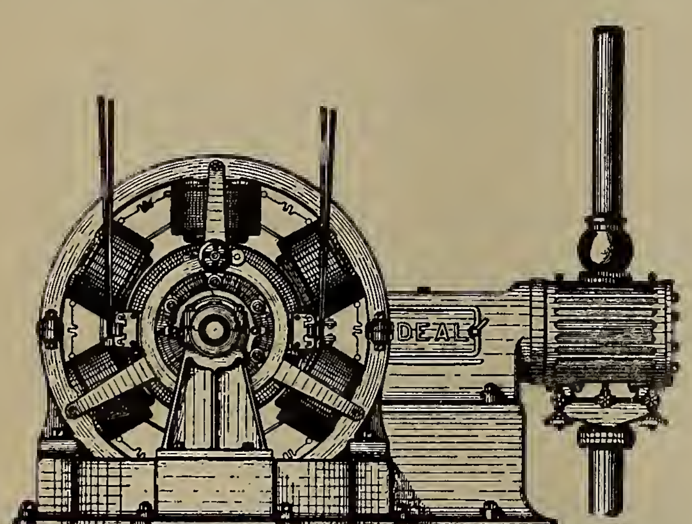
Electric Light for the Dead.—It is reported that a deceased millionaire of Vienna made provision in his will for the constant illumination of the vault where his body lies, for one year, by electricity. He also desires to have the interior of his coffin illuminated in like manner.

Faure's Patent in Germany.—The Imperial Court of Appeal at Leipsic has just decided in an action brought by the Hagen Accumulator Company against certain manufacturers of secondary batteries in Germany, that the employment of lead in the state of super-oxide, oxide, or insoluble salts as a filling material for accumulator plates comes under Faure's patent.

From Gas to Oil.—In Crowland, Lincolnshire, England, oil has been substituted for gas in street lighting on account of the high price of gas due to the coal strikes. An English contemporary wonders why the Crowlanders did not advance a step and introduce electric light.

THE "PRISCILLA'S" ELECTRIC LIGHT PLANT.

A notable electric light plant is being installed on board of the new steamer "Priscilla," of the Fall River Line. It was contracted for by Mr. W. R. Fleming, the well-known electrical engineer and contractor, Mail



ENGINE AND DYNAMO ON THE "PRISCILLA."

and Express Building, New York city, and has some novel features.

The dynamos are connected directly to "Ideal" engines, and there will be three sets, each set being on one base. For the purpose of convenience and economy in space the three machines will be placed radially, the rear of the engine cylinders turned towards the central point. The switchboard will form a part of the general circle, so that the attendant will have the whole plant "under his thumb," so to speak. Each engine, of the single type, is of 75 h. p., and each dynamo is of 50 k. w. capacity, and of the General Electric Company's make.

The engines will be elegantly finished in coach colors, with nickel trimmings, and altogether the plant will be a model one. It is being installed by the General Electric Company.

The accompanying illustration gives a side view of the engine-dynamo combination to be used on the "Priscilla."

Mr. Fleming has closed a number of contracts recently for complete electric light and power plants, and he is making a specialty of direct-connected dynamos on the same base with the engine.

The steamer "Priscilla" is now lying at Fletcher's ship yard in Hoboken, N. J. where she is being fitted out.

THE NEW YORK INSULATED WIRE CO.

One of the oldest electrical concerns in the United States is the New York Insulated Wire Company, which, through its enterprising officers, has acquired a name and fame as broad as the Union itself. This house has built its great reputation on its famous "Grimshaw White Core Insulated Wire," which is known the world over for its excellence in quality and durability.

The Grimshaw Patent White Core Wires and Cables resist acids, heat, cold, moisture and sewer gases. They are of the highest insulation qualities under all conditions of exposure. Years of trial have demonstrated this fact.

The indestructible White Core is claimed to be superior to anything now made whether it is necessary to protect conducting wires from exposure to heated surfaces of boilers, steam-pipes, etc , moisture in mines and tunnels or underground conduits, and is now being used very extensively by the principal telegraph and electric light companies, in sugar refineries, paper mills, dye works, breweries, steamships, yachts, etc.

Special care is taken in the preparation of the compound, the ingredients being composed of the best known insulating materials yet discovered.

The copper wire is first carefully coated with pure tin, thus avoiding oxidation and chemical action of the sulphur used in vulcanizing the compound.

The covering known as the "White Core" is first put on the wire, over which is placed the second coating of dark rubber, then follows a wrapping of Grimshaw Insulating Tape, which is finally covered with special finishing slicker, producing a glossy and weatherproof outside covering, absolutely impervious to water.

The method of applying the compound in distinct layers prevents absolutely the possibility of air holes extending from the wire to outside surface, an occurrence so frequent with single coated wires. The care taken in the manufacture of this wire will be appreciated by the fact that it takes from five to six days to prepare it for the market.

Grimshaw White Core Wire was selected by the World's Columbian Exposition for the entire incandescent lighting installation at Jackson Park, Chicago. It was chosen after a most careful and thorough investigation of the merits of the various goods offered to the Exposition Company. Some idea of the vast amount of wire may be had when it is stated that no less than 100,000 incandescent lamps in the various buildings had to be fed. This is said to have been the largest wire installation ever undertaken, and the success which attended the result during the past summer speaks volumes for the ability of the New York Insulated Wire Co. to accomplish great things.

Besides the Grimshaw wires used in this immense installation mention should be made of the fact that the contract included Grimshaw Tape and Splicing Compound necessary for the finishing of the work, and great quantities of the celebrated Vulca wire ducts were also used.

The company does much work for Uncle Sam's government in Washington. Many of the government buildings are wired with Grimshaw White Core. These include the Capitol and White House, and the fact that the company has been so successful in securing government contracts seems to particularly warrant the claim that Grimshaw wires are the "Nation's Choice." This name is peculiarly appropriate and the Company evidently has an undisputed right to it.

All wires used by this company are drawn true to gauge, and are of the highest conductivity and uniform tensile strength. They are thoroughly tested before leaving the factory so as to insure the best of service.

The company manufactures wires and cables for all classes of electrical work including telegraph, telephone, electric light, electric railway feeders, etc.

The "Vulca" electrical wire ducts are for interior wiring and the material of which they are made is said to possess better insulating qualities than hard rubber, while costing only half. Vulca tubing is not affected by acids, cements or plaster, and is invaluable where it is necessary to run wiresthrough flooring, brick walls over metallic beams, etc. It is incombustible, moisture proof, and impregnable against the attacks of rats or other vermin.

The General Manager of the New York Insulated Wire Company is Mr. James W. Godfrey, a gentleman whom everyone in the electrical trade thinks highly of. Mr. Godfrey is one of the most enterprising personalities in the business, and when he is around it is safe to assume that there is lots of business being transacted. Mr. R. E. Gallagher, the secretary of the company, is also a very pleasant gentleman to meet, and while office work keeps him indoors much of the time, he is very much wide awake when he does go out.

INFLUENCE OF TEMPERATURE ON ELECTRIC BATTERIES.

In order to get the best results from an electric battery plant, such as is used in a large telegraph office, three things are necessary, namely: thorough insulation of the cells, regularity in replenishing the charges in the cells and uniformity of temperature. The first two conditions are comparatively easy of attainment, as it is within our power at all times to secure good insulation and keep the cells properly charged; but the third factor is a variable one, and beyond our power to control. Were it possible to maintain an even temperature in our battery rooms, we could, with proper care of the battery, depend upon a quite uniform current, but those who use battery current for the operation of telegraph or other electric signal lines know the practical difficulties that stand in the way of the realization of this desirable condition. Yet, probably very few realize what the main cause of the trouble is. They are apt to conclude that the battery is run down, and the battery man usually is credited, in language of varying degrees of strength, as being the author of troubles for which he is no more responsible than is a baby.

Variation in temperature is really accountable for a good deal of the fluctuation of current experienced on telegraph lines. This, however, being a natural condition, cannot well be offset by any means that are at hand. Such changes in volume of current sometimes cause serious annoyance in the operation of the circuits and this is especially the case when they occur on railroad signal lines. This fact was touched upon by Mr. George L. Lang, superintendent of telegraph of the New York and New England railroad, in his paper on "Batteries" read before the Convention of the Association of Railway Telegraph Superintendents, held in Milwaukee, Wis., June 20 and 21, last. Therein he said: "If possible keep your battery at an even temperature, from 50 to 60 degrees. Our early teaching was that our battery must be kept in a dry place. Theoretically this is all right, but in my signal work I have found we get the very best results when the battery is underground, and where there is more or less dampness.

"I do not argue from this," continued Mr. Lang, "that the dampness is a benefit to the battery; but I do claim that moderate moisture is far less detrimental than the frequent and often times extreme changes in temperature which are inevitable when batteries are kept above the ground simply to keep them dry."

Here it is shown from practical experience the results of even temperature while placing a battery underground is not altogether desirable on account of inevitable moisture, yet the advantage of a uniform current, resulting from the even temperature of the underground chamber, more than compensates the slight loss of current due to the moist surroundings.

From this it is evident that if the underground receptacle for the battery were constructed with reference to making it as dry as possible, the very best condition possible in the maintenance of electric batteries might be realized.

In this connection it is proper to remind those of our readers who do not follow these matters up very closely, that electrolytes behave differently to metals under the influence of changes of temperature. It is well known that the electrical resistance of the metals, *increases* with increase of temperature—and that of electrolytes *decreases* under the same influence. Hence it is, that electric wires have greater resistance in hot weather than in cold, while the resistance of batteries decreases as the temperature rises and increases as it lowers. Therefore the colder the battery liquids become the greater is the internal resistance of the battery. Obviously, there must be a point in the temperature, where the best results can be obtained from a battery when placed underground, all other things being equal, and Mr. Lang gives that temperature as being between 50 and 60 degrees. Could we maintain an even degree of temperature above ground, still better results would, of course, be obtained, because we would then not have the same degree of moisture to contend with that we find underground.

Mr. W. H. Preece, the well-known English electrician, found by tests, that when a Daniell cell was heated from zero C. to 100° C., its resistance decreased abruptly at first, and afterwards more gradually, falling from 2.12 to 0.66 ohms. Under the same conditions other forms of battery would of course, give different results, according to the difference in electrolytes used, etc., but the evidence just cited shows how sensitive batteries are to changes of temperature. It will probably also furnish a clue to the cause of a good deal of the trouble experienced on electric wire's operated by battery currents, which is usually ascribed to the neglect of the battery man or causes other than the real one.

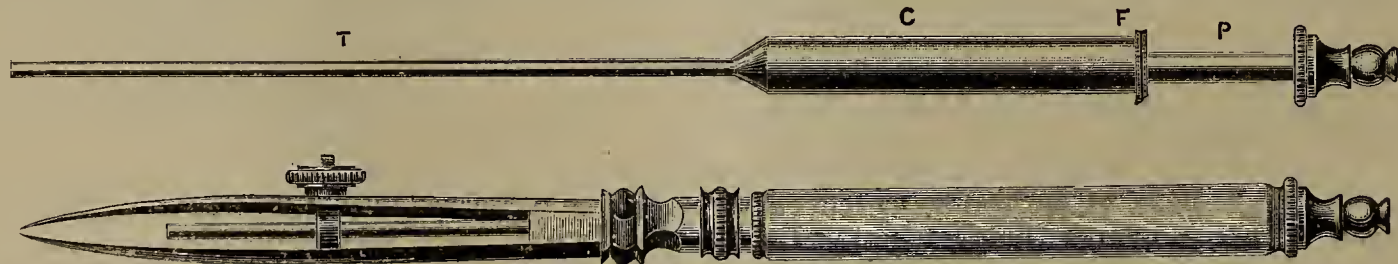
STEAM VS. ELECTRIC RAILWAYS.

In a recent lecture delivered in England by Dr. Edward Hopkinson, that gentleman, among other things, said, with reference to electric railways in cities: The City and South London line had enabled experiments to be made on the efficiency of the railway system as a whole, taking into account the loss of power in the generators, on the line, and in the motors, and in the resistances of the locomotives. The loss in the line was about 11 per cent. of the electrical power generated, and the efficiency of the locomotives as a whole was 70 per cent.; thus the electrical efficiency of the entire system was 62 per cent. The trains weighed, with full load of 100 passengers, about 40 tons, and the average speed between stations was 13 5 miles per hour. The cost of working, including all charges, during the last half year was 6½d. per train mile. It was perhaps hardly a fair comparison to compare the cost of working such a line as the South London line with the cost of steam traction on other lines, inasmuch as steam could not possibly be used in the tunnels, only 10 ft. 6in. in diameter, in which this line was constructed, but the comparison was not uninstructive. Take the Mersey Railway, where the gradients and nature of the traffic were similar. On the Mersey Railway the locomotives weighed about 70 tons, and the train, which was capable of carrying about 350 passengers, 150 tons. According to the published returns of the company, the cost of locomotive power is 14d. per train mile—*i. e.*, more than double the cost on the South London line, but for a train weighing between four and five times as much, but capable of carrying only three and a half times the number of passengers; thus the cost of steam traction per ton mile of train was about half that per ton mile of train for electric traction. But it was not on the cost per ton mile that the success of a passenger line depended. The real basis of comparison was the cost per passenger mile, and here electric traction had great advantage over steam, as the dead-weight of the electric motor was small compared with the dead weight of steam locomotives of the same power; and with electric motors the trains could be split up into smaller units at but slightly increased cost, so permitting a more frequent service. We could not expect, therefore, that electric traction, with our present knowledge, would take the place of steam traction on our trunk lines; but it had its proper function in the working of the underground lines now projected for London, Paris, Berlin, Brussels, and other large towns, and also, he thought, on other urban lines; for example, on the Liverpool Overhead Railway, where trains of large carrying capacity were not required but a frequent service was essential; and finally, also, on those short lines, whether independent or branches of the great trunk lines, where water power was available.

A USEFUL DRAWING PEN.

Mechanical draughtsmen will appreciate the advantages the "Injector" Reservoir Drawing Pen possesses. Frequently a stop to refill the ordinary drawing pen spoils the work, and an instrument such as the one illustrated herewith has long been looked for.

The illustrations are so clear that they tell their own story, but a few explanatory words will not be amiss. As will be seen, a tube projects from the handle down between the nibs of the pen. This tube is the extension of the ink reservoir, as shown in the lower illustration.



DRAWING PEN.

The reservoir is filled with ink by dipping the lower end of the tube, T, in the ink and putting the plunger, P, out as far as it will go. The plunger acts as a small pump, and the ink flows into the reservoir as the plunger recedes. After placing the reservoir in the pen handle, as shown in the upper illustration, the pen is fed with ink by simply pressing slightly on the plunger, which forces the ink out of the reservoir.

The pen can be used in the ordinary way without the reservoir.

The milled head, F, provides access to the interior of the reservoir.

This instrument is giving excellent satisfaction; it is a great labor saver, and draughtsmen will not be slow to appreciate its advantages. Each pen is tested by an expert draughtsman before being sent out.

It is made by Jackson Bros., Ltd., drawing material contractors, 50 Call Lane, Leeds, England, and the price named on their circular is four shillings English money ($1.00 American money), post free.

NOTES OF GENERAL INTEREST.

Personal.—Mr. Newton Hall has severed his connection with the *Electrical World* to accept the position of assistant manager of the *Electrical and Street Railway Reporter*, of this city.

Lighthouses.—Twenty-two lighthouses on the English coast are connected electrically with the mainland and like communication with several others is being established.

New Management.—On January 9, the Dry Dock, East Broadway and Battery Railroad Co., of New York city, elected a new board of directors, only four of the old board remaining in the new.

Reduced Its Size.—Our contemporary, the *Electrical World*, appears with the first number of the year, in an entirely new form. The old size has been reduced, and the reading pages contain two columns. The paper has a very attractive appearance, and is of a much handier size, being a little larger than the Electrical Age.

Convenient Shade.—The electric light shade invented by Joseph H. Huber, of Greensburg, Pa., is a very convenient and serviceable device. It is adjustable, so that the light can be reflected on any part of the desk or table, and screened from the eyes. It is light and attractive in appearance, and should receive much favor.

Literary Notes. — The *Forum* for January contains many timely and interesting articles written by well-known authorities. The *Forum* occupies a field of literature practically its own, and it is of the highest class The price of the magazine has been reduced to $3.00 per year or 25c. per copy which makes remarkably cheap reading.

New Engine—Mr. Calvert R. McGahey, of the firm of McGahey Bros., Foundry and Machine Works, Elkton, Va., is the inventor of a steam engine which is said to effect a saving of 20 per cent. of the power usually lost in steam engines. The feature of the engine is the balanced slide-valve, and tests have proved it to be a very meritorious invention.

For Greater Safety.—The Jersey City Board of Aldermen passed resolutions a few days ago, requesting the Board of Street and Water Commissioners, to pass an ordinance restricting the speed of trolley cars to such a rate as will insure safety to the traveling public, and compel the Consolidated Traction Company to place upon each car such invention as will insure at least the safety of life in case of accident.

The Evolution of the Incandescent Lamp.—Every one interested directly or indirectly in the lamp question, which is a live one at present, should familiarize himself with the early history of this celebrated invention. "The Evolution of the Incandescent Lamp," by F. L. Pope, gives a complete history of the development of the lamp. It is an interesting and instructive story. Copies can be had at the Electrical Age office, first floor World building, New York city. Price, 80 cents.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, January 13, 1894.

Mr. W. A. Vail, 136 Liberty street, city, has taken the agency for this territory of the La Roche Electric Works, of Philadelphia.

The Interior Conduit and Insulation Co., 44 Broad street, New York city, has just issued a neat catalogue of Lundell motors and dynamos. These machines are very efficient and have a high reputation. They are very compact and possess some very interesting and valuable features.

Mr. F. R. Chinnock, general electrical contractor, has opened an office in Room 618, Central Building, 143 Liberty street. Mr. Chinnock is well known in the trade, and he is in every way competent in his line. He will hereafter do a general electrical contracting business for the installation of complete electric and steam plants, and also act as consulting, electrical and mechanical engineer. He has started in with his usual vim and vigor, and he will undoubtedly meet with his former success, as he has already several large contracts booked.

Bateman & Miller, electrical engineers and contractors, 143½ East 23d street, city, are among the most enterprising concerns of the kind in the city. They contract for electric railroad, marine, village and station work, complete installations of isolated plants and wiring of buildings for light. They carry a large line of electrical goods, including electric bells, burglar alarms, etc., and give prompt attention to repairing and alterations. The firm makes a specialty of storage batteries, and is the sole agent for the well-known Bedford lubricating oils. The members of the firm are Charles E. Bateman and John Miller.

The New York Carbon Works, 18 Cortlandt street, city, is one of the largest concerns of the kind in the country. The business was established in the spring of 1884, by Mr. Henry Müeller, in Hudson street, near Fourteenth. Since then it has grown to immense proportions, and now occupies a large factory in Newark, N. J., equipped with a large steam plant. Carbons are here plated by electricity, and carbons for all purposes are produced. The company makes a specialty of battery carbons, which products are celebrated everywhere.

The Standard Paint Co., No. 2 Liberty street, was awarded medals at the World's Fair for its well-known P. & B. goods, including insulating paper and compounds. P. & B. paint is an excellent article for preserving and coating all kinds of iron work, brick or wooden walls exposed to moisture, to prevent sweating; painting metal roofs, preserving wood or iron placed under ground, and a great variety of other purposes. The insulating paper and compounds are used very extensively by electrical companies, and are rapidly gaining in favor. They have a very high reputation as being reliable and effective. Thousands of barrels of this company's materials are used yearly for insulating and water-proofing wires. W. T. H.

TRADE NOTES.

The Page Belting Company, Concord, N. H., has issued a very neat fac-simile of the World's Fair award received by that company for its notable exhibit of belts. It is an excellent piece of work, and no doubt its extensive distribution will bring these celebrated belts into greater prominence than ever.

Queen & Co., Inc., Philadelphia, have a line of very good commercial ammeters and voltmeters in the "Magnetic Vane" type which they have manufactured in large quantities for several years. These instruments are designed for light and power plants and when placed on a switchboard will indicate current or potential all day long. They are mounted in handsome cases, to present an attractive exterior, and are dust proof as also weather proof; at least as much so as is possible, with first-class switchboard instruments.

The Phœnix Iron Works Co., of Meadville, Pa., manufacturers of the celebrated Dick and Church engine, recently issued an attractive catalogue of their engines. The single cylinder, compound, tandem compound, and four cylinder triple expansion engines are fully described and illustrated. These engines are very extensively used in electric light and power stations and have an excellent reputation for efficiency.

Electrical and Street Railway Patents.

Issued January 9, 1894.

512,214. Composite Telephonic and Multiple-Telegraphic Transmission. Frank A. Pickernell, Newark, N. J. Filed Aug. 25, 1893.

512,217. Electric Call. Purdy M. Randall, Concord, N. H., assignor of one-half to Charles A. Herbert, same place. Filed May 6, 1893.

512,227. Regulator for Dynamo-Electric Machines. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Co., same place. Filed Dec. 29, 1887.

512,250. Electric Indicator. Adrian H. Hoyt, Manchester, N. H., assignor to the Whitney Electrical Instrument Co., Saco, Me. Filed March 15, 1893.

512,253. Secondary Battery. William C. Lockwood, New York, N. Y. Filed Aug. 6, 1892.

REISSUE.

11,398. Electric Connection. Hercules Sanche, Detroit, Mich. Filed June 20, 1892. Original No. 430,974, dated June 24, 1890.

Note—The foregoing were issued January 2.

512,266. Electrolytic Apparatus. Emile Andreoli, London, England. Filed Feb. 20, 1893.

512,320 Electric Incandescent Lamp. John Peil and Karl K. McFadden, Chicago, Ill. Filed Apr. 18, 1893.

512,327. Electrically-Propelled Vehicle. James H. Rogers and Willard Fracker, Washington, D. C. Filed Jan. 31, 1893.

512,331. Electric Cut-Out. Albert P. Seymour, Syracuse, N. Y. Filed Nov. 18, 1892.

512,340. Coil for Electro-Magnets. Nikola Tesla, New York, N. Y. Filed July 7, 1893.

512,343. Method of Laying Railway-Rails in Paved Streets. George C. Warren, Utica, N. Y. Filed May 5, 1893.

512,351. Street-Railway Crossing. William C. Wood, Brooklyn, N. Y., assignor to the Lewis & Fowler Girder-Rail Company, same place. Filed Mar. 31, 1893.

512,373. Trolley Cut-out. Melancthon Hanford, Malden, Mass. Filed Sept. 22, 1893.

512,378. Time and Dating Stamp. Winfield S. Jewell, Indianapolis, Ind, and Alonzo C. Stevens, Des Moines, Iowa. Filed July 11, 1891.

512,386. Electro Magnet. Frank R. McBerty, Downer's Grove, assignor to the Western Electric Company, Chicago, Ill. Filed May 16, 1893.

512,395. Producing Illuminated Letters. James H. Rogers, Washington, D. C., assignor of one-half to Calvin V. Graves, Natural Bridge, N. Y. Filed Feb. 28, 1893.

512,397. Spark-Regulator for Dynamo-Electric Machines. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed June 1, 1889.

512,398. Apparatus for Telephone-Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Co., same place. Filed Apr. 26, 1893.

512,399. Apparatus for Telephone-Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Co., same place. Filed Apr. 26, 1893.

512,413. Telephone-Call Recorder. William B. Thomson, Chicago, Ill., assignor of one-half to Sylvanus Heermans, same place. Filed June 28, 1893.

512,417. Insulated Conductor. Charles N. Waite, Newton, Mass. Filed Feb. 20, 1893.

512,422. Printing-Telegraph. Emil A. Wirsching, New York, N. Y., assignor of one-half to Aloys Wirsching, same place. Filed May 12, 1893.

512,424. Alternating-Current Dynamo. James J. Wood, Fort Wayne, Ind. Filed June 23, 1893.

512,425. Connection Between Separately-Excited Dynamos and Their Exciters. James J Wood, Fort Wayne, Ind. Filed Oct. 17, 1893.

512,444. Closed-Conduit Railway. Charles J. Kintner, New York, N. Y. Filed June 22, 1893.

512,448. Socket for Incandescent Lamps. Thos. L. Pfarr, Jr., Pittsburg, Pa. Filed Feb. 13, 1893.

512,464. Incandescent Lamp. Augustus C. Carey, Lake Pleasant, Mass. Filed Mar. 29, 1893.

512,473. Secondary Battery. Frank K. Irving, New York, N. Y., assignor to the Franklin Electric Co., same place. Filed Sept. 13, 1892.

512,480 Sand-Box for Cars. Henry McPherson, Troy, N. Y., assignor of one-fourth to Cornelius V. Collins, same place. Filed Mar. 27, 1893.

512,481. Electric Arc Lamp. Regina Niewerth, Berlin, Germany. Filed Mar. 22, 1893.

512,482. Electric-Arc Lamp. Regina Niewerth, Berlin, Germany. Filed Oct. 24, 1893.

512,503. Electrolytic Diaphragm. Thos. Craney, Bay City, Mich. Filed Sept. 26, 1892.

512,510. Depolarizer for Voltaic Cells. Gardner Hewett, New York, N. Y. Filed April 3, 1893.

512,514. Electrode for Secondary Batteries. William Morrison, Des Moines, Iowa, assignor to the American Battery Co., Chicago, Ill. Filed Apr. 25, 1892.

512,515. Overhead Switch. Arthur L. McCredie, Sydney, New South Wales. Filed Mar. 29, 1893. Patented in New South Wales, Sept. 8, 1887, No. 173; in Victoria, Apr. 7, 1888, No. 5,746; in Queensland July 25, 1888, No. 441, and in New Zealand, Mar. 16, 1891, No. 4,884.

512,535. Electric-Railway Current-Collector. Eben M. Boynton, West Newbury, Mass. Filed Oct. 12, 1893.

512,567. Battery. Wilbur M. Stine, Athens, Ohio. Filed July 21, 1891.

512,603. Electrical Transformer or Converter. Charles L. Coffin, Detroit, Mich. Filed December 11, 1891.

512,604. Apparatus for Electrically Welding Metal. Charles L. Coffin, Detroit, Mich. Filed Mar. 9, 1893.

512,614. Electric Switch. Jesse L. Hinds, Syracuse, N. Y. Filed May 16, 1892.

512,636. Reflector for Electric Lamps. Joseph W. Turnbull, Pascagoula, Miss, assignor of three-fifths to Charles Boster, same place, and Emile Ferdinand Del Bondio, New Orleans, La. Filed Nov. 3, 1891.

512,637. Incandescent Electric Lamp. Joseph W. Turnbull, Pascagoula, Miss. Filed May 2, 1893.

512,656. Relay. Fred M. Locke, Victor, N. Y. Filed June 19, 1891.

512,667. Double-Carbon Arc Lamp. Charles E. Scribner, Chicago, Ill. Filed April 16, 1892. Renewed May 9, 1893.

ELECTRICAL AGE

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CONTENTS.

EXHIBITS AT THE CONVENTION.

It is refreshing to learn that no restrictions will be placed upon intending exhibitors, by the proprietor of the hotel at which the National Electric Light Association will have its headquarters during the Washington convention. At a good many of the conventions in recent years, the hotels have prohibited exhibits on the premises, which action had the effect of somewhat discouraging enterprising dealers in electrical supplies in coming forward with samples of their goods. On the other hand at those conventions where exhibits have been encouraged there has always been a large attendance of supply men, who spared neither effort nor expense to place their samples on exhibition in the most attractive manner. Exhibits no doubt stimulate trade, and it certainly pays to be in attendance at conventions with articles of trade. It may not bring immediate returns, but it places the exhibitors name before the trade, and he will be thought of later on.

EXPIRING PATENTS.

The Commissioner of Patents has initiated an innovation that will be of value to inventors and the public generally. The *Patent Office Gazette* now gives a list of patents expiring each week. The date of issue of each expiring patent is also given. Electrical people by this means will know from week to week the state of the electrical business, as regards the patents covering electrical inventions. The new departure will, no doubt, be greatly appreciated. Elsewhere in this issue we give a list of electrical patents that expired during the first three weeks of January.

THE SERVICES OF AN EXPERT.

An interesting case has just been tried in this city which involves the question as to what the services of an electrical expert are worth. Professor H. A. Rowland, of Johns Hopkins University, Baltimore, sued the Cataract Construction Co., which is developing the Niagara Falls water power scheme, for $30,000 for expert service. The company paid him $3,500 and considered it ample compensation, while the trial jury awarded the Professor $9,000. Therefore, as the matter stands now, three different values are placed on the Professor's services—his own, the company's and the jury's. After all, professional services are much like other articles of trade: they are worth just what they will fetch.

THE BELL RECEIVER PATENTS.

One concern in this city announces that it will sell telephone receivers similar to those used by the telephone company after January 30. Others will, very likely, engage in the manufacture of these instruments, and no doubt there will be some lively competition for trade until the business gets settled down to an even basis. Any one who has a non-infringing transmitter, can, after the 30th of January, operate a telephone plant without danger of infringement. There are some points about a telephone, however, that are yet protected by patents, and those who feel that they have a grievance against the telephone company, should proceed cautiously in the matter of buying and selling telephones. "Be sure you are right, then go ahead."

Electrical and Allied Industries of New York and Brooklyn.—Part IV.

MAGNESIA SECTIONAL COVERING.

The importance of having steam pipes, boilers, etc., covered with some non-conducting material to prevent radiation of heat, and consequent loss of power, is becoming rapidly recognized by all steam plant managers. In these days of scientific refinements, every possible advantage is taken to reduce expenses at the coal pile. The coal pile is reached through attention to the multifarious details of a steam plant, and one of the most important of these is the carrying of the steam through the pipes with the least possible loss of power.

The Magnesia Sectional Covering is so extensively used for the purposes above indicated, that a description of its merits and its application will be of interest to our readers.

FIG. 2—MAGNESIA COVERED PIPE AFTER FIRE.

Besides being an insulator of heat, it is also an insulator of cold and fire from without. These coverings are as well used to insulate water pipes, hot air flues, and for fireproofing wood or iron. Magnesia covering

FIG. 3—MAGNESIA COVERED PIPES, BROOKLYN CITY RAILWAY PLANT.

is fireproof and firm, and is easily applied, presenting a neat appearance. The blocks can be used for covering boilers, domes, heaters, tanks, kettles, smoke-flues, engine and pump cylinders, and a great variety of other purposes where it is essential or desired to protect from heat or cold. Magnesia blocks can also be used in construction work in buildings, and is very valuable for such purposes on account of the heat-resisting qualities of the material.

Messrs. Ledoux & Co., of New York, made exhaustive tests of Magnesia Sectional Covering, and their re-

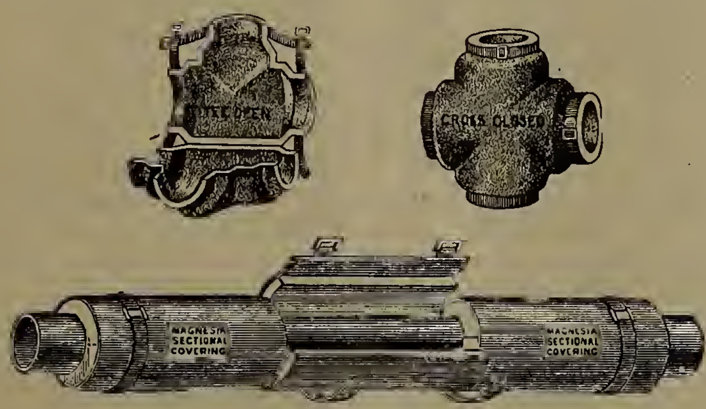


FIG. 1—MAGNESIA SECTIONAL COVERING.

port states that it is the best and most economical material for its purpose that they have ever seen.

It being understood that a covering is used to save coal, it must be apparent that the covering which does this the most effectually, is the most profitable to use, even at greater first cost.

We give three very interesting illustrations of the application of Magnesia Sectional Coverings. The first (Fig. 1) shows how pipes are covered with the magnesia sections. Fig. 2 shows a pipe likewise covered, standing alone and apparently untouched, amid the ruins of the A. W. Eaton Paper Co.'s mill, Lee, Mass., which was destroyed by fire. The fact of this magnesia covered pipe being the only part of the plant that is intact, speaks well for the protection afforded by the covering. The story is better told in this one illustration than could be in a volume of print.

Fig. 3 shows the plant of the Brooklyn City Railway Company, with all the steam pipes covered with Magnesia Sectional Covering. This immense power plant is one of the largest of its kind in the country, and the use of magnesia covering in such places exemplifies the value with which it is regarded. It is used in hundreds of other plants throughout the country.

THE WASHINGTON CONVENTION.

The headquarters of the National Electric Light Association during the convention in Washington, on February 28, March 1 and 2, will be at the Ebbitt House. This hotel, which is one of the best known in the country, is located on the corner of 14th and F streets, and has every modern convenience. Mr. H. C. Burch, the manager, is a broad-minded man, and the members may be assured that they will receive the best of care during their stay at the Ebbitt. A flat rate of $3 00 a day will be charged for delegates and others attending the convention, and we understand that Mr. Burch will place no restrictions on intending exhibitors.

SUBMARINE TELEGRAPH CABLES. — According to latest reports there are in the world 140,344 nautical miles of submarine telegraph cable. Of this total the various governments own 14,480 miles of cable and 21,560 of wire; the balance is owned by private companies.

"WARD" LAMPS.

We illustrate two lamps made by the Electric Construction and Supply Co., 18 Cortlandt street, New York city, for photo-engraving and focusing work, and for the stereopticon.

The photo-engraving lamp gives a powerful arc light that can be used during dark days, at night, or any other time when the sunlight is not sufficiently strong for the work. The lamp is mounted on a strongly constructed tripod, placed on rollers, which permits of the apparatus being freely moved about. The lamp frame is adjustable, so that it can be raised, lowered and fixed at any point desired. This enables the operator to concentrate the light upon the object to the best advantage.

These lamps have 2,000 candle-power or more, and have a regular feed and equal distribution of light to give uniform exposures. They are simple in construction, and easy of manipulation, and as they are designed for incandescent circuits, there is an entire freedom from danger to the operator.

Many large photo-engraving, and other similar establishments, are using these lamps with entire satisfaction, and since their introduction, the work of photo-engraving has been greatly simplified and time saved. The light is as pure as sunlight, and by its use work

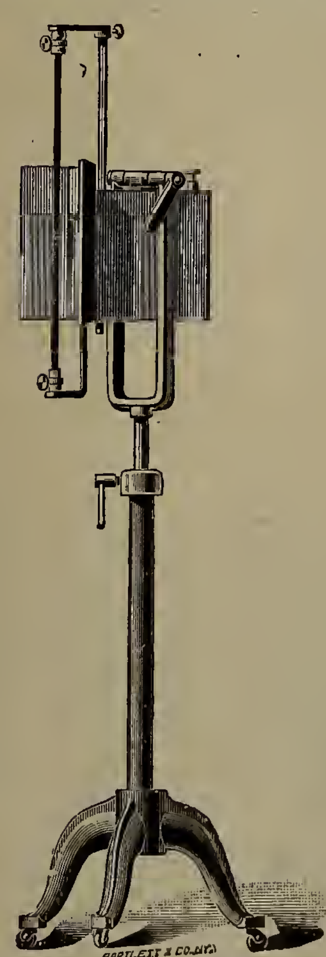
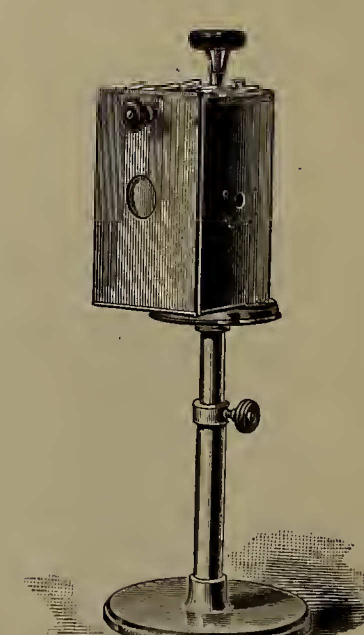


PHOTO-ENGRAVING LAMP.



STEREOPTICON LAMP.

can be carried on independent of bright daylight, with as good results.

The "Ward" stereopticon lamp is shown in our second illustration. It is an automatic focusing arc lamp, arranged especially for stereopticon work. The lamp is made for twelve amperes of current, but can be made for heavier currents when desired. It feeds in a vertical position, but will run and do good work at a slight inclination.

It is said to be the best lamp ever constructed for this class of work, the steadiness and intensity of the light being two of its most important features, besides its compactness.

The carbons used in these lamps are one-half inch in diameter, of special make.

Stereopticon lamps are made for both continuous and alternating currents, and are mounted on an adjustable standard, to admit of raising or lowering the light to the level of the stereopticon lens.

ARTISTIC ELECTRICAL GLASSWARE.

The ease with which the electric light is adapted to elegant surroundings, has led to a wonderful development in the manufacture of artistic glassware, for enhancing the beauty and uses of the light. Manufacturers of glassware have given this department of their industry especial attention in late years, with the result that some of the most exquisite work is now turned out in the way of shades, bulbs, etc., for electric lighting.

FIG. 1.

FIG. 2.

One of the most enterprising concerns of the kind is the Phœnix Glass Company, 42 Murray Street, New York City, and wherever one may go this company's goods are met with. The Phœnix Company was one of the first to exploit the electrical field, perceiving the great possibilities that lay in that direction, and today it enjoys the highest reputation for the quality and variety of goods it manufactures. Its World's Fair exhibit, it will be remembered, was one of the most elegant and attractive in the electricity building. Situated as it was in the very centre of the building, surmounted by the Tower of Light, it could not fail to attract the attention of the thousands of sightseers.

PHOENIX GLASS CO.'S WORLD'S FAIR EXHIBIT.

In this exhibit were arranged in the most artistic manner samples of elegant glass shades and bulbs for electric and gas light. They were in the richest designs of rich cut etchings and vari-colored tints, and some were valued as high as $200 each. The tinted goods were of the most delicate shades, including sapphire and topaz, cream and ruby, and orange and citron, and there were silver etchings in rococo, arabesque and empire designs, and etchings with dainty tinted edges. Among the cut glassware were star cut balls of the Phœnix cutting, 36 inches in diameter, and Phœnix diamond-cut pineapples, 20 inches in diameter.

A few representative designs are given in the accompanying small illustrations. Fig 1 shows a twist stalactite. These stalactites come in opalescent tints, and are extremely handsome when surrounding an electric light Fig. 2 shows a rich cut bulb, and Figs. 3 and 4, opal shades.

Among the newer goods shown in the Phœnix Company's latest catalogue, are etched combinations, cut and etched and rich cut crystal, suitable for house, store or public buildings. The company is making a special feature of rich cut bowls or dishes to be inserted in walls or ceilings. These bowls are very handsome and artistically wrought, and are especially designed for interior decorations. The Phœnix Glass Company supplied the gas and electric globes and shades for the Waldorf, Netherlands and Plaza hotels in New York city, the Metropolitan Life Insurance Building, New York city, the new City Hall in Richmond, Va., the Auditorium Hotel, Chicago, and many other equally famous buildings.

Mr. A. H. Patterson, the vice-president and manager of the company, is well known in the electrical trade. He is an up-to-date gentleman, and he can divine the needs of the electrical trade as accurately as any one. To his sagacity and ability as a manager, the excellent reputation enjoyed by his company and its goods is largely due.

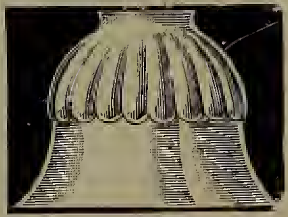


FIG. 3.

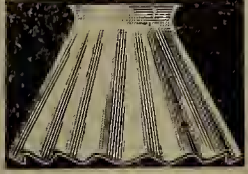


FIG. 4.

NEW YORK ELECTRICAL SOCIETY.

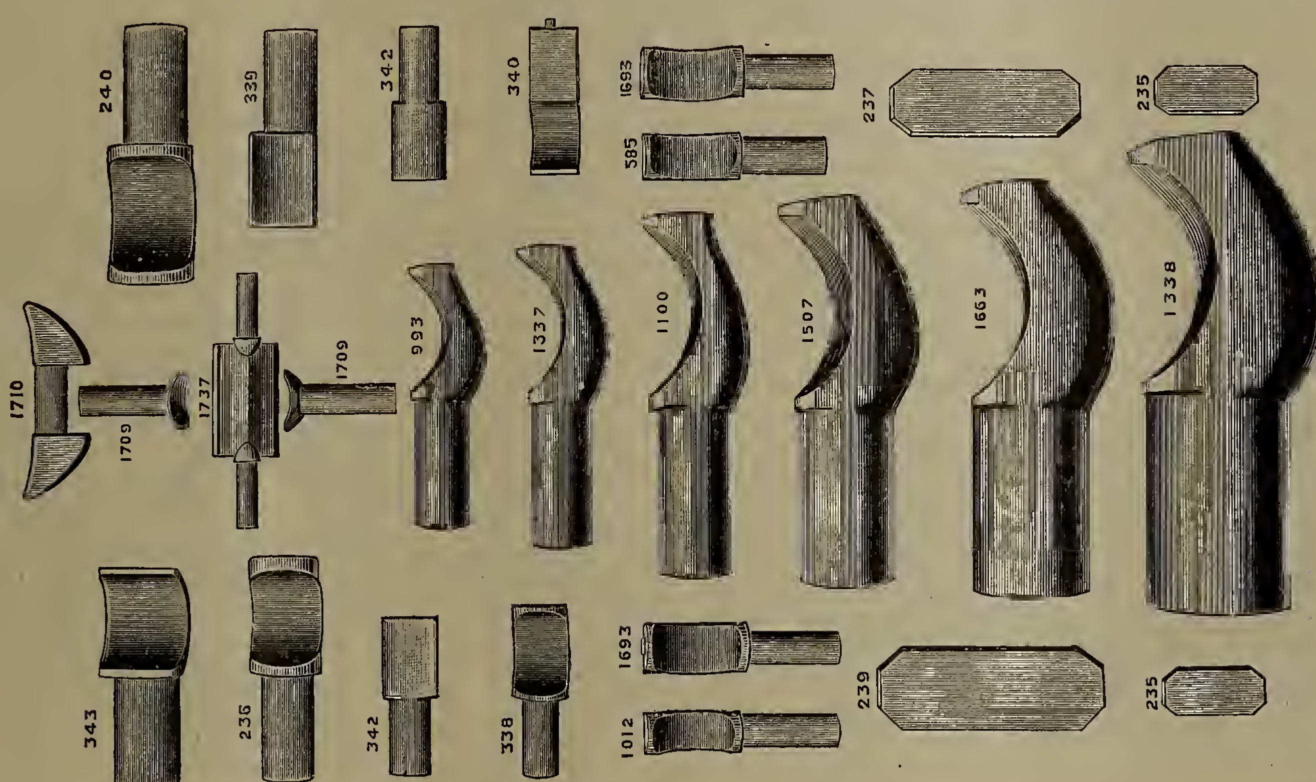
The forty-ninth meeting of this society was held at Columbia College on the evening of January 16, at which Dr. M. I. Pupin delivered a lecture on "Electrical Resonance."

In the course of his lecture, Dr. Pupin considered the dynamical view of electro-magnetism; the relation of electrical resonance to this view; pure resonance; modification of resonance effects; hysteresis; harmonical analysis of alternating current machinery by elecctrical resonance; bearing of electrical resonance upon transmissions of signals through conductors possessing distributed self-induction capacity, and made some remarks on long distance telephony and telegraphy.

—If you would read a man's character, do your reading through a keyhole when he is alone.

DROP FORGINGS.

In the construction of electric dynamos and motors, too much attention cannot be given to the character of the forgings, which constitute an important part of the completed machine. Only the best of materials should be used to secure the highest efficiency, and they should be finished and fitted in the best manner possible. Any defects, either in the materials or fitting, are sure to result in loss, therefore, too much stress cannot be laid on the importance of giving these matters particular attention.



ELECTRICAL FORGINGS.—J. H. WILLIAMS & CO.

The firm of J. H. Williams & Co., 9–15 Richards street, Brooklyn, N. Y., the well-known manufacturers of drop forgings of all kinds, is making a specialty of electrical forgings of the highest grade, from iron, steel, copper, bronze and aluminum. It will be seen from the accompanying illustration that a large variety of pieces of this class are turned out by the firm. Their goods are of the very best materials, and give the best of results in actual use. The metal is homogeneous, and free from flaws, and the pieces are accurately finished to design.

The firm has abundant facilities for turning out the largest pieces used in electrical apparatus, and in any quantity. The works are very extensive, as may be judged from a view of the interior of the factory, which is given herewith, and constantly employ a large force of men. The view represents a busy place, with long lines of drop hammers and forges.

This firm manufactures drop forgings for all purposes, and its wrenches, etc., are well known among engineers all over the land. Besides the regular line of goods turned out here, special forgings are made to order for any purpose whatever, from the most delicate part to the largest piece.

WORKS OF J. H. WILLIAMS & CO., BROOKLYN, N. Y.

Among the articles manufactured by this firm, other than those referred to, may be mentioned lathe dogs, keys, Brock's patent chain pipe wrenches, thumb-nut and thumb-screw blanks.

They also make a specialty of railway pieces, in which only the best of materials enter.

"SMITH, OF NEW YORK."

In 1842, "Smith, of New York," opened his first establishment for the manufacture of lamps for street cars. Since then the business has grown to immense propor-

C. G. SMITH.

tions, and the name "Smith, of New York," is well known to street railway people all over the world. The present quarters are located in the five-story building, Nos. 350 and 352 Pearl street, New York city, where a force of eighty men are constantly employed in the manufacture of a great variety of lamps for use on

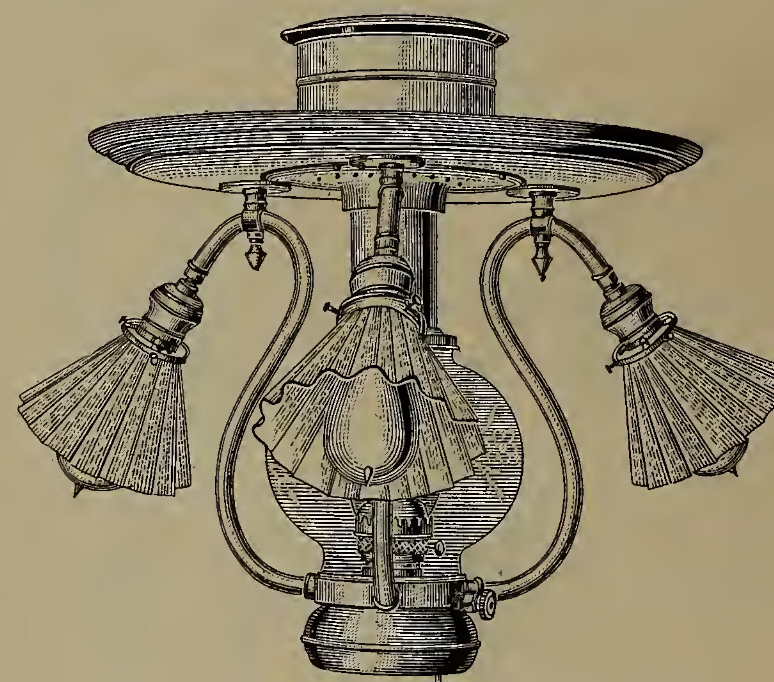
VIEW OF FACTORY. "SMITH OF NEW YORK."

street cars of every kind—horse, steam, cable and electric.

The founder of the business was Willard H. Smith. On his death in 1882, his son, C. G. Smith, and his widow assumed control of the large interest, and under their management the business has continued to grow.

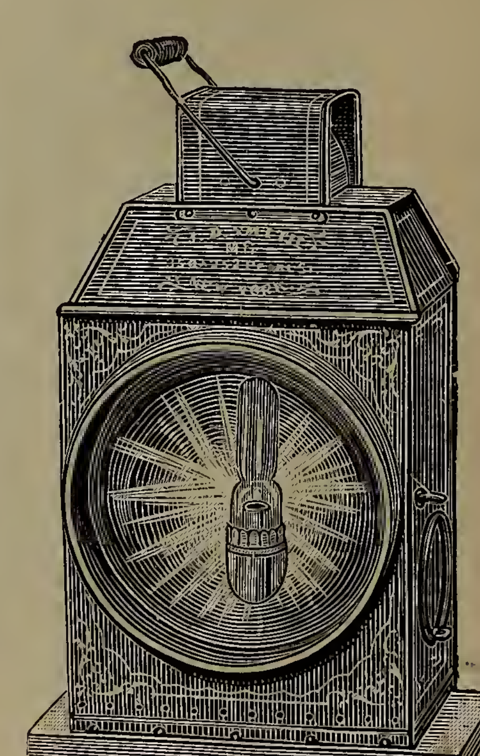
Mr. C. G. Smith, the present manager, is an energetic young man, full of business, and is personally known to every street railway manager in the country. He was born in 1861. He has gotten out many patents on lamps, and is constantly making improvements and bringing out new designs. He keeps up with the times, and the products of his factory are works of art and skill.

We give three views of as many departments of the



NO. 70. COMBINATION ELECTRIC AND OIL LAMP.

establishment. That of part of the factory shows the men at work at the benches, while on the floor are piled boxes and barrels filled with the various parts of lamps, in the different stages of manufacture. Another gives a view of a portion of the warerooms on the ground floor, and the third illustration shows Mr. Smith's office, with



SMITH HEADLIGHT.

a few samples of lamps of various styles, depending from the ceiling.

In the factory every modern appliance is used to facilitate the production in large quantities of lamps of the various patterns. A large steam power is required, and skillful workmen are employed for the work. Power presses of the latest design are used for shaping the metal.

We give illustrations of a few of the most important classes of lamps turned out from this establishment.

COMBINATION OIL AND ELECTRIC LAMP.

OFFICE OF "SMITH OF NEW YORK."

The Double Signal lamp was made for the Third Avenue R. R. Co., New York. It has a lens on each side, one red and the other green, and caps are provided to cover either color. These lamps are made so that electric light may be substituted for oil.

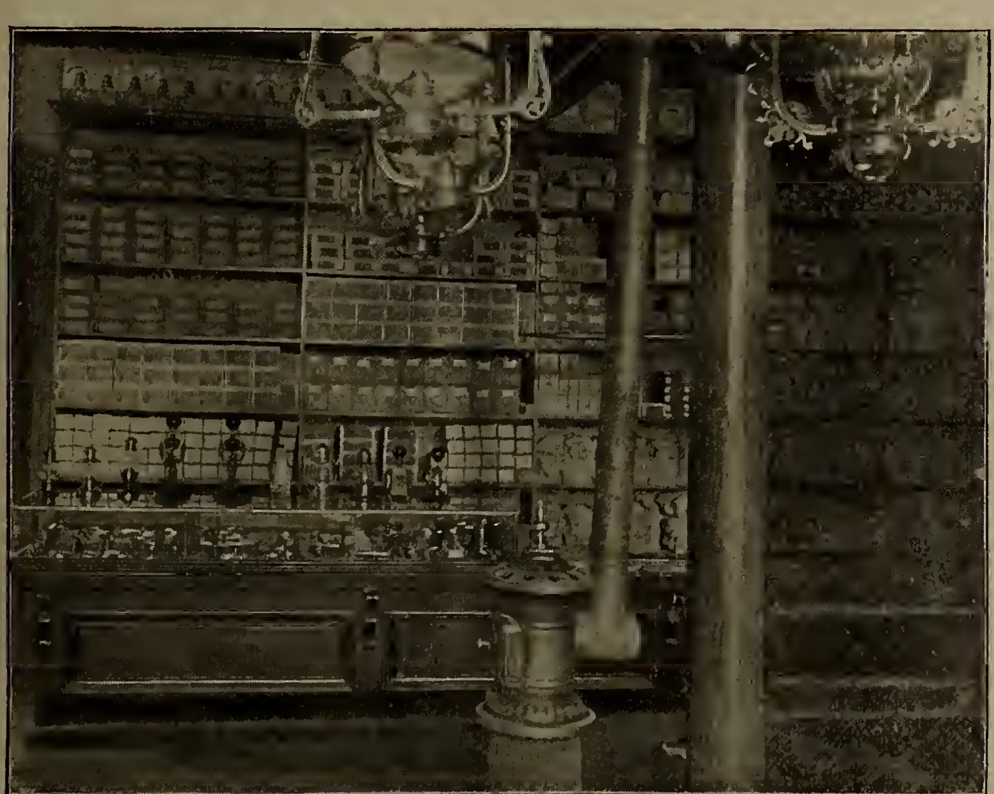
The No. 70 combination oil and electric lamps were made especially for the new cars of the Baltimore Electric Railway, Baltimore, Md. They are also used on the new cars built by the J. W. Fowler Car Co., and the John Stephenson Company. They, it will be noticed, are very handsome in design, and are as luxurious as can be found in the best Pullman Railway cars.

Two other styles of combination oil and electric lamps are illustrated. "Smith, of New York," is said to be the first one to introduce centre lamps in street cars, and the idea soon took a firm hold on street railway men.

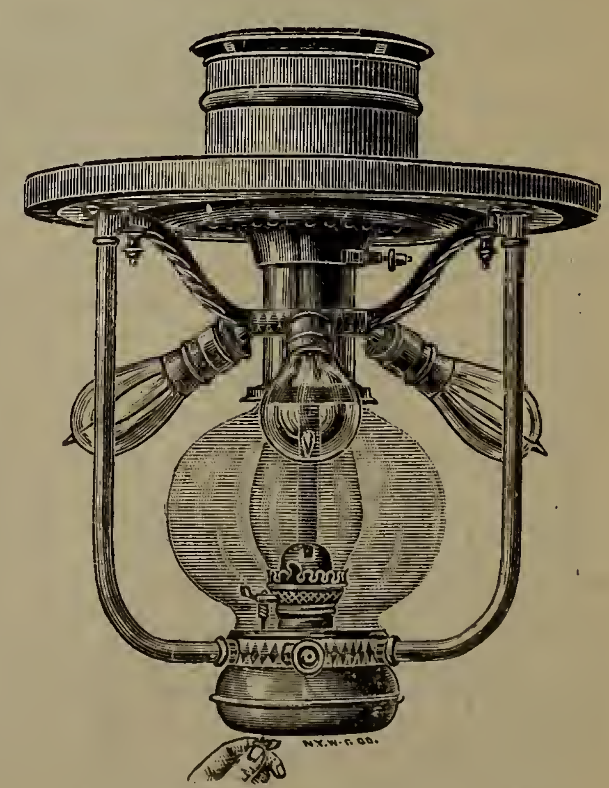
The headlights made by "Smith, of New York," are very extensively used on cable and electric cars, and are celebrated for their reflecting power and excellence of finish.

Lamps from this concern are found in many foreign cities, notably in Leeds, England, where they are in use on the electric lines.

It is stated that "Smith, of New York," manufactures more street car lamps than all other manufacturers combined, and, judging from the busy appearance of the factory, it would seem to the casual observer, that this claim has a good deal of foundation in fact.



WAREROOMS, "SMITH OF NEW YORK."



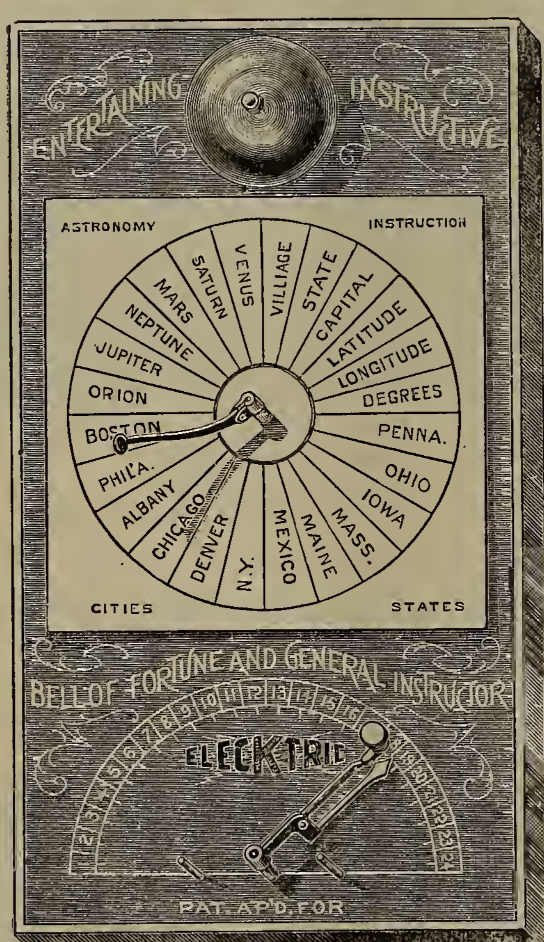
COMBINATION OIL AND ELECTRIC LAMP.

—Battles are never won without a fight.

AN INTERESTING NOVELTY.

The accompanying illustration is that of a very interesting piece of apparatus manufactured by the Knapp Electric and Novelty Co., 34 Warren street, New York city. It is called the "Bell of Fortune and General Instructor." It is both instructive and entertaining, and will undoubtedly find much favor among young people.

With each box comes twelve cards containing answers to questions on a great variety of subjects, geographical, historical, astronomical, foreign, etc. A card is placed in the space shown in the illustration, and by reference to the key of questions pertaining to the particular card, any of the questions may be asked. Each question is numbered, the numbers corresponding with those on the semi-circular plan at the bottom of the board. The pointer is turned around to the proper number and the button pressed down. When this is



KNAPP'S "BELL OF FORTUNE."

done the arm circulating about the answer-card drops into the space containing the answer to the question.

This device is a decided novelty and probably will meet with a good demand.

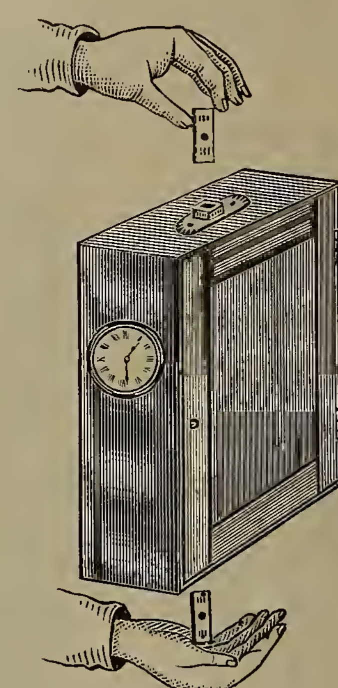
Prof. Rowland's Suit.—The suit brought by Prof. H. A. Rowland against the Cataract Construction Co., of Niagara Falls, which was briefly referred to in our last issue, was on Saturday, January 20, decided in the Professor's favor. Prof. Rowland brought suit for $30,000 for services in connection with the development of plans for the utilization of Niagara's water power. The company paid him $3,500 and refused to pay any more on the ground that it was ample compensation. The jury awarded Prof. Rowland $9,000, including the amount already paid him. The case was tried before Judge Shipman in the United States Circuit Court. The company's counsel gave notice of a motion for a new trial.

—Be not deceived by appearances. Many a rich man wears shabby clothes and many a pauper wears rich clothes.

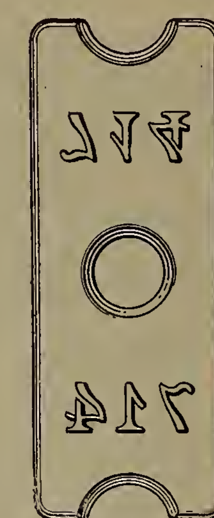
ENGLISH'S TIME RECORDER.

A time recorder is a necessity in any establishment where it is desired to keep a record of the time of arrival and departure of employees.

The English time recorder is one of the most perfect devices of this character. It makes an accurate record

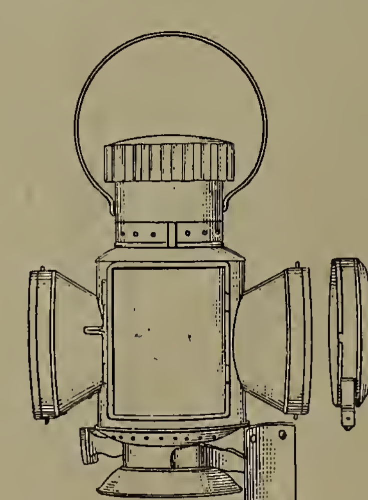


TIME RECORDER.



CHECK.

of the time of arrival and departure of employees as fast as they can drop their checks into the slot. The records are printed, and the machine is simple in construction. The mechanism is all enclosed in an oak case 17 inches high, 14½ inches wide, and 7 inches deep. A slot is provided at the top, into which the checks are dropped by the employees, and on one side is the face of the clock. Each check is numbered, which number corresponds with the name of the employee holding the check. As the employees arrive they drop the brass check into the slot and each holds his hand underneath to catch the check as it drops out of the machine, after making the record. The records can be filed away for reference. The machine is reliable and accurate in its work, and is said to be the best and most rapid time recorder on the market. It is sold



SMITH SIGNAL LIGHT. (SEE PAGE 43.)

by Stanley & Patterson, the well-known electrical supply house, 32 and 34 Frankfort street, New York city.

Enterprising Journalism.—City Editor: "The street is all excitement. An electric light wire has blocked traffic, and no one knows whether it is a live wire or not."

Editor: "Detail two reporters to go to the wire immediately—one to feel of it and the other to write up the result."—*New York Weekly*.

EXPIRED PATENTS.

The following is a list of electrical patents that expired on January 2, 9 and 16, of this year, as given by the Patent Office, Washington :

JANUARY 2.

185,841. Multiple Circuit-Closers for Electric Circuits. J. H. Striedinger, New York, and A. Doerflinger, Brooklyn, N. Y. [Filed Nov. 24, 1876]

JANUARY 9.

186,104. Automatic Electric Telegraphs. R. K. Boyle, New York, N. Y. [Filed June 15, 1876.]

JANUARY 16.

186,215. Printing-Telegraph Transmitters. George M. Phelps, Brooklyn, N. Y. [Filed Oct 26, 1876.]

186,234. Electro-Magnetic Dental Pluggers. J. E. Dexter, New York, N. Y. [Filed Oct. 23, 1876.]

186,283. Dial-Telegraphs. John H. C. Watts, Baltimore, Md. [Filed Dec. 1, 1876.]

186,330. Acoustic Electric Telegraphs. T. A. Edison, Menlo Park. N. J., assignor to the Western Union Telegraph Company. [Filed May 16, 1876.]

186,340. Electro-Harmonic Telegraphs Elisha Gray, of Chicago, Ill., assignor, by mesne assignments, to the Harmonic Telegraph Company, New York city. [Filed Jan. 27, 1876.]

186,355. Under-Ground Telegraph lines. W. Mackintosh, New York, N. Y. [Filed Feb. 17, 1874.]

186,356. Under-Ground Telegraph Lines. W. Mackintosh, New York, N. Y. [Filed Feb. 17, 1874.]

SELF-SETTING ANNUNCIATOR.

The Vanderpool self-setting annunciator is one of the best devices of the kind ever invented. The indicators are arranged radially around the bell, placed in the centre of the apparatus. When a call is received a white disk appears behind the black number corresponding with the number of the push button, bringing the figure out in bold relief against the white ground. The disk remains in this position until the next call is received, when it changes its position to indicate the last call. It is evident, therefore, that the *last* call is always indicated.

There are no drops to get out of order, and the instrument need never be touched. The numbers of the calls are painted in black on clear glass, and are practically invisible until the white disk is placed behind, and the numbers thus become visible at a long distance.

This annunciator is constructed in a simple manner, and is not easily deranged. It is very artistically gotten up, and is ornamental in appearance.

The fact that it is self-setting, and needs no attention, is an important one.

These annunciators are made by Mr. A. A. Vanderpool, 317 South 19th street, Newark, N. J.

CHICAGO FIRE DEPARTMENT.—We have received from Prof. J. P. Barrett, superintendent of the City Telegraph, Chicago, Ill., a copy of the rules and requirements of the Chicago Fire Department, for the installation of wiring and apparatus for electric light and power, adopted January 15, 1894. The rules and requirements are very complete, and provide for every detail of the subject.

—Judge a man by what he does, not by what he says.

ELECTRIC AND OTHER SYSTEMS OF HOISTING.

Mr. George A. Goodwin, of London, is the author of a paper recently presented to the Society of Civil Engineers, on the "Merits of Steam, Electricity, and Water for Hoisting Work." In summing up his presentation of the matter he sets forth the following advantages and disadvantages of each system :

Steam—Advantages.—(*a*) The first cost of installation is less than for hydraulic or electric plants.

(*b*) In the case of the cranes only, as they supply their own motive power, they cannot be affected by the failure of a main or the machinery at the power station, as in hydraulic or electric.

(*c*) The installation can be added to gradually at a less initial cost than with hydraulic or electric plants, where the power station should be sufficiently large for the maximum duty likely to be required from it.

Disadvantages.—1. It is slow in action compared to hydraulic or electric power, working only at about half the speed.

2. Each crane generating its own power ; they are more costly to work than hydraulic or electric cranes, where one generating station supplies power for the whole plant.

3. The drivers of the cranes have to be men of above the average intelligence, and fairly good mechanics.

4. The consumption of coal and fresh water is considerable, and if the cranes and capstans were not required to work, but kept in a state of readiness, more coal and water would be consumed than for the hydraulic or electric plant, if they were kept idle in a similar manner, there being so many more boilers to keep under fire, viz., one to each crane and one stationary, one to each group of capstans.

5. The cranes are noisy, and owing to great speed, have much vibration, with consequent wear and tear entailing a high cost for repairs, and danger of fire, as the boilers are liable to emit sparks with the smoke.

6. Generally, they require to be supplied with coal from a store, entailing labor and creating dirt. The machinery is more complicated than hydraulic, and partly exposed to the weather, in addition to which its wear and tear is considerable, and there are possible risks of explosion.

7. The cost of working is higher than hydraulic or electric.

Hydraulic—Advantages—(*a*) The power for working the plant being generated at a central station, the cost of working is reduced to a minimum, there being only one set of boilers to fire, and practically no fresh water is required beyond a few gallons daily.

(*b*) The machinery is quick in action, at least twice the speed of steam, and speed for speed for lifting, compared with electric, has a much less wear and tear, the cranes being capable of working 60 lifts per hour, or more if desired. At the trial of the large hydraulic 35-cwt. cranes made for the Tillbury Docks, 81 working lifts were made in 47 minutes, in which the goods were lifted out of a boat, slewed round, and landed on the quay.

(*c*) Only one driver and stoker is necessary ; a lower and cheaper class of men can work the cranes and capstan than is the case in steam-driven ones. It is, however, necessary to have one skilled mechanic to generally look after the work.

(*d*) If the plant should be required to stand idle for any length of time, only a very small amount of fuel would be consumed.

(*e*) Generally the machinery is noiseless, simple, clean, all protected from the weather, and has not much wear and tear ; the cranes can be easily moved along the quay.

(*f*) Besides the hydraulic power being used to work the machinery already referred to, it would be available for elevating purposes in neighboring warehouses and for the extinction of fires by means of injector hydrants.

(*g*) The cost of working is less than by steam, but about the same as by electricity, but the upkeep is less than either.

Disadvantages.—1. The initial cost is greater than for steam and slightly more than for electric cranes.

2. In the case of a breakdown at the power-generating station, or failure of the mains, all the plant would be temporarily stopped. Although the author mentions this, he does not consider it at all likely to occur, nor does he know of any case where this has taken place; it is only necessary to have all details made amply strong.

Electric—Advantages.—(*a*) The power for working the plant being generated at a central station, the cost of generating is reduced to a minimum, &c., the same as in hydraulic.

(*b*) Machinery is quick in action, though not quite so quick as hydraulic.

(*c*) Only one driver and stoker is necessary, &c., the same as in hydraulic plant.

(*d*) If the plant should be required to stand idle, &c., the cost is the same as for a hydraulic plant.

(*e*) Generally the machinery is fairly noiseless; it is cleaner than either steam or hydraulic, and can easily be arranged to be self-propelling along the quays.

(*f*) The power can also be used for lifting purposes in neighboring warehouses.

Electric—Disadvantages.—1. Speed for speed of lifting, there would be more wear and tear than in the hydraulic system.

2. In case of breakdown at the power generating station or the failure of a main, all the plant would be temporarily stopped.

3. The drivers of the cranes would have to be men of above the average intelligence.

4. The upkeep would be slightly more than in the case of a hydraulic plant.

The author concludes that, all things considered, the hydraulic system is the most satisfactory one, and considers that more improvement will be effected in this system than in steam or electricity.

STREET RAILWAY NEWS.

THE WALKER MFG. CO.'S NEW DEPARTURE.

Since the announcement that the Walker Manufacturing Company had decided to add an electrical department to its immense plant for the manufacture of street railroad dynamos, motors and other electrical transmission machinery, work has progressed quietly but rapidly. The first machines to be placed on the market are now nearing completion, and within a short time, the company will be in active business in this line of work.

It was predicted at the time of the announcement that the Walker people would prove an unusually strong factor in the electrical field, and this prophecy is borne out by the fact that business has already been offered the company, both from Eastern and Western roads. Judging from recent reports, there appears to be no doubt in the minds of those in any way interested, of the immediate and unqualified success of the new machines. To all who have seen them the general designs are eminently satisfactory, and the rapid progress of the work has called forth the most favorable comments. The closest attention has been paid to mechanical detail. The improvements suggested and already carried out, are considered by experts who recently visited the Walker plants, to be a distinct advance on any existing types of the older companies, in fact this verdict was rendered only a few days ago, by prominent railway men and future purchasers, who visited the company's shops to note the progress of the work.

One especially noticeable feature is the ease and facility with which the work is being done. There have been no unusual delays in assembling the various parts, and fewer annoyances in construction than generally attends the first output.

The "Wheel-type" idea has been followed in the designs for generators, and this plan will prevail throughout. So far it has been impossible to obtain details of construction, as the company's officers are not yet ready to give out specific information.

Within a very short time, however, a full description of the new machines, illustrated with cuts, is promised.

C. & P. MANUFACTURING CO.

The C. & P. Manufacturing Co., of Brooklyn, has been organized under the laws of New York, and will manufacture the well-known C. & P. electrical apparatus for arc, incandescent and alternating lighting. The company will make a specialty of power transmission apparatus. Mr. Churchwood, formerly of the Easton Electric Co., is the electrician of the company, and Mr. Perry, former manager of the same company, is prominently identified with the new concern. Among those interested in the new company are Mr. Davidson, the pump manufacturer, and Simpson Brothers, the well-known iron workers of Brooklyn.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, January 20, 1894.

The Edison Illuminating Company, of Brooklyn, is after some of the street and public building lighting of that city. It put in a bid the other day.

The Schultz Belting Co., of St. Louis, Mr. A. B. Laurence, New York manager, has issued a very neat wall calendar for 1894. A copy of this calender can be had by engineers and superintendents for the asking and a two-cent postage stamp.

The Commercial Cable Co. has issued a leaflet that is unique; it is of such a character that everyone who sees it, is bound to read it through, It contains a few of the amusing comments made by visitors at the company's World's Fair exhibit, touching the apparatus and its operation. It is a really good idea.

The Home Electric Supply Co., 61 Fulton street, city, is carrying a large stock and variety of goods. They are manufacturers of electric bells, burglar alarms, annunciators, and amateur supplies. They are also the sole manufacturers of "The Excelsior" home medical cabinet with graduating dial, for physicians' and and patients' use. Batteries, wires, and a general line of electrical goods are kept in stock.

J. Jones & Son, 39 Vesey street, city, are doing a good trade as importing and manufacturing electricians. They are wholesale dealers in electrical supplies, and are general jobbers. Repairing of all kinds to motors, dynamos, etc., is given prompt and the best of attention, and the firm does wiring for all electrical purposes, from electric light and power to bells. Satisfactory work is always guaranteed. The members of the firm are James Jones, James Jones, Jr., with Ernest A. Lowe as manager.

The Manhattan Electrical Supply Co., 36 Cortlandt street, city, announces in a circular to the trade that after January 30, it will put upon the market telephone receivers, similar to those used by the Bell Telephone Company. The patent on the Bell receiver expires on January 30. It cautions the public, however, against using magneto bells with automatic switches changed by the weight of the telephone receiver, also where the shunt of the generator armature is automatically cut out by turning the crank that revolves the generator. These points are yet controlled by the Bell Telephone Company in patents.

The Thomson-Houston Electric Co , of New York, formerly the East River Electric Light Company, is in the hands of a receiver, the appointment of that functionary being made on January 19. This action was brought at the instance of Henry R. Worthington, the well-known pump manufacturer, on an unsatisfied judgment for $1,576.53. The judgment was secured on November 8, last. The Thomson-Houston Co. claims that it was unable to pay the amount of this and other judgments. The company has a bonded indebtedness of $600,000, secured by mortgage, and has not paid the interest due upon the coupons last September, which amounts to about $18,000.

Mr. J. C. Granger, who has for the past 28 years been treasurer of the E. P. Gleason Manufacturing Co., corner Houston and Mercer streets, city, resigned his position on the first instant. Mr. Granger has formed a co-partnership with Mr. Nichols, the name of the firm being Nichols & Granger, and these two gentlemen will manufacture flexible gas tubing, which is extensively used for diop-lights, elevators, etc. The office and works of Nichols & Granger will be located at the corner of Hudson and Bank streets, city. Mr. Granger was a most zealous worker in the interests of the Gleason company, and gave his duties as treasurer the strictest attention. The company by his departure has lost an important member of its staff. Mr. Granger has the best wishes of a host of friends for success in his new venture.

Mr. F. C. Timpson, agent for the Electrical Engineering and Supply Co , of Syracuse, N. Y., 126 Liberty street, has a large supply store on Thames street, at the rear of the above address. Mr. Timpson carries a large stock of goods of the above named company, for immediate delivery. His stock includes sockets for all systems, rosettes of all kinds, switches, cut-outs, lamps, junction boxes, line equipment and all sorts of specialties for electric lighting. Mr. Timpson understands his business thoroughly, and no one in the trade is better known than he.

The Brooklyn Electric Mfg. Co., 286–290 Graham street, Brooklyn, N. Y., is full of business these days. This company is the manufacturer of quick-break switches, switchboards, panels, cut-outs, etc., making a specialty of switchboards. One of the latest products from this establishment is an elegant white marble board, 6 feet high by 15 feet long. It is fitted with 55 quick-break switches for currents ranging from 25 to 1,000 amperes, the former being single throw, double pole, and the latter double throw, treble pole. They are all finely finished. The board was made for the Tucker Electric Construction Co., 14–20 Whitehall street, New York city, for the new Vanderbilt mansion on Fifth avenue. The Brooklyn Electric Mfg. Co. has been running its factory night and day since the 1st of December, and has doubled the floor space and capacity for the production of its goods.

Edward N. Andrews, manufacturer of machinery and tools, 286 to 290 Graham street, Brooklyn, N. Y., has a complete establishment for the manufacture of his line of goods. He is designer and maker of all kinds of special tools and machinery, and produces duplicate parts of all classes of machines, electrical apparatus and small novelties. He also makes experimental models of inventions, and has every facility for the production of fine work.

J. H. Bunnell & Co., the well-known electrical supply house, 76 Cortlandt street, city, are to be congratulated on the selection by President Cleveland, of their No. 4 Improved Double Deck Medical Battery. The front page of last Sunday's New York *World* has an illustration showing President Cleveland taking a little stimulant for his nerves from one of these machines. The machine gives a more powerful shock than he expected, and, as a consequence, he is executing a pedal movement which is a cross between a Highland Fling and an Irish jig. The caricature is intended to represent the President's dilemma in the Hawaiian situation, but the Bunnell No. 4 Double Decker is doing the work.

W. T. H.

C. & C. MOTOR PLANTS.

The C. & C. Electric Company, 404 Greenwich street, New York city, has just completed the equipment of an entire outfit of electric motors in the Bible House power plant. These motors displace an immense upright belt, running through five stories, also hundreds of feet of subsidiary belting. The motor plant includes eight machines varying from three to twenty-five H. P., belted direct to large Hoe presses. Their introduction has already resulted in the guaranteed saving of 25 per cent. in coal bills, and it is expected that they will ultimately effect a saving of 50 per cent.

The C. & C. Electric Company has also installed a large motor plant at the works of the De Lavalle Separating Company, Poughkeepsie, N.Y. This plant includes seven 5-H. P., C. & C. motors, one in each bog, or section of the building. Each motor is belted direct to its own line of shafting, the motors being placed on elevated platforms, while the starting switches are placed down low so as to be of easy access for starting and stopping.

The manager of the DeLavalle works is astonished at the small amount of power required by the motors to do the work of the establishment There are three other bogs separated from the main building, each having its motor and shafting—there being 10 motors altogether.

The Weston Electrical Instrument Co., 114 to 120 William street, Newark, N. J., has just issued circular and price-list No. 3, descriptive of the Weston standard portable direct-reading voltmeter for alternating and direct current circuits.

Electrical and Street Railway Patents.

Issued Jauuary 16, 1894.

512,687. Electrical Limiting Time-Interval Clamp or Brake. Allan W. Dow, New York, and Thomas R. Griffith, Brooklyn, N. Y. Filed Dec. 27, 1892.

512,706. Apparatus for Electrolytically Treating Raw Hides. Paul R. de F. d'Homy, Chicago, Ill. Filed Feb. 4, 1893.

512,711. Rail-Bond Connector for Electric Railways. Herbert R. Keithley, Chicago, Ill. Filed Feb. 27, 1893.

512,723. Electric Inhaler. Reuben L. Laroom, Fandon, Ill. Filed Sept. 29, 1893.

512,749. Car-Truck. James T. Robinson, and Charles M. Robinson, Altoona, Pa. Filed Oct. 22, 1892.

512,754. Railroad-Signal. Charles Selden, Baltimore, Md. Filed Feb. 1893.

512,757; Process of Making Secondary-Battery Plates. Wm. L. Silvey, Dayton, Ohio. Filed Sept. 12, 1892.

512,769. Machine for Winding Electro-Magnets. Richard Varley, Jr., Englewood, N. J. Filed Apr. 13, 1893.

512,774. Electric-Switch. Ernest T. Warner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Dec. 1, 1891.

512,797. Electric Heater. Wm. C. Bowen, Norwalk, Ohio. Filed Apr. 14, 1893.

512,805. Switchboard. Wm. A. Childs, Englewood, N. J. Filed Oct. 25, 1893.

512,820. Motor-Generator. John C. Henry, Westfield, N. J. Original application filed Apr. 29, 1892. Divided and this application filed Dec. 29, 1892.

512,821 Ceiling Fan-Motor. William Hochhausen, Brooklyn, N. Y. Filed Sept. 4, 1891.

512,823. Secondary Battery. Arthur Hough, San Francisco, Cal. Filed Sept. 14, 1893.

512,836. Life-Saving Device for Tramways. Louis Martineau, La Roche, France. Filed Feb. 28, 1893. Patented in France, Aug. 9, 1892, No. 223,498.

512,843. Dynamo-Electric Machine or Motor. Howard S. Rodgers, Hartford, Conn. Filed Jan. 31, 1893.

512,851. Rail-Joint. Clarence L. Wheeler, Marion, Ind. Filed May 1, 1893.

512,852. Rail-Joint. Clarence L. Wheeler, Marion, Ind. Filed May 1, 1893.

512,853, Commutator and Connection for Dynamos. Gilbert Wilkes, Detroit, Mich., assignor to Hugh McMillan, same place. Filed Oct. 2, 1893.

512,872. Sextuplex Telegraph. Thomas A. Edison, Menlo Park, N. J., assignor to The Western Union Telegraph Company, New York, N. Y. Filed June 2, 1877.

512,880. Electric-Arc Lamp, Charles J. Hartley, Decatur, Ill., assignor of two-thirds to John K. Warren and Bradford K. Durfee, same place. Filed Mar. 31, 1893.

512,888. Trolley-Wire Insulator. Henry H. Luscomb, Hartford, Conn. Filed Oct. 18, 1893.

512,910. Cable-Car Transfer Device. John T. Schweizer, Wilmington, Del., and Jacob H. Burger, Philadelphia, Pa. Filed May 20, 1893.

512,921. Signal-Light for Street-Cars. James A. Trimble, New York, N. Y. Filed Dec. 7, 1892.

512,923. Electric-Railway Trolley. Walter Van Benthuysen, New Orleans, La. Filed Mar. 24, 1893.

512,970. Electric Washing-Machine. John P. Johanson, New York, N. Y. Filed May 9, 1893.

513,006. Continuous-Electric-Current Distributing System. Michael von Dolivo-Dobrowolsky, Berlin, Germany, assignor to the Allgemeine Elektricitats-Gesellschaft, same place. Filed Nov. 24, 1893.

513,014. Cable-Grip. Frank T. Hogg, Brownsville, Pa. Filed Mar. 1, 1893.

513,023. Electric-Railway Trolley. George W. Mackenzie, Beaver, Pa., assignor of two-thirds to Moses B. Sloan and Thomas C. Sloan, same place. Filed April 5, 1893.

513,033. Car-Brake Handle. Austin B. Collett, Lynn, assignor of one-half to John S. Baker, Beverly, Mass. Filed Nov. 10, 1893.

513,052. Electric Search-Light. Charles E. Ongley, New York, N. Y., assignor to George J. Schoeffel, same place. Filed Aug. 22, 1893.

513,051. Apparatus to Control the Strokes of Piston-Rods Electrically. Charles E. Ongley, New York, N. Y., assignor to George J. Schoeffel, same place. Filed Aug. 22, 1893.

513,062. Automatic Regulator for Dynamo-Electric Machines. Elmer A. Sperry, Cleveland, Ohio, and George E. Mills, Ravenswood, Ill. Filed April 25, 1892. Renewed Dec. 7, 1893.

513,065. Automatic Electro-Magnetic Switch. Herbert P. White, Philadelphia, Pa. Filed Sept. 25, 1893.

513.066. Means for Adjusting Electric Lamps. Niels M. Andersen, Omaha, Neb., assignor of one-half to Charles Edward Bickford, same place. Filed April 7, 1893.

ELECTRICAL AGE

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Copy for advertisements or changes therein should be in our hands before the Saturday preceding publication day.

NEW YORK, FEBRUARY 3, 1894.

CONTENTS.

"SURVIVAL OF THE FITTEST."

The fact that a prominent manufacturer of cable railway machinery has recently perfected plans to engage in the manufacture of electric railway apparatus, is full of significance, and any one who can read the signs of the times need not be told the meaning of this move. In a word, it means the acknowledged superiority of electric over all other forms of power for the operation of street railway cars, and, on the other hand, it is an admission that cable railways are not long for this world. It is an unique example of the "survival of the fittest."

HOW TO GET BUSINESS.

We desire to call attention to the page containing notes under the head of "Possible Contracts." In the past these items have led to a great deal of business for contractors and supply dealers, and as our information is the latest obtainable, the value cannot be overestimated. The ELECTRICAL AGE endeavors at all times to do the greatest good to the greatest number. The "Possible Contracts" department alone is worth the price of a yearly subscription to the ELECTRICAL AGE ten times over, and if you want business the ELECTRICAL AGE will tell you where you may get it.

JUDGE RICKS' DECISION.

By far the most important decision in the long list of cases of contention involving the rights to manufacture incandescent lamps in this country was decided on January 23 last, by Judge Ricks in the United States Circuit Court, in Cleveland, Ohio. The specific case in question was that of the Edison General Electric Company against the Buckeye Electric Company, of Cleveland, Ohio. Some months ago the General Electric company asked for a preliminary injunction against the Buckeye company, to restrain the latter from manufacturing lamps, in infringement of the Edison patents.

The Buckeye company made no defence, and the injunction was, consequently, granted. After a thorough investigation, counsel for the Buckeye company came to the conclusion that the Edison lamp patents expired on November 10, 1893, with the expiration of the English patents, and proceeded to secure a dissolution of the injunction against their clients on that ground, with the result as above stated. Judge Ricks holds, substantially, that the correction of the patent made by the patent office, at the request of the Edison company, limiting the American patent to the term of the English patent, constituted a dedication to the public of the remainder of the term of the American patent after the English patent expired. He further holds that the Edison company is estopped, by procuring this correction, from claiming that the American patent runs longer than the English patent.

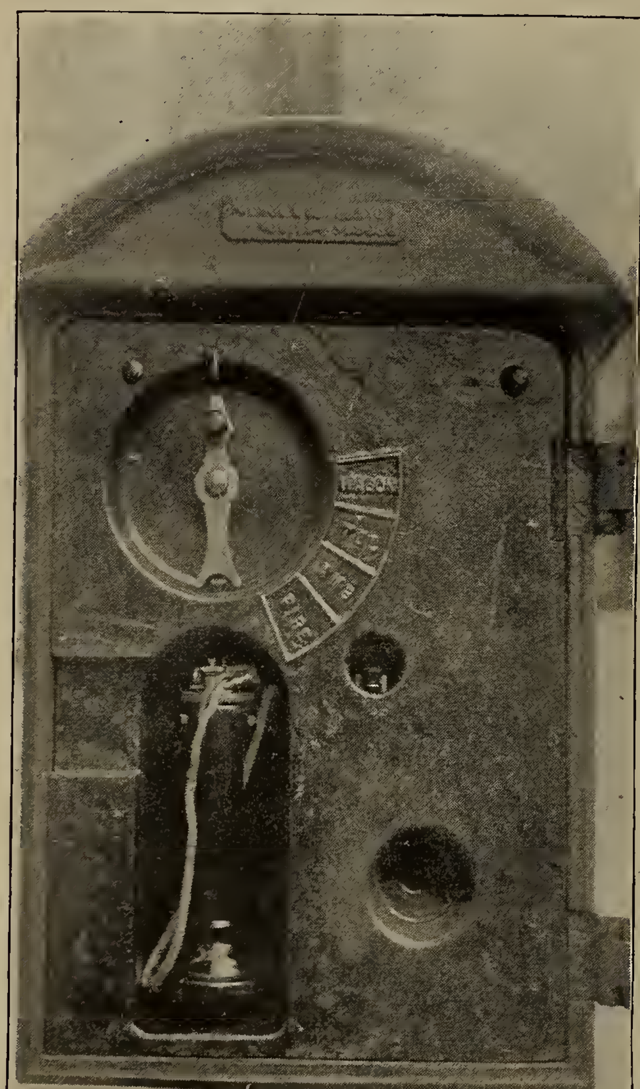
There seems to be some doubt as to the effect of this decision. In some quarters it is claimed that the decision throws the manufacture of lamps open to the public, while, on the other hand, it is claimed that it affects the Buckeye company only. Counsel for the Edison General Electric company state that the decision does not have a direct bearing upon the incandescent lamp issue. The position of the Buckeye company in the matter is an extremely interesting one. The company claims that the ruling of Judge Ricks cannot be appealed from, as there is no decision from which to appeal, and that it cannot be interfered with as long as Judge Ricks' ruling stands. This claim is probably based on the fact that the action of Judge Ricks simply dissolves the injunction against the Buckeye company. The Edison General Electric company, on the other hand, announces its intention to appeal.

Electrical and Allied Industries of New York and Brooklyn.—Part V.

THE BROOKLYN POLICE PATROL TELEGRAPH SYSTEM.

Brooklyn has for the past few years maintained the lead of all other cities in the matter of police signal systems, and, today, it represents the highest development of that method of protecting citizens. The system in use is essentially electric, and consequently quick and efficient, and its perfection is due to the public spirit and enterprise of the superintendent of the system, Mr. F. C. Mason.

The system is perfect in every detail and reliable in actual service, which are essential qualities in a system of this character. While the principles involved are correct, much of the success in practical operation is also traceable to the mechanical perfection in construction of the various pieces of apparatus. The instruments have been made for many years by Mr. Frederick Pearce, formerly of Pearce & Jones, the well-known manufacturers of electrical apparatus and supplies, 77 and 79 John street, New York city, under his patents.



INTERIOR OF AUTOMATIC BOX.

The present system in Brooklyn is not the growth of a day. It is the result of experience of years with the object of attaining a system as nearly perfect as possible. Of the twenty-two police precincts into which the city is divided fifteen are now protected by the Pearce signal system (formerly of Pearce & Jones), and the others are being gradually included. The station-house in each precinct comprises a central office of the signal system, on the average twenty-two signal boxes being scattered throughout each precinct, and the boxes, as a rule, being attached to telegraph or telephone poles, or walls of buildings. Each box contains a call box, similar to those used in the Fire Department service, and a telephone set, consisting of transmitter and receiver. The telephone set is very compactly constructed, in order to meet the requirements in the matter of economy of space.

The boxes are located at both ends of the patrolmen's beats, and each patrolman is required to report to headquarters a number of times while on duty, the operator at headquarters keeping a record of such communications.

In order to communicate with headquarters, all the patrolman has to do is to open the box with the key with which he is provided and pull down the handle of the automatic box setting it to the signal required. The signal received on the register at the station-house corresponds with the number of the box and its special signal, so the operator knows at once whence it comes The telephone can be used at all times when verbal messages require its use.

The station-house in each precinct is connected with police headquarters by telephone, so that that portion of the city covered by the system is practically under instantaneous control of headquarters. In case of the breaking out of a fire, a riot, or the occurrence of an accident, or lawlessness of any nature, the patrolman goes to the nearest signal box and communicates all the facts to his station-house, whence orders are immediately given for the despatch of the necessary relief. Patrol wagons are stationed at the headquarters of those precincts now operating the signal systems, and these are gotten under way with the greatest despatch when necessity demands.

POLICE PATROL.

The wires of the signal system are, as a rule, run on poles; the elevated railway structures, however, supporting a good many of those that follow the line of the road. In the latter case the wires are cabled, no less than 75,000 feet of okonite cable being used.

There are at the present time no less than 250 signal boxes of the Pearce & Jones system in use in the city, and the number is constantly increasing, about two precincts being equipped each year.

The system is well maintained, practical linemen being regularly employed in the service, and under the constant supervision of the superintendent of the telegraphs, Mr. Frank C. Mason; the system is kept in perfect running order and up to the top notch of efficiency.

Mr. Mason is not a stranger to our readers. He is well known in the electrical trades, and is as well liked as he is known. It is mainly to his enterprise and keen foresight as to the necessities of a large city in the matter of a comprehensive and efficient police signal system, that the perfection of the Brooklyn system is due.

Mr. Mason was formerly in the telephone service on Long Island, as superintendent, and it will be remembered by our readers that he was appointed an honorary assistant in the Department of Electricity at the World's Fair—an honor that any man would be proud of.

Our illustrations tell the story in a nutshell. One gives a view of the interior of a signal box.

On his arrival at the box the policeman sends in his signal on the automatic call box, the signals being arranged as follows: "Send patrol wagon," "Send ambulance," "Send fire engine," "Use telephone," and others. Generally, in cases of fire or need for an ambulance, the telephone is used, as by that means the exact location and full particulars can be given. The simplicity of the apparatus in the box is the most noticeable feature, and it is a very important one.

Another illustration shows the apparatus at the precinct headquarters. The register is shown at the right, on which instrument a record is made on tape of all signals received, and by means of the jack-switch shown at the front of the desk, the telephone is cut in at any circuit. The galvanometers at the back of the desk are the watchmen of the various circuits, showing the condition of the lines and batteries at all times.

The apparatus of the system throughout is of the finest character and workmanship, and reflects great credit upon the manufacturer, Mr. Frederick Pearce. Superintendent Mason, and other Brooklyn officials, are exceedingly enthusiastic over the Pearce system. It is both simple in construction and reliable in action.

When we think for a moment how much depends upon the rapid action and movement of police forces in large communities, it is surprising how backward the police departments in most cities are. The Pearce signal system is designed to meet every necessity in police service, and no doubt, it will rapidly extend in use as it becomes more widely known.

RECEIVING APPARATUS AND TELEPHONE AT PRECINCT HEADQUARTERS.

THE NOVAK LAMP CASE.

Touching the reference in our issue of January 20 to Judge Shipman's decision in the Novak lamp case, it should be stated that the Judge stayed the operation of the injunction granted until January 23, or until the first day of the assembling of the Court of Appeals, and "that this stay shall then *ipso facto* terminate unless the defendants have perfected their appeal, and said case is ready to be called for argument in its due order as a preferred case on the calendar of that day, and the defendants then stand ready to argue the same." In this case the stay shall continue until the appeal is decided by the appellate court. The Waring Company, of Manchester, Conn., in conformity with the order of the court, on January 18 filed a bond of $10,000 pending the appeal.

Yacht Lighting.—Mr. James Gordon Bennett's steam yacht, "Namouna," has recently been fitted throughout with electric lights, at Liverpool. Decorative effects as well as utility were aimed at in the installation of the plant. A battery of accumulators is used in connection with the plant, and on the bridge of the ship a powerful search-light is placed.

ELECTRIC LIGHT APPLIANCES.

The accompanying illustrations show some handy devices in the way of electric light appliances that have some novel features, and are commendable for their simplicity and effectiveness in action.

Fig. 1 shows a little device for use in connection with incandescent lamps that is remarkable for its power of reflecting light. It is called the Klein Reflector. It consists of a collar of highly polished aluminum, large enough to pass over the neck of the lamp bulb, and

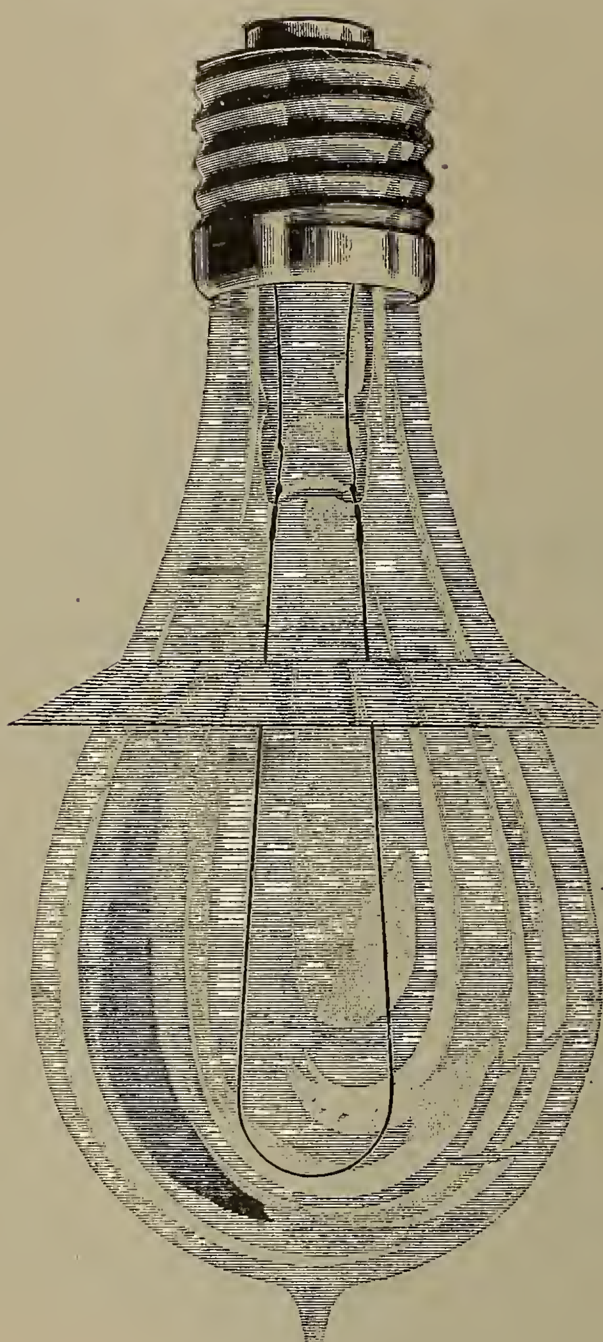


FIG. 1.

rest on the expanding sides of the bulb, about one-third the way down. In the process of manufacture it is formed into several radial faces each acting as a reflector, and thereby increasing the brilliancy of the light thrown downward.

It is said that the light is increased fully 33⅓ per cent. by the use of this simple little device, and yet, as is evident, there is no increase of current to produce this increase of light.

There is nothing unsightly about the reflector; in fact it is hardly noticeable. It is applicable to any make of lamp, and is as easily changed from one lamp to another as it is to change a lamp.

Being of very light material its weight on the bulb is negligible, and while it throws more light downward it does not shade the light behind the lamp.

It is really a very efficient little appliance, and will probably find a large market.

Figs. 2, 3 and 4 show the "Klein" push-button switch in as many different forms. The illustrations are the actual size of the articles represented. Fig. 2 is the regular style of push-button switch for surface work. Two buttons are provided, one black and the other white. By pressing the white button the current is turned "on" and the lights burn, while by pressing the black button the current is cut off and the lights, consequently, go out.

The standard switch is finished in polished brass or

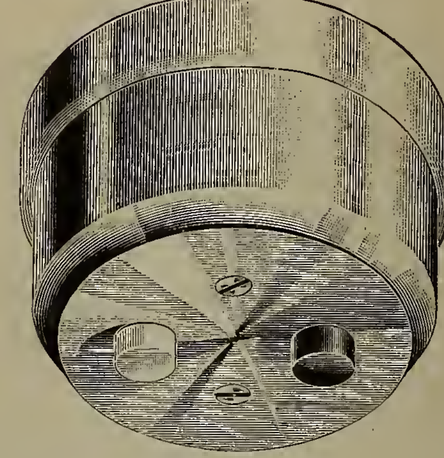


FIG. 2.

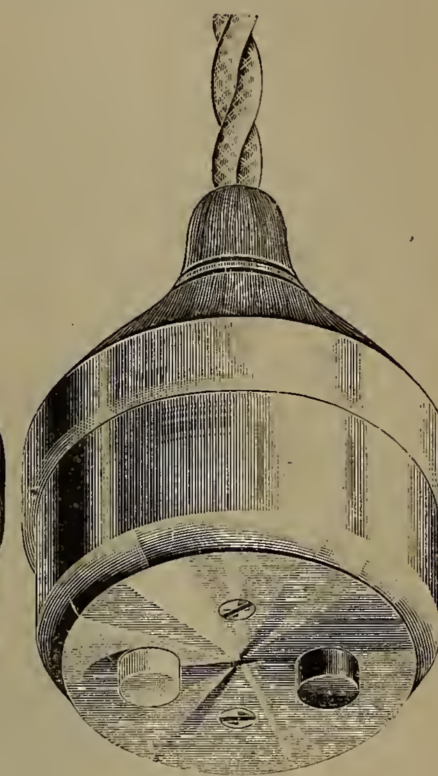


FIG. 3.

gilt, the base being of porcelain. Other styles of finish can be had to order. The switch shown has a capacity of 5 amperes, and is of the single pole pattern.

Fig. 3 represents a pendant or flexible cord switch, the mechanism being the same as that in the switch just described. This form of switch is very convenient for controlling chandeliers, brackets, etc., or rows of ceiling lights. The base through which the cord passes is made of insulating material and highly finished.

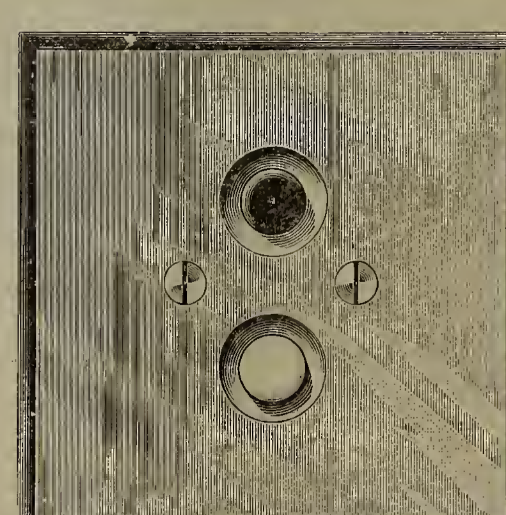


FIG. 4.

Fig. 4 shows the same kind of switch made up in the flush or wall form. A neat, nickel-plated, beveled-edge plate is fastened to the cover of the regular form of switch, the latter being itself set into the wall or partition, only the plate and buttons showing; the switch is entirely closed and perfectly safe to use concealed with a flush plate cover.

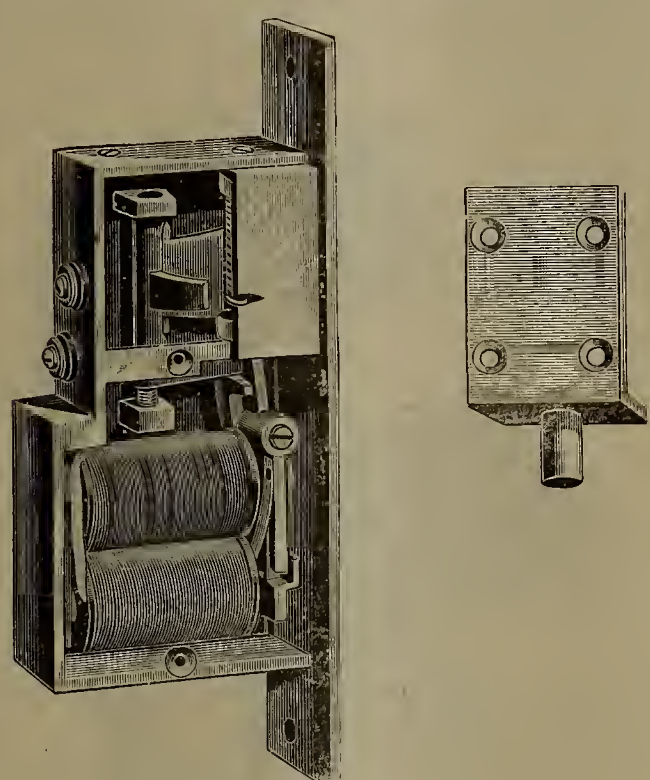
These switches are simple in construction, safe to use, neat in appearance, quick acting and cheap.

All of these appliances are made by the Interior Wiring and Fixture Co., general electrical contractors and manufacturers of gas and electric fixtures, 14 Clinton Place, New York city.

ELECTRIC DOOR OPENER.

An improvement in electric door openers is shown in the device herewith illustrated.

In the construction of this door opener, only two springs are used in the operation of the latch. An "air" spring is provided, which takes the place of the permanent magnets in other electric door openers. This "air" spring holds the latch, after the button has been pushed, until the door is opened; then the catch is released and resets itself in position to be again operated by the push button. This attachment is applied only when called for. In operation it acts thus: When a button is pushed the latch is drawn by the magnets and held in that posi-



SCHNEIDER'S ELECTRIC DOOR OPENER.

tion by means of the catches and springs shown in the illustration, until the door is opened. The opening of the door trips a catch which allows the latch to become reset for another operation.

The face plate of this electric door opener is extra long, so as to fit in the place of other styles of door openers and make neat work of it. This apparatus is very ingeniously gotten up, and is reliable and quick in its action. It is patented and manufactured by John S. Schneider, No. 551 Kouwenhoven street, Astoria, Long Island City, N. Y.

COOLING TRANSFORMERS.

Professor Henry A. Rowland, of Johns Hopkins University, has been granted patents on three methods of cooling parts of electrical apparatus that become heated by hysteresis, Foucault currents, etc. In transformers, he provides thin, flat vessels placed among the laminæ alternately, and passing cooling liquids through the same.

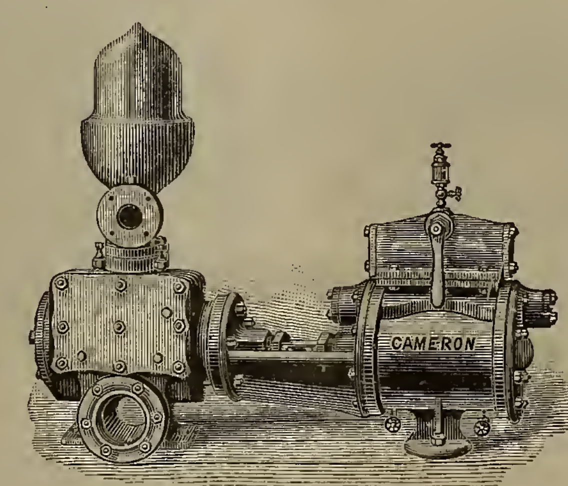
In another form of apparatus he places the transformer in a closed vessel containing a volatile fluid, which, by boiling, carries off the heat developed in the transformer. A condenser is connected at either end of the closed vessel, and provided with means for reducing the pressure therein.

In apparatus generating or carrying large currents, where the conductors are large, he provides a hollow conductor through which the cooling liquid circulates. The hollow conductor begins and terminates at the terminals of the machine, the solid conductors being connected therewith in such a manner as to leave the ends of the hollow conductor free for the inflow and discharge of the liquid.

CAMERON STEAM PUMP.

The Cameron direct-acting steam pump is manufactured in the United States and Europe under patents granted to Mr. A. S. Cameron. Since this pump was placed on the market, it has constantly increased in public favor, and today it stands among the leading pumps.

In some quarters there exists an objection to direct-acting pumps, but the Cameron pump is free from all objectionable features. The motion of the piston at the end of the stroke corresponds with that derived from a crank, turning the centers softly, allowing the valves to seat easily, avoiding concussion and rendering it impossible for the piston to strike the cylinder covers, however rapidly it may be traveling.



CAMERON PUMP.

This pump has few parts and is noted for its simplicity of construction and reliability. It starts at any point of the stroke, and will run at any desired speed. The supply of water may be cut off from the suction-pipe without danger to the pump, and the interior parts of the machine are so arranged that they cannot possibly become deranged.

The valves are readily accessible, and the construction of the valve-chest admits of the use of valves of any material to suit liquids of any temperature or consistency.

These pumps are made for every possible service and of any size required. They are manufactured by the A. S. Cameron Steam Pump Works, foot of East 23d street, New York city.

THE BUCKEYE ELECTRIC CO.

This company is very naturally highly elated over its success in securing a dissolution of the injunction restraining it from manufacturing incandescent lamps. It proposes to "pitch in" at once, now the field is clear and put upon the market its well-known lamps, which have always enjoyed a high reputation for efficiency and long life. The company will be in a position by July to turn out 6,000 lamps a day, and by the end of the year expects to increase its capacity to 10,000 a day. The Buckeye company is receiving congratulations from every direction.

The plant of the Whitehall, N. Y., Electric Light and Power Co. was destroyed by fire, January 21. Loss about $8,000.

GLEASON'S STANDARD SILVERED GLASS REFLECTORS.

The E. P. Gleason Mfg. Co., who is constantly adding to its already large line of appliances for electric lighting, is now in the market with new styles of silvered reflectors as shown in the accompanying illustrations. These reflectors are made in shapes of the staple electric shades, radial fluted and spiral corrugated, richly silvered inside, enameled green outside, greatly increasing the candle power of electric lamps. The reflectors are always bright, cannot tarnish and are easily cleaned. The crowning feature is the price. They are said to be the cheapest and simplest reflectors ever put on the market.

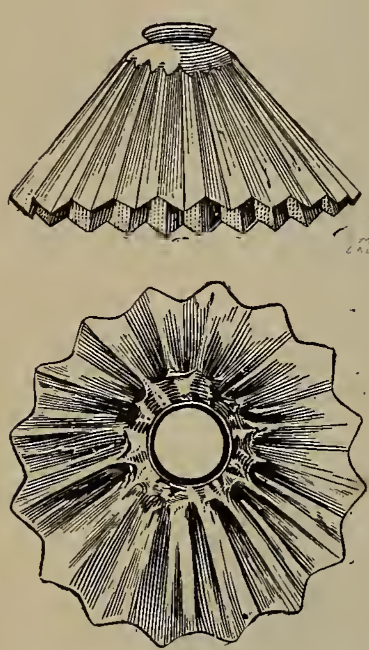


FIG. 1.

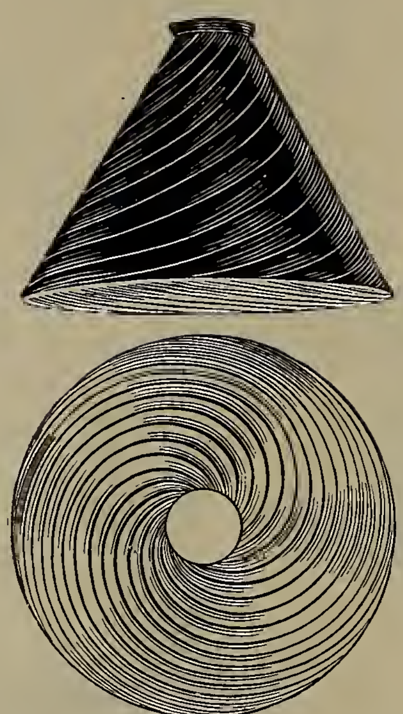


FIG. 3.

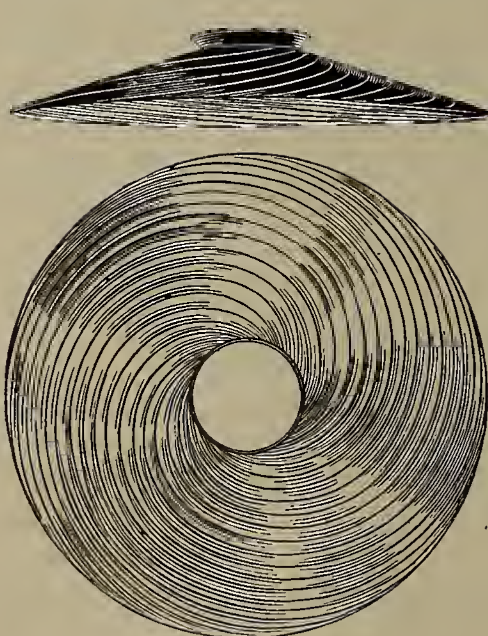


FIG. 2.

Fig. 1, shows top and side views of the Radial Fluted shade; Fig. 2, shows same views of the Flat Spiral Corrugated shade, and Fig. 3, the same of the Deep Spiral Corrugated shade.

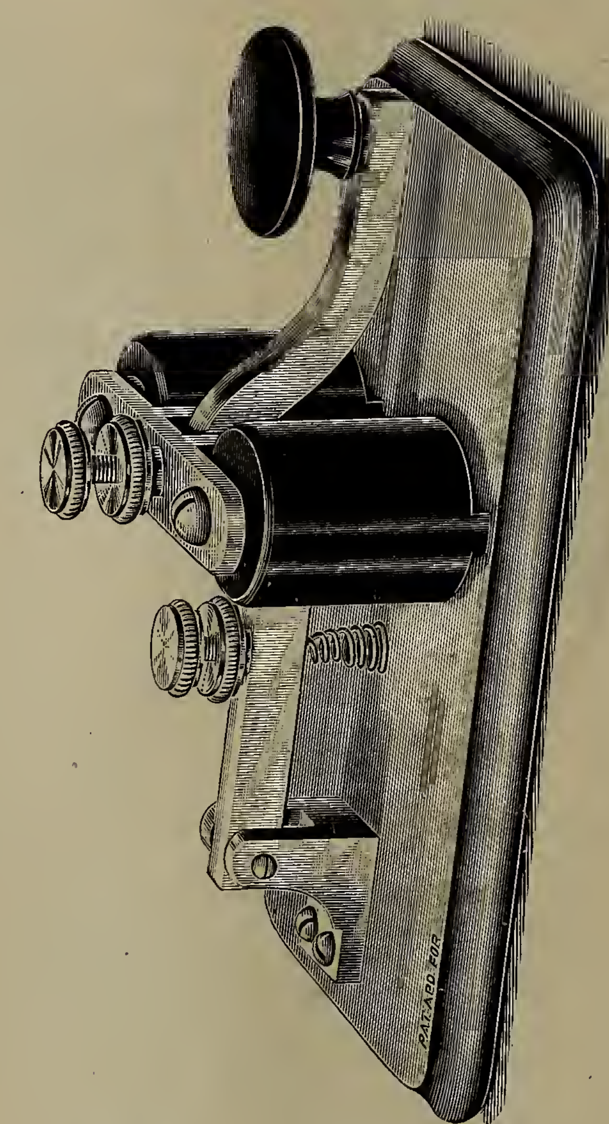
The E. P. Gleason Manufacturing Company, 181–189 Mercer street, New York city, will be glad to send a circular and price list to those who are interested in these goods.

The Lewistown, Pa., Electric Light Company has purchased the gas works in that place for $10,000.

MECHANICAL TELEGRAPH INSTRUMENT.

The instrument illustrated herewith is a very convenient device for the use of those learning telegraphy. It is wholly mechanical in operation, but the results in practice are precisely the same as from an electro-mechanical instrument. The advantage possessed by this instrument is, of course, the absence of battery and wires to look after, and its portability is another great point. The learner can carry the instrument wherever he pleases, having no battery or other accessories to bother with.

The key is exactly like a regular telegraph key in appearance and action, and the sound from the movements of the sounder-lever is as sharp and clear as that from the electrical sounder. The parts are adjustable, to suit the ear and touch of the student, and the instrument is highly finished.



MECHANICAL TELEGRAPH INSTRUMENT.

Any one desiring to learn or practice telegraphy, will find this instrument very useful. It is made and sold by The E. S Greeley & Co., 7 Dey street, New York city, manufacturers and dealers in electrical apparatus and supplies of all kinds.

WILL PROF. ELIHU THOMSON START A NEW COMPANY?

A dispatch from Boston on January 28, to the New York *World*, states that Prof. Elihu Thomson, with a number of other Thomson-Houston people, are taking steps to organize a new electric company to manufacture under his patents, and secure, if possible, the big plant in Lynn, of the General Electric Company.

It is stated that Professor Thomson claims that the

General Electric Company failed to fulfil its part of its contract with him, and, therefore, he is free to act.

It has been common knowledge for a long time that the relations between Professor Thomson and the General Electric Company have been strained, and while such a move as is proposed is full of significance to the electrical trade, it is not altogether surprising that the crisis has been reached. At this writing, the report has not been verified, but it seems to be accepted in the trade as probably correct.

Professor Thomson, according to the information at hand, will take with him several of the old Thomson-Houston people, and Mr. John Pevear, a capitalist of Lynn, is mentioned as the probable president of the new corporation.

The Lynn factories were to have closed down on February 1, for the purpose, it is alleged, of taking an inventory; but it is believed that they will not be opened again. Eighteen months ago, about 4,000 persons were employed at the Lynn factories, but now there are only 500.

The outcome of this threatened separation of Professor Thomson from the General Electric Company will be watched with intense interest by every one in the electrical trades, and should the Professor carry his determination into execution, there will likely be lively times.

TELEPHONE NOTES.

A Canadian journal predicts that after January 30, telephones "will be sold like hats or cigars."

A Philadelphia paper says that the telephone service in that city is "still in its infancy." You'd better wake up, over there!

A bill has been introduced in the Ohio Legislature to regulate telephone rentals. In cities of over 100,000 inhabitants the rental shall not be more than $3 a month and this rate is reduced for smaller places.

Telephone Conversations.—Between 80,000 and 90,000 telephone conversations take place each day in New York city, being an average of 16 conversations for each subscriber. Many subscribers use their telephones from 100 to 200 times daily.

A bill has been introduced into the Massachusetts House providing for the assessment of a tax to the American Bell Telephone Company on all shares of stock in subsidiary companies outside of Massachusetts. It is stated that the parent company owns $22,000,000 worth of such securities.

"A graceful thing for the Bell Telephone Company to do," says the Boston *Post*, "on the date of the expiration of its patent would be to lower its rates to a popular basis." Another graceful thing it might do would be to give all its employés a three months' vacation, with double pay and with a trip to Europe and expenses added.

In the West appears the first case of an opposition telephone company. The Citizens' Telephone Company, of St. Joseph, Mo., has, it is stated, commenced operations. It is using the "Harrison Telephone," and Harrison enthusiasts expect to see their instruments in every residence in the city, so cheap are the rates going to be.

Telephone Exchange Burned.—Fire destroyed the telephone exchange in Louisville, Ky., on January 21. The switchboard, with a capacity of 3,000 wires, was completely destroyed, and General Manager Gifford states that it will require three months to restore the service to the condition it was in prior to the fire. The loss is said to be about $100,000.

Electricity on Canals.—It has been determined to introduce electricity for the propulsion of canal-boats on the Chesapeake and Ohio canal. The plan is to run the boats in tows, the leading boat supplying the motive power. To carry the scheme into effect a company has been organized with a capital of $250,000, in Baltimore, with C. K. Lord, third vice-president of the Baltimore & Ohio R. R., Lloyd Lowndes, H. C. Black, Alexander Shaw and Clarence Lane as incorporators.

Electric Light Investments.—In a paper read by Mr. H. C. Thom, before the recent meeting in Milwaukee of the Northwestern Electrical Association, that gentleman stated that only twenty per cent. of the electric light stations in this country were paying 4½ per cent. He thought electrical investments should pay seven per cent., and advocated higher rates.

The Edison Electric Light Co. has brought suit against the Manufacturers' Club, Spreckels Sugar Refining Co., and the Colonnade Hotel, all of Philadelphia, to enjoin them from using incandescent lamps alleged to contain infringements on the plaintiff's patents.

STREET RAILWAY NEWS.

C. E. Loos & Co, of Chicago, are arranging to build an electric road in Freeport, Ill., to supplant the horse car system.

Electric Extensions —The Preston and Main street mule lines, in St. Louis, were turned into electric roads January 21.

Suit.—The Union Trust Co., of St. Louis, Mo., has brought suit against the Richmond, Ind., Electric Railway Co., on bonds for $212,000, and a receiver has been appointed for the latter company.

Car Sheds Burned.—The car shed and fourteen cars of the Savannah Electric Railway were destroyed by fire on January 18. Loss, about $50,000. Seven of the burned cars were motor cars, the others being trailers. It is thought the fire was of incendiary origin.

Electric Road at Niagara.—The proposed electric railroad between Lewiston and Youngstown near Niagara Falls, it is expected, will be in operation by July 1, of this year. A company with a capital of $75,000 has been organized for the purpose of building the road. The company is required to keep lights burning on its poles within the town limits of Lewiston.

A Committee of the Board of Fire Underwriters, a few days ago, waited upon Mayor Gilroy to protest against any further extension of the trolley system in New York city. They stated that an increase of insurance rates would result from such action. The Mayor assured the committee that they would be given an opportunity to be heard should any extensions be proposed. The only trolley lines in New York city are in the annexed district, North of the Harlem River. There is no trolley road on Manhattan Island.

MR. RICHARDSON'S WILL.

The will of the late Wm. Richardson, of Brooklyn, was admitted to probate a few days ago. It bequeaths all the property of the deceased to the widow. At her death it is to be divided into five equal parts; two to go to the daughter and one to each of the three sons.

The estate is valued at $165,980.

IMPORTANT INCANDESCENT LAMP DECISION.

VICTORY FOR THE BUCKEYE ELECTRIC COMPANY.

Judge Ricks, in the United States Circuit Court for the Northern district of Ohio, on January 23, rendered a decision in the case of the Edison General Electric Company against the Buckeye Electric Company, dissolving the injunction against the latter named company. The Judge declares that, in his opinion, the American patents on the Edison incandescent lamp expired on November 10, 1893, concurrently with the expiration of the English patents of the same device.

The following are the main points of the decision:

STATEMENT OF THE CASE.

This case is now before the Court upon a motion to dissolve the preliminary injunction allowed herein on the 28th day of July, 1893. Said injunction enjoined the defendant from using lamps infringing the second claim of Letters Patent No. 223,898, for the alleged infringement of which the bill of complaint was brought. The motion recites what the record discloses: that the Letters Patent upon which the bill is filed bear date the 27th day of January, 1880, and purport to be for the full term of seventeen years from that date; that after said Letters Patent were issued, and on or about the 15th day of November, 1883, Thomas A. Edison, to whom said Letters Patent were granted, filed with the Commissioner of Patents of the United States a duly verified petition, wherein, among other things, he alleged that while his said application for Letters Patent was pending he applied for and obtained Letters Patent for the same invention in several foreign countries, to-wit:

British Patent, dated November 10, 1879, No. 4,576
Canadian Patent, dated November 17, 1879, No. 10,654
Belgian Patent, dated November 29, 1879, No. 49,884
Italian Patent, dated December 6, 1879; and
French Patent, dated January 20, 1880, No. 133,756

and that no other patents were granted upon his invention in foreign countries before the grant of said United States Patent No. 223,898; and at the time of filing said application for said United States patent, and while the said application was so pending, he was advised that the rules and practice of the office, under the prevailing construction of Section 4,887 of the Revised Statutes of the United States, did not require an applicant to acknowledge during the pendency of his application a foreign patent applied for and granted subsequent to the filing of such application, and that he therefore did not acknowledge the above named foreign patents, and that the United States Letters Patent were granted to him unlimited, for the full term of seventeen years. He further, in said petition, tendered said Letters Patent No. 223,898 to the Commissioner of Patents, and requested that they be corrected so that his said patent should be limited to expire with the date of said foreign patent, referred to in his petition, having the shortest time to run. The said petition of Thomas A. Edison for such correction of his said patent was duly consented to and concurred in in writing by *The Edison Electric Light Company*, to whom the said Edison had assigned the said Letters Patent.

The motion further alleges that the United States Commissioner of Patents, upon the filing and due consideration of said petition, for the correction of said patent, granted the said request, of the said Thomas A. Edison and *The Edison Electric Light Company*, and accepted the surrender of said patent for the purpose of such correction, and corrected said letters patent in accordance with the request made in said petition, and endorsed thereon such correction, wherein and whereby said letters patent were, at the election and request of the said complainants, limited so as to expire at the same time with the foreign patent having the shortest time to run, naming said patents as hereinbefore described, and certified that the proper entries and corrections had been made in the files and records, and that the said amendment was made that the United States patent might conform to the provisions of Section 4,887 of the Revised Statutes.

Said motion further avers that said British patent No. 4,576, dated November 10, 1879, was for the same invention as that for which the said United States letters pa ent aforesaid were granted, and as your petitioners are informed, advised and believe, and therefore allege, was for the term of fourteen years from the said November 10, 1879, and that said British patent No. 4,576 has now expired.

Said motion further avers that the defendant, the said *The Buckeye Electric Company*, was organized for the purpose of manufacturing and selling incandescent lamps in the month of February, 1890, that at the time of its organization it had an authorized capital of $100,000, and its investment at that time was about $25,000; that before said business enterprise was started and said capital invested, the parties interested in the enterprise made diligent examination of the records of the Patent Office with reference to patents pertaining to incandescent electric lamps, and also informed themselves as to the prevailing understanding of the trade and persons engaged in similar enterprises, as to the rights of parties to manufacture incandescent electric lamps, notwithstanding said Letters Patent No. 223,898, and other patents professing to cover the manufacture of incandescent electric lamps at that time, and among other things, ascertained that the Circuit Court of the United States, in case heard by Mr. Justice Bradley, had decided to be invalid a certain patent upon incandescent lamps, known as the Sawyer-Mann Patent, which was considered by the trade and all parties interested as being in all respects as valid as the said Letters Patent No. 223,898, which patent was commented upon and referred to in said case, and that at the time of said ruling the electrical engineers and all parties interested throughout the country, accepted that decision as holding that the public generally were free to make, sell and manufacture incandescent electric lamps in the form now claimed, and subsequently decided to be an infringement of the Letters Patent in the bill of complaint described. And prior to the time that said *The Buckeye Electric Company* engaged in the business there were many other concerns in the United States manufacturing incandescent lamps, among the principal of whom were *The Sawyer-Mann Company*, of New York city; *The Thomson-Houston Company*, of Lynn, Mass.; *The Bernstein Company*, of Boston; *The Sun Beam Incandescent Lamp Company*, of Chicago; *The Perkins Incandescent Lamp Company*, of Manchester, Conn.; *The Brush-Swan Company*, of Cleveland, Ohio, and others; that none of th se companies had ever been sued by the owners of the Edison patent, as called.

Said motion further avers that the defendants, and those interested, also ascertained from such investigation that the particular patent in suit in this case was then believed to have expired by reason of the termination of the Canadian patent covering the same invention, issued on November 17, 1879, it being, as was then understood by the petitioners, the prevailing opinion of the courts that the termination of the Canadian patent, by the decision of the Deputy Commissioner of Patents terminated at the same time as the Edison patent sued upon herein, which had been issued in the United States subsequent to the date of said Canadian patent, and it was the distinct understanding of the defendant at the time said company began business that there was no valid patent outstanding which could in any way interfere with their carrying on the proposed business of manufacturing and selling incandescent electric lamps. And the defendant, in common with other manufacturers throughout the United States, continued business with its said investment of about $25,000, until the summer of 1891, without molestation or threat of interference by anyone claiming the patents were infringed by the defendant; that in the summer of 1891, the defendant, *The Buckeye Electric Company*, having some months before that time discovered and put into practical use a filament superior in every respect to that which was then and is now used by the complainants herein, and had so far increased its business that it became necessary to largely increase its investment. And thereupon further examination was made by the parties interested in the said *Buckeye Electric Company's* enterprise as to the patent of the said Thomas A. Edison, and it appeared from the examination which was then made, for the second time, that said Letters Patent had been, upon the petition of Thomas A. Edison, as hereinbefore described, corrected so that said patent was limited to expire with the aforesaid patents issued by foreign countries having the shortest time to run, and that said patent would expire on the tenth day of November, 1893; that consequently the United States Letters Patent would expire at the same time. And thereupon, and before any ruling had been made by the Circuit Court of the United States sustaining the validity of the said Edison patent, and in full reliance on said petition, and with the concurrence and consent of complainants, as hereinbefore set forth, and upon the certificate of the patent as issued and corrected, limiting its term as aforesaid, the said defendant, for the further purpose of introducing its improved and superior filaments, further increased its investment in said electric light business, so that it now has, and since said summer of 1891 has had, invested in said business and in connection therewith, about the sum of $125,000. The motion avers that said investment was made in good faith, believing that in no event could the United States Letters Patent of the said Thomas A. Edison continue in force longer than November 10, 1893, which said defendant was induced to belive by the action of the said Edison and his associates as hereinbefore recited.

The motion further avers that after the decision of Judge Wallace, hereinbefore referred to, an appeal was at once taken by the parties to said suit, so that the defendant and others in the same line of business continued to manufacture lamps pending said appeal; that shortly thereafter negotiations were opened between the defendant and complainant with a view of completing some arrangement by which a sale or consolidation of interests could be effected; that these negotiations were carried on constantly from about September, 1892, until February, 1893, during which the defendant operated its factory, with the acquiescence, and substantially at the request of said *General Electric Company*, and materially increased its capacity at the suggestion and request of the said *General Electric Company*. These negotiations finally failed, and immediately upon such failure the defendant closed its factory by reason of the ruling of the Circuit Court of Appeals for the Second Circuit, sustaining said claim of the Edison patent, and said factory remained closed until a subsequent decision of Judge Hallet, in the Eastern District of Missouri, in a case in which the Goebel defense to the validity of the Edison patent was presented, and the complainants were refused an injunction. Upon such ruling the defendant opened its factory and continued manufacturing until the decision of Judge Seaman, of Milwaukee, when the defendant again closed its factory; and said motion avers that said defendant has at no time knowingly or wilfully infringed complainants' rights.

By reason of the premises, the defendant avers that said United States Letters Patent No. 223,898, so far as the rights of the defendant to now manufacture lamps is concerned, is no longer in force, said invention having been, by the voluntary act of the owners, as hereinbefore described, dedicated and abandoned to the public; and that by reason of said action the public generally, and especially the defendant, has thus made large investments upon the faith of the expiration of said patent at the date to which its term was so expressly limited by request of the owners thereof, and have now the right to manufacture and use and sell the lamps covered by said patent, and that the complainants, by reason of the acts aforesaid, are estopped to claim any benefits under said patent as against the defendant, since November 10, 1893.

This motion is supported by affidavits of the officers of the defendant, and by most of its directors, each of whom avers the truthfulness of the facts hereinbefore set forth.

The complainants, in reply, file affidavits in which they admit the proceedings in the Patent Office, substantially as set forth in the defendant's motion, but declare with great particularity the circumstances under which said proceedings were taken, alleging and claiming that the same were taken under a mistake of law, and under the advice of eminent counsel. They further deny that the defendant was misled by the negotiations set forth in their motion, and that they in any way impaired their legal rights to insist upon a continuation of the injunction now in force. They further deny that the defendant was misled by reason of complainants' conduct because of the proceedings in the Patent Office, and deny that they are estopped by virtue of those proceedings to insist that their patent is in force for the full term of seventeen years from the date it was issued.

OPINION OF THE COURT.

Ricks, J.:

It will be seen from the foregoing statement of facts that the complainants do not deny the proceedings instituted by them in November, 1883, in the Patent Office, substantially as set forth in the defendant's motion. But they contend that they are not bound by the action of the Patent Office, taken upon their petition, for several reasons; among these, and chiefly:

First: Because the petition for a limitation upon the duration of their patent, filed by the complainants, and the proceedings in support thereof on their part, were taken under a mistake as to the law, and as to their rights under the patent, and that this error was corrected as soon as possible after discovery.

Second: Because the action and orders of the Patent Office were without authority of law, of no force and validity, and therefore did not in any way affect the patent.

(*To be continued*).

THE LOVE ELECTRIC RAILWAY.

Mr. M. D. Law, who has charge of the electric railroad in Washington, which is being operated on the Love system, informs us that there has not been five minutes delay since the road was put into operation, last March, that could be attributed to the failure of insulation or the system. The cars have run through storms and snow without any trouble, while under the same conditions the overhead trolley lines have on several occasions been compelled to shut down. The Love system is an underground conduit system.

Copper wire is approximately 1¼ times the weight of iron wire of the same size.

POSSIBLE CONTRACTS.

Charles Corliss, of Haverhill, Mass., is at the head of a project to build a double track electric street railway from Haverhill to Nashua, N. H. The road will be about twenty miles long.

Albert Spiers has secured a franchise for the establishing of an incandescent electric light plant at St. Charles, Mo.

Petitions are being circulated in Philadelphia, Pa., for the city to establish a plant for the generation and sale of electricity at the lowest possible price.

A bill has been introduced in the Nova Scotia legislature at Halifax, N. S., for the incorporation of the Nova Scotia General Electric Co.

The Middletown-Goshen Traction Co., Middletown, N. Y., has applied for permission to construct a road through the town of Goshen.

The Worcester and Millbury Street Railway Co., Worcester, Mass., has petitioned for leave to increase its capital stock in order to extend its lines to Northbridge, via Sutton and Grafton. Address Thomas Robinson, treasurer, Dedham, Mass.

It is proposed to extend the electric light system from New Garden, Pa., to Landenberg, Pa.

It is proposed to establish a $10,000 electric light plant in Dawson, Ga.

A $45,000 electric light plant is to be put in by the city of Kalamazoo, Mich.

An electric railway between Mount Holly and Burlington, N. J., is proposed. A company has been incorporated for the purpose of building the road.

There is talk of establishing an electric light plant at one of the water powers at Grafton, Wis., to light that place, Cedarburg and neighboring towns.

NEW CORPORATIONS.

The New Sharon Electric Light and Power Co., of New Sharon, Iowa, has filed articles of incorporation with a capital of $1,200.

The Fisher Electrical Manufacturing Co., of Detroit, Mich., has just been organized, with a capital of $50,000.

Mr. Howard T. Marshall, of East Bridgewater, Mass., is taking steps for the organization of an electric light plant for that place.

The Chicago Electric Company. Chicago, Ill., with a capital of $1,000,000, was organized January 19. Incorporators: Walter M. Lenhart, John W. Alderman and E. S. Norton.

January 24.—The Metropolitan Electric Equipment Company, of New York City; capital, $20,000; directors, Maurice T. Ward and Darius Colomboni, New York City, and James F. Hughes, Brooklyn.

The Central Electric Service Company, Milwaukee, Wis., capital, $100,000. Incorporators: Francis Hinton, W. E. Powell and W. D. Van Dyke.

January 24.—The Atchison Telephone Company, Atchison, Kan., capital $100,000, has applied for a charter. The directors are B. P. Wagener, David Kelso and Elizabeth Ingalls of Atchison, W. G. Decelle, St. Paul, and O. H. Simonds, Duluth. The purpose of the company is to put in a telephone line in connection with a new street railway and electric light enterprise.

The Burlington County Electric Co., Burlington, N. J., to build an electric road between Burlington and Mount Holly. Capital, $125,000. Incorporators: Jacob F. Burrows, James L. Greib and William L. Esler, of Philadelphia; S. H. Morrison, of Camden, and Robert B. Esler, Jr., of Ardmore, Pa.

The Braddock and Homestead Street Railway Co., of Pittsburg, Pa. Officers: President, C. Jutte, Pittsburg; directors, W. C. Jutte, E. K Morse, C. M. Buchanon, George W Theis and C. Jutte, Pittsburg.

The People's Light and Power Co., of Newark, N. J. Capital, $2,000,000. The incorporators are: James K. Corbiere, Caldwell; Joseph L. Munn, East Orange; James E. Reynolds, East Orange; Elisha B. Gaddis, Newark, and Thomas A. Nevins, Orange.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, January 27, 1894.

J. G. White & Co., 29 Broadway, city, the well-known electric railway contractors, have secured the contract for the electrical equipment of the Edmonston avenue and Monument street lines of the Baltimore Traction Co., Baltimore, Md. This firm built all of the electric lines for this company.

Mr. William S. Barstow, of the Edison Electric Illuminating Co., Brooklyn, on the night of February 2, delivered a lecture before the Department of Electricity, of the Brooklyn Institute of Arts and Sciences. His subject was "The Electrical Stations of the Edison Electric Illuminating Company in Brooklyn."

The G. H. Wise Electric Co., 199 Fifth avenue, Brooklyn, contracts for electric wiring in all its branches, and makes a specialty of wiring houses and churches for light. The company installs electric bells, annunciators, etc., and gives prompt attention to work in Brooklyn, New York and New Jersey.

Mr. C. D. Bernsee, Vanderbilt building, representative of the Eco Magneto Watchman's Clock Co., has recently closed several orders for this apparatus. The orders include 75 stations for the Singer Mfg. Co., South Bend, Ind.; 40 stations for the Metropolitan Opera House, New York; 50 stations for the big Baltimore factory of Marburg Bros., the tobacconists, and 50 stations for the Brooklyn Cooperage Co. Mr. Bernsee is securing orders on most favorable terms.

Thomas L. Fowler & Co., dealers in metals, brass and copper, 55 Fulton street, city, report a great improvement in business. They deal in sheet copper, brass and copper wire, seamless brass and copper tubing, silicon bronze wire, aluminum and aluminum alloys, and insulated wires for electrical purposes. They are also the Eastern agents for the Detroit Copper and Brass Rolling Mills, Detroit, Mich.

Mr. Gilbert G. McDuff, who is well known in the electrical trades, is general business manager of the American Electrical Publishing Co., 136 Liberty street. The new enterprise is in good hands.

Mr. E. Durant has resigned his position with Frederick Pearce, 79 John street, which he has held for the past three and a half years. Mr. Durant will hereafter be found with H. Ockershausen, 103 East 9th street, city.

The National Conduit Co., Times Building, city, is busy installing 100,000 feet of conduit in Worcester, Mass. The company has just closed a contract with the Philadelphia Traction Company for over 2,000,000 feet of conduit, in which to run feeder wires. This is an additional contract, the former one being for the same amount of conduit. The National Company ran its factory night and day last year to keep up with the orders. Six thousand feet a day was turned out. This speaks well for this system.

W. H. McKinlock, President of the Metropolitan Electric Co., of Chicago, was met by the writer a few days ago in the office of the Standard Paint Company, 2 Liberty street, city. He informed me that he had just closed a contract with the Standard Paint Co. to exclusively handle the latter's products in the West. His house will carry a complete and large stock of P. & B. products for immediate delivery, and he had just given Mr. F. S. De Ronde his first order for stock. Mr. De Ronde, the Standard Paint Co.'s efficient salesman, is to be congratulated on his success in carrying this contract through. The demand for P. & B. goods is immense. Electrical houses are using thousands of barrels annually. Orders for 500 barrels for P. & B. Compound are considered medium sized orders nowadays, so great is the output.

Mr. F. W. Brigham, of the Atlantic Covering Co., 220 Devonshire street, Boston, manufacturer of magnet wires, etc., is also agent for the Paranite rubber and insulated wires and cables, made by the Indiana Rubber and Insulated Wire Co. Mr. Brigham makes his New York headquarters at Stanley & Patterson's, 32 Frankfort street, this city, the well-known electrical supply house, where he keeps on hand a large stock of the goods above referred to for immediate shipment. These goods are meeting with great popular favor. W. T. H.

CHEAP BOOKS.

We have a few valuable books which we will sell at a great reduction. Order at once, as the stock is rapidly being sold out. Make your selection, remit the price given and we will fill your order by first return mail.

Evolution of the Incandescent Lamp, By F. L. Pope	$0.80
Houston's Dictionary of Electrical Terms and Phrases. First Edition	2.00
A Practical Treatise of the Incandescent Lamp. By Randall	.40
A. B. C. of Electricity. By Meadowcroft	.40
Electric Light Installations. By Solomon	.80
How to Make Electric Batteries at Home. By Trevert. (Paper)	.10
Telegraphic Apparatus. By Terry & Finn	.75
Experimental Electricity. By Trevert	.75
Electro Plating. By Trevert	.40
Everybody's Handbook of Electricity. By Trevert. (Paper.)	.15
Puck's Girdle. (Sketches)	.10
Nellie Harland. A Railroad Romance	.10

The Shultz Belting Co., St. Louis, Mo., has just received an order from England for 2,800 feet of belting, and one from Russia for 15,000 feet. The company reports trade looking up, and the outlook for business is fair. Orders are coming in freely.

PATENTS EXPIRED JANUARY 23, 1894.

186,453. Electro-magnetic Telegraph Apparatus. Robert K. Boyle, New York, N. Y. [Filed June 6, 1876.]

186,467. Electric Train-Signals. L L. Ferris, New York, N. Y. [Filed Dec. 28, 1876.]

186,545. Fire-Alarm-Telegraph Bell Strikers. William Donaldson, Cincinnati, Ohio, assignor to F. Millward, Trustee, same place. [Filed Oct. 14, 1876.]

186,518. Telegraphic Alarm and Signal Apparatus. T. A. Edison, Menlo Park, N. J., assignor to the Domestic Telegraph Co, of New York. [Filed May 18, 1876.]

186,553. Electric Thermostats. E. J. Frost, Philadelphia, Pa. [Filed Dec. 22, 1876.]

186,572. Electric Railroad Signals. J. D. Hughson, Prairie City, Ill., assignor to himself and G. W. Hamilton, same place. [Filed July 11, 1876.]

186,642. Electric Motors. D. Ward, Binghamton, N. Y. [Filed July 13, 1876.]

Electrical and Street Railway Patents.

Issued January 23, 1894.

513,076. Trolley Wheel. George C. Bourdereaux, Peoria, Ill. Filed Jan. 31, 1893.

513,095. Phonograph. Thomas A. Edison, Llewellyn Park, N. J. Filed Dec. 27, 1889.

513,109. Electrical Radiator. Walter D. Hough and Elmer Z. Burns, Niagara Falls, N. Y. Filed Jan. 9, 1893.

513,111. Electric-Arc Lamp. William Jandus, Cleveland, Ohio, assignor of one-half to John B. Barton, same place. Filed Oct. 22, 1892.

513,112. Gas and Electric Coupling. William J. Kelly, Boston, Mass. Filed Sept. 19, 1893.

513,113. Electric-Light Fixture for Music-Stands William J. Kelly, Boston, Mass. Filed Sept. 19, 1893.

513,122. Electric Safety Device for Elevators. Robert W. Magrane, Brooklyn, N. Y. Filed Mar. 17, 1892.

513,126. Rheostat. Wynn Meredith, Aurora, Ill. Filed Apr. 20, 1892.

513,134. Electric Elevator. Norton P. Otis, Yonkers, assignor to the Otis Brothers & Company, New York, N. Y. Filed June 25, 1890.

513,181. Microphone. Albin Gröper, Dusseldorf, Germany. Filed Jan. 14, 1893.

513,213. Electric-Motor Controlling Device. Jere E. Stanton, Boston, Mass. Filed June 19, 1893.

513,219. Electric Bell. Charles Turnbull, Jr., North Shields, England. Filed July 24, 1893.

513,220. Electric Bell. Charles Turnbull, Jr., North Shields, England. Filed Nov. 11, 1893.

513,226. Motor-Support for Motor Trucks. Walter S. Adams, Philadelphia, Pa., assignor to John A. Brill, same place. Original application filed Nov. 12, 1891. Divided and this application filed Oct. 10, 1893.

513,230. Track-Sweeper for Railways. George M. Brill, Philadelphia, Pa. Filed Mar. 25, 1893.

513,245. Secondary Battery. Evelyn Paget and Leonard Paget, New York, N. Y. Filed Feb. 9, 1893.

513,250. Electric-Light Cut-off. Joseph B. Stewart, Haverstraw, N. Y. Filed June 21, 1893.

513,251. Electro-Mechanical Gong. Nathan H. Suren, New York, N. Y., assignor to The Gamewell Fire Alarm Telegraph Co. same place. Filed Oct. 11, 1893.

513,259. Automatic Electric Stop-Motion for Knitting-Machines. Jules Buchel, New Orleans, La. Filed Mar. 18, 1893.

513,262. Electrical Time Signaling Apparatus. James H. Gerry, Brooklyn, assignor to the Self-Winding Clock Co., New York, N. Y. Filed Mar. 6, 1893.

513,264. Electric Meter. John C. Henry, New York, N. Y. Filed Dec. 24, 1891.

513,270. Process of and Apparatus for Melting Metals by Means of Electricity. August F. W. Kreinsen, Hamburg, Germany. Filed Sept. 28, 1892.

513,283. Grip for Cable-Cars. William H. Russell, Vancouver, Canada. Filed Sept. 23, 1893.

513,294. Electrical Apparatus for Firing Submarine Mines. Giulio Bertolini, Venice, Italy. Filed Apr. 6, 1892. Patented in Italy Sept. 22, 1891. No. 30,304.

513,299. Coin-Operated Telephone-Switch. Charles F. Brown, Yarmouth, Canada. Filed Apr. 29, 1893.

513,300. Electric Gas-Lighter. Winsor L. Brown, San Francisco, Cal. Filed June 22, 1893.

513,305. Telephone-Transmitter. Frank R. Colvin, New York, N. Y. Filed Oct. 10, 1893.

513,345. Electric Call-Bell for Pneumatic Tubes. Leopold Strouse, Baltimore, Md. Filed Apr. 6, 1893.

513,347. Magneto-Electric Machine. Horace H. Taylor, Los Angeles, Cal., assignor of one-half to George W. Mitchell, same place. Filed Mar. 15, 1893.

513,349. Means for Neutralizing Self-Induction in Alternating Circuits. Elihu Thomson and Edwin W. Rice, Jr., Swampscott, Mass., assignors to the General Electric Company, of New York. Filed Sept. 1, 1893.

513,350. Automatic Rheostat. Burton C. Van Emon, San Francisco, Cal., assignor to the Electrical Engineering Company, same place. Filed Apr. 4, 1893.

513,352. Annunciator System. Alonzo L. Vogt, Delaware, Ohio, assignor to himself and Edwin G. Lybrand, same place. Filed Mar. 8, 1893.

513,364. Apparatus for Registering Telephone-Calls. Ludwig Kahn, Hamburg, Germany. Filed Mar. 2, 1893.

513,370. Method of and Apparatus for Preventing Phase-Displacement in Alternating Circuits. Charles P. Steinmetz, Lynn, assignor to the General Electric Company, Boston, Mass. Filed Sept. 9, 1893.

513,391. Electric Meter. Charles Gudgell, Independence, Mo. Filed June 21, 1892.

513,401. Electric Motor for Street-Cars. Benjamin G. Lamme, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, same place. Filed Mar. 27, 1893.

513,420. Method of Cooling the Iron of Transformers. Henry A. Rowland, Baltimore, Md. Filed Feb. 9, 1893.

513,421. Method of Cooling Transformers. Henry A. Rowland, Baltimore, Md. Filed Feb. 8, 1893.

513,422. Means for Cooling Electric Conductors. Henry A. Rowland, Baltimore, Md. Filed Feb. 14, 1893.

513,425. Self-Induction Coil. Charles F. Scott, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, same place. Filed Nov. 25, 1892.

513,426. Span-Wire for Overhead Electric Railways. Sidney H. Short, Cleveland, Ohio, assignor to the Short Electric Railway Company, same place. Filed April 1, 1890.

513,440. Supply System for Electric Railways. Henry S. Pruyn, Hoosick Falls, N. Y., assignor to James S. Gibbs, Chicago, Ill. Filed Sept. 16, 1893.

513,457. Resistance Coil. Harry P. Davis, Pittsburg, Pa., assignor to the Westinghouse Electric and Manufacturing Company, same place. Filed Apr. 22, 1893.

513,459. Dynamo-Electric machine. George F. Dieckmann, Chicago, Ill., assignor to the Dieckmann Electrical Company, same place. Filed Dec. 23, 1892. Renewed Dec. 15, 1893.

513,460. Commutator for Dynamo-Electric Machines. Harry L. Fee, New Orleans, La. Filed July 26, 1893.

513,466. Electrical Means for Propelling Canal Boats. Joseph Sachs, New York, N. Y. Filed Feb. 15, 1893.

513,469. Electric Clock System. James H. Gerry and Frederick M. Schmidt, Brooklyn, assignors to the Self-Winding Clock Company, New York, N. Y. Filed May 16, 1893.

ELECTRICAL AGE

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NEW YORK, FEBRUARY 10, 1894.

CONTENTS.

HOW IT FEELS.

How do you feel since you became absolute possessor of a telephone receiver?

PROF. THOMSON'S DENIAL.

The story printed in a New York daily paper a few days ago, and referred to in the last issue of the ELECTRICAL AGE, regarding the probable organization of a new electric company in Lynn, Mass., with Prof. Elihu Thomson at the head, turns out to be a mere vaporing. Prof. Thomson is reported to have been surprised when he learned through the newspapers what he was going to do, when, in fact, he had never thought of the matter before. Daily newspaper reporters make men do queer things, sometimes. The story, however, was undoubtedly sent out for a purpose, but Prof Thomson, it seems, was entirely innocent.

THE BUCKEYE LAMP CASE.

We conclude in this issue Judge Rick's decision in the Buckeye Lamp case. This decision marks a new era in this remarkable controversy, and everybody is now on the expectancy. What will be the next development? is the universal question.

THE WASHINGTON CONVENTION.

The convention of the National Electric Light Association, which will be held in Washington, takes place on February 27 and 28, and March 1, and not February 28, March 1 and 2, as reported. As the time for the convention draws nigh interest grows. On another page we give a partial list of the papers to be read at the meetings. The character of the papers announced shows the constant tendency towards practical things in discussions. Electric light men do not want any theoretical considerations at their business conventions; what they want to know is, how to give the best service for the least outlay.

"AN OUNCE OF PREVENTION" ETC.

Our attention has recently been directed to the number of instances where electric light stations have been destroyed by fire and, in consequence, whole towns or large sections have been deprived of light for an indefinite period. The question naturally arises, "is there no way to avoid the results of such disasters?" Obviously a spare, duplicate plant would meet the case; but duplicate plants are too expensive to install and maintain for emergencies, so the remedy must be looked for in some other direction. Is it possible to prevent fires in electric light stations? It is, we think, if stations are constructed and maintained properly. The remedy, therefore, would seem to be in avoiding the cause. Accidental fires will occur sometimes in spite of every precaution, but where every precaution is taken fires are of extremely rare occurrence. It is a very serious matter to deprive the streets and stores of a community of light, and the managers of electric light stations should make every provision against such a misfortune. The destruction of a station by fire means loss of light to consumers and revenue to the company, it may be, for several days and nights, at least; whereas, if a little more money had been expended in the first place in an effort to make the station fire-proof as far as possible, disaster certainly would be averted. Electric light companies, whether in small or large communities, should give this subject closer attention, if they would prosper.

Electrical and Allied Industries of New York and Brooklyn.—Part VI.

PERFORATED ELECTRIC LEATHER BELTING.

HON C. A. SCHIEREN.

The idea of perforating leather belting when run at high speed, to prevent air-cushions from forming between belt and pulley, was first brought out by Chas. A. Schieren & Co. Hon. Chas. A. Schieren was granted a patent for this invention on May 24, 1888, and it is considered by practical electrical engineers to be one of the most important improvements in the manufacture of belting.

These belts have been thoroughly tested and have been found to run looser, with less strain on the bearings, with less oil, and with less noise, it is claimed, than any other belts in the market. They are used in street railway and electric light plants in every city and town in the United States, and in the principal cities, New York, Chicago, Philadelphia, Brooklyn, Boston, Baltimore, St. Louis and Washington, the great majority of belts used for electrical purposes are of the Perforated Electric brand.

Fig. 1 of our illustrations shows a Perforated Electric Belt running a dynamo at the station of the Consolidated Gas and Electric Company, Batavia, N. Y. It will be noticed that it runs slack, which is much less wearing on the machinery.

An interesting view is given in Fig. 2. The Perforated Electric Belt shown in this illustration is 3 ply, 72 inches (6 feet) wide, and 126.9 feet in length. It was made by C. A. Schieren & Co. for the Hudson County Electric Co., of Hoboken, N. J. A fair idea of the size of this enormous belt may be had by comparison with the height of the man.

Our other illustration, Fig. 3, gives views of machines, etc., used by the firm in the manufacture of Perforated Electric Belts. No. 12 is a view of the riveting and finishing department in C. A. Schieren & Co.'s factory. The perforating machine is shown in the middle distance perforating a belt. No. 13 is a waxed-thread sewing machine. No. 14 shows the endless wire screw machine, and No. 15 represents the machine for winding up belts.

C. A. Schieren & Co. use the heart, or the most solid

FIG. 2.

part of pure oak tanned leather in the manufacture of their belting. The leather receives a special coat of dressing, which completely fills the pores and adds much to its strength. The layers of leather are bound together by patent wire screw fastenings, leaving smooth surfaces, so that the belt may be run on either side.

C. A. Schieren & Co.'s offices are at 47 Ferry st., New York city; agencies in Philadelphia, Boston and Chicago.

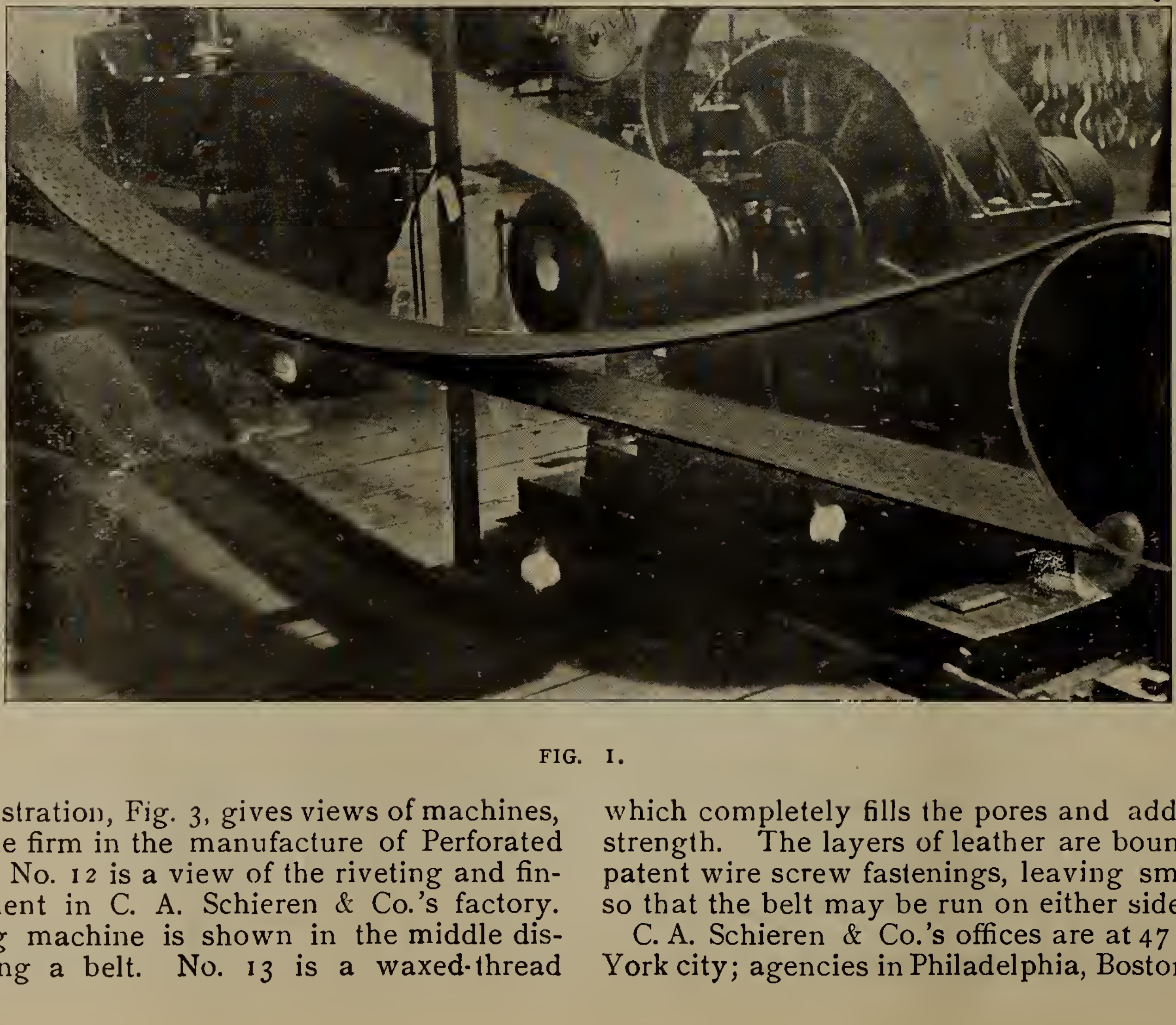


FIG. 1.

ESSICK PAGE PRINTING TELEGRAPH.

The Essick Page Printing Telegraph System has recently been placed before the public by the Union Telegraph and News Company, No. 1 Broadway, New York city, which controls the system.

This system is practically an electrical typewriter—the transmission of messages being accomplished on a keyboard similar to that of a typewriter, while the message is received at the distant office automatically, and printed in page form. The paper on which messages are received is 4¾ inches wide (about the width of note paper), and is in a continuous roll, the messages being torn off as required.

These instruments can be attached to any telegraph line, and the system takes less battery than is required to work a single wire on the Morse system. Any one who can spell can easily learn to send messages—in fact, it is as easy to learn as operating a typewriter.

The instruments are worked in series, and a line of any length, with intermediate offices, can be worked on this system as accurately as on any other.

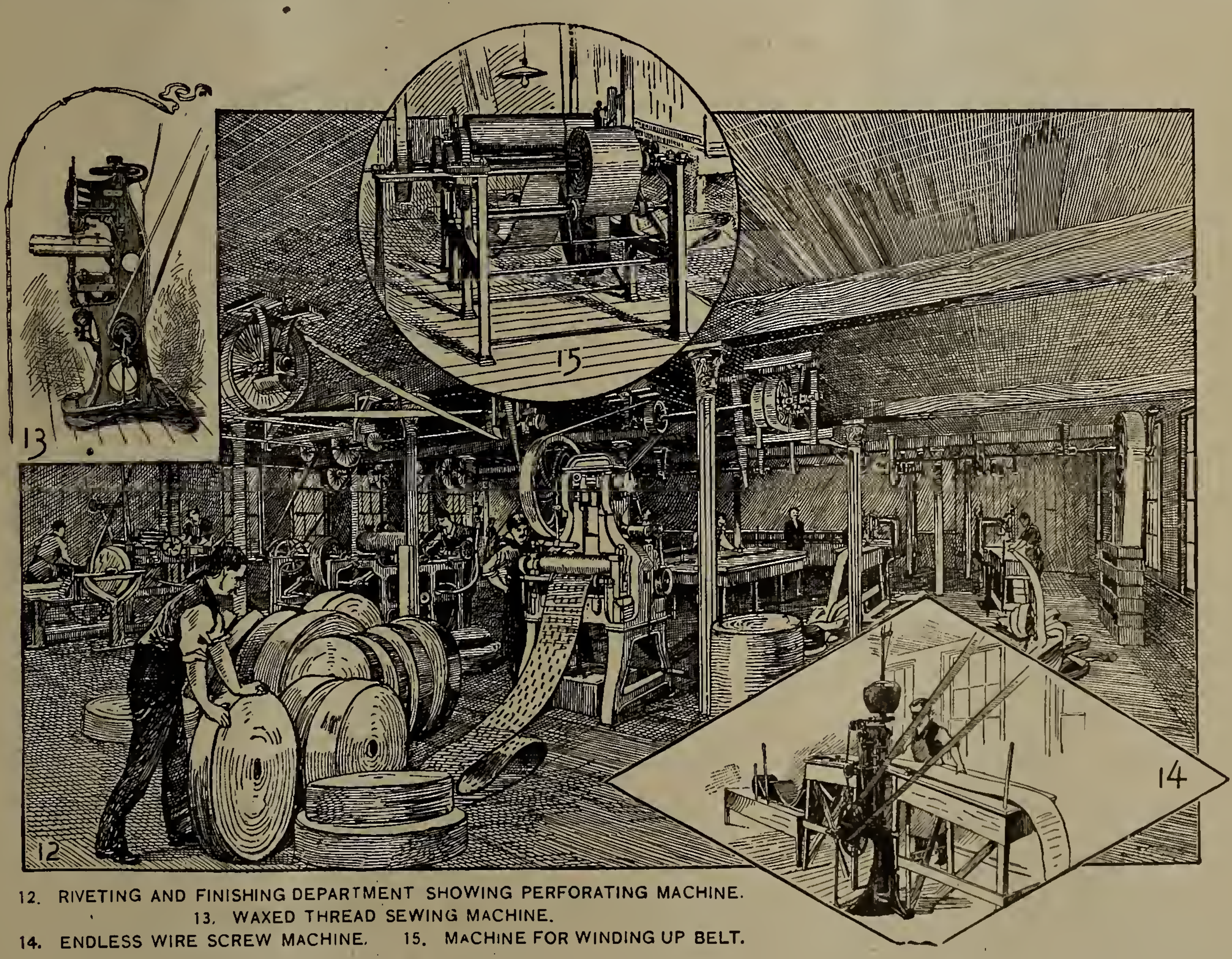
As the messages are transmitted they are also printed on the home receiving instrument, thereby insuring accuracy. In case of error the mistake can positively be traced to the person making it. No attendance is necessary at the receiving station, as the receiving instruments are controlled entirely by the instrument from which messages are being transmitted. The instruments work synchronously, and are consequently always in adjustment.

For private lines the system has no equal, and for railroad lines its importance is obvious. Frequently the operator at small railroad stations is called away by other duties just at the moment when the train despatcher may desire to send train orders. It can be easily understood how an accident could occur under these circumstances, but with offices equipped on the Essick system, the order is received and printed whether the operator is present or not.

ESSICK PAGE PRINTING TELEGRAPH.

As no skilled labor is necessary to operate the instruments a railroad company having its offices equipped on this system would not be at the mercy of strikers in case of a strike. All instruments on the line work simultaneously, and they are about as rapid as the Morse system and far more accurate, as errors can be detected at once and traced to their source.

This system is unequalled for quick and accurate communication between office and factory, house and office, or between any two or more stations on a private



12. RIVETING AND FINISHING DEPARTMENT SHOWING PERFORATING MACHINE.
13. WAXED THREAD SEWING MACHINE.
14. ENDLESS WIRE SCREW MACHINE. 15. MACHINE FOR WINDING UP BELT.

FIG. 3.

line. It is always ready for operation, and can be used on long or short lines equally as well.

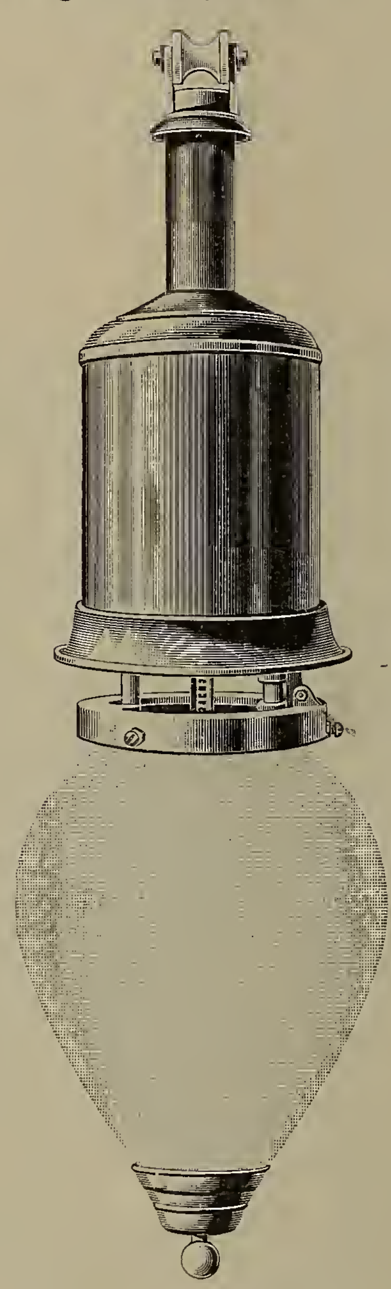
The Kiernan News Agency of New York city distributes its news on this system, each customer's office being provided with a "page" receiving instrument in place of the old "ticker."

The system seems to fill a long-felt need for something of the sort, and no doubt the company will have its hands full for a long while to come in filling orders. Mr. Edward S. Fitch is the general agent, with office at No. 1 Broadway.

ALTERNATING ARC LAMP.

The great success achieved by the "Ward" arc lamps for direct incandescent circuits, naturally turned the attention of the makers of these lamps to the problem of designing an arc lamp for alternating circuits. That they solved the problem is evident from the fact that their lamp of this class is doing fine work and is building up a big reputation.

These alternating arc lamps are used most economically on alternating incandescent circuits, where there is no energy consumed by resistance, which is used simply to take up the excess voltage. They burn perfectly steady, and when used on 30-volt circuits require no resistance; on 50 or 52 volt circuits, however, it is necessary to interpose a resistance or choke coil.



ALTERNATING ARC LAMP.

This lamp is simple in construction and strongly made, and it is weatherproof, requiring no hood for out-of-door purposes.

These lamps are made in two sizes, viz: 10 and 14 amperes, and in two lengths, 36 and 46 inches, burning respectively 9 and 12 hours. The 10 ampere lamps are trimmed with ½-inch carbon, and the 14-ampere lamps with ⅝-inch. Both upper and lower carbons are soft-cored.

Many improvements in details have been added to this lamp. For instance, the special globe holder greatly facilitates the work of the trimmer. The globe is supported top and bottom and can be lowered and swung out so that the trimmer can put in new carbons and clean the lamp without removing the globe.

On the 50-volt lamps the choke or resistance coil is placed on the top of the lamp and is thoroughly waterproof, and by putting a special economy coil on a 100-volt secondary circuit, one, two or three lamps can be burned without waste of energy.

Fig. 1. gives a view of the alternating arc lamp, and fig. 2 shows the method of connecting the same to a circuit. The choke coil is omitted on 30-volt lamps.

These lamps are made by the Electric Construction and Supply Co., 18 Cortlandt street, New York, the manufacturers of the well-known "Ward" arc lamps for incandescent circuits, and they come in standard and ornamental designs.

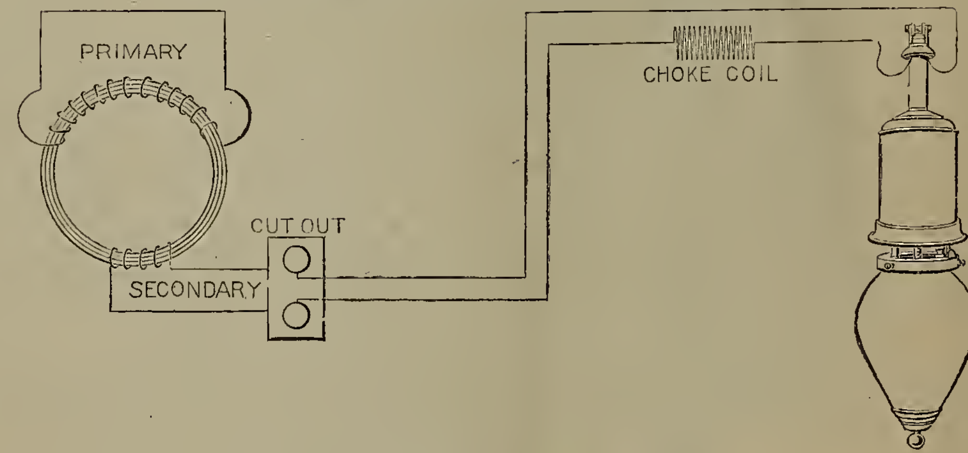
THE "CLIMAX" STEAM BOILER.

One of the most interesting boiler exhibits at the late World's Fair, at Chicago, and one that attracted a great deal of attention from steam users, was that of the Morrin "Climax" boilers, manufactured by the Clonbrock Steam Boiler Works, Smith, Lorraine, Creamer and Court streets, Brooklyn, N. Y.

The "Climax" boiler is of the upright type, and is claimed to be the most efficient made. It occupies small floor space, and is about as near the acme of perfection in a boiler as can be attained. Economy in fuel is another great feature of this boiler.

The steam generator proper consists of loop-shape tubes and a vertical cylinder extending throughout the whole height of the boiler, around which the tubes are arranged. The cylinder is similar in construction to any ordinary cylindrical boiler shell, is perfectly steam-tight, and is provided with the usual manhole plate.

Within the cylinder there is arranged another cylinder, whose upper end is open and its lower end closed. The bottom of this cylinder rests on brackets riveted to the outer cylinder, and the upper end of the inner cylinder extends about up to the water-line. The latter cylinder is, in fact, a built-up one; it is made in short sections, so that they can be readily removed when repairs are necessary. The lower end of the tubes are connected to the inner cylinder by short tubes crossing the annular space. These short tubes are simply driven into the main tubes. The other end of the short tubes need not be, nor are they expanded, as perfectly steam-tight joints are not necessary.

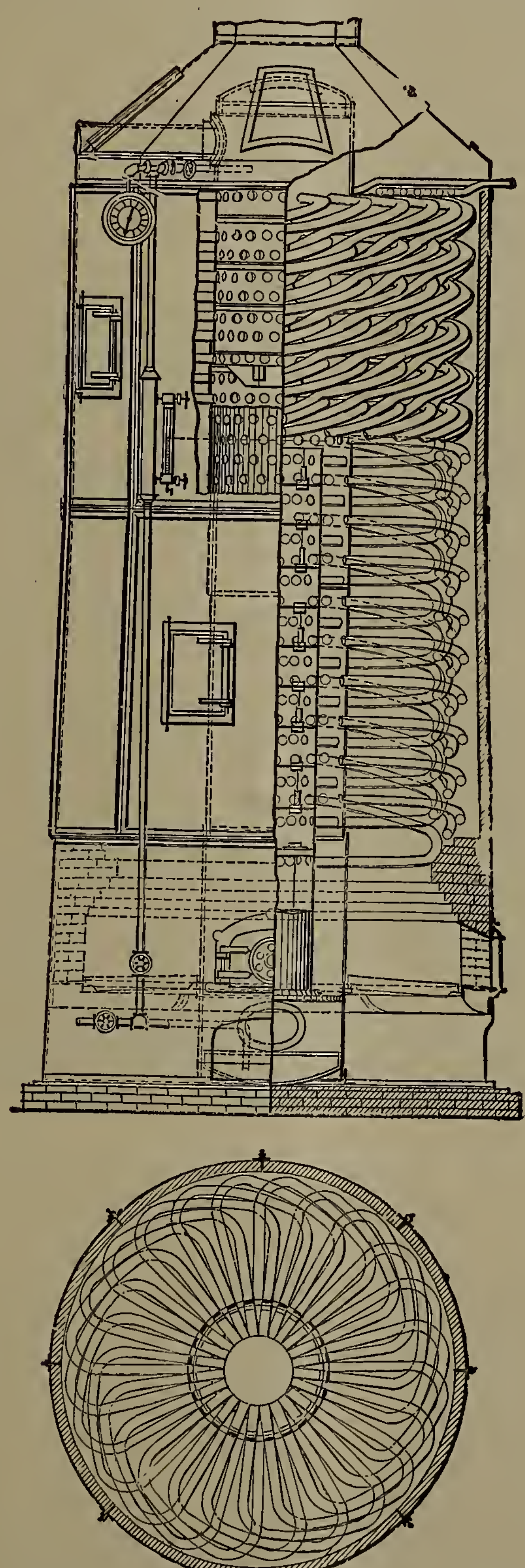


CONNECTIONS OF ALTERNATING LAMP.

The fire-box surrounds the outer cylinder and is annular in form. The casing is made in sections, bolted together.

This arrangement allows any one of the sections to be removed without disturbing the other sections, when it is necessary to replace a tube. Sometimes the inside of the casing is lined with terra-cotta.

In the action of the steam generator the water, as it is heated, will ascend in the loop-like tubes, flow into the annular space, between the inner and outer cylinders referred to, and a fresh supply of water is drawn from the inner cylinder. In this manner a constant circula-



ELEVATION AND PLAN "CLIMAX" BOILER.

tion is maintained in the tubes, causing the steam and water in the annular space to ascend and the solid water in the inner cylinder to descend.

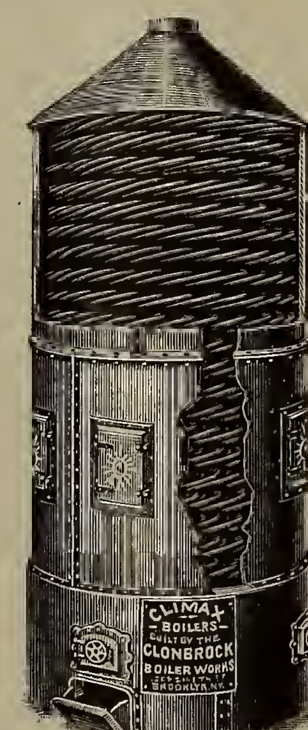
A deflector directly above the inner cylinder tends to deposit any water that may be carried by steam. The tubes above the water-line will dry and superheat the steam; the diaphragm plates above the deflector compel the steam to circulate in succession through each tier of the steam and drying tubes.

The feed-water, in entering the generator, has to flow through the coil resting on the upper tier of tubes and is well heated.

The ratio of grate to heating surface in these generators is about 1 to 50. It will be seen that the heating surface is very effective, and consequently steam is rapidly formed, and high economy of fuel obtained.

The World's Fair exhibit consisted of three boilers, the middle one being, it is said, the largest ever constructed, having a capacity of 1,000 nominal H. P. There were 1,000 three-inch tubes used in its construction, each 12 feet long, and there was a heating surface of 10,000 square feet. The main steel shell was 54 inches in diameter by ⅞-inch thick. The fire-box was 15 feet 4 inches in diameter oil being used as fuel. The boiler, however, was supplied with a stationary grate for use in case of accident to the oil apparatus. The boilers on each side of this monster were of 500 H. P. each.

A test of a 500 H. P. "Climax" boiler was made last year at the plant of the Brush Electric Co., Baltimore, and some splendid results were obtained. It is stated



"CLIMAX" BOILER.

that 748.2 H. P., were developed under actual conditions, or 824.5 H. P., from and at 212°, being an excess over the rated capacity of 64.8 per cent. Under actual conditions 10.3 pounds of water were evaporated per pound of fuel; from and at 212 degrees 14.65 pounds.

THE NEW YORK ELECTRICAL SOCIETY.

This institution, founded in 1881, is the oldest existing electrical society in this country, and its usefulness is extending from year to year. The object for which the Society was established is to afford all who are interested in electricity, whether as a science or as an art, an opportunity of coming together for interchange of ideas and to increase their knowledge by annual courses of lectures, which have been a feature of the Society's work since its inception.

The meetings for the remainder of the season include papers on the following subjects, and when practicable, visits will be paid to various points of interest:

"Electrical Heating to Date." By W. S. Hadaway.

"An Evening at an Electric Lighting Station."

"An Evening at an Electric Railway Station."

"Experimental Demonstrations with the Static Machine." By Dr. W. J. Morton.

"Progress in Storage Battery Work." By C. O. Mailloux.

The Society makes no distinction whatever in the grade of its membership. to which any person interested in its work is eligible without examination of any kind as to his knowledge of the subject. Mr. George H. Guy, 534 Temple Court, New York City, is secretary.

LIGHTNING RODS.

The question of protection of buildings from lightning is one that is not yet quite settled, but scientific investigation is gradually solving the difficult problem. Many of the so-called lightning rods used on structures of all kinds are protective only in name, and buildings would be just as secure from damage by lightning without them. The value of lightning rods, however, is unquestioned when they are properly erected, and especially is this true in the case of tall structures, such as chimneys, etc.

In a recent number of *Popular Science Monthly*, Mr. Alexander McAdie, discusses the subject at considerable length, and concludes his article by giving a few points to be observed in the erection of lightning rods, which we reproduce herewith for the benefit of our readers:

1. Get a good iron or copper conductor of rod or tape form, preferably the latter. If copper, have it weigh about six ounces to the foot; if iron, about two pounds to the foot. 2. The nature of the locality will determine to a great degree the need of a rod. In some localities rods are imperative; in others, needless. 3. The very best ground you can get is, after all, for some flashes, none too good; therefore do not imagine that you can overdo it in making a good ground. 4. If the conductor at any part of its course goes near water or gas mains it is best to connect it to them. Whenever one metal ramification approaches another it is best to connect them metallically. 5. The top of the rod should be plated, or in some way protected from corrosion and rust. 6. Independent grounds are preferable to water and gas mains. 7. Clusters of points or groups of two or three along the ridge rod are recommended. 8. Chain or link conductors are of little use. 9. Very little faith is to be placed in the so-called area of protection. 10. Indifference of lightning to the path of least resistance. Nearly every one who has written in late years has taken it for granted that lightning always follows the path of least resistance. This is not true. 11. Any part of a building, under certain conditions, may be struck, whether there is a protector on it or not.

NEW ORLEANS ELECTRICAL SOCIETY.—The new rooms of the New Orleans Electrical Society were formally opened on the evening of January 19. The meetings will be held on the first Friday of every month, for the reading of papers and discussions on electrical subjects. The query box will hold a prominent part in the proceedings of the meetings. The new rooms are at 37 Union street.

NATIONAL ELECTRIC LIGHT ASSOCIATION.

Mr. C. O. Baker, Jr., master of transportation of the National Electric Light Association, informs us that a concession of a fare and a third rate to the Washington Convention has been granted from all sections of the country except that portion west of the Mississippi, and north of Burlington, Peoria and Chicago, these cities, however, being included in the rate.

Mr. Baker hopes to receive a like concession from the Western Traffic Association.

The following named gentlemen have charge of transportation matters in their respective localities:

A. C. Shaw, Boston, Mass.
C. F. Hesser, Cincinnati, O.
H. A. Cleverly, Philadelphia, Pa.
E H. Heinrichs, Pittsburg, Pa.
M. J. Sullivan, Chicago, Ill.
James I. Ayer, St. Louis, Mo.
E. R. Weeks, Kansas City, Mo.
W. W. Borst, Denver, Col.

The Convention will be held on February 27 and 28, and March 1.

Among the topics to be considered and discussed at the convention will be the "Storage Battery for Street Railways," and papers entitled "The Importance of Complete Metallic Circuits for Electric Railways"

What is the most economical size for Arc Dynamos?
Arc Lights on Incandescent Circuits.
How to Rate Arc Lamps.
Underground Circuits.
How to Wire Buildings.
Commercial Alternating Motors.
Meters vs. Flat Rates will be read and discussed.

A paper entitled "Electric Lighting at the World's Fair and Some of its Lessons," illustrated with stereopticon, by T. C. Martin and L. Stieringer; "Impressions of a Central Station Man Abroad," by E. A. Leslie; "The Importance of Complete Metallic Circuits for Electric Railways," by J. H. Vail, will also be read, and other papers, subjects to be announced.

THE RECEIVER PATENT.

At noon, January 30, the patent on the Bell Telephone Receiver expired legally. It was issued on January 30, 1877, and was in force the full seventeen years allowed by law. Anyone may now manufacture, buy or sell telephone receivers constructed after the Bell model without fear and with perfect freedom.

The Metropolitan Telephone and Telegraph Company, of New York, has, in consequence of the expiration of this patent, established a sales department where receivers are sold outright at a low figure. General C. H. Barney is manager of this department. Mr. U. N. Bethell, general manager of the Company, purchased the first receiver sold by the company. Probably he will put it in a glass case and keep it under lock and key.

TELEPHONE NOTES.

The Kansas Court of Appeals has decided that a telegraph company is a common carrier, and comes under the operation of the Inter-State and Commerce Law.

The Long Distance Telephone Company has completed arrangements to extend its system to St. Louis, Mo. Work is to be commenced at once.

The Bell Telephone Company has applied to the Massachusetts Legislature for permission to increase its capital stock from $20,000,000, to $50,000,000. It is stated that the company has spent a great deal of money in developing its lines in every state, and needs a larger working capital. On the other hand, it is claimed that the object is plainly the watering of the stock to the extent of $30,000,000.

The Southern New England Telephone Company is selling receivers outright.

It is proposed to establish a long distance telephone line between Sioux Falls, South Dakota, and Dell Rapids and Salem, the distance being respectively 22 and 34 miles. Mr. Wainman, general manager of the Northwestern Telephone Co., is at the head of the enterprise.

The People's Telephone Co., of Baltimore, which was organized about a year ago, is making preparations to engage in active work. Mr. H. C. Watts is president of the company and Chas. H. Ware is secretary. The company claims to have over 1,000 subscribers.

Mr. G. M. Jarvis, of Chicago, is seeking to effect arrangements for the location of a factory in Oconto, Wis., for the manufacture of telephones.

STREET RAILWAY NEWS.

It is reported that the Toronto and Montreal street railway systems are to be controlled by one company.

The car sheds of the Ann Arbor (Mich.) Electric Street Railway Co. were destroyed by fire on January 25; nearly all of the cars were burned. The total loss amounts to $20,000; there is insurance of $11,000.

Dr. Adams' Patents.—The taking of testimony in the suit of the Adams Electric Railroad Company, against the Lindell Railroad Company, of St. Louis, has been concluded. The Adams Company charges the Lindell Company with infringement of the patents controlled by Dr. Wellington Adams. It is stated that the General Electric Company is paying the legal expenses for the Lindell Company. The testimony comprises 2,308 printed pages and 254 exhibits, in the shape of models and drawings. The case will be tried in March next.

Injunction.—Some time ago a franchise was granted by the East Orange, N. J., township, to the Newark Passenger Railway Co. to erect trolley lines on Main street, in East Orange. The Newark Passenger Railway Co. was subsequently absorbed by the New Jersey Traction Co. and the East Orange officials sought to restrain the latter company from operating the trolley road, on the ground that the franchise was given to the Newark line alone, and did not provide for any successors or assigns. The New Jersey Traction Co. secured a temporary injunction against the action of the town officials, and now seek to have it made permanent. There is some question as to whether the original franchise was legally granted.

CABLE RAILWAY SIGNAL SYSTEM.

Mr. Frederick Pearce, 79 John street, New York city, has just completed an electrical signal system for the Third Avenue Cable R. R., for use in connection with the operation of that road. In case of accident along the line of the road at any time, word can be immediately sent to the power-house.

A special signaling instrument is placed in a water-tight box alongside each manhole in the street. When it is desired to send a signal the cover of the box is lifted, and the lever of the automatic box raised. The lifting of this lever winds the spring inside the box, and at the same time transmits to the power-house the signal indicating the object of the call. When the lever is released, the signal indicating the number of the box is transmitted. The signals are arbitrary. For instance 1 may mean "stop the cable;" 2 "go easy;" 3 "go ahead"; 4 "fire; bring on wrecking wagon," etc., etc. The wrecking wagon is provided with apparatus for lifting fire hose over the tracks so that the passage of cars need not be interrupted.

Call boxes are placed every two blocks between Ann and 130th streets, a distance of nine miles. The system requires 10 wires (underground) from 130th street to 6th street; 9 from 6th to Bayard street, 8 from Bayard to Ann street. Okonite wires are used throughout.

Inside each box is a telephone switch to admit of telephone connection, which can be readily made, and conversation carried on between power-houses and the boxes.

The instruments are well protected, strongly made and, being in water-tight boxes, are free from the possibility of trouble through moisture.

IMPORTANT INCANDESCENT LAMP DECISION.

VICTORY FOR THE BUCKEYE ELECTRIC COEPANY.

(*Continued from page 57.*)

The complainants' statement of the facts under which this action of the Patent Office was invoked, admits that they were advised and believed at the time that such action was necessary in order to remove doubts as to the validity of the patent as originally issued. These doubts arose because of a decison of one or more of the Federal Courts that it was essential to the validity of a patent, where foreign patents for the same invention had been applied for, that the date of such foreign patents, and their limitation, should be cited in the application, so that the limitation of the American patent would appear on its face. In view of the uncertainties thus existing as to the validity of the Edison patent, because of these omissions in the application for the patent, and to remove all doubts, the patentee and the assignee both joined in a petition to the Commissioner of Patents, in which they stated that while the application for Letters Patent No. 223,898 was pending, said patentee applied for and obtained Letters Patent for the same invention in several foreign countries, as hereinbefore fully set forth in the statement of the case. The petitioners further represented that because of the omissions of such recitals in the application, the United States Letters Patent were granted to the patentee, unlimited, for the full term of seventeen years. The petitioners further say that they were advised that said Letters Patent when issued, should have been limited upon their face to the term of the foreign patent having the shortest term prior to the date of the United States Patent. Thereupon the petitioners tendered the said United States Letters Patent to the Commissioner of Patents, and requested that they be corrected according to the provisions of the first clause of Rule 164. Upon this petition, the Commissioner issued the following certificate:

"Department of the Interior,
United States Patent Office.

Washington, D. C., Dec. 18, 1883.

In compliance with the request of the party in interest, Letters Patent No. 223,898, granted January 27, 1880, to Thomas A. Edison, of Menlo Park, New Jersey, for an improvement in electric lamps, is hereby limited so as to expire at the same time as the patent of the following named having the shortest time to run, viz:

British	Patent, dated November 10, 1879,	No. 4,576
Canadian	Patent, dated November 17, 1879,	No. 10,654
Belgian	Patent, dated November 29, 1879,	No. 49,884
Italian	Patent, dated December 6, 1879, and	
French	Patent, dated January 20, 1880,	No. 133,756.

It is hereby certified that the proper entries and corrections have been made in the files and records of the Patent Office.

This amendment is made, that the United States Patent may conform to the provisions of Section 4,887 of the Revised Statutes.

BENJAMIN BUTTERWORTH,
Commissioner of Patents.

(SEAL.)

Approved:

M. L. JOSLYN,
Acting Secretary of the Interior."

On the sixth day of March, 1893, the complainants, as petitioners, forwarded another application to the Commissioner of Patents, in which they recited their former petition; the action taken thereon; that subsequent thereto, by decision of the Circuit Court of Appeals of the Second Circuit, said former action of the Commissioner was declared to have been taken without authority of law, and therefore void, and asking that the former correction of the records by the Commissioner of Patents be cancelled. Thereupon the following action was taken by the Commissioner of Patents:

"Now in compliance with the request of the parties in interest, said certificate is hereby cancelled, and the proper entries and corrections have been made in the files and records of the Patent Office.

In testimony whereof, I have hereunto set my hand, and caused the seal of the Patent Office to be affixed, this 15th day of March, 1893.

W. E. SIMONDS.
Commissioner of Patents.

(SEAL.)

Approved:

CYRUS BUSSEY,
Asst. Secretary of the Interior."

What is the legal effect of these applications of the petitioner, and the action of the Commissioner of Patents thereon? It is urged on behalf of the defendant that these proceedings, deliberately taken by the complainants, amounted to a voluntary dedication by them to the public, of the patent, from and after November 10, 1893, at which time the British Patent expired by limitation. It is contended in reply, that, even though such action was a dedication by the complainant as claimed, it was a dedication of something which was to be given to the public some time in the future, and long before the dedication was to take effect, it was revoked and annulled, and no rights thereby passed, either to the defendant or to the public.

While it is true that the complainants' proceedings in the Patent Office were not had with any reference to the defendant, but had reference solely to their relations to the public, the defendants had, as one of the public, the same right to be influenced and governed by the complainants' conduct as though it had been the result of their representations to each other as individuals or corporations. The complainants' proceedings were a matter of public record. Their acts and conduct were of such notoriety, that the defendant, by law, was bound to take notice of them so far as they affected its legal rights under the complainants' patent.

But conceding that there is doubt as to whether the above decisions are conclusive of the controversy, the revocation, which the complainants claim to have made of their dedication to the public was not made until March, 1893, nearly ten years after their voluntary limitation of the term of their patent, as hereinbefore stated. If they were in doubt as to the legality of their conduct in the proceedings in the Patent Office, they should have acted so soon as such mistake was suggested.

For the reasons hereinbefore fully considered, it seems to me plain that the complainant is estopped from now claiming that its conduct did not induce such well defined belief as to the limitation of its patent on the defendant's part. Without deciding how far others not similarly situated had the right to rely upon such conduct on the part of the complainants, or without passing upon the question of how far the public generally acquired rights under the complainants' proceedings in the Patent Office, by which they limited the life of their patent, it is sufficient to find, under this motion, that the defendant, by reason of the circumstances particularly set forth in its motion, did rely in good faith upon the complainants' conduct, and had a right to be, and was, in fact, influenced thereby.

The application for a dissolution of the injunction is based upon evidence as to a fact which did not exist at the time the temporary injunction was allowed. At the time such application was made, the complainants' patent had not then expired according to the limitation put upon it by its proceedings in the Patent Office. The rule is well settled that on such an application the complainants' rights to an injunction must be clearly established. While it is true, that on a motion to dissolve, the burden of proof is on the defendant, yet the rule is equally well settled that evidence which would prevent the allowance of an injunction would be sufficient to dissolve it, and that an injunction will be dissolved on new evidence raising grave doubts as to the complainants' right to the temporary injunction in force.

For the reasons hereinbefore stated, if on the application for the injunction now in force, the facts now relied upon in support of the motion to dissolve had been available as a defense, I would not have allowed a temporary injunction. The complainants' right to such an injunction under such a defense would have been so doubtful that it would not have been entitled to an injunction under the rules cited.

As the case is now presented on the motion to dissolve, one of the two parties must suffer loss. If the injunction is continued, the defendant is wholly without remedy. It has shown that it was honestly misled by complainants' conduct, and in good faith made additional investments upon the belief so formed. The complainants cannot complain if, for this reason, the benefit of the doubts expressed are given to the defendant and the injunction is dissolved. If I am in error as to this conclusion, no great harm can result to the complainants, for if such error is established they can recover for the damages caused thereby, and their right to contest as to other infringers not able to show such meritorious claims to estoppel as defendant has established can be asserted without prejudice from this decision.

NEW ELECTRIC LIGHT STATION.

The new electric light station now being completed at North Attleboro, Mass., will be one of the most modern plants to be found anywhere.

The building is of brick, 70 by 53 feet. The boiler room is 30 by 30 feet. On the southwest corner of the building is a tower 48 feet high, through which all of the wires pass through a deck and connect with the switchboard.

The building is 30 feet high. The engine room has a basement 8 feet high, which contains the foundations for engines and dynamos.

There is one tandem compound condensing engine of 225-horse power, medium speed, which will be used to run a 2,000-candle power dynamo for street lighting and one high pressure 70-horse power engine to run a 1,000-candle power dynamo for commercial lighting.

The boiler is one of T. H. Morrin's patent, being an upright of 250-horse power, built by the Clonbrock Iron and Boiler Works of Brooklyn, N. Y.

There are 370 steel tubes exposed to the fire, besides the central drum. It has been tested to 315 pounds cold water pressure to the square inch.

NEW CORPORATIONS.

The St. Joseph and Lake Shore Electric Railway Co., St. Joseph, Mich., January 23. Capital stock $75,000. Officers: C. P. Wright, president; J. S. Wolfe, vice-president; A. L. Thacher, treasurer, all of Chicago; S. C. Rosenburg, St. Joseph, secretary.

Electrical Annunciator Co., Portland, Me., to manufacture electrical apparatus. Capital $500,000. The officers are: President, E. W. Mann of Norfolk, Mass.; Treasurer, A. C. Allyn of Rochester, N. Y.

The Iowa Telephone Co., Des Moines, Ia. Capital $500,000. Incorporators: E. P. Eastman, F. W. Chamberlain, Geo. C. Henry and Lamonte Cowles. The company will operate exchanges in Burlington, Ia., and other places in the state.

A company with a capital of $300,000, is being organized for the purpose of constructing an electric road from Holyoke to Springfield, Mass., via Chicopee Falls.

The Braddock & Homestead (Pa.) Street Railway Co. with a capital of $7,500, has been granted a charter.

The Gem Electrical Construction and Supply Co., Dayton, Ohio. Capital stock $10,000. Incorporators: Geo. H. Butterworth, Harry H. Heathman, E. M. Heathman, Wm. F. Breidenbach and H. W. Pleasant.

The Wymanlea Electric R. R. Co. has been incorporated with a capital of $300,000 for the purpose of building and operating an electric railway between Springfield, Mass., and Boston. The officials are: Henry T. Dickinson, of Springfield, president; A. L. Green, of Holyoke, clerk, and C. Fayette Smith, Holyoke, treasurer.

The People's Electric Railway Co., of Holyoke, Mass., has been organized to build lines in that place. Capital stock, $100,000. Wm. F. Whiting, Dr. Chas. H. Curran, and W. H. Brooks are interested in the enterprise.
Add Pos Con.

The Indianola Fourth Street Railway Co., of Columbus, Ohio; Capital $10,000.

The Lynchburg, (Virginia) Traction Co. has been incorporated at Richmond.

Superior Light, Heat and Power Co., at Chicago; Capital stock, $50,000; incorporators, F. L. Goulding, L. J. Moseness and A. F. Wright.

POSSIBLE CONTRACTS.

Surveys are being made for a proposed electric road between Burlington, Vt., and Hinesburgh, Vt. Mr. Sinclair, civil engineer, Burlington, Vt., has charge of the surveys.

There is talk of extending the Sandusky, Milan and Norwalk (Ohio) Electric Railway to the southern part of Huron County. Mr. G. H. Dewitt is president of the company.

Hon. W. C. Anthony, of Newburgh, N Y., and Lewis F. Goodsell, of Highland, are interested in a project to light the village of Highland Falls, N. Y., by electricity. The plant is to be operated by water power.

There is talk of building an electric railroad at Sea Isle City, N. J., next summer.

The Broadway Railroad Company, of Brooklyn, has petitioned the town of Flatlands for a franchise to construct and operate a trolley road in that town.

It has been suggested that Henniker and Hillsboro, N. H., establish a joint electric light plant.

It is proposed to build an electric railway to connect Parsonville, Va., with towns on the lower part of the peninsula.

The telephone is to be extended from Pendleton to Canyon City, Neb., a distance of 130 miles.

The Brooklyn City Railway Co., Brooklyn, N. Y., has obtained a franchise for operating street car lines on various streets in Flatlands.

The Stillwell Meat Co., of Hannibal, Mo., intends to put in an incandescent electric light plant, with a capacity of three hundred lights.

The Newtonville and Watertown Street Railway Co., Watertown, Mass., proposes to extend its tracks as soon as the weather will permit; also to make other improvements in its line.

The Gardner Electric Street Railway Co., Gardner, Mass., has asked for permission to construct and operate an electric street railway in that place.

An electric railway is proposed between Minneapolis, St. Paul, Superior and Duluth, Wis., the motive power to be derived from water falls along the route. Mr. M. B. Ridgeway, of Minneapolis, is one of the promoters.

Steps are being taken by the Maumee Valley R. R. Co, Toledo, Ohio, to construct an electric line between Perrysburg and Toledo. Wm. B. Taylor is president of the Company.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, February 3, 1894.

Mr. Samuel G. Booker, general manager of the Fidelity Carbon Co., St. Louis, Mo., was in town last week. He reports a big business and that his company is doing well.

The Interior Conduit and Insulation Company, 44 Broad street, is a prominent competitor for the $50,000 prize offered by the Metropolitan Traction Company some time ago for an electric system of street car propulsion as cheap as the trolley system, but minus the overhead-wire accessories. Mr. E. H. Johnson, President of the Interior Company, admits that he is after the prize, and what is better yet, he thinks he will get it, using the Johnson Lundell motor. Further than that he uses a third (centre) rail for conveying the current, he will say nothing at present. He has great faith in the system, and if he gets the prize it will be something worth crowing about—not so much on account of the prize-money, but for the solution of the problem of street railroading without overhead wires.

The Board oe Electrical Control has refused the application of the New York Heat, Light and Power Company for permission to lay a subway in Nassau street, from Maiden Lane to Spruce street.

A few days ago what is said to be the largest submarine cable ever laid in this country, was placed across the East River from the foot of 38th street, New York city, to Hunter's Point. It was made by the Safety Insulated Wire and Cable Company, for the Metropolitan Telephone and Telegraph Company. It is nearly a mile long, (actually 5,000 feet) 2¾ inches in diameter, and weighs 21 tons. It contains 20 conductors, each composed of 3 copper strands. Mr. L. F. Requa, treasurer of the Safety Insulated Wire and Cable Company, superintended the operation of laying the cable. The cable was laid from the Western Union Company's cable steamer, "Western Union."

The Fitch Excelsior Switch Co., 45 Broadway, New York city, has had one of its automatic electric switches on trial on Gates avenue, near Broadway, Brooklyn, for six weeks. Four hundred and fifty eight-ton cars passed over it daily and it worked to perfection. This switch is operated by the driver of the approaching car. A section of the rails is insulated from the rest. In this section the automatic switch is connected to the rails. When a car is on the insulated section the mere act of cutting off or on the trolley current operates the switch. The switch is operated by two powerful electro-magnets which are charged by the trolley current. The mechanism is very simple and durable, and is always reliable in action. The parts are well protected, so that no foreign substances can get inside the box and interfere with operations.

Mr. James F. Kelly has opened offices at No. 906 Temple Court, this city. Mr. Kelly is the General Eastern Agent for the National Electric Co., of Eau Claire, Wis., and his many friends wish him much success. The National Electric Company is well represented in the East, and through his intimate relations with the electrical trades Mr. Kelly will prove a valuable addition to that Company's staff of representatives.

Otis Bros. & Co., 38 Park Row, city, manufacturers of the well known Otis electric passenger elevators, Otis electric pumps, Otis electric freight elevators, hoists, etc., continue to receive their large quota of orders. Since January 1, they have closed contracts for six Otis electric passenger elevators, to be placed in New York city, one in Atlanta, Georgia, two in Montreal, and one in Winnipeg, Manitoba, and two freight electric elevators.

J. B. Coffman, of the Eureka Tempered Copper Co., North East, Pa., was a caller at this office last week. He had with him one of his patented Automatic Brush Holders, which are made by the Eureka Copper Co. Mr. Coffmann is one of the most practical electricians in the country. He is a jewel in his line.

Mr. F. H. Prentiss, vice-president, and Chas. H. Rockwell, secretary and treasurer of the Buckeye Electric Company, were in the city this week.

Mr. F. E. Alexander is now connected with the Interior Wiring and Fixture Co., 14 Clinton Place, New York city.

Mr. Norden electrical engineer and contractor, 136 Liberty street, city, has secured the contract for lighting the town of Belair, Md., with 250 incandescent direct and 500 alternating incandescent lights. His contract includes engines, dynamos, etc He has just completed the rewiring of the brewery of the James Everard Brewing Co., in New York. Mr. Norden wired this concern's ale brewery last year. He will put upon the market shortly a fan motor which will be entirely enclosed.

Hatzel & Buehler, 114 Fifth avenue, electrical engineers and contractors, have just finished their contract in the New York *Herald* building. They put in 3,500 16 c. p. lamps and approximately 150 h. p. in various sizes of motors, for operating the various departments. They have also completed an installation in the new House of Relief, Hudson and Jay streets, including five 5 h.p. and four 3 h.p. motors. This firm has been awarded the contract to install in the Bloomingdale Insane Asylum, White Plains, N. Y., three 50 k.w. generators, one 150 and one 75 h.p. Dixon Corliss engine, switchboard, motors, etc. Also the wiring of the new residence of Commodore Gerry for 2,000 lights and five motors for ventilating purposes; wiring complete for 400 lights in First Presbyterian Church, New York City; rewiring St. Bartholomew's Church, New York City; for 600 16 c. p. lamps, one two h. p. and one h. p. motor, and wiring of administration building; New York hospital for 100 16 c. p. lamps. They have secured other wiring contracts. This firm makes a specialty of electric light and power plants.

The Wells Engine Company, 9 Liberty street, manufacture "Balanced" Compound-Vertical Automatic Engines that yield the highest economy in fuel and space, with great durability and a most perfect motion. The "Balance" principle makes it especially desirable where direct connection is desired, and also where there is great variation in load. Its advantages increase in ratio with the bore of cylinder, *i. e.*, tons being balanced, in large engines, against pounds in small ones.

Chas. A. Schieren & Co., 47 Ferry street, city, manufacturers of the well-known patent perforated electric leather belting for electric railways and electric lighting purposes, have just issued a neat pamphlet giving points on their belting. It contains several illustrations and gives a list of some of the street railroad stations that have been equipped with perforated electric belts. The firm recently made 6 72-inch 3-ply belts, as follows: 126 9/12 feet, 72-inch 3-ply Perforated Electric, for North Hudson County Electric Co., (for street railroad plant) Hoboken, N. J. 116 feet, 72-inch 3-ply Electric Belt for Brooklyn City R. R. Co., Brooklyn, N. Y. 122 2/12 feet, 72-inch 3-ply Perforated Electric, sold to World's Columbian Exposition Co., Chicago, Ill. 127 6/12 feet, 72-inch 3-ply Perforated Electric Belt for Lockport Paper Co., Lockport, N. Y. 118 8/12 feet, 72-inch 3-ply Perforated Electric Belt, for Hudson Electric Light Co., Hoboken, N. J. 120 feet, 72-inch 3-ply Perforated Electric, which ran on Buckeye Engine at World's Fair, Chicago, Ill. Perforated belts run comparatively noiseless and are, therefore, used extensively in isolated plants all over the country and give the best of satisfaction.

During the rounds of the writer the past week in New York City, Brooklyn, Long Island City and other places, most encouraging reports were made of the business outlook by manufacturers and the trade generally. Among those who report a hopeful outlook, and who are receiving good orders, may be mentioned the following: E. P. Gleason Mfg. Co., glass and metal goods, Houston and Mercer streets, city; The McCreary Electrical Specialty Co., 136 Liberty street; W. A. Vail, La Roche Dynamos, 136 Liberty street; Murphy & Co., slate switchboards; The Okonite Co., Wire and Cable Mfrs., 13 Park Row, N. Y.; C. D. Shain, Weston Electrical Instruments, etc., 136 Liberty street, N. Y.; McLeod, Ward & Co., Safety Insulators and Kinsman's Desk Lamps, 91 Liberty street, N. Y.; Norman Hubbard, Packard Vacuum Pumps, 93 Pearl street, Brooklyn, N. Y.; Day's Kerite, W. R. Brixey, sole Mfr., 203 Broadway, N. Y.; E. P. Hampson & Co., Engineers and Contractors, 36 Cortlandt street, N. Y.; Bishop Gutta Percha Co., Mfrs. White Core India Rubber Wires and Cables, 422–426 E. 25th street, N. Y.; The Gamewell Fire Alarm Telegraph Co., 1½ Barclay street, N. Y.; John H. Schneider, Electric Door Openers, Astoria, Long Island City; Empire China Works, Porcelain Insulators, 144 Greene street, Brooklyn, N. Y.; Fred'k Pearce, Mfg. Electrician, 79 John street, N. Y.; Sieb & Starke, Electric Door Openers, 411 E. 107th street, N. Y.; The Garvin Machine Co., Machine Tools, Laight and Canal streets, N. Y.; R. Edwards, Mfg. Electrician, 144th street and 4th avenue, N. Y.; H. Senior, Wood Engraver, 10 Spruce street, N. Y.; The Gen. Incandescent Arc Light Co., Arc lamps for direct, and alternating and incandescent circuits, 572–578 1st avenue, N. Y.; The Scott Electric Mfg. Co., search light and arc lamps for incandescent, railway circuits, etc., 89 Liberty street, N. Y.; The Peckham Motor Truck and Wheel Co., 1006 Havemeyer Building, N. Y.; R. A. Keasbey, magnesia sectional covering, 54 Warren street, N. Y.; Otis Bros. & Co., Otis electric pumps, elevators, hoists, etc., 38 Park Row, N. Y.; Smith of N. Y., reflectors and car lamps, 350 Pearl street, N. Y.; W. W. Tupper & Co., grate bars, 39 Cortlandt street, N. Y.;

W. R. Ostrander & Co., speaking tubes, electric bells, annunciators, etc., 204 Fulton street, N. Y.; C. & C. Electric Co., dynamos and motors, 404 Greenwich street, N. Y.; The Brooklyn Electric Mfg. Co., quick break switches, 286–290 Graham street, Brooklyn, N. Y.; The Manhattan Electrical Supply Co., 36 Cortlandt street, N. Y.; C. & P. Mfg. Co., dynamos, motors, 635 Kent avenue, Brooklyn, N. Y.; The Electric Con. and Supply Co., "Ward" arc lamps for all purposes, for direct, alternating, incandescent and railway circuits, 18 Cortlandt street, N. Y. The Goodyear Hard Rubber Co. and The India Rubber Comb Co., sole agents for Chicago Electric Wires and Cables, 9, 11 & 13 Mercer street; J. H. Bunnell & Co., Mfrs., all kinds of electrical instruments and supplies, 76 Cortlandt street; The E. S. Greeley & Co., Mfrs. of all kinds of test instruments, telegraph and general electric supplies, 5 & 7 Dey street; Vulcanized Fibre Co., fibre for all electrical uses, 14 Dey street; L. J. Wing Co., gas engine, electric light plants a specialty, ventilation and blowers, 126 Liberty street; The Standard Paint Co., P. & B. specialties, 2 Liberty street: N. Y. Electrical Works, mfrs. of electric railway supplies, 161 Washington street, and many others.

TRADE NOTES.

The Electric Manufacturing Co, of America, has bought out the factory of the Gillette Electric Co., Red Bank, N. J. The new company will make electric instruments, magnetos, telephones, etc. The factory is a three-story building, 50x100 feet in dimensions, and fitted with the finest machinery for that class of work. Mr. Joseph F. Bray, of Red Bank, N. J., is manager of the new company, and Mr. John C. Francis is the superintendent.

The Weston Electrical Instrument Co., 114–120 William street, Newark, N. J., reports that they did more business in January this year than any month during the previous year. The Weston instruments are constantly growing in favor.

The Hanson & Van Winkle Company, Newark, N. J., has a fine exhibit of its well-known plating dynamos and polisher's goods. The company reports business good.

N. S. Large & Son, manufacturers of electrical supplies, 321 Chestnut street, Philadelphia, Pa., have issued an illustrated price-list of their switches and switchboards. This firm gives personal attention to model, experimental and repair work.

Electrical and Street Railway Patents.

Issued January 30, 1894.

513,482. Anti-Inductive Conductor. Horace F. Chick, Watertown, assignor to John A. Emery, trustee, Boston, Mass. Filed May 29, 1893.

513,507. Utilizing Electric Motors for Operating Machinery. Carl Hoffmann and Ernest Richter, Berlin, Germany, assignors to Siemens & Halske, same place. Filed Apr. 11, 1893. Patented in Germany Feb. 9, 1893, No. 66,984.

513,526. Fire-Alarm-Telegraph System. Michael J. O'Sullivan, Baltimore, Md., assignor to Thomas Janney, Jr., & Co. Filed June 7, 1893.

513,533. Commutator. George A. Rollins, Chicago, Ill. Filed Apr. 11, 1893.

513,534. Signaling System for Telephone Circuits. John I. Sabin and William Hampton, San Francisco, Cal. Filed Aug. 18, 1893.

513,537. Signaling System for Telephone Trunk-Lines. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Co., same place. Filed June 16, 1893.

513,545. Circuit-Controller for Regulators. Barton B. Ward, New York, N. Y. Filed May 10, 1893.

513,564. Electric-Wire Cleat or Holder. Albert W. Fuller, Saugus, Mass. Filed Mar. 13, 1893.

513,566. Trolley-Wire Finder. Edward Gale, Peoria, Ill. Filed Nov. 21, 1892.

513,587. Electro-Mechanical Device for Bells, &c. William O. Meissner, Chicago, Ill. Filed Sept. 11, 1893.

513,592. Annunciator. Joseph H. McEvoy, Waterbury, assignor to the Ansonia Electric Co., Ansonia, Conn. Filed May 8, 1893.

513,593. Electric Bell. Joseph H. McEvoy, Waterbury, assignor to the Ansonia Electric Co., Ansonia, Conn. Filed May 8, 1893.

513,599. Gearing for Electric Locomotives. George W. Swartz, Florence, Ala. Filed Oct. 6, 1892.

513,602. Electric Furnace. Elihu Thomson, Lynn, Mass. Filed June 10, 1886.

513,611. Dynamo-Brush. Wilfrid H. Fleming, Bayonne, N. J. Filed Nov. 13. 1893.

513,612. Electrical Registering Device. Friedrich von Hefner-Alteneck, Berlin, Germany, assignor to Siemens & Halske, same place. Filed Nov. 3, 1893. Patented in Germany Mar. 31, 1884, No. 30,287; in Belgium, Apr. 22, 1884, No. 64,898; in Austria-Hungary, Apr. 22, 1884, No. 15,821 and No. 31,734, and in France July 21, 1884, No. 163,412.

513,615. Method of Operating Electric Loom-Shuttles. Levi W. Lombard, Saco, Me., assignor to Joseph N. Smith and Benjamin F. Spinney, Lynn, Mass. Filed Feb. 6, 1893.

513,626. Automatic Rheostat. Garson J. Sturgeon, Erie, Pa., assignor to the Keystone Electric Co. same place. Filed Mar. 31, 1893.

513,630. Detachable Electric-Wire-Holding Device. Cornelius Beard, Brookline, Mass. Filed Oct. 20, 1893.

513,661. Electrolytic Cell. Claude T. J. Vautin, London, England. Filed Apr. 19, 1893.

513,670. Car-Brake. Herbert E. Collett, Chelsea, Mass., assignor of three fourths to Herbert E. Collett, Jr, Lynn, Mass., and Charles W. Armstrong and Jas. Howard Bing, Philadelphia, Pa. Filed July 24, 1893.

513,672. Car-Brake. Willard Curtiss, Grand Rapids, Mich., assignor of one-half to Wm. T. Powers and Wm. H. Powers, same place. Filed Sept. 19, 1893.

513,701. Wheel-Fender or Guard for Cars. George Blakistone, Baltimore, Md. Filed July 18, 1893.

513,703. Safety Fender or Trap. George Blakistone, Baltimore, Md. Filed Oct 20, 1893

513,711. Railroad-Rail Joint. Arthur J. Moxham, Johnstown, Pa. Filed Feb. 20, 1890.

513,720. Telephone. Herbert S. Page, Somerville, Mass., assignor of five-sixths to John K. Whiting, same place, and Harvey A. Hopkins, Wellington, Mass. Filed May 15, 1893.

513,725. Electric-Arc Lamp. Frank A. Perret, Brooklyn, N. Y. Filed Nov. 7, 1892. Renewed July 15, 1893.

513,729. Telephone-Transmitter. Francis H. Richards, Hartford, Conn. Filed Dec. 4, 1893.

513,730. Telephone-Transmitter. Francis H. Richards, Hartford, Conn. Filed July 31, 1893.

513,745. Switch-Bar. Franklin A. Weller, Boston, Mass., assignor of one-half to Herbert C. Hill, same place. Filed Feb. 27, 1893.

513,775. Annunciator. Manious Garl, Akron, Ohio, Filed June 28, 1893.

513,777. Electric Connection for Railway-Rails. Alfred Green, Rochester, N. Y., assignor of one-half to William Rosbrough, same place. Filed Sept. 30, 1893.

513,796. Automatic Circuit-Closer. Henry Lewers, Carson City, Nev. Filed July 11, 1893.

513 829. Electric Alarm. David S. Schureman, Rockford, Ill. Filed May 6, 1893.

513,839. System of Electrical Distribution. Charles H. Talmage, St. Louis, Mo. Filed Mar. 31, 1893.

513,846. Trolley-Pole Stand. Gustaf Valley, Cleveland, Ohio, assignor to the Steel Motor Co., same place. Filed May 16, 1893.

513,847. Trolley-Pole Stand. Gustaf Valley, Cleveland, Ohio, assignor to the Steel Motor Co., same place. Filed May 11, 1893.

513,850. Electrical Theatrical Appliance. Henry E. Waite, New York, N. Y., assignor to H. C. Miner, trustee, same place. Filed Aug. 29, 1893.

513,859. Electrically-Propelled Drive-Wheel. Carl G. Anderson, Lynn, Mass. Filed Sept. 1, 1892.

513,883. Switch-Operating Device. Handley P. Cogswell, Brooklyn, N. Y. Filed May 2, 1893.

513,888. Street-Railway Brush. Philip A. Coonradt and Arthur R. Coonradt, Rockford, Ill. Filed Sept. 8, 1893.

513,894. Sectional Electric Railway, George W. Demmick, Lynn, Mass., assignor of one-half to Henry Robinson, George Fuller, John S. Earl, and Knott P. Martin, same place. Filed July 20, 1893.

513,895. Power-Transmitting Mechanism for Electric Locomotives. Mark W. Dewey, Syracuse, N. Y., assignor to the Dewey Corporation, same place. Filed Apr. 17, 1891.

513,910. Storage-Battery. George B. Fraley, San Francisco, assignor to John L. Eckley, Eckley's Station, Cal. Filed June 26, 1893.

513,921. Electric-Arc Lamp. Manuel R. Gutierrez and Milton T. Thompson, Jalapa, Mexico. Filed Aug. 8, 1893.

513,949. Connector for Electric Wires. Edward H. Munson, New Britain, Conn. Filed May 9, 1892.

513,950. Insulated Rail-Chair. Louis McCarthy, Boston, Mass. Filed Sept. 27, 1892.

513,951. Incandescent-Lamp Socket. Jas. McFarlane and Wm. B. Edgar, Glasgow, Scotland. Filed Mar. 31, 1893. Patented in England Apr. 12, 1892, No. 7,016.

513,956. Annunciator. Frederick W. Ross, Boston, Mass., assignor to the Electric Gas Lighting Co., of Maine. Filed Oct. 6, 1893.

513,960. Automatic Telephone-Switch. Augustus C. Wheat, Chicago, Ill., assignor of one-half to William Hubbard, same place. June 5, 1893.

REISSUE.

11,400. System of Electrical Distribution. Wm. Stanley, Jr., and John F. Kelly, Pittsfield, Mass., assignors to the Stanley Laboratory Company, same place. Filed Nov. 29, 1893. Original No. 507,391, dated Oct. 24, 1893.

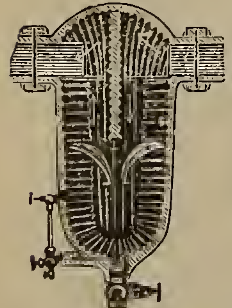
ELECTRICAL PATENTS EXPIRED JANUARY 30, 1894.

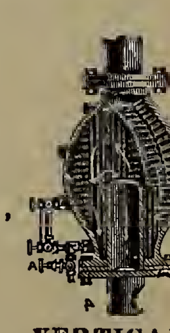
186,679. Street-Car Brakes. L. Kimpel and E. Ferchland, Brooklyn, N. Y. [Filed Feb. 5, 1876.]

186,755. Magnetic Holders for Feeding Screw and Other Blanks. E. E. Quimby, Orange, N. J., assignor to American Screw Co., Providence, R. I. [Filed Oct. 20, 1876.]

186,787. Electric Telegraphy. A. G. Bell, Boston, Mass. [Filed Jan. 15, 1877.]

186,887. Fire and Police Alarm Signal Apparatus. C. Selden, Cincinnati, Ohio, assignor to himself and S. P. Peabody, same place. [Filed May 26, 1876.]





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Copy for advertisements or changes therein should be in our hands before the Saturday preceding publication day.

NEW YORK, FEBRUARY 17, 1894.

CONTENTS.

BURYING ELECTRIC WIRES.

Agitation over the subject of placing electric wires underground is very active in many cities throughout the country. In Boston there seems to be a growing sentiment in favor of having the legislature take the matter up and legislate the wires underground. In Louisville, Ky., the city council is grappling with the underground problem, and in St. Louis a small legal war is in progress over the same question. Even the smaller cities of Lowell and Worcester, Mass., are disturbed over the subject, and in Cambridge the question is coming to a head.

A SUGGESTION.

It would be a pleasant episode during the National Electric Light Association convention, in Washington, for the association, in a body, to call upon the President. The meeting could be easily arranged, no doubt.

THE BEST IS THE CHEAPEST.

The policy of the Board of Electric Light Commissioners, of South Norwalk, Conn., is one that should be adopted by all public and private electric light enterprises. In their first annual report they state that in every instance the purchase of cheap material and supplies has been avoided, "proving that true economy lies in the use of good material." There are thousands of electrical plants in this country that are run upon a basis diametrically opposite to this, in a fruitless endeavor to earn dividends. It is somewhat remarkable that the declaration of so important a principle should at this time emanate from one of our smallest cities, when in large communities, where this law should be recognized and practised to its fullest extent, we find in many cases a reverse condition of things. Cheap work and cheap materials will sooner or later lead to ruin. The report referred to is worthy of careful study. It shows what may be accomplished when there is a desire to do things well, whether it be in municipal or private lighting.

AMERICAN VS. ENGLISH TELEGRAPHS.

Mr. W. H. Preece, the well-known English electrician, who visited this country last summer as a delegate to the Electrical Congress, recently made a report to the Institution of Electrical Engineers, London, of his observations in the United States. The greater portion of his report refers to the telegraphs of this country, and it makes extremely interesting reading. It is hardly necessary to state that our American telegraph system is, in this instance, viewed through intensely English eyes, and while Mr. Preece gives American enterprise a nice little pat on the back, he is confirmed in his view that things telegraphic are done better in England than in America. We print elsewhere in this issue a portion of his remarks, which, we are sure, will be read with much interest. Mr. Preece is right in one statement; that is, that American operators have not made the same advance in technical education that English operators have. This is due to a great many causes, which we shall not attempt to discuss here; suffice it to say, that if American operators would take the trouble to study the technical part of their duties, they would become infinitely more valuable to themselves and their employers. There are some who look to the future in this direction, but they make a very small proportion of the whole. All credit to the few.

ELECTRIC REFLECTORS.

The accompanying illustrations show two styles of electric reflectors made by the E. P. Gleason Mf'g. Co., 181 to 189 Mercer St., New York City.

Fig. 1 shows the fancy standard reflector pendant, with ornamental band and crown adjustable holder, patented. All the parts are staple, detachable and carried in stock.

Fig. 2 is of the plain standard reflector pendant, with patented adjustable holder.

The pendants consist of sliding canopy, iron crowfoot, 12-inch polished brass stem, an opal shade 20 inches in diameter, adjustable holder and separable cluster. The pendants are easily wired, because the cluster is separable, top and bottom.

SOUTH NORWALK'S ELECTRIC LIGHT PLANT.

We have received a copy of the first annual report of the Electric Light Commissioners of South Norwalk, Conn., for the year ending October 12, 1893. The electric light plant in this place is owned and operated by the city, and the commissioners' report is very complete.

The net cost of operation during the year, October 13, 1892, to October 12, 1893, was $5,807.93. The plant has a capacity of 120 lamps, the average number of lamps in service during the year being 90. The average number of nights lighted for the year was 311; the cost per lamp per year was $64.53¼; per night, .20¾.

The previous price paid per year for 81 lamps, averaging 800-c. p., was $4,638.12; present price paid per year for 90 lamps, averaging 1,400 c. p., $4,420.43.

The electric plant was installed by the Western Electric Company, and consists of two 60 light, direct-belted machines, with automatic regulators. The engine is a 100 H. P., "Ideal" automatic high-speed, making 300 revolutions a minute, and the boiler, 125 H. P. capacity, is of the horizontal tubular type, with a Weitmyer patent furnace. Mr. A. E. Winchester is the consulting engineer, and W. L. Bonnel, superintendent.

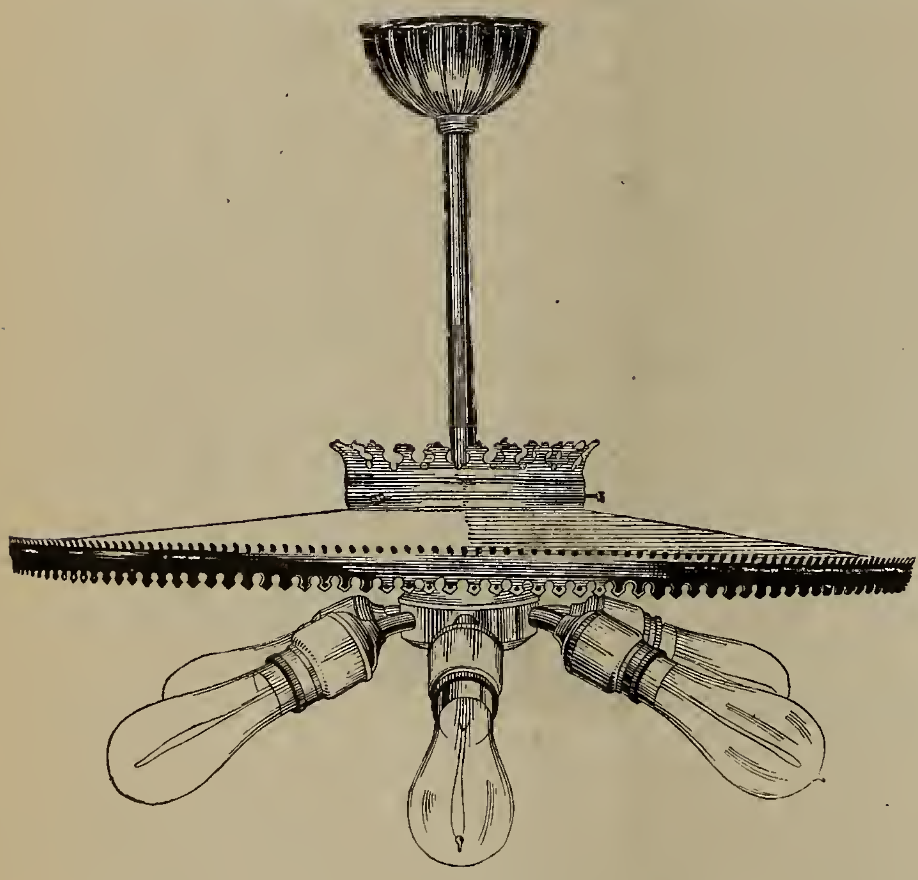


FIG. 1.

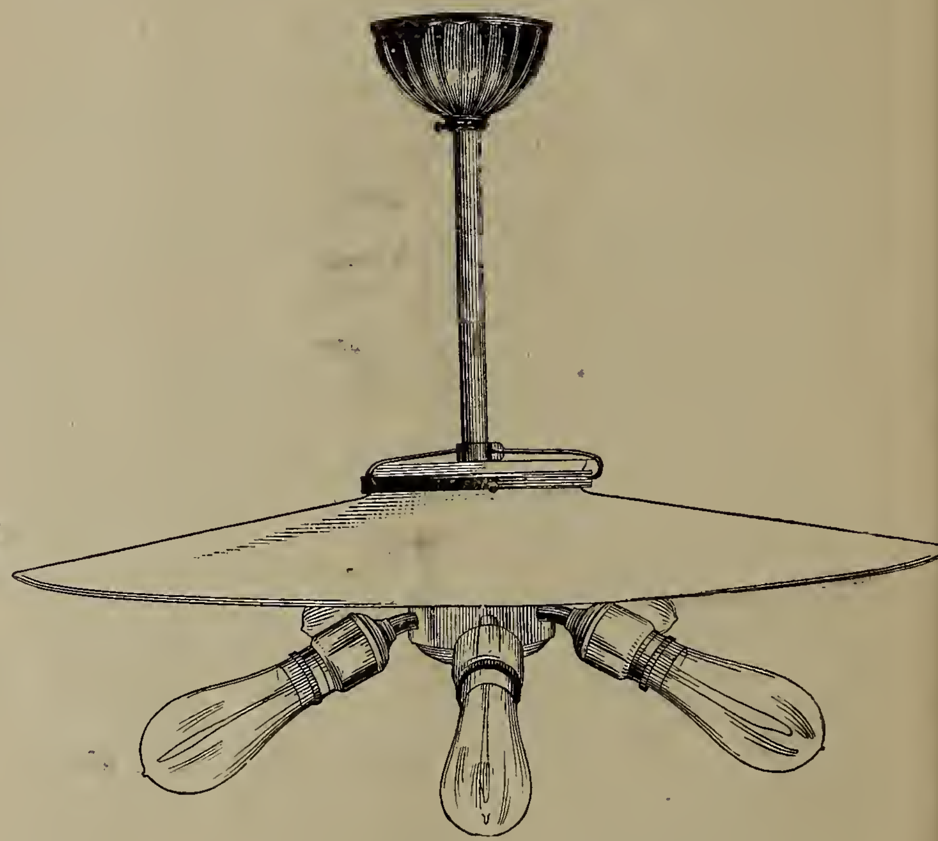


FIG. 2.

LAMP DECISION.

MUST NOT REPAIR LAMPS.

A decision was rendered in Boston, February 9, by the United States Circuit Court of Appeals, Judges Putnam, Nelson and Webb, in favor of the Edison Electric Light Company against the Davis Electrical Works et al.

The suit was brought by the Edison Company against the Davis Company for the alleged infringement on the incandescent lamp, and the case was recently heard by Judge Colt, in the United States Circuit Court, resulting in a temporary injunction being issued restraining and enjoining the Davis Company from making the lamp.

The Edison Company claimed that the Davis Company bought up lamps with the filament destroyed, which they purchased at a small price, or which in other ways came into their possession, and after reconstructing them sold them as repaired lamps.

From the order issued by Judge Colt in the Circuit Court, the Davis Company took an appeal to the United States Circuit Court of Appeals.

The opinion rendered by Judge Putnam is in substance as follows;

"In this case the plan of construction which permits no severance of the parts by an ordinary method of detachment, the sale price of the entire device, about 30 cents, the comparatively large cost of the so-called reparation, the special skill required to make it, the fact proven that the device is made so cheaply that it can be thrown away without substantial loss when the filament is worn out and the experience that, though the patent had run about 13 years and some 13,000,000 of lamps had been made before respondents commenced the so-called reparations, destruction of the lamp after the filament was worn out had been the rule, distinguished this device in this respect from those which preceded it, exclude the suggestion of either express or implied assent by the patentees to a renewal of the filament and compel the appellants to meet directly the issue of reparation as against reconstruction.

"We therefore adopt the language of the court below as follows:

"'From the very nature of the Edison invention I do not see how the glass bulb can be opened and a new filament inserted without making essentially a new lamp.'

"The business under the patent has been long established, manufacturing about 1,000,000 lamps annually.

"The fundamental basis of jurisdiction in equity in relation to patent rights and trade-marks is the necessity of protecting established enterprises from the great uncertainty caused by infringements and by the difficulty of measuring the direct and indirect losses if infringements continue."

THE SIMPSON ACOUSTIC TELEPHONE.

The telephone situation being one of the most prominent before the public at the present time, a description of the Simpson Acoustic Telephone, owned by the Union Telephone Company, 50 Broadway, New York city, will be of interest.

These telephones are highly recommended for private lines, are said to give perfect articulation, and are simple in construction. They are especially adapted for communication with stables, depots, offices, banks, stores, hotels, private dwellings, etc., also for factories, for communication between the office and the various departments.

They are said to work perfectly at any distance up to

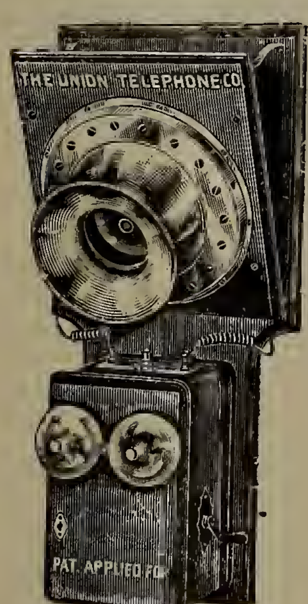


FIG. 1.

two miles, and as there are no batteries to look after, the telephone needs no care and will last a lifetime.

Fig. 1 shows the single telephone, which is suitable to place in a window with the wire running out through the window casing—the telephone being placed on brackets.

Fig. 2 shows the main board of the multiple-duplex system, which is to be used where several lines from different points are brought together. It will be seen there is a horizontal bar with annunciator drops over the top of each mouthpiece. When a person from a distant point desires to communicate, he simply rings his call bell, when the drop over the corresponding mouthpiece at the central board will fall, indicating exactly which line is being operated. On the other hand, if the person at the main board wishes to call any department, he throws the drop down by hand on the line which he wishes to speak over and rings the bell, when the one so called will be simultaneously notified, without disturbing any of the other lines.

Owing to the method of construction of this telephone, ninety-five per cent. of all sound waves are collected and distributed by the diaphragm, and all annoyances due to reverberation are avoided.

The requirements for constructing the line are very simple, and it is not at all necessary to avoid angles, all that is requisite being to keep the line free from pressure against any solid substance. To avoid this, hangers are furnished through which the line passes, and they can be so adjusted that the line can clear in going through holes in partition and around angles.

The Simpson telephone is well thought of by those who use it, and it is recommended as a very efficient device.

AMERICAN TELEGRAPHS SEEN THROUGH ENGLISH EYES.

Mr. W. H. Preece, electrician of the General Post-office, London, England, who visited the World's Fair, and was a delegate to the International Electrical Congress held in Chicago last year, read a paper before the English Institution of Electrical Engineers on what he saw during his sojourn with us.

The American telegraph systems receive the greater part of his consideration, and in concluding this portion of his review he says:

"It is quite impossible to inspect the telegraph system

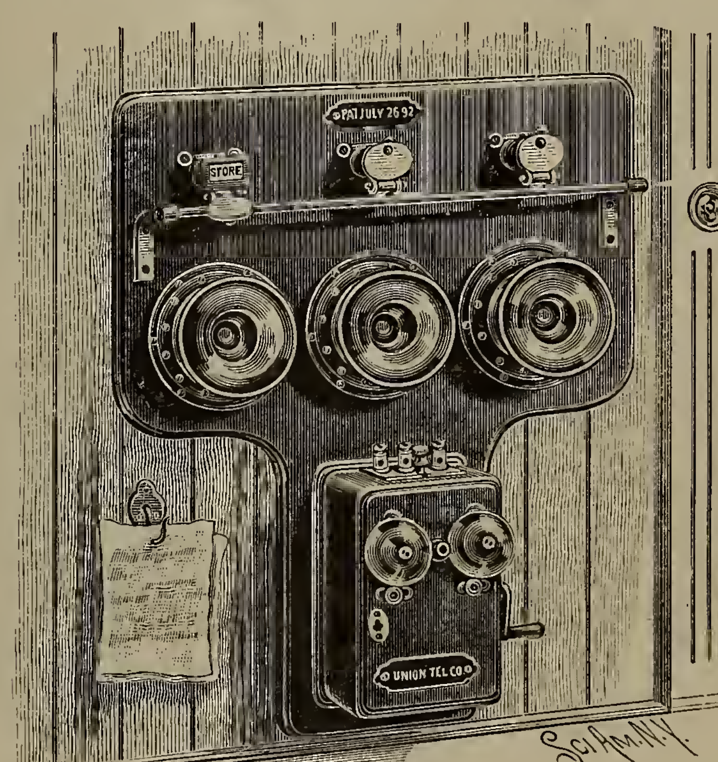


FIG. 2.

of the United States and compare it with our own system without drawing comparisons between the way in which the work is done in the two countries. The result of my previous visit was to confirm my view that we do our work better in England than they do in the States. Our apparatus is better; our speed is higher. Messages are handled with greater reliability. A message can be sent and its reply received with certainty in an hour in England. I fancy such rapidity would astonish the users of the telegraph in the States, except those in such busy centres as New York and Chicago, and generally the speculative branches of the community. The domestic telegram scarcely seems to have reached the United States, and this is probably owing to the fact that the district of private residences, the small towns and the villages do not possess telegraph offices, unless they are supplied by the railway company at the railway station, or by the Western Union Company, who do the work for the railway company. I fail to see any superiority in the manipulative skill of American operators. They certainly have not made the same advance in technical education that we have, and altogether it may be said that the management of the telegraphs in the States in the hands of private enterprise does not compare favorably with the management of the telegraphs by the State at home. At the same time it must not be assumed, because the Government have advantageously taken the telegraph in hand at home, that such a process would be possible in the States. In my opinion it would be actually impossible.

* * * * *

"The commercial management is at present, as I have pointed out, characterized by great energy. I do not, however, acknowledge that they show greater energy than we do in England. Competition may make it more conspicuous, but it is not more reaching. Our speculative business, stocks and racing is done as well as theirs. The management at home is characterized in all particulars with similar energy to that which I observed in the States; and I come back without any views or wrinkles which I think could be impressed with advantage on the commercial or technical management of our system at home, unless it be the encouragement of offices in hotels, for it is found everywhere that the telegraph office at one's door prompts the desire or want to telegraph."

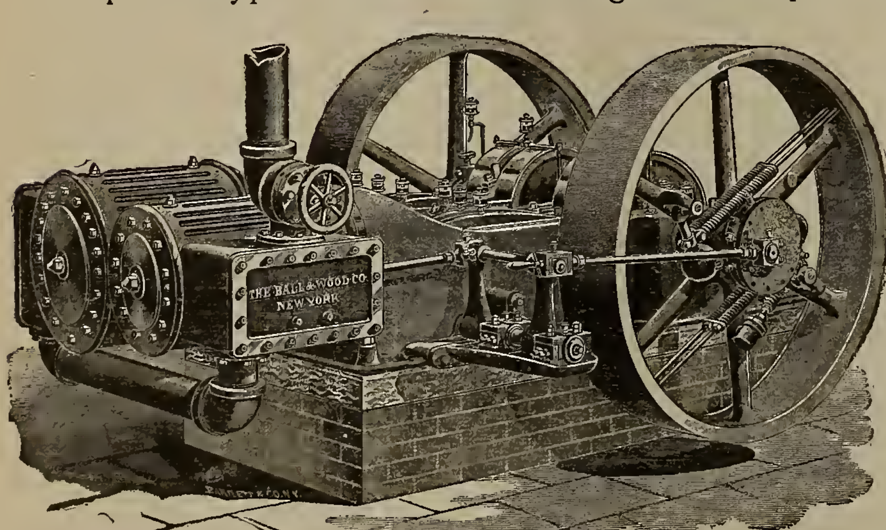
Regarding the use of dynamos for the production of telegraph currents, as practiced in this country, Mr. Preece is convinced that the Western Union Company, in New York, would have effected considerable economy if they had used accumulators charged by the electric lighting plant, instead of supplying the elaborate series of engines and dynamos now working their circuits direct.

BALL & WOOD CROSS COMPOUND ENGINE.

The various types of engines made by the Ball & Wood Company, 15 Cortlandt street, New York, are familiar to most electric light and power station managers. They are of the improved automatic, cut-off type, and are made in the simple, compound, horizontal and vertical patterns. They are high speed, and in electric work, are connected directly to the dynamos.

These engines are especially noted for their regularity of action, economy and small floor space required. They are reliable in service, as they must be to give satisfaction in electric work, where almost incessant operation is required.

The illustration given herewith shows the cross-compound type of Ball & Wood engine. Compound



CROSS-COMPOUND ENGINE.

engines are also made with cylinders in tandem, the selection of either style depending upon ulterior considerations. The conditions that really determine choice between tandem and cross-compound are mainly those of size and shape of the engine-room, the nature of the mechanisms to be operated, etc.

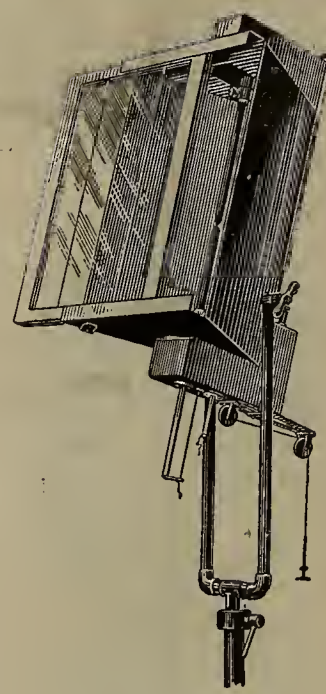
In situations where floor space is a consideration of prime importance, vertical compound engines are preferable. This company furnishes such engines.

The cross-compound engine—and often non-condensing—is very popular for railway power houses. They permit the construction of a compact plant and provide the essential duplication of generating units. These cross-compound engines can be easily run up into larger sizes and still keep within the limits of safety from stoppage or breakdown.

All parts of the Ball & Wood engines are fitted to standard gauges, and are kept in stock for immediate delivery, thus saving time in filling orders.

SCOTT ELECTRO-CALCIUM LIGHT.

Among the infinite number of applications of the electric light, none has developed a greater range of possibilities and effects than its use on theatrical stages. The electric light lends itself with remarkable facility to the production of stage and scenic effects—effects that



ELECTRO-CALCIUM LIGHT.

could hardly be approached in any other way. The lime or calcium light is the nearest approach to electric light for such uses, but it is bulky, expensive and does not produce the brilliant effects possible with electric light.

The Scott Electrical Manufacturing Co., 89 Liberty street, New York city, makes a specially designed automatic electric focusing arc lamp for stage lighting effects, that is giving most excellent satisfaction to the large number of theatres now using it. It is adapted to work on any direct, low potential current, and can be worked automatically from the stage switchboard, wherever it may be placed.

The lamp is wound for currents of from 14 to 20 amperes, at 50 volts, and gives a candle-power of from 3,000 to 4,000.

To appreciate the advantage of the electric light over the calcium light, it may be stated that the candle-power of the latter is from 900 to 1,100.

The Scott lamp is portable, the total weight of the apparatus being but 50 lbs., and there is perfect freedom from danger in handling. It is mounted on an iron stand, and is provided with a telescoping rod for the purpose of setting it at any desired height, a set-screw holding it firmly in place.

The form of the lamp is such that all the usual appliances (lens box, boomerang box, olivet box or hod and colors, etc.,), can be used as with the calcium light.

The accompanying illustration shows the lighting apparatus.

The testimonials received by the Scott Company, show that the lamp is held in high esteem by theatre managers. The largest theatres in the country are using the Scott lamp.

BLUEPRINTING.

It is no exaggeration to say that blueprinting has become the most important work of the draughting room, and it therefore seems odd that it does not receive more general and closer attention than at present.

To use blueprint paper to best advantage, the printing device is of first importance. This consists essentially of the print frame and the bath tray, and, as the latter is a fixed factor, the print frame deserves especial attention.

The first style to come into general use is shown in Fig. 1, and is generally accepted as the best form of print frame for large work. In larger sizes a print frame is rather unmanageable, and for that reason contrivances have been produced for exposing the frame outside of window, on a platform provided with rails, and so arranged that the frame can be manipulated without taking it off the rails. The frame rests in iron uprights, in which it can be turned or locked at any slant, and these uprights are attached to a framework running on wheels on the rails. This device is shown in Fig. No. 2.

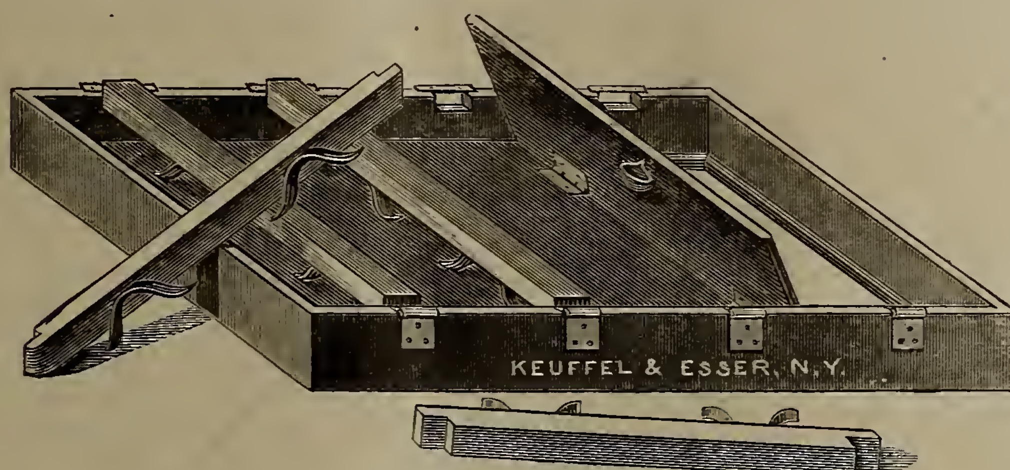


FIG. 1.

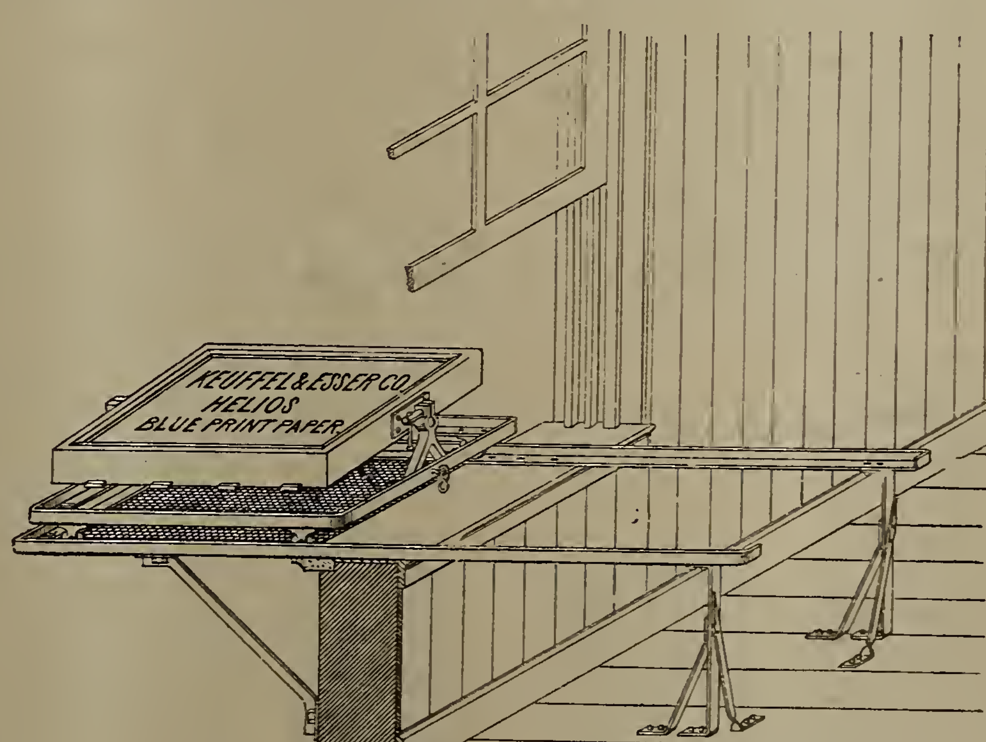


FIG. 2.

In very many offices a yard or court, or flat roof, is accessible and available for blueprinting, and in that case the device shown in Fig. 3 has many advantages over that just described. It consists of the usual frame which can be turned or locked at any slant. It is mounted on two uprights attached to a solid hard-wood truck with wheels.

These frames are manufactured by Keuffel & Esser Company, dealers in Drawing Materials, etc., in New York and Chicago.

Ground has been broken at Brinton, Pa., for the new plant of the Westinghouse Electric & Manufacturing Co.

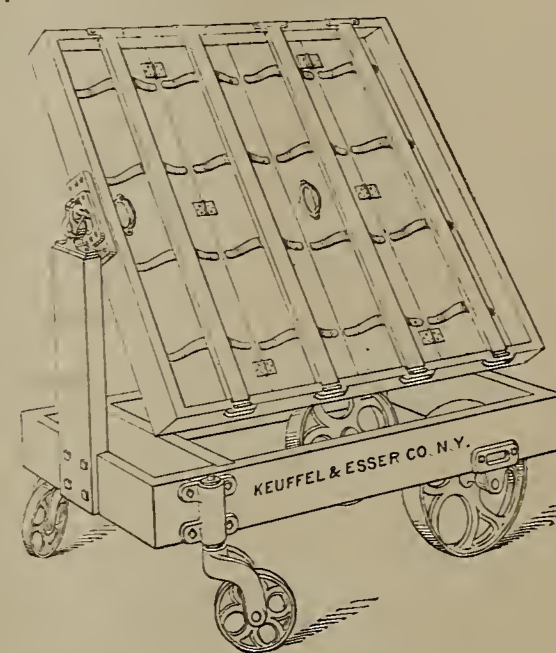


FIG. 3.

Mr. Frank A. Wilcox has been appointed receiver for the Akron Electrical Manufacturing Co., Akron, Ohio. The embarrassment is said to be temporary, and that work will soon be resumed. The company's capital is $100,000.

The old board of directors and officers were re-elected at the annual meeting of the stockholders of the Edison Electric Illuminating Co., of Boston, Mass., held on February 6. The annual report shows a gratifying condition of business.

PROTECTING HIS REPUTATION.

The following is a copy of a letter sent to us by Mr. C. S. Van Nuis, manufacturer of Ajax switches, New York, which we publish for the information and benefit of all concerned:

Editor Electrical Age:

My attention has been called to a circular issued by George B. Pennock, in which my name is unwarrantably used, and which, to say the least, is misleading.

To a casual observer, this circular would appear to be a report of an exhaustive test of the Pennock system of multiplying power by a "volt distributor," and assumes that I would be responsible for the statements and figures contained therein.

A more careful perusal of the subject, however, would reveal to the experienced engineer the real object of the author (to mislead), so there is little need to warn those posted in such matters; but, for the benefit of laymen and would-be investors in electrical enterprises, allow me to say, through the columns of your paper, that I have never made a detailed report of the Pennock system of distribution for anyone.

At the solicitation of a client, I called at Mr. Pennock's laboratory, to investigate the workings of the machine. After listening to Mr. Pennock's explanation of, and claims for, his crude apparatus, and taking several readings of the current output of his battery while during various kinds of work, I was unable to report a multiplication, or saving of power to any extent whatever, by the use of the "volt distributor," much less to verify Mr. Pennock's large claims to economy.

Before seeing Mr. Pennock's apparatus, I suggested to my client that the electricians of the country condemned it as a fraud, though I visited the exhibit in Boston with a fixed determination to give due credit to any point of merit I might find.

My search for merit was fruitless, but a careful survey of the exhibit, and of the methods employed by Mr. Pennock and his satellites, confirmed the report I had heard of this system in other localities.

A hungrier set of parasites is seldom seen, seeking as their prey any one with money. The bunco steerer's vocation seems mild when compared with this.

In the circular referred to, Mr. Pennock has arbitrarily assumed conditions and figures to suit his own convenience, while the facts in the case do not warrant a single conclusion in this truly wonderful document.

C. S. Van Nuis.

THE NATIONAL STATISTICAL ASSOCIATION.

The many friends of Mr. Allen R. Foote will be pleased to learn of that gentleman's connection with the National Statistical Association, at Washington, D. C. Mr. Foote is Vice-President and Manager of the Association, the object of which is to collect and record and tabulate, to be preserved for and furnished to its clients, such legislative, legal and statistical information as it may from time to time find to be of the greatest service to its clientele, so far as the same may be obtained from public documents and records, published addresses and arguments, magazine and newspaper articles, and from special reports made to the Association by its clients, correspondents, agents or counsel. Each client will receive a monthly circular announcing the information obtained since the issue of the last circular. These announcements will be made in the form of an index, each item classified and entered under appropriate headings, so as to enable a client to quickly find the mention of any item that may be of interest to him. The general offices of the company are in the Washington Loan and Trust Co. building, Washington, D. C. Besides Mr. Foote, the other officers are: W. B. Webb, Pres., Henry Randall Webb, Treas., George S. Boudinot, Secretary and Statistician.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Nomination circulars are being sent to members, with blank forms to be filled out with the names of those whom each member desires to place in nomination. The annual election takes place on May 15, 1894, and the nominations should be returned to Secretary Pope before March 1.

NEW YORK ELECTRICAL SOCIETY.

The next meeting of the New York Electrical Society will be held at Columbia College, 49th street and Madison avenue, on Thursday, February 15, at 8 p. m.

Mr. Joseph Sachs will deliver a lecture on: "Electric Canal Boat Propulsion, with special reference to the Erie Canal."

Synopsis: 1. The Erie Canal Agitation. 2. The Necessary Requirements for a Feasible System. 3. Several Ways in which Boats can be Electrically Operated on the Erie Canal (*a*) Propeller; (*b*) Cable Hauling, Belgian System; (*c*) Rack or Rail Hauling with Stationary Rail on Bank or Overhead, Motor on Boat Gripping Rail by Means of an Arm from the Boat; (*d*) Movable Cable on Bank and Gripping Devices on an Arm Extending from the Boat. (*e*) Motor on Bank; i. e., Locomotive on Bank or Overhead; 4. Comparison of the Various Methods and their Efficiency, including the Cost of Installation and Operation of Propeller and Hauling Method. 5. General Considerations of Canals Other than the Erie. The lecture will be fully illustrated by means of the lantern.

NEW PUBLICATION.

We have received a copy of No. 1, Vol. 1, of *Electrical Literature*, published by Fred. De Land, 565 The Rookery, Chicago. The object of this publication is, as stated in the preface, "to supply a brief synopsis in a classified form of each important article and editorial that may have any bearing on any phase of electrical engineering appearing in any publication, either American or foreign, and is a continuation of the Synoptical Index formerly appearing in *Electrical Engineering.*"

It is the same size as its predecessor, the cover being pea-green in color.

Electrical Literature is published monthly, and will certainly fill a long-felt want in electrical libraries.

Electrical literature is so bountiful these days that to keep an index of the multitude of articles that are constantly appearing, takes up too much time of the busy man of today. *Electrical Literature* fills this niche exactly, and Brother DeLand, no doubt, has struck a responsive chord.

The first number of *Electrical Literature* bears evidence of great care in its preparation. We wish Mr. De Land abundant success.

A Large Tobacco Bill.—A suit has been brought against the Pittsburg Electric Club to recover a bill of $458.33 for cigars and tobacco furnished the club. Our Pittsburg brethren must smoke pure Havanas; the best is none too good for them.

A SERVICE OF GOOD WILL FOR THE ELECTRICAL FRATERNITY.

Washington, D. C., February 12, 1894.

Editor Electrical Age:

Kindly inform your readers that I will be very glad to oblige any of them in such ways as may be by them desired, to make their attendance at the convention of the National Electric Light Association, to be held in this city, February 27 and 28 and March 1, enjoyable. It may be especially serviceable to some to have arrangements made for hotel accommodations, for printing cards, circulars, etc., before their arrival. If so, I shall be glad to attend to these and similar matters for them, as an expression of my good will.

I should be addressed as follows:

Allen R. Foote,
Care The National Statistical Association,
Washington Loan and Trust Company Building,
Washington, D. C.

GENERAL ELECTRIC WORKS RESUME OPERATIONS.

The General Electric works, in Schenectady, N. Y., resumed operations on full time on February 5, after a period of reduced working hours, which has extended over several months. General Manager Kruesi said that the force would be gradually increased in accordance with the demands, and that preference would be given to former employees of the company.

After a week's shut down for the purpose of taking an inventory, the Lynn Works of the General Electric Co. were reopened on February 5.

PERSONAL.

Mr. George Emmons has been selected to succeed Mr. E. W. Rice, Jr., as General Manager of the Lynn works of the General Electric Company. Mr. Emmons is a very estimable gentleman; the selection is a wise one.

THE WASHINGTON CONVENTION.

The following is a copy of a letter sent out by Mr. C. O Baker, Jr., Master of Transportation, to members and delegates to the National Electric Light Association, regarding transportation to Washington, on account of the convention on the 27th and 28th of this month and March 1:

136 Liberty street,
New York, Feb. 12, 1894.

Gentlemen: The various Passenger Associations have granted a rate of a fare and one-third for round trip from all points east of Chicago, Burlington and Peoria and the Mississippi River to Washington, D. C. Negotiations are now pending with the Western Traffic Association for members in that territory to secure this rate. Ask the ticket agent from whom you purchase your going ticket for delegate certificate to National Electric Light Association Meeting, which, when properly filled in and certified at Association Headquarters in Washington, will entitle you to return for one-third the regular fare.

A special vestibuled train, composed of parlor cars, will leave via Royal Blue Line, foot of Liberty street, New York, at 1:20 P. M., Monday, 26th instant; and will leave Twenty-fourth and Chestnut streets, Philadelphia, at 3:20 P. M., arriving at Washington, D. C., 6:20 P. M. Seat checks for this train can be procured from the undersigned at $1.25 each, and railroad tickets from New York to Washington at $6.50 each. Railroad tickets can also be obtained at any Blue Line ticket office. Be sure you get a certificate when purchasing ticket. Please make checks payable to C. O. Baker, Jr.

Very respectfully,
C. O. Baker, Jr.,
Master of Transportation.

The following is the programme of the meetings:

TUESDAY, FEBRUARY 27, 1894.

Meeting of the Executive Committee at 9 A. M., Parlor 36, Ebbitt House. Morning session, 10.30 o'clock, Grand Army Hall. Address: President E. A. Armstrong.

Reports of Committees on Legislation, C. H. Wilmerding, chairman; on World's Columbian Fair, B. E. Sunny, chairman; on Relation Between Manufacturing and Central Station Companies, F. Nicholls, chairman.

Afternoon session, 2 o'clock—Reports of Committees on Data, H. M. Swetland, chairman; on Finance, John A. Seely, chairman; on Underground Conduits and Conductors, M. J. Francisco, chairman; on Rules for Safe Wiring, William J. Hammer, chairman.

Paper by E. A. Leslie: "Impressions of a Central Station Man Abroad."

WEDNESDAY, FEBRUARY 28, 1894.

Morning session, 10 o'clock—Paper by J. H. Vail: "The Importance of Complete Metallic Circuits for Electric Railways."

Topic—Electrolytical Effects of Return Currents.

Topic—Storage Batteries.

Afternoon session, 2.30 o'clock—Paper by A. B. Herrick: "Development of Switch Boards for Modern Central Stations."

Topic—What is the Most Economical Size for Arc Dynamos? Discussion by Charles R. Huntley, George Redman, E. F. Peck, G. H. Blaxter, H. H. Fairbanks.

Topic—Underground Circuits. Discussion by George W. Plympton, H. J. Smith, C. H. Wilmerding, M. J. Francisco, John A. Seely.

Topic—How to Rate Arc Lamps. Discussion by James I. Ayer, C. F. Hesser, A. J. De Camp, E. W. Rollins, George R. Stetson, M. A. Beal.

Evening session, 8 o'clock—Paper by T. C. Martin and L. Stieringer: "Electric Lighting at the World's Fair and Some of its Lessons," illustrated with stereopticon.

THURSDAY, MARCH 1, 1894.

Morning session, 10 o'clock—Paper by Chas. F. Scott: "Polyphase Transmission."

Topic—Arc Lights on Incandescent Circuits. Discussion by C. L. Edgar, L. B. Marks, J. T. Ridgway, W. S. Barstow, Thomas Spencer, Jno. C. Knight, Frederic Nicholls.

Topic—Meters vs. Flat Rates. Discussion by Chas. E. Scott, J. D. Barth, W. J. Green, J. J. Burleigh, J. Gynne, J. J. Moore.

Topic—The Alternating Motor. Discussion by Nikola Tesla and others.

Afternoon session, 2.30 o'clock—Executive session.

Reports of Secretary and Treasurer and Executive Committee. Election of officers.

The Cowles Electric Smelting & Aluminum Co., of Cleveland, Ohio, has filed a bill of complaint against the Carborundum Co., of Monongahela City, Pa., claiming that the secret process of smelting of ores by an electric current, and the using of an improved electric furnace, arc being infringed upon by the defendant company.

STREET RAILWAY NEWS.

THE LOVE CONDUIT RAILWAY SYSTEM.

Washington, D. C., Jan. 3, 1894.

Editor Electrical Age:

In answer to your inquiry, as regards the operation of the Love Underground Trolley system in Washington, I would say that it is an undoubted success in every way. The road was started March 2, 1893, and has run successfully every day since on a regular schedule. All cars of the Rock Creek Ry. Co., which run on the overhead system, pass over this road, to the entire satisfaction of that company as regards operation, notwithstanding the fact that a lengthy paper was read recently before the American Institute of Electrical Engineers, in which the author made the broad statement that,

"There is not a city in America today, where a bare "conductor laid in a conduit can earn a dividend on "the capital invested. No matter what the system "may be, no matter how well the insulators may be "protected, unless the conduit is made air-tight and "water-tight (which of course no slotted conduit can "be), mud and dirt will get in and settle on the conductors."

The accuracy of these statements I wish to deny, one and all, and if the author of the paper will take the trouble to investigate, he will find that he does not have to inquire of "interested parties." Any business man outside of the horse railroad lines in Washington will praise the Love system.

The writer of the same paper quotes from a number of well-known authors, statements made several years ago, which, I feel convinced they would not make now, in view of the fact that this road has been in successful operation for nearly a year, and that the road in Chicago has never been shut down from any failure of insulation, of which fact there is abundant proof.

I have been with this road since the first dirt was moved in its construction, and have watched it daily, and positively assert, and can prove that since the current was put into the line, March 2, that there has not been five minutes delay, from any failure of insulation caused by moisture. Nor has a single line insulator given out during that time.

Mr. Stetson further says that,

"The details do not appear to have been worked out "so completely as they were in the Bentley-Knight "system."

It is the very absence of such details and complication, that gives the system success. It may not be "Electrical Engineering," but nevertheless it means dividends to the railway company, for it does not require skilled labor to handle the system.

It is very gratifying, notwithstanding this attack of "Electrical Engineers," to know that there are bills now before Congress for the building of 68 miles of this "non-dividend earning system," to be laid in Washington, and that the Rock Creek Co. has asked for ten miles of extension of the same system.

I am sorry that the open conduit cannot earn a dividend, for there will be a pile of it put in in the next year.

M. D. Law.

The Avondale street railway car sheds and machine shop in Cincinnati were burned February 2. The loss is estimated at $175,000.

It is stated that Mr. George Westinghouse is constructing a railway on his private grounds, near Pittsburg, on which to conduct experiments with the new Westinghouse system of electric railway. This system obviates the necessity of overhead wires, and is said to include a third rail for the purpose of conveying the current. The experimental track is about one-fourth of a mile long.

The Nashville Electric Railway Company, Nashville, Tenn., made an assignment on February 3. Its liabilities are stated to be about $900,000.

The County Medical Society, of Philadelphia, Pa., recently passed resolutions for the purpose of bringing about a reform in the matter of street railway car gongs. President P. A. B. Widener, of the Philadelphia Traction Company, sent a letter to the Mayor, stating that he would give the matter due attention, and, if possible, arrange a bell on the cars that will ring sufficiently loud to take the place of the clattering gong.

The various street railway companies, of Newton, Mass., will probably soon be consolidated. A bill is now before the legislature asking for authority for that purpose. The new company is to take the name of the Natick, Newton and Boston Street Railway Company.

The Massachusetts House Committee on Street Railways, is considering a bill requiring street railway companies to issue transfer checks, good on all connecting cars.

The Union Street Railway Company, of New Bedford, Mass., has given a mortgage on its property to the Old Colony Trust Company for $500,000, for the purpose of refunding $100,000 outstanding bonds to fund floating debt for new property, etc.

The Supreme Court of Wisconsin has decided that the Janesville, Wis., Street Railway Company must provide guard wires for its trolley line. This case was brought by the Telephone Company.

The holders of $568,000 of first mortgage bonds of the United Electric Railway, Nashville, Tenn., have asked the United States Circuit Court that the back interest on the bonds be paid.

The question of an electric railway between Flushing and Jamaica, and other places on Long Island, is being agitated.

It is proposed to construct another street railway in Petersburg, Virginia.

Manager H. H. Littell, of the Buffalo Railway Company, is authority for the statement that electricity transmitted from Niagara Falls may be had in the early spring for the purpose of operating the cars of that company.

A second mortgage has been placed upon the property of the Milwaukee Street Railway Co., Milwaukee, Wis., for $1,300,000, in favor of the Central Trust Co., of New York. The latter company holds the first mortgage, amounting to $10,000,000.

POSSIBLE CONTRACTS.

A movement is on foot in New Brunswick, N. J., to construct an electric street railway in that place. The question of franchise is still before the common council.

The Philadelphia City Council has been asked for permission by Theodore Cramp, President of the Market Street, Richmond and Frankford Elevated Electric Railway, to construct and operate an electric elevated railway. The road is to be built with a double track, and will be eight miles long.

Efforts are being made by Portland, Maine, capitalists to purchase the charter of the Portsmouth Horse Railroad. This is said to be a part of the plan to secure a route for an electric railroad between Boston and Portland.

The directors of the Middletown (Conn.) Railroad Company have decided to expend $150,000 during the coming season in the improvement of their property and the extension of their lines to Meriden.

The Jersey City, Harrison and Kearney Railway Company has been granted permission by the Jersey City Council to extend its lines into Jersey City.

The Hartford Street Railway Company, Hartford, Conn, has been granted permission to equip its roads on the trolley system.

Proposals are advertised for by the road committee of Hudson County (Jersey City, N. J.) for the erection of an electric light plant, complete, for the purpose of lighting a new public road leading to the county farm.

The North Hudson County Railway Company, Hoboken, N. J., has applied to the street and water commissioners of that city for permission to operate its lines on the trolley system.

Steps have been taken in Annapolis, Md., with the object of having an electric light plant established there.

NEW CORPORATIONS.

The Brocton Street Railway Co., of Brocton, Chautauqua County, N. Y., has been organized with a capital of $10,000. Directors, Owen W. Powell, T. C. Moss, and C. F. Ryckman, of Brocton.

The Hazelwood Electric Co., Pittsburgh, Pa., capital $20,000. Directors, T. M. Jenkins, F. C. Kolme, H. O. Hernberger, P. J. Edwards, W. A. Haller, of Pittsburgh.

The incorporation of the Richmond, Manchester and Petersburg Electric Railway Co., Virginia, has been petitioned for, in the Virginia Senate.

The Highland Street Railway Co., Westfield, Mass., has applied for a charter. The capital stock of the company is $12,000. Among those interested is R. D. Gillett.

The incorporation of the Virginia Electric Railway Co. has been petitioned for, in the Virginia Senate.

The Central Union Telegraph Co., of Oberlin, Ohio, has been incorporated with a capital stock of $50,000.

The Mosher Manufacturing Co., of Dallas, Texas, has been incorporated for the purpose of manufacturing electrical apparatus, etc. Capital stock, $50,000. Incorporators: J. E. and W. M. S. Mosher, Thos. J. Jones and J. S. Hetherington.

A petition has been made for the incorporation of the Natick, Newton and Boston Street Railway Company, with a capital of $350,000, with authority to purchase certain existing franchises.

The Hamilton Beach Electric Railway Company, Hamilton, Ontario, is seeking incorporation with a capital of $48,000. Incorporators: John Calden, J. N. Waddell, A. E. Carpenter, Robert Campbell, of Hamilton.

The Harrison Telephone Company, of Davis, Tucker County, West Virginia, has been organized with an authorized capital of $1,000,000. Incorporators: S. B. Elkins and H. G. Davis, of W. Va.; F. S. Landstreet, of Davis, W. Va.; E. J. Fredlock, of Piedmont, W. Va, and R. C. Kerens, of St. Louis, Mo.

Electric Storage and Equipment Company, Chicago; capital stock, $250,000. Incorporators: E. W. Applegate, Oliver R. Stratton, H. Bartlett Lindley.

The Mason Electric Company, of Chicago, has been incorporated with a capital stock of $10,000. Incorporators: Norman Totten, Frank A. Moore and Manton Maverick.

The Harrison International Telephone Co., at a meeting in Chicago, on February 6, decided to organize at once in every state and territory, proposing to give telephone service at greatly reduced rates. At present Harrison instruments are used mainly on private lines.

A new electric street railway company has been organized in Holyoke, Mass., with a capital of $100,000. Among those interested are: Wm. Whiting, James E. Delaney, Chas. H. Curran, Rollo Kelton, and Wm. H. Brooks.

HOUSTON & KENNELLY.

It will doubtless surprise our readers to learn that two gentlemen, well known in the electrical field have determined to sever the connections they have held so long in their respective avocations. We allude to Edwin J. Houston, Professor of Physical Geography and Natural Philosophy in the Central High School, of Philadelphia, who has held this chair for the past twenty-six years, and who has just resigned; and Mr. A. E Kennelly, who, during the past six years has been Mr. Thomas A. Edison's right hand man and chief electrician, and who is about to leave Mr. Edison's laboratory. These gentlemen have decided to establish in Philadelphia, a firm of electrical experts, to be known as Houston & Kennelly. Professor Houston is President and Mr. Kennelly one of the Vice-Presidents of the American Institute of Electrical Engineers. We wish them success in their new undertaking.

NEW BOOKS.

ELECTRIC WAVES, By Dr. Heinrich Hertz, pp. 278, with numerous illustrations. Macmillan & Co, London and New York, price $2.50

This work is a record of the researches of the late Prof. Hertz, on the propagation of electric action with finite velocity through space. It is the English translation from the German original, by D. E. Jones, B. Sc., Director of Technical Education to the Staffordshire County Council, with a preface by Lord Kelvin.

The original papers were published in *Wiedemann's Annalen*, but the demand for copies of the same being so great the publishers of that periodical invited Prof. Hertz to prepare his papers for publication in a collected form. The collected researches were published last year in German, and the present work is the English translation of the same.

The introduction, which was written by Prof. Hertz, describes the manner in which the investigations were undertaken, and also discusses their bearing upon electrical theory and the criticisms to which they have been subjected.

This work will find a warm welcome among English and American scientists and others who have, from time to time, read Prof. Hertz's researches into this profoundly interesting subject.

ELECTRIC LOCOMOTIVE.—An English contemporary states that an electric locomotive has been tried on the railway between Havre and Paris. It was attached to a train of 13 cars and is said to have attained a speed of 75 miles an hour.

NOTES OF GENERAL INTEREST.

It is stated that the public is waiting to hear the thud of dropping prices for telephone service.

The Buffalo General Electric Company has commenced a suit against the Toledo, Ohio, Electric Company, to collect $1,097.64.

It is stated that the Maryland Legislature will consider the question of putting criminals to death, in that State, by electricity, in place of hanging.

Permission has been granted by the Philadelphia City Council to a company for the construction and operation of the Drawbaugh telephone and telegraph system within the city limits.

The Brush Electric Company, Cleveland, Ohio, has placed in Detroit, Mich., an order for arc-lamps, which is said to be the largest single order ever placed for arc-lamps in this country.

Mortgaged.—The Milwaukee and Wauwatosa Electric Co. has been mortgaged for $84,000, to Capt. Pabst. The mortgage runs for a period of twenty years, with interest at 6 per cent.

It is stated that the General Electric Company will consolidate its several departments, in Lynn, in one or two buildings. Little or none of the machinery of the other buildings will be moved.

The Mather Suit.—Judge Shipman, will on March 5, hear the answer of the defendants in the case of the Edison Electric Light Co. against the Mather Electric Light Co., of Manchester, Conn.

Mr. J. P. Ord has been chosen second Vice-President of the General Electric Company, and General B. F. Peach, Treasurer. Mr. Ord will have charge of the treasury, credit and accounting departments.

Mankato, Minn., was deprived of electric light for four weeks, owing to the refusal of payment of two months' bills by the city, the latter claiming non-fulfilment of contract. The matter has been adjusted, and the lights are burning again.

A trial was made on the 1st of February of the incandescent light system at the mid-winter fair, San Francisco. The plan is to outline the main buildings with incandescent lamps. The lamp circuits run under the eaves of each of the buildings, around the domes, and up and down pilasters and columns. It is stated that the effect will be splendid.

STORAGE BATTERY PATENTS.

The Brush Electric Company and the Consolidated Electric Storage Company, as co-complainants, have sued the Electric Storage Battery Company and W. W. Gibbs, president, manufacturers of the chloride accumulator, for infringement in the United States Circuit Court, at Trenton, N. J. The suit is brought on the Brush storage battery patents, recently sustained by the United States Circuit Court of Appeals. The motion for preliminary injunction will be heard before Judge Green on the 20th instant.

The publication of a list of new incorporations is a feature of the Electrical Age. When a new company organizes it is presumed it is going to transact some business, and if it is going into business it must necessarily need materials. Advertisers and subscribers of the Electrical Age have materials for sale, and therefore they should keep a close watch on the "New Corporations" column. Eternal vigilance is the price of success these days.

NEW YORK NOTES.

Office of the Electrical Age,
World Building, New York,
February 10, 1894.

L. J. Wing & Co., 126 Liberty street, are making a specialty of small electric light plants, run by their improved gas engine and dynamo outfit.

Died.—Mr. Hassan H. Wheeler, president of the American District Telegraph Co. in Brooklyn, died at his home on the morning of February 2, at the age of 56 years.

The lamp and gas committee of Brooklyn have recommended that bids for gas and electric street lighting be re-advertised. The committee thought that the figures previously submitted were too high.

The Royal Arc Electric Co., 136 Liberty street, has come out with its new incandescent arc lamp. This lamp has a special receptacle for inclosing the points of the carbons, which, it is claimed, gives a life of 70 hours to the carbons.

Mr. C. S. Van Nuis, 136 Liberty street, City, manufacturer of the celebrated Ajax Switches, says he can break anything in the current line. Some one in Boston, he says, will be all broke up before he (Van Nuis), gets through with him.

The Brooklyn District Telegraph Co., at a meeting a few days ago, elected the following directors: Albert B. Chandler, Chas. H. Erwin, Walter C. Humstone, Henry R. Heath, Robert J. Kimball, Thos. F. Nevins, James Shevlin, Chas. A. Tinker, Geo. G. Ward.

The Mason Electric Co., Real Estate Exchange, Brooklyn, is receiving orders for its phonograph, telephone and power batteries. A large amount of cash has been subscribed and paid in for the purpose of extending the business. Mr. J. H. Mason, the well-known electrician, is manager of the company.

The National Conduit Manufacturing Co., Times Building, City, has taken three additional offices in the same building. The officers of the company will be glad to have their friends call and see them, especially those who are desirous of placing orders for a first-class conduit, and those who desire to investigate the merits of such a conduit system.

The Third Avenue Cable road began operations downtown on Sunday, February 11. On Monday the real test was made, and many blockades and little mishaps occurred. These, however, were not unlooked for, as it is beyond the range of human possibility to put a system of this magnitude into operation without experiencing a little friction at first. W. T. H.

TRADE NOTE.

The following is a copy of a letter handed to our representative by Mr. W. A. Vail, 136 Liberty street, New York City, New York Agent for the La Roche Electric Works, Philadelphia Pa.:

Quincy, Mass. Feb. 5, 1894.

La Roche Electric Works,
Philadelphia, Penn.

Gentlemen:—The 2600 light La Roche Alternator ordered from you, arrived and has been tested. The machine takes the place of a 2200 light A. C. Westinghouse dynamo, which they built for us, and which, after eight week's experimenting upon, they failed to make carry its load. After giving the Westinghouse Co. all opportunity to put their machine in acceptable condition, we ordered your 2600 lighter, which you delivered to us very promptly.

Upon testing the machine, the maximum load was 2775 lights, which was all the load we had to test with. After one hours' run we found the difference in temperature was only two degrees between the armature and the room, which was very gratifying to us, as our experience with your 1300 light A. C. Machine led us to anticipate this pleasing result.

Truly yours,

(Signed), Fred. W. Austin, Supt.
Quincy Electric Light and Power Co.

The Page Belting Co., Concord, N. H., has issued a handsome souvenir in commemoration of the twenty-fifth anniversary of the establishment of the business. It gives a history of the Page Belting Company at the World's Fair, and is fully illustrated.

Electrical and Street Railway Patents.

Issued February 6, 1894.

513,975. Induction Mechanism for Electrostatic Instruments. Wm. E. Ayrton and Thos. Mather, London, England. Filed May 1, 1893. Patented in England, July 29, 1890, No. 11,862.

513,982. Electric Conductor. Horace F. Chick, Watertown, assignor of two-thirds to Frank A. Spooner and Ronald A. Stuart, Boston, Mass. Filed May 1, 1893.

514,018. Cut-Out Block. Edward J. McEvoy, New York, N. Y. Filed July 29, 1893.

514,019. Circuit-Controller. Edward J. McEvoy, New York, N. Y., assignor of one-half to the Wm. Cramp & Sons' Ship and Engine Building Co., Philadelphia, Pa. Filed Aug. 31, 1893.

514,030. Load-Governor for Electric Currents. Frank E. Pritchard, Oswego, N. Y. Filed Nov. 19, 1891.

514,047. Dynamo and Motor. Montgomery Waddell, Bridgeport, Conn. Filed Mar. 13, 1893.

514,056. Conduit Electric Railway. Rufus C. Beardsley, Lafayette, Ind. Filed Jan. 28, 1893.

514,057. Hood for Electric-Arc Lamps. Sigmund Bergmann, New York, N. Y. Filed Jan. 10, 1893.

514,058. Electric-Arc-Light Fixture. Sigmund Bergmann, New York, N. Y. Filed Jan. 10, 1893.

514,075. Electrical Measuring or Indicating Instrument. Samuel E. Hitt, Rockford, Ill Filed Apr. 7, 1893.

514,077. Electric Motor. John D. Ihlder, Yonkers, assignor to the Otis Brothers & Co., New York, N. Y. Filed Sept 29, 1893.

514,078. Electric Elevator-Motor. John D. Ihlder, Yonkers, assignor to the Otis Brothers & Co., New York, N. Y. Filed Sept. 29, 1893.

514,087. Electric Shuttle-Motion for Looms. Levi W. Lombard, Lynn, Mass., assignor to B. F. Spinney and J. N. Smith, same place. Filed Mar. 18, 1893.

514,088. Electric Shuttle-Motion for Looms. Levi W. Lombard, Lynn, Mass., assignor to B. F. Spinney and J. N. Smith, same place. Filed Mar. 18, 1893.

514,089. Electric Shuttle-Motion for Looms. Levi W. Lombard, Lynn, Mass , assignor to B. F. Spinney and J. N. Smith, same place. Filed Mar. 23, 1893.

514,109. Electric-Car Truck. Charles F. Winkler, Kingston, N. Y. Filed May 22, 1893.

514,112. Closed-Conduit Electric Railway. Frank M. Ashley, Hawthorne, N. J. Filed Dec. 23, 1892.

514,113. Electric Railway. Frank M. Ashley, Hawthorne, N. J. Filed Dec. 23, 1892.

514,114. Electric Railway Conduit. Frank M. Ashley, Hawthorne, N. J. Filed Dec. 23, 1892.

514,115. Electric Battery. Frank Bayer, New York, N. Y., assignor of one-half to Thomas B. Wilson, same place. Filed Aug. 24, 1893.

514,120. Electric Railway. Oscar A. Enholm, New York, N. Y., assignor to Edward C. Reiss and John J. Ashley, Brooklyn, N. Y., and Frank M. Ashley, Hawthorne, N. J. Filed Oct. 3, 1892.

514,121. Safety-Guard for Street-Cars. George T. Foster, Rochester, N. Y. Filed May 6, 1893.

514,128. Signaling System. Joseph G. Noyes and Louis Winterhalder, Milford, Conn. Filed July 3, 1893.

514,131. Electric Meter. Carl Raab, Kaiserslautern, Germany. Filed Jan. 21, 1893.

514,134. Closed Conduit for Electric Railways. Henry A. Seymour, Washington, D. C., assignor to the Short Electric Railway Co., Cleveland, Ohio. Filed Aug. 29, 1892.

514,133. Underground Electric Conductor. Henry A. Seymour, Washington, D. C., assignor to the Short Electric Railway Co., Cleveland, Ohio. Filed Aug. 30, 1890.

514,135. Motor-Controlling Device for Electric Locomotives. Sidney H. Short, Cleveland, Ohio, assignor to the Short Electric Railway Co., same place. Filed Jan. 6, 1890.

514,139. Electric-Arc Lamp. Gustavus G. Wagner, New York, N. Y., assignor to the Interior Conduit and Insulation Co., same place. Filed Nov. 15, 1892.

514,140. Alternating Dynamo. James J. Wood, Fort Wayne, Ind. Filed June 20, 1893.

514,150. Commutator Brush. Jesse F. Kester, Buffalo, N. Y., assignor to the F. P. Little Electrical Construction and Supply Co., same place. Filed Nov. 23, 1893.

514,168. Means for Generating Electric Currents. Nikola Tesla, New York, N. Y. Filed Aug. 2, 1893.

514,167. Electrical Conductor. Nikola Tesla, New York, N. Y. Filed Jan. 2, 1892.

514,170. Incandescent Electric Light. Nikola Tesla, New York, N. Y. Filed Jan. 2, 1892. Renewed Dec. 15, 1893.

514,202. Electric Alarm. Friedrich Sauer and Carl Hentzschel, Berlin, Germany. Filed July 8, 1893.

514,212. Electric Signaling Device. Jas. N. Connolly, New York, N. Y. Filed Nov. 9, 1893.

514,221. Insulator. Lawrence B. Gray, Boston, Mass. Filed June 22, 1893.

514,228. Electrical Transmission of Power. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Co., of Connecticut. Filed Nov. 18, 1889.

514,258. Temperature-Compensating Device. William H. Bristol, Hoboken, N. J. Filed Oct 31, 1893.

514,260. Secondary Battery. Hiram H. Carpenter, St. Louis, Mo. Filed Dec. 21, 1892.

514,267. Electrode for Secondary Batteries. Jules Legay and Lucien Legay, Fils, Levallois, France. Filed Oct. 13, 1890. Patented in France July 25, 1890, No. 207,211; in Belgium July 28, 1890, No. 91,411; in England July 30, 1890, No. 11,919; in Switzerland Oct. 15, 1890, No. 2,903; in Italy Jan. 22, 1891, XXV, 28,980, LVII, 112, and in Germany Mar. 24, 1891, No. 60,840.

514,274. Electric-Trolley-Wheel Shield. Henry S. Pruyn, Hoosick Falls, N. Y. Filed May 10, 1893.

514,275. Method of and Apparatus for the Electric Deposition and Refining of Copper or other Metals. Logan S. Randolph, Baltimore, Md. Filed Aug. 24, 1893.

514,276. Process of Electrolytic Separation of Nickel from Copper. Pierre De P. Ricketts, New York, N. Y. Original application filed Apr. 20, 1892. Divided and this application filed May 15, 1893.

514,279. Auxiliary Fire-Alarm Telegraph. Joseph Sachs, New York, N. Y. Filed Apr. 20, 1893.

514 301. Rheostat. John T. Birch, Pittsburg, Pa. Filed Nov. 16, 1893.

514,303. Series Electric Railway. Michael A. Cattori, Rome, Italy. Filed May 18, 1893. Patented in Italy Jan. 27, 1893, No. 33,332, and Feb. 8, 1893, No. 33,406.

514,304. Insulated Pipe-Coupling. Edmund E. Clift, Philadelphia, Pa., assignor to John F. Pole, same place. Filed Oct. 10, 1892. Renewed Aug. 9, 1893.

514,305. Electrolier. Edmund E. Clift. Philadelphia, Pa., assignor to John Shaw, trustee, and John F. Pole, same place. Filed July 1, 1891. Renewed Aug. 9, 1893.

514,318. Electrode for Use in the Manufacture of Chlorin and Caustic Soda. James Greenwood, London, England, assignor to the Caustic Soda and Chlorine Syndicate, Limited, same place. Orginal application filed Jan. 10, 1893. Divided and this application filed Oct. 18, 1892. Patented in England Feb. 5, 1891, No. 2,134; in Germany Apr. 10, 1891, No. 62,912; in France May 11, 1891, No. 213,377; in Norway May 13, 1891, No. 2,372; in Belgium May 15, 1891, No. 94,903; in Cape of Good Hope, June 5, 1891, No. 182; in Natal June 10, 1891; in Victoria June 17, 1891, No. 8,816; in South Australia June 19, 1891, No. 1,959; in New South Wales June 20, 1891, No. 3,065; in Queensland, June 22, 1891, No. 1,350; in Italy June 30, 1891, XXV, 29,711, and LVIII, 359; in Portugal July 1, 1891, No. 1,596; in Turkey July 8, 1891, No. 234; in Spain July 18, 1891, No. 12,110; in Ceylon Sept. 14, 1891, No. 369; in India Dec 4, 1891, No. 259; in Canada July 29, 1892, No. 39,524; in Austria-Hungary Feb. 6, 1892, No. 41,706 and No. 77,721, and in Transvaal Mar. 15, 1892, No. 347.

514,325. Instrument for Measuring and Regulating Electrical Resistances. George B. Lawrason, New Orleans, La. Filed June 13, 1893.

514,353. Trolley-Wire Shield. Louis Eschner, Philadelphia, Pa. Filed Apr. 30, 1892.

514,361. Automatic Electric Fire-Alarm. William A. Guthrie, Durham, N. C. Filed Aug. 19, 1893.

514,362. Fire-Alarm and Sprinkler. William A. Guthrie, Durham, N. C. Filed Oct. 17, 1893.

514,389. Cable-Grip. John A. Tauberschmidt, Washington, D. C. Filed Aug. 16, 1893.

514,398 Electric Signaling Apparatus for Railways. Edgar C. Wiley, Bristol, Tenn., assignor to the Wiley Railway Electric Signal Company, same place. Filed May 11, 1893.

514,417. Globe-Holder for Arc Lamps. John T. Dempster, Summit, N. J., assignor to Sigmund Bergmann, New York, N. Y. Filed Feb. 13, 1893.

514,425. Electric-Arc Lamp. William B. Luce, Brookline, Mass. Filed Mar. 16, 1893.

514,429. Regulator for Electric Motors. Sidney H. Short, Cleveland, Ohio, assignor to the Short Electric Railway Company, same place. Filed Jan. 26, 1891.

ELECTRICAL PATENTS EXPIRED FEBRUARY 6, 1894.

187,055. Electro-Magnetic Attachments for Time-Locks. W. W. Sherar, Rochester, N. Y. [Filed Oct. 7, 1876.]

187,182. Telegraph-Insulators. Paul Seiler, San Francisco, Cal., assignor of one-half his right to J. Herz, same place. [Filed Nov. 18, 1876.]

187,175. Compound Telegraph-Wire. Wm. E. Rice, Worcester, Mass. [Filed Aug. 17, 1876.]

REISSUE.

7,489. Anodes for Electroplating with Nickel. A. Hermann and W. H. Taylor, Stamford, Conn., assignors, by mesne assignments, to the Yale Lock Manufacturing Company, same place. Patent No. 166,367, dated Aug. 3, 1875. [Filed May 5, 1876.]

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CONTENTS.

THE WASHINGTON CONVENTION.

Judging from the general interest that is being taken in the convention of the National Electric Light Association in Washington next week, it is manifest that the selection of the National Capital as the meeting-place was a wise one. Up to the present writing over 100 persons will enjoy the ride on the special train which leaves New York on Monday, February 26, at 1:20 P.M. This line is a very fast one, the schedule time between New York and Washington, being but five hours, or at a speed of nearly 50 miles an hour. We are informed that an effort will be made to make a record on this trip, and that the train will pull into Washington a good deal ahead of time. There is no more favorable spot in the East to visit at this season than Washington, and those of the delegates who are bent on sight-seeing, and their friends, will certainly find plenty to keep them busy. We suggested in our last issue that it would be an event of great interest for the Association to call on the President in a body. It will be easier to meet the chief magistrate in this way than it would be if individual effort alone were depended upon to break down the barriers of etiquette, business, etc. Elsewhere we print matter of general interest regarding the convention. There promises to be a large attendance, and every one that can go should not fail to do so.

A PRIZE OFFERED.

The Society for the Promotion of Industry, of the Netherlands, has offered a medal and prize for the best paper on utilizing wind-mill power in the generation of electricity. This is a good chance for American electrical engineers to distinguish themselves. Some one should be able to capture this prize, for we certainly have the ability here. The conditions of the offer are given on another page in this issue.

THE "NOVAK" LAMP CASE.

The United States Circuit Court of Appeals at Hartford, Conn., has sustained Judge Shipman's decision in the suit of the Edison Electric Light Company against the Waring Electric Company of South Manchester. This confirms Judge Shipman's order issuing an injunction prohibiting the defendants from making the "Novak" incandescent electric lamp. After Judge Shipman in the Circuit Court granted the injunction, the defendants filed a bond of $10,000 to indemnify the plaintiff company for any damages, pending an appeal to the United States Circuit Court of Appeals, and have since continued making the lamp.

ARE TELEPHONE AND TELEGRAPH INTERESTS TO BE CONSOLIDATED?

A rumor has been going the rounds for the past few days to the effect that there was a possibility of a union between the American Bell Telephone Company and the Western Union Telegraph Company; and another is, that the Long Distance Telephone Company contemplated going into the telegraph business. How much truth there is in either of these reports it is impossible to learn at the present time, but there seems to be a prevalent feeling in the trade that consolidation may really be contemplated by the two giant concerns. The corporate name of the Long Distance Telephone Company is the "American Telephone and Telegraph Company." If the promoters did not intend that the company should engage in the telegraph service, why was the word "Telegraph" adopted as part of the corporate title? It is possible that they looked far enough ahead to see what the ultimate result of their venture would be.

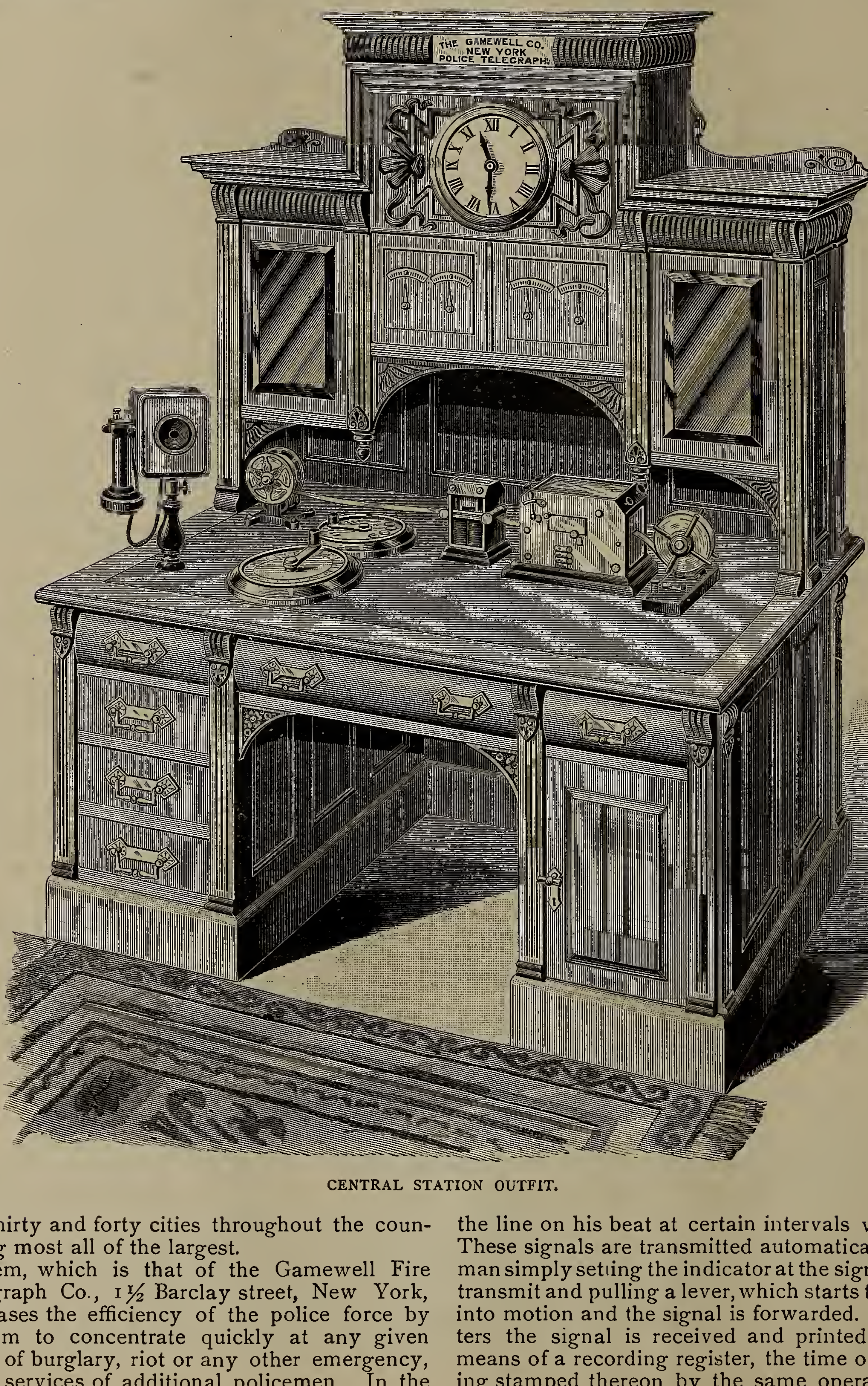
THE GAMEWELL POLICE TELEPHONE AND TELEGRAPH SIGNAL SYSTEM.

To Chicago belongs the honor of being the first city to use the telegraph and telephone combined as an auxiliary to the police service. This was in 1880, and under the supervision of Mr. John P. Barrett, city electrician of Chicago, and late chief of the Department of Electricity, at the World's Fair, the value of the system was at once made apparent. Since that time the police telephone and signal system has been introduced in between thirty and forty cities throughout the country, including most all of the largest.

This system, which is that of the Gamewell Fire Alarm Telegraph Co., 1½ Barclay street, New York, greatly increases the efficiency of the police force by enabling them to concentrate quickly at any given point in case of burglary, riot or any other emergency, requiring the services of additional policemen. In the event of any disturbance, the patrolman runs to the nearest signal box and turns in an alarm, which, as received at headquarters, indicates the nature of the trouble.

The system herein referred to comprises essentially, street signal boxes, central station outfits and stable outfits, besides the usual batteries, wires, etc.

The signal boxes are placed at convenient points in the districts covered by the system, and are connected with headquarters by wire. The patrolmen are required to turn in a signal from one of the boxes along the line on his beat at certain intervals while on duty. These signals are transmitted automatically, the patrolman simply setting the indicator at the signal he wishes to transmit and pulling a lever, which starts the mechanism into motion and the signal is forwarded. At headquarters the signal is received and printed on a tape by means of a recording register, the time of its receipt being stamped thereon by the same operation. That is



CENTRAL STATION OUTFIT.

all that is done in simply reporting attention to duty. In case of emergency, however, other signals are sent, which, on receipt at headquarters, are given the attention requisite. A telephone set is cut in when verbal communications between the box and headquarters are desired, and in case the services of a police patrol wagon or ambulance are necessary, the call is sent

WALL BOX.

from headquarters to the stable, where all the relief apparatus is located.

In stables situated at a distance from headquarters the stable outfit shown in one of our illustrations is placed. A call from headquarters, whether it be for ambulance or patrol wagon, is received in three different ways simultaneously—usually, on a gong and on recording register. The usual signal consists of an indicator showing the number of the box whence the call originally came; the gong strikes the same number, and on the register the box number is punched out on the tape. In this way it is impossible for a signal to escape attention.

The wall, or signal boxes, of which an illustration is given herewith, are designed to be placed in depots, warehouses, factories, etc., and on poles or walls of buildings where it is unnecessary or impracticable to place the sentry street station, or as a matter of economy, and may be interspersed between the more expensive and elaborately equipped street stations.

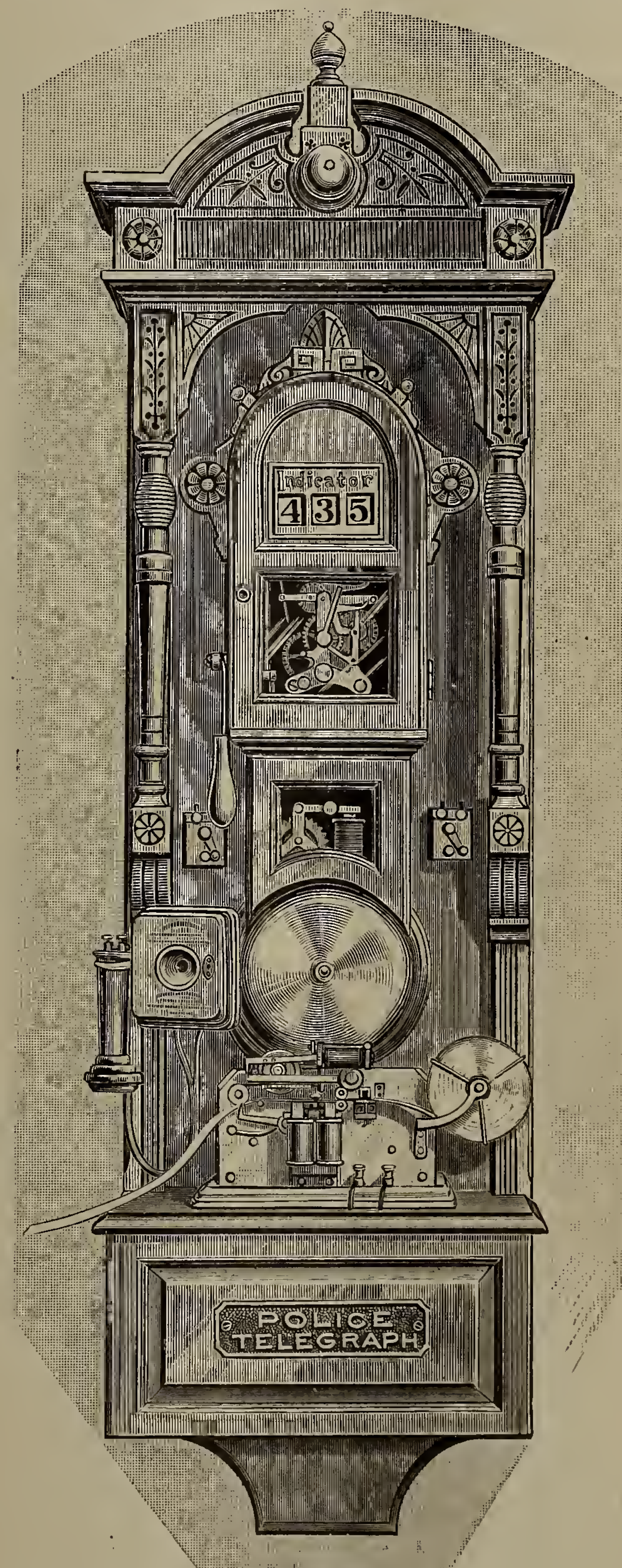
A certain number of calls in every signal box can be, if desired, reserved for the use of individual patrolmen to indicate their personal presence at the box; but the safest and probably the only method of identifying a patrolman at the box, is by the sound of his voice while using the telephone.

All boxes are provided with key and bell for code signaling, and they are so arranged and electrically connected that, although out of circuit when the boxes are not in use, they are instantly made operative as soon as the box door is opened or the citizens' key is used.

When a patrolman is wanted at his station, the fact is immediately made known to him as soon as he signals his presence at a box.

The advantage of automatic signals over those given vocally can not be overestimated. In cases of excitement, experience has abundantly proven that wrong impressions are often unwittingly conveyed by the speaker or received by the listener, while with an automatic printed message there can be no variation or mistake. The mechanical result is invariably the same.

In connection with this system of Police Patrol Telegraph, a combination of visual signals attached to the top of the booth stations or lamp-posts can be furnished. These signals combine the use of semaphores by day and



STABLE OUTFIT.

flash lights by night, together with the continuous ringing of a large bell.

In almost every city there are points at which these visual signals could be placed and operated to great advantage, for by their use the patrolman who comes within sight or sound of them can be summoned to the box or booth for conversation, or to receive orders from a central station.

The bells of the fire-alarm telegraph may be utilized, where this system is in use by the police department, to summon, in cases of emergency, the entire force to rally at the nearest street station, and then directions may be given them by telephone; so that when desired, the facts in detail may be made known to every policeman in the city.

Among the cities where this system is in operation are the following: Allegheny City, Pa., Baltimore, Md., Brooklyn, N. Y., Buffalo, N. Y., Brookline, Mass., Charleston, S. C., Chicago, Ill., Cincinnati, Ohio, Columbus, Ohio, Denver, Col., Detroit, Mich., Fort Wayne, Ind., Grand Rapids, Mich., Hartford, Conn., Hyde Park, Ill., Jersey City, N. J., Joliet, Ill., Lake View, Ill., Long Island City, N. Y., Lynn, Mass., Milwaukee, Wis., Minneapolis, Minn., New Haven, Conn., New Orleans, La., Omaha, Neb., Paterson, N. J., Peoria, Ill., Philadelphia, Pa., Pittsburg, Pa., Portland, Me., Rochester, N. Y., St. Louis, Mo , Toronto, Ont., Washington, D. C., Youngstown, Ohio.

The Gamewell Company has just completed the Paterson, N. J., installation, which includes 40 street boxes on four separate circuits, one central station outfit and one stable outfit.

In Jersey City there are 40 boxes, five central stations and three stable outfits.

In addition to this system, the Gamewell Company is well known all over the country, through its automatic fire-alarm system, which is now in use in nearly 400 cities and towns.

ECO MAGNETO WATCHMAN'S CLOCK.

Although we feel a greater sense of security and satisfaction when we know that our property is protected, (or is supposed to be protected) by a watchman, yet, while we are asleep or away from the property, what assurance have we that the watchman is faithful to his trust? Watchmen are not all alike; some are trustworthy and others are not. It is to insure the faithful performance of duty on the part of watchmen, that watchmen's clocks were invented.

One of the best of these devices on the market is the well-known Eco Magneto Watchman's Clock.

Most all electric watchmen's clocks depend upon an electric battery for their operation; but batteries are very undesirable adjuncts, and if they can be avoided it is well to do so. They are undesirable on account of their propensity to run down and otherwise become inoperative at a time when they should be doing their duty.

In devising the Eco Magneto clock the main objec was to do away with batteries, and thus strengthen the weak point of electric watchman's clocks in general.

In this system the "station" consists of a small box containing a magneto machine. When the watchman inserts his key into the box, and turns it around once, he gives a very rapid revolution to the armature of the magneto, and the current thus generated excites the electro-magnet of the clock and the record is made.

A circular paper dial, with radial divisions, corresponding to hours and fractions thereof, is moved by the clock mechanism, and when a signal is received from a station the record made thereby on the paper shows at what time the watchman transmitted the signal. Current is sent over the circuit only as often as the watchman turns in his signal.

These clocks are constructed in a simple manner, and are not easily deranged. They also possess the very important advantage of being proof against tampering, and in no possible way could a dishonest watchman circumvent the duty of the clock, to serve his own ends. Another advantage is that no expert is required to connect it up and put it in operation; anyone with ordinary intelligence can do that as well.

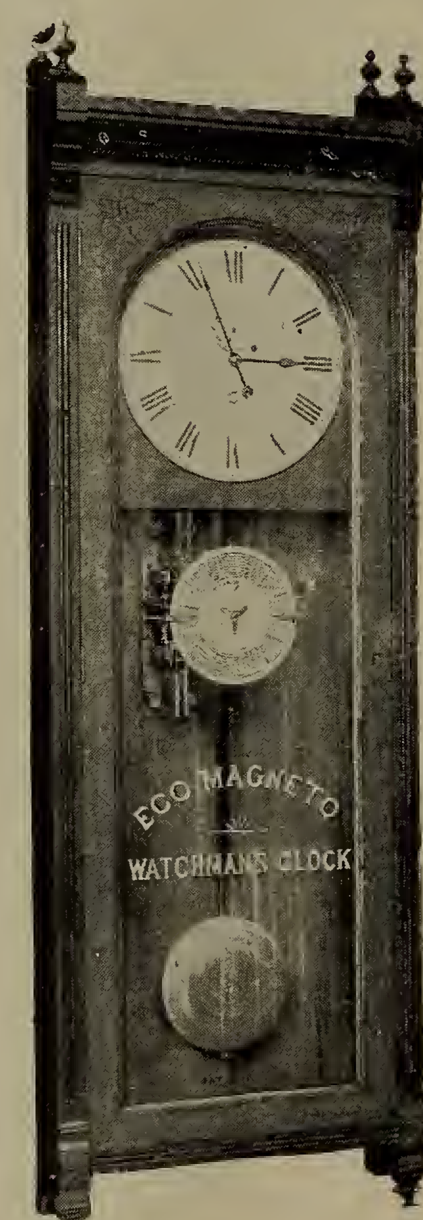
The Eco Magneto Clock keeps an exact record of the times the watchman visits each station, and it is said to be cheaper then any electric watchman's clock. No false records can be made on it. It has been approved by insurance companies and fire departments, and is in general use in mercantile, manufacturing and financial firms, institutions and corporations, where it is giving the utmost satisfaction.

Mr. C. D. Bernsee, Vanderbilt Building, corner Beekman and Nassau streets, New York city, is the manufacturer of these clocks. Mr. Bernsee took charge of the system in May, 1888, since which time he has installed nearly 2,000 Eco Magneto Clocks.

NOTES.

The Newark Electric Light and Power Company's plant, Newark, N. J., was damaged a few days ago by a fire in an adjoining building. A portion of the city was left in darkness for a while.

The Ohio House of Representatives has adopted a resolution providing for a special committee to investigate into the feasibility and cost of equipping the canals with electricity.



ECO MAGNETO WATCHMAN'S CLOCK.

A dispatch from the City of Mexico states that a syndicate of Mexican and American capitalists has been organized for the purpose of constructing a Pan-American telegraph line to extend along the Pacific Coast from Victoria, B. C., to Santiago, Chili, passing through the United States, Mexico, the Central American States and Pacific Coast countries of South America.

IMPROVED HIGH-SPEED WIND MILL.

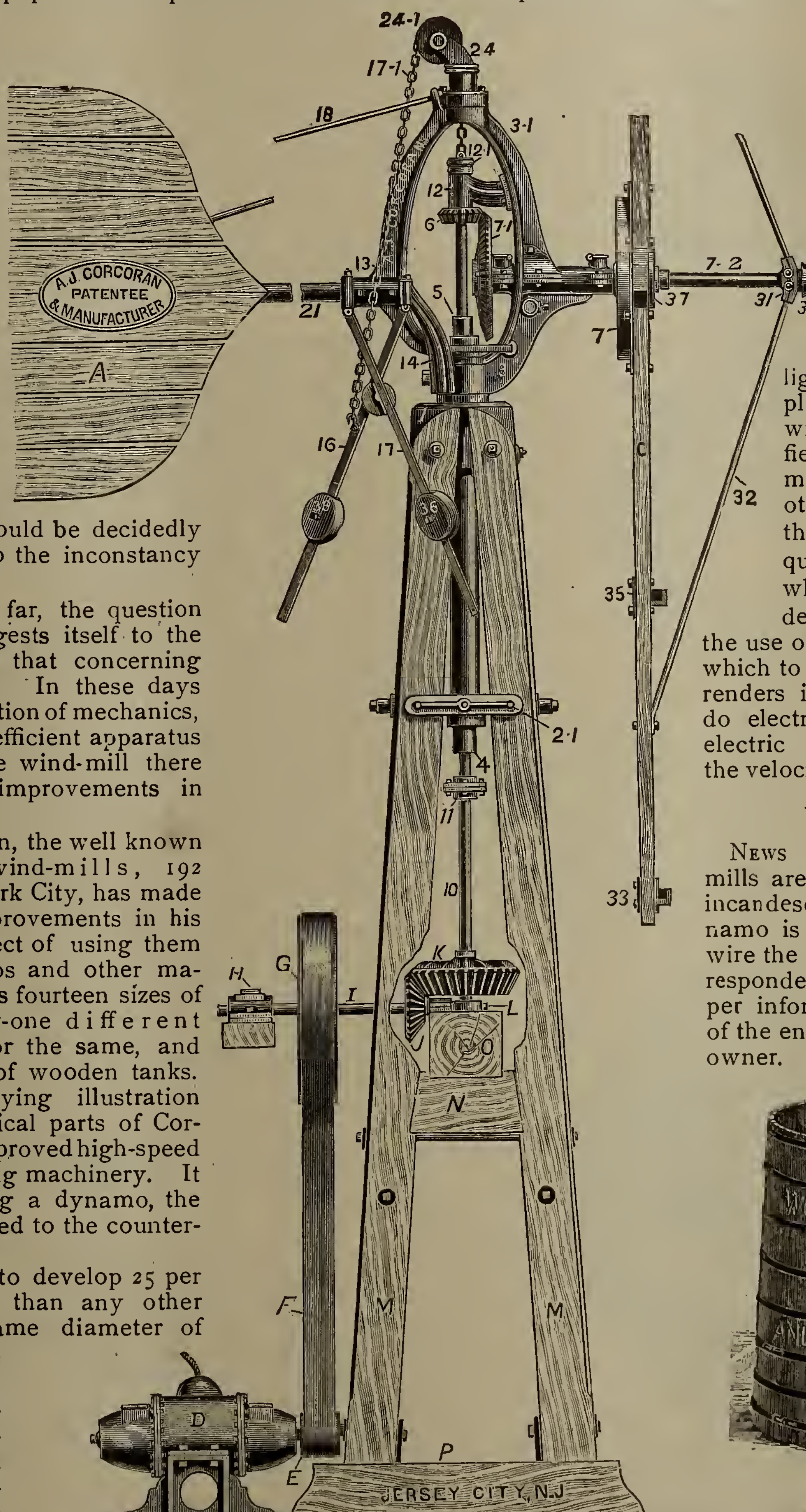
Considerable attention was recently directed to the subject of applying the power of wind-mills to the generation of electricity for light and power purposes through the offer of $150 and a gold medal, by the Netherland (Holland) Society for the Promotion of Industry, for the best paper on the production of electricity by wind-mills.

The question has often been asked, even by most casual observers, why wind-mills could not be used for the purposes above indicated. Of course the wind is a very uncertain factor, but while a mill is in operation it can be made to operate a dynamo, the latter charging a storage battery. Current from the battery is constant, whereas from the dynamo direct it would be decidedly otherwise, owing to the inconstancy of the wind.

Having got this far, the question that naturally suggests itself to the electrician next is that concerning the wind-mill itself. In these days of scientific application of mechanics, we want the most efficient apparatus always, and in the wind-mill there have been great improvements in this direction.

Mr. A. J. Corcoran, the well known manufacturer of wind-mills, 192 Broadway, New York City, has made many valuable improvements in his mills with the object of using them for driving dynamos and other machinery. He makes fourteen sizes of wind-mills, twenty-one different kinds of pumps for the same, and one hundred sizes of wooden tanks.

The accompanying illustration shows the mechanical parts of Corcoran's new and improved high-speed wind-mill for driving machinery. It is shown as running a dynamo, the dynamo being belted to the counter-shaft.



IMPROVED HIGH-SPEED WIND MILL.

This mill is said to develop 25 per cent. more power than any other wind-mill with same diameter of wheel. It is made mostly of steel, wrought and malleable iron, combining strength and lightness, and is fitted with the new "X" governor and a new device for bracing the wind wheel. It is also provided with a new direct balance connection, working in noiseless guides for transmitting the power of the wind-mill to the machinery.

This mill is said to be the only one having scientifically graduated blades. The wood used in its construction is subjected to a process for prevention of decay, thus greatly prolonging its life.

In the vicinity of New York alone more than 500 of these mills have been erected, and they are to be found in every part of the globe.

The parts of these mills are made to standard gauge and are interchangeable.

It is not intended to do town lighting, or light large areas, by the power of these mills. They are designed more particularly for the lighting of private dwellings, in suburban districts, and their capacity is from 10 to 300 lights. This special application of wind-mills will no doubt find a large field of operations. Wind-mills are superior to any other forms of power, in that they practically require no attention, and while the power generated depends upon the wind, the use of a storage battery from which to draw current as needed, renders it entirely practicable to do electric lighting or supply electric power, irrespective of the velocity of the wind..

News from the East.—"His mills are already illuminated by incandescent burners, and his dynamo is of sufficient power to wire the town," is the way a correspondent of a "down east" paper informs the readers thereof of the enterprise of a certain mill owner.

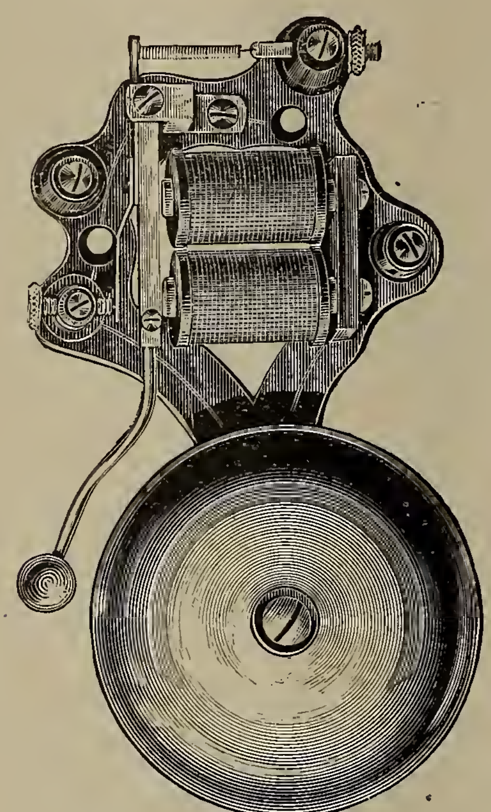
CORCORAN TANK.

The Cleveland and Berea electric road is rapidly approaching completion. The poles are all in place, and work has been commenced on the power house at Berea. The distance between the two places is twelve miles.

HUEBEL & MANGER.

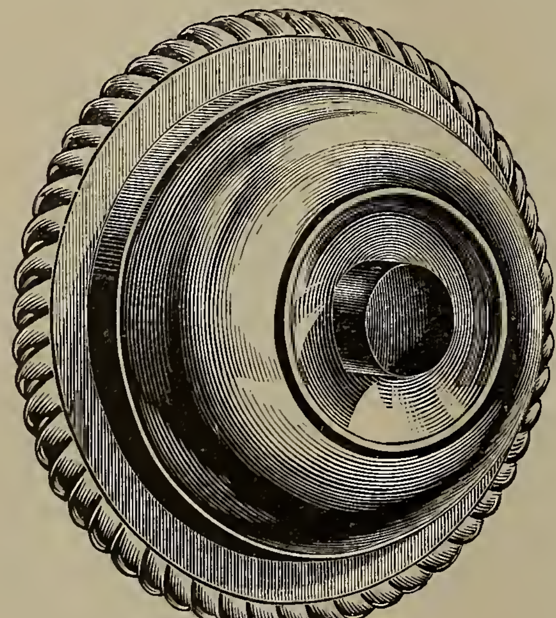
The electric bells made by Messrs. Huebel & Manger, 286–290 Graham street, Brooklyn, have a deservedly popular reputation.

We illustrate an iron frame skeleton bell (fig. 1) made by this firm, which has some excellent features. It is neat in form and appearance, and is simple in construction and well made. The armature is pivoted, and the contact and tension screws are both easily adjusted, and are provided with a locking device. The best cast bell-metal is used for the gongs, which are nickel-plated, and all bells are provided with the firm's improved non-turning, binding and contact posts.



IRON FRAME SKELETON BELL.

Fig. 2 shows a very neat push-button made by this firm. It is made of cast bronze and finely finished, having a hard rubber centre. The improved water-tight, round, bronze push-button made by this firm is much sought after for damp localities. They are used on government vessels and in cold storage warehouses, where condensation occurs.



BRONZE PUSH BUTTON.

This firm makes a large variety of improved bells, push-buttons, etc., and have a large trade.

THE WASHINGTON CONVENTION.

A special vestibuled train, composed of parlor cars, will leave via Royal Blue Line, foot of Liberty street, New York, at 1:20 P. M., Monday, 26th instant; and will leave Twenty-fourth and Chestnut streets, Philadelphia, at 3:20 P. M., arriving at Washington, D. C., 6:20 P. M. Seat checks for this train can be procured from the undersigned at $1.25 each, and railroad tickets from New York to Washington at $6.50 each. Railroad tickets can also be obtained at any Blue Line ticket office. Be sure you get a certificate when purchasing ticket. Please make checks payable to C. O. Baker, Jr., Master of Transportation, 136 Liberty St., New York.

The following is the programme of the meetings:

TUESDAY, FEBRUARY 27, 1894.

Meeting of the Executive Committee at 9 A. M., Parlor 36, Ebbitt House. Morning session, 10.30 o'clock, Grand Army Hall. Address: President E. A. Armstrong.

Reports of Committees on Legislation, C. H. Wilmerding, chairman; on World's Columbian Fair, B. E. Sunny, chairman; on Relation Between Manufacturing and Central Station Companies, F. Nicholls, chairman.

Afternoon session, 2 o'clock—Reports of Committees on Data, H. M. Swetland, chairman; on Finance, John A. Seely, chairman; on Underground Conduits and Conductors, M. J. Francisco, chairman; on Rules for Safe Wiring, William J. Hammer, chairman.

Executive Session.

WEDNESDAY, FEBRUARY 28, 1894.

Morning session, 10 o'clock—Paper by J. H. Vail: "The Importance of Complete Metallic Circuits for Electric Railways."

Topic—Electrolytical Effects of Return Currents.

Topic—Storage Batteries.

Afternoon session, 2.30 o'clock—Paper by A. B. Herrick: "Development of Switch Boards for Modern Central Stations."

Topic—What is the Most Economical Size for Arc Dynamos? Discussion by Charles R. Huntley, George Redman, E. F. Peck, G. H. Blaxter, H. H. Fairbanks.

Topic—Underground Circuits. Discussion by George W. Plympton, H. J. Smith, C. H. Wilmerding, M. J. Francisco, John A. Seely.

Topic—How to Rate Arc Lamps. Discussion by James I. Ayer, C. F. Hesser, A. J. De Camp, E. W. Rollins, George R. Stetson, M. A. Beal.

Executive session.

Evening session, 8 o'clock—Paper by T. C. Martin and L. Stieringer: "Electric Lighting at the World's Fair and Some of its Lessons," illustrated with stereopticon.

THURSDAY, MARCH 1, 1894.

Morning session, 10 o'clock—Paper by Chas. F. Scott: "Polyphase Transmission."

Topic—Arc Lights on Incandescent Circuits. Discussion by C. L. Edgar, L. B. Marks, J. T. Ridgway, W. S. Barstow, Thomas Spencer, Jno. C. Knight, Frederic Nicholls.

Topic—Meters vs. Flat Rates. Discussion by Chas. E. Scott, J. D. Barth, W. J. Green, J. J. Burleigh, J. Gynne, J. J. Moore.

Topic—The Alternating Motor. Discussion by Nikola Tesla and others.

Afternoon session, 2.30 o'clock—Executive session.

Reports of Secretary and Treasurer and Executive Committee. Election of officers.

Following is a list of delegates and others who are so far booked for the special train to Washington:—

C. R. Huntley and wife, Buffalo.

C. O. Baker, Jr., and wife, Newark, N. J.
John A. Seely and wife, New York.
E. F. Peck and wife, Brooklyn.
E. A. Armstrong, President N. E. L. A., Camden, N. J.
J. J. Burleigh and wife.
H. A. Cleverly, Philadelphia.
J. F. Noonan and party of six, Paterson, N. J.
B. E. Greene and party of five, New York.
G. M. Phelps, New York.
F. R. Colvin, New York.
T. C. Martin, New York.
Jos. Wetzler, New York.
G. H. Blaxter, Pittsburg.
R. T. McGonigle, Pittsburg.
I. H. Davis, New York.
C. W. Price and wife, New York.
S. L. Coles, New York.
Capt. Willard L. Candee and wife, New York.
Geo. T. Manson and daughter, New York.
R. B. Corey, New York.
J. J. Bissell, Brooklyn.
J. Ferguson, Brooklyn.
E. W. Seymour and wife, New York.
Chas. A. Bragg and wife, Philadelphia.
W. J. Hammer, New York.
Capt. W. J. Brophy, Boston.
W. F. Osborne, New York.
H. J. Smith and wife, New York.
A. J. DeCamp and wife, Philadelphia.
H. B. Cutter, Philadelphia.
T. E. Crossman, New York.
W. J. Morrison, Baltimore.
F. A. Scheffner, New York.
A. D. Newton, Hartford, Conn.
C. E. Newton, Hartford, Conn.
M. E. Baird, Hartford, Conn.
H. H. Fairbanks, Worcester, Mass.
W. A. Vail, New York.
J. H. Vail and daughter, New York.
E. E. Bartlett, New York.
C. D. Shain, New York.
L. B. Marks, New York.
R. W. Pope, New York.
D. A. Smith, New York.
Romaine Mace and wife, New York.
E. W. Little and wife, New York.
Mr. Van Giesen, New York.
P. C. Ackerman, New York.
H. C. Adams and wife, New York.
H. M. Swetland and wife, New York.
Jos. Wright, Paterson, N. J.
G. J. Jackson, New York.
Thos. R. Taltavall, New York.
W. T. Hunt, New York.
E. B. Wyman, New York.
F. W. Harrington, New York.
A. H. Patterson and wife, New York.
H. L. Shippy, New York.
A. E. Davis, New York.
T. H. Brady, New Britain, Conn.
Chas. McIntire, Newark, N. J.
W. C. Bryant, Bridgeport, Conn.
G. A. Redmond, Rochester, N. Y.
E. C. Perkins, Manchester, Conn.

Mr. John Jacob Astor has given a contract for the building of an electric yacht ninety feet long. The boat is to be built of steel and will be one of the handsomest and most elegantly equipped pleasure craft in this country. It will take a year to build the boat. The yacht will be operated by storage battery power.

WINDMILL POWER.

A CHANCE TO WIN A PRIZE.

The Netherland Society for the Promotion of Industry, has offered a prize of $150 and the gold medal of the Society for the best paper submitted on the means of obtaining energy through windmills, the accumulation of this energy electrically, and to transmit it or to make it transportable. Other points to be considered in papers competing for this prize, are the following:

1. What is the average energy a common windmill is able to produce, per day of 24 hours, in combination with an electric accumulator; what would be the installation most suitable to this effect and what would be the cost of *one* horse power hour?

2. Is it possible, from an economical point of view, to apply the new aerial motors on an extensive scale for the accumulation and the utilization of this energy? If so, what mechanical appliances would be required for this purpose?

The project of a supposed application of the system, by which a factory is supplied with light and power, is wanted as an illustration.

The drawings belonging to the answers must be made on white paper (no blueprints), on a scale of one-quarter.

Answers must be sent before July 1, 1894, with the author's name in a closed envelope, to the general secretary of the Society, F. W. Van Eeden, at Haarlem, Holland.

Further information about the conditions may be obtained at the same address.

Gutta-percha.—M. J. Lagarde, in a recent paper on gutta-percha, communicated to *Les Annales Télégraphiques*, gives some valuable information with reference to the constitution of different gums, which may explain a fact which has been well known to telegraph engineers for many years, viz., that the gums which have the highest specific resistance often have inferior insulating qualities from the standpoint of durability. M. Lagarde points out that the presence of resins, especially of alban, increases the insulating power of the gum, but at the same time they are a source of deterioration. As, therefore, two gums at any given time may have the same insulation resistance, when tested electrically, and yet be very differently constituted, chemical analysis is the only sure guide to the choice of gums. M. Lagarde summarizes the results of his experiments by saying that a tolerably good gum should contain at least 55 per cent. of pure gutta, not more than 5 per cent. of water and 1 per cent. of foreign substances, and equal amounts of fluavil and alban; a good gum should contain at least 60 per cent. of pure gutta, not more than 5 per cent. of water, and 8 per cent. of foreign substances, and equal amounts of fluavil and alban; and a first-class gum should contain at least 60 per cent. of pure gutta, not more than 3 per cent. of water and 5 per cent. of foreign substances, and 12 per cent. of alban.

To Supervise Telephones and Telegraphs.—A petition has been presented to the Massachusetts Senate requesting the establishment of a board of telephone and telegraph commissioners for the control and supervision of telephone and telegraph companies in Massachusetts. It provides that every telephone and telegraph company shall make a return to the board in a form and at a time prescribed by the said board, setting forth indebtedness, financial condition, etc., and said board shall have the general supervision of all corporations engaged in the manufacture and sale of telephone and telegraph instruments, and in the operation of telephone and telegraph lines. Upon complaint in writing of the Mayor of a city, or the selectmen of a town, in which a telephone or telegraph line is located, or of twenty customers of such company, either of the character, or quality of the services, or price for the use of the same, the board shall notify the company of such complaint and there shall be a hearing. The board shall make an annual report of its doings to the legislature, and the expenses of the board are to be borne by the several telephone and telegraph companies in proportion to their gross earnings.

MR. PREECE'S TRIP TO AMERICA.

Referring to the telephone in his recent address * before the Institute of Electrical Engineers, London, Mr. W. H. Preece said:—"The telephone in the United States is essential to the business man, and its price is compared with that of an office boy. Labor in the States is expensive, and an office boy costs more than a telephone subscription. The present generation in America has grown up with the telephone. It has become a factor of business, and absolutely essential to the transaction of that business. Its use has passed its climax; it has reached its normal stage. There is no touting for business; business comes. Every new office must have it. The working is excellent, and they are alive to the necessity of maintaining its efficiency at the very highest point. Education is complete, not only of the staff, but of the customer. The apparatus itself is being perfected. Uniformity of practice is being introduced under the operation of the paternal control of Boston, and the influence of technical education and of technical institutions is being felt everywhere. I find a group of highly educated, clever young electricians being engaged and encouraged by the telephone companies. New blood is being introduced, and great zeal and activity is shown."

Regarding the efforts made during the recent International Electrical Congress at Chicago, to introduce other new units, in addition to those recommended for adoption, Mr. Preece says:—"An attempt was made to introduce other units, but the feeling is pretty strong that language-framing electricians must rest on their oars for a time. New ideas and new measurements must have new terms and new names, but the general public must become more accustomed to the new language already invented before proceeding to manufacture more novelties in phraseology. The new terms are even now very difficult to explain, and still more difficult to understand. Moreover, electricians themselves are not sufficiently unanimous either as to the necessity or upon the accuracy of the definitions of the new conditions, and therefore they can afford to wait for a final settlement for another congress some years hence—perhaps in Paris in 1900."

MANAGEMENT OF BOILERS.

What is greatly needed at present, says Daniel Ashworth, the well-known authority on steam boilers, is to lay aside the idea that anyone is good enough to fire and manage boilers. There are many plants in operation where, by incompetency in this line, the steam efficiency is greatly lessened, furnaces and boilers working in neglected conditions, fuel wasted, and the community begrimed with volumes of unnecessary smoke; and, in addition to these evils, that of jeopardizing lives and property. Unless this matter is considered, and such action taken as will improve this corps of operatives, it would seem absurd to be continually reaching and extending into the higher refinements of steam engineering, when such simple and important features are ignored at the threshold.

As a fitting close to this, it would be proper to ask what degree of intelligence or knowledge would qualify one to fire boilers.

1. That the fires should be maintained with uniformity, and that no openings, in the form of bare places, showed upon the bars to permit the cold air to pass through.

2. The judgment that will enable him by a glance at the ashpit to know at once, to a great extent, the condition of the fires.

3. He should know something of the various fittings of the boilers, such as valves, etc., and the details of the furnaces.

4. But not least, an ambition to grasp the details, so as to qualify him for a still higher plane, which would certainly follow, provided there was judgment enough in the superior to note such details.

* See ELECTRICAL AGE, February 17, 1894.

STREET RAILWAY NEWS.

STREET RAILROADS IN MASSACHUSETTS.

The Railroad Commissioners of Massachusetts have made their annual report on street railroads in that State.

The total length of street railways, Sept. 30, 1893, including double track, but not sidings, was 874.14 miles. Of this total, 711.08 miles were operated in whole or in part by electric power, and 163.06 wholly by horse power. This shows, as compared with the previous year, an increase of 214.78 miles equipped with electric power, and a decrease of 95.49 miles equipped for horse power only.

The aggregate capital stock of the 60 companies, Sept. 30, 1893, was $25,883,575, an increase of $2,293,009 over the previous year, resulting from new or additional issues of stock.

The whole amount of cash dividends declared and paid the last year was $1,716,637.50—an average of 6.03 per cent. on the total amount of capital stock outstanding at the end of the year, as against 6.71 per cent. in 1892. Computed (as it should be) on the mean amount of capital stock outstanding at the beginning and end of the year, the average dividend the last year was 6.94 per cent. as against 7.34 per cent. in 1892.

The gross assets of the companies, Sept, 30, 1893, were $50,130,276.20, gross liabilities, $49,589,687.91.

The funded debt of the companies, amounted to $14,109,000—an increase of $4,138,850 over the previous year, resulting from additional issues of bonds, or from the assumption of additional bonded liabilities.

The total number of passengers carried during the last year on the railways of all the companies making returns to the board was 213,552,009—an increase of 19,380,067 passengers over the previous year. The number of passengers carried on the street railways exceeded the annual number carried on all the railroads of the State, by 93,772,062.

The total income of the companies from all sources, for the year ending Sept. 30, 1893, was $10,894,704.11, and the total expenditures were $10,617,641.99, leaving a net balance of income for the year of only $276,762.12 to carry to surplus account.

The average cost of the street railways of the State per track mile (including the cost but not including the length of sidings, as it stood on the books of the companies, Sept. 30, 1893,) was $26,792 for construction, $15,455.06 for equipment, and $11,738.03 for land, buildings and other permanent property, making a total average cost of $53,985 69 for each mile of main railway track, including double track.

It is too early, as yet, says the report to draw exact and final conclusions with regard to the financial economy of electric power, as compared with horse power in street railway operation.

The total number of persons injured in connection with street railway operation, as reported by the companies for the year ending Sept. 30, 1893, was 585; of whom 45 received fatal injuries.

The number of passengers injured was 311, of whom only two were injured fatally. Most of the accidents to passengers occurred as they were getting on or off the cars.

The injuries to employees were 48 in all, of which five were fatal. The number of injuries to travelers and others on the street was 226, of which 38 were fatal.

Of the whole 585 injured, at least 44 were children.

There are 133 grade crossings of railroads.

NEW YORK'S CABLE ROADS.

New York city has now to her credit, or discredit, two cable street railways running down town, the Broadway and the Third Avenue lines. They are first-class roads of their kind, but the kind is poor. There is one consolation, however, and that is: the cable conduits will form a first-class receptacle for the electric conductors when these roads shall be operated by electricity. It takes time to work these changes, but come they must.

The Cayadutta Electric Railroad has been leased to the Fonda, Johnstown & Gloversville Railroad Company, Johnstown, N. Y. This brings all the electric railroads in Fulton County under one management.

The Lynchburg Street Railway and Lynchburg Electric Company, Va., have been consolidated.

A bill has passed the Virginia Senate for the incorporation of the Richmond, Manchester & Petersburg Railway Company.

Mr. Henry J. Robinson on behalf of the Ninth Avenue and Metropolitan street railroads, New York City, has applied to the railroad commissioners for permission to change the motive power on the Ninth Avenue line from horse to cable. He stated that the Metropolitan Company wants to lay a cable through Fifty-third street, up Ninth avenue, and up Sixty-fourth street. There was no opposition on the part of the property owners, he said.

NEW CORPORATIONS.

The South Norfolk Street Railway Company, of Norfolk, Virginia, has been incorporated.

The Eldorado Land, Developing and Mining Company, of Denver, Colorado, has been incorporated with a capital stock of $1,000,000, for the purpose of operating an electric plant, besides other industries. Incorporators, J. W. Shannon, G. A. Smith and J. W. Young.

The proposition to establish a municipal lighting plant in Buffalo seems to be growing in favor every day. The Joint Council Committee have investigated he subject and favor such a plant. It is thought that the council will vote $100,000 for the establishment of a city plant.

The Citizens' Te'ephone Company of the City of Newburgh, N. Y., has been incorporated. Incorporators, James L. Logan, Benjamin B. Odell, Jr, William T. Hilton, James G. Graham, Jr., L. Waring, Thomas P. Kilmer, William J. McKay.

The Lincoln Mutual Telephone Company, Lincoln, Ill., has been incorporated. Incorporators, A. B. Crifield, S. S. Hoblit, J. W. Collins and others.

POSSIBLE CONTRACTS.

The Camden, Gloucester & Woodbury Railroad Company is seeking an entrance into Woodbury, N. J., with its electric line.

It is proposed to build an electric road from Howard to Avoca, Steuben County, N. Y.

There is a strong sentiment in Grand Rapids, Mich., in favor of a municipal electric lighting plant.

EFFECTS OF ELECTRICITY ON THE BODY.

The science of electro-therapeutics is comparatively new, and within the last few years has made wonderful advances. All medical men now recognize the virtue of the electric current as a remedial or ameliorative agent, and the electro-medical outfit has become as much a necessity in a doctor's practice as any of the medicines he prescribes.

The electric current, when passed into the human body, produces three different and distinct effects. These effects are known as catalytic, cataphoric and electrotonic. These may seem to be very profound looking words, but their meaning can be very easily understood.

When a current of voltaic electricity is passed through a compound substance, that substance is decomposed into its elements. This action is commonly known as electrolysis, but the same action is termed by electro-medical scientists as catalysis, which means to dissolve into parts. As is well known, water is decomposed by an electric current, the separation of the hydrogen and oxygen gases taking place, and all liquids are likewise decomposable. It is evident, therefore, that the liquids in the human body are subject to chemical change by the action of an electric current.

It has been proven that a mild electric current, in its catalytic effect, aids nutrition by hastening and assisting the chemical changes that are ordinarily going on in the human body. Should the current be too strong, however, it destroys the tissues of the body.

The catalytic effect of the current will destroy the roots of hair, and for that reason it is one of the means used for removing objectionable growths of this character from the surface of the body.

The cataphoric action of the current is to carry with it the fluids that lie in its path. This action will go on through membranes of the body. The passage of fluid through the membranes under the action of the current, is known as osmosis. One of the cataphoretic effects of the current on the body is to increase the nutrition of the parts to which it is applied. Drugs can be carried through the skin into the body by cataphoresis.

The electrotonic effect of a current is stimulating to the body. It increases the circulation, and thus promotes nutrition. It has a quieting effect on the nerves, and is invigorating and refreshing.

ELECTRIC CANAL BOATS.

Mr. Joseph Sachs delivered a lecture before the New York Electrical Society, at Columbia College, on the evening of February 15, on the subject of electrical canal boat propulsion, with special reference to the Erie Canal. Mr. Sachs considered six methods of propulsion for canal-boats, namely: propellers; flexible submerged cable system, (similar to the European method); rigid rail towing or hauling (exterior); rigid rail towing or hauling (submerged); moving cable; motor locomotive haulage and the electric trolley system.

Mr. Sachs concluded his lecture by giving the comparative figures on the cost of operation of canal-boats by the electric haulage system and the screw propeller system. "If the electric propelling system is installed," said Mr. Sachs in conclusion, and maintianed by the state, and we do not consider interest on plant, a much greater saving can be shown in favor of the haulage method. With a properly installed plant, on this basis, from 30 to 50 per cent. can be saved over the present steam method.

The haulage system here referred to, consists in an electric motor run parallel to the canal upon a suitable structure or track, and receiving current from contact wires adjacent thereto. This motor locomotive is connected with the boat by any suitable means, the latter being towed along as the motor advances.

ELECTRIC ROAD CARRIAGE.

Henry P. du Bellet, United States Consul at Rheims, France, in a report to the State Department, thus describes a new electric road carriage made for Mr. Paul Souchain, of Armentieres, department of Nord, France, which is considered as the solution of the problem studied for many years by the French electricians.

This carriage is a six-place phaeton built on four wheels. All its upper part is movable, so as to facilitate the inspection and care of the condensers and electric motor. The electric current is furnished by a battery of condensers "Dujardin" composed of six boxes of nine elements, or altogether, fifty-four elements. Each box is 44 centimeters (17 inches) in length, 33 centimeters (14 inches) in width, and 31 centimeters (13.6 inches) in height.

Each element contains one positive and two negative sheets inclosed in a box of ebonite. The nine elements are coupled together in tension and always in the same manner. The recipient containing the elements is hermetically closed with a piece of ebonite. Each element can be easily inspected, examined, and kept in good condition. The nine elements are closed in a box made out of pitch pine, forming thus six batteries entirely independent and communicating through twelve wires (two in each box) to the commutator.

In using a lever the commutator turns and can be placed in five different positions, establishing contacts between the pieces of copper and fourteen elastic jaws communicating through twelve wires to six batteries and through two wires to the motor. The following are the connections made by the commutator in its five positions:—

Position at rest.—All the condensers, circuit disconnected. Motor in short circuit putting on the brake for stoppage.

Position of first speed.—The six batteries placed in derivation on the motor (17 volts).

Position of second speed.—Three batteries of two elements on tension (34 volts).

Position of third speed.—Two batteries of three elements on tension (50 volts).

Position of fourth speed.—The six batteries on tension (100 volts).

The motor is of the system "Rechniewsky," of a normal energy of 2,000 watts, able, when necessary, to develop as much more. It is placed in the centre of the carriage, and, by the means of a Vaucanson (endless) chain, put in motion a shaft revolving on the system of differential motion.

Over the back wheels are placed four batteries of accumulators or condensers, the motor and the differential system controlling the wheels; under the front seat are the two other batteries, a commutator coupler, and a tool box. On the dashboard is an electrometer, a disconnecter, an interrupter of the lights placed in the three lanterns, and an interverter to back the carriage.

Under the vehicle are found soft wires, which can be connected with a stationary dynamo for the purpose of reloading the batteries. The mechanism for guiding the carriage is applied to the fore part of the carriage, to which is added a screw wheel put in motion by an endless screw ending under the hand of the driver and of very easy management.

This carriage, all ready to work, weighs 1,350 kilograms, or 2,970 pounds, and carries six passengers. On a pavement in an average condition 70 kilometers (42½ miles) can be covered at a speed of 16 kilometers (9 miles 1,484 yards) per hour without reloading the batteries, and the carriage can be turned entirely around on a street less than 4 meters (13.1 feet) wide.

On a level and on an average pavement the usual speed naturally depends on the number of accumulators, the greatest speed—16 kilometers (9 miles 1,484 yards) per hour—being furnished by using six batteries on tension.

The Milwaukee Street Railway Company was able to keep its cars in motion during the severe blizzard a couple of weeks ago. The snow-plows were in active operation all day, and managed to keep the tracks clear of snow sufficiently to allow the cars to move.

The Connecticut Dynamo and Motor Company, of Hartford, Conn., has increased its capital stock.

The Westinghouse Electric and Mfg. Company has received a second order from the Cataract Construction Company, of Niagara Falls, for a 5,000 h. p. generator.

The law passed by the General Assembly of Arkansas taxing telephone and other companies operated in the State, has been declared unconstitutional by the United States Circuit Court.

Application has been made by the Consolidated Traction Company, of Orange, N. J., for permission to extend its lines.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, February 3, 1894.

The Delaware, Lackawanna and Western Railroad Company has decided to introduce the Hall block signal system on its lines. The equipment of the Morris and Essex division will be commenced at once. This action on the part of the railroad company is the result of the pressure of public sentiment against the company on account of the collision on the D. L. & W., at the Hackensack river bridge in January last, when thirteen lives were lost. The Hall system is well known for its simplicity and efficiency.

The Dale Manufacturing Co., 22 Cortlandt St., City, carries large and varied lines of electrical fixtures and supplies, including electroliers, fixtures, brackets, etc.

Death of Mrs. G. M. Phelps. We, in common with the rest of the electrical fraternity, extend to Mr. Geo. M. Phelps, President of *The Electrical Engineer*, our heartfelt sympathy in the recent loss of his wife by death.

Mr. H. W. Baker, New York Agent for the Elektron Manufacturing Co., Springfield Mass., is wreathed in perennial smiles, because orders continue to come in thick and fast. He is laying plans for some big orders for the noted Elektron motors.

Twenty-seven members of the Massachusetts Legislature went down to Bellport, L. I., on February 16, as guests of the Long Island Boynton Bicycle Railroad Company, to witness the operation of that company's railroad system. An application has been made to the Massachusetts Legislature for charters to operate the bicycle system in Boston and suburbs, and the committee came down for the purpose of investigating the same.

The Metropolitan Electric Equipment Company, 10 and 12 Chambers street, city, are contractors for the complete or partial equipment of buildings with the system of the Edison Illuminating Company, of New York. They furnish estimates, and orders are executed for wiring fixtures, dynamos, motors, engines, etc. The members of the company are Maurice T. Ward, president; Jas. F. Hughes, general agent; D. Colombani, secretary and treasurer.

The Waddell-Entz Company, of 203 Broadway, N. Y. City, with works at Bridgeport, Conn, was put into the hands of a receiver on February 13, Mr. Montgomery Waddell being appointed as such. This company is manufacturer of general electrical apparatus and owned several patents. The receivership was asked by Alfred A. Whitman, Treasurer, and Percival Knauth, President. both of which gentlemen hold debenture notes of the company for $13,000 each. The company owes, it is said, over $43,000.

McLeod, Ward & Co., 91 Liberty Street, have lately completed a 300-light plant for Alfred Dolge & Son, 110-112 East 13th Street, City. They put in one of Dallett & Sons' dynamos, which is run by a gas engine. McLeod, Ward & Co., are the general agents for the Dallett dynamos and motors and a gas engine. Dolge & Son tried two other dynamos before accepting the Dallett. The Kinsman desk lamp recently described by us is made by McLeod, Ward & Co. This firm brought out a handsome portable lamp recently.

The Bishop Gutta-Percha Company, 420-426 East 25th street, city, manufacturers of the celebrated Bishop Balata and rubber-covered wires and cables for submarine and subterranean purposes, and other first-class insulated wires, are building an addition to their present large factory, 25x38 feet, and 4 stories high. In this new section the company will install a 150 h. p. Green engine, of Providence make. This new addition will increase the company's manufacturing capacity 30 per cent. Several of the New England Butt Co.'s improved braiding machines will be put in, also some new grinding machinery. The new shafting and gears will be of the Cresson Company's (Philadelphia) make. The Bishop Company is now figuring on some large contracts, some to the value of $50,000. The outlook for the Company's future business is most satisfactory.

F. Schmerber and J. S. Du Vall, managers of the New York office of the Ball Engine Company, of Erie, Pa., took charge of this office January 1 last, and are meeting with well-deserved success. Mr. Schmerber is an experienced engineer and contractor and thoroughly understands every detail of a first-class steam plant. He was formerly connected with the Pierce-Miller Engine Company and is an expert in the drawing of specifications and designing of steam plants, especially for light and power purposes. Mr. Du Vall has been connected with this office for some time and is a capable manager, looking after detail and correspondence. The two gentlemen make a good team, and are prepared to undertake the installation of steam plants of any dimensions with Ball horizontal and new vertical engines, with all the best appliances. W. T. H.

Electrical and Street Railway Patents.

Issued February 13, 1894.

514,460. Electrical Conductor. Dallas B. Hayward, Easton, Md. Filed July 21, 1893.

514,461. Electrical Signal Apparatus. George W. Hey, Syracuse, N. Y. Filed Apr. 22, 1892.

514,462. Electrical Apparatus. George W. Hey, Syracuse, N. Y. Filed May 8, 1892.

514,480. Cut-Out. Hermann Lemp, Lynn, Mass., assignor to the Thomson-Houston Electric Co., of Connecticut. Filed Oct. 5, 1888.

514,491. Electrical Fire-Arm. John L. McCullough, Brooklyn, N. Y. Filed Apr. 7, 1893.

514,501. Electrical Annunciator. Charles F. Scattergood, Albany, N. Y. Filed Nov. 3, 1893.

514,504. Current-Regulator for Dynamo-Electric Machines. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Co., same place. Filed Dec. 10, 1888.

514,505. Electric-Arc Lamp. Charles E. Scribner and Ernest P. Warner, Chicago, Ill., assignors to the Western Electric Co., same place. Filed May 27, 1890.

514,506. Electric-Arc Lamp. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Co., same place. Filed Aug. 1, 1891.

514,524. Influence-Machine. Harry F. Waite, New York, N. Y. Filed Oct. 28, 1893.

514,554. Magazine-Fuse for Electric Circuits. Charles B. Jones, Cincinnati, Ohio, assignor to the Jones Bros. Electric Co., same place. Filed Nov. 10, 1893.

514,561. Electric Railway. Paul W. Leffler, Minneapolis, Minn., assignor to the Leffler Electro-Magnetic Railway Co., Chicago, Ill. Filed May 13, 1893.

514,566. Electric-Railway-Crossing Signal. Michael J. O'Sullivan, Baltimore, Md. Filed May 22, 1893.

514,580. Apparatus for Testing the Resistance of Conductors of Electricity. Elmer G. Willyoung, Philadelphia, Pa., assignor to the Queen & Co., Incorporated, same place. Filed June 26, 1893.

514,581. Electrical Measuring-Instrument. Elmer G. Willyoung, Philadelphia, Pa., assignor to the Queen

& Co., Incorporated, same place. Filed Oct. 13, 1893.

514,582. Electrical Measuring-Instrument. Elmer G. Willyoung and Madison M. Garver, Philadelphia, Pa., assignors to the Queen & Co., Incorporated, same place. Filed Oct. 13, 1893.

514,583. Electric-Arc Lamp. John E. Woolverton, New York, N. Y., assignor to the Woolverton Glow Arc Electric Light Co., same place. Filed Sept. 22, 1892.

514,586. Electrical Transmission of Power. Charles S. Bradley, Yonkers, N. Y. Filed June 23, 1890.

514,593. Electrical Measuring-Instrument. Madison M. Garver and Elmer G. Willyoung, Philadelphia, Pa., assignors to the Queen & Co., Incorporated, same place. Filed Oct. 13, 1893.

514,641. Electric Pendulum Clock. Henri Campiche, Geneva, Switzerland. Filed July 28, 1893.

514,651. Electric Cigar-Lighter. Alexander J. Graydon. Indianapolis, Ind. Filed Mar. 6, 1893.

514,655. Car-Brake. John Kerwin, Detroit, Mich., assignor of one-half to Andrew McBride and John Campbell, same place. Filed Sept. 19, 1893.

514,665. Pole for Electric Railways. Edward W. Serrell, New York, N. Y. Filed Jan. 9, 1893.

514,681. Electrolytic Cell. Ernest A. Le Sueur, Ottawa, Canada. Filed Apr. 15, 1893.

514,686. Electric Annunciator. Israel E. Rickey, Oakland, Cal. Filed May 10, 1893.

514,695. Telephone. Charles T. Bloomer, New York, N. Y. Filed May 9, 1893.

514,697. Electric Alarm for Pressure-Gauges. William H. Bradt, Troy, N. Y. Filed Nov. 22, 1893.

514,714. Bond-Wire for Electric Conductors. Albert Hoffmann and Joseph Brogan, Milwaukee, Wis. Filed July 5, 1893.

514,718. Electric-Railway System. Paul W. Leffler, Minneapolis, Minn., assignor to the Leffler Electro Magnetic Railway Company, Chicago, Ill. Filed Nov. 22, 1892.

514,739. Incandescent Electric Lamp. George H. W. Timbrell and John C. Fyfe, Denver, Col.; said Fyfe assignor and said Timbrell assignor of one-eighth of his interest to Lewis F. Kimball and Stephen W. Wright, same place, and James White, Cleveland, Ohio. Filed Sept. 18, 1891. Renewed Jan 15, 1894.

514,746. Apparatus for Periodically Completing and Interrupting Electric Circuits. Ernest L. Berry and Frederick Harrison, London, England. Filed Oct. 6, 1893.

514,749. Life-Guard for Street-Cars. Theophile Euphrat, Darien, Conn. Filed Aug 20, 1893.

514,775. Electric Alarm. Samuel T. Sanders, Granite, Mont. Filed July 29, 1893.

514,801. Trolley. John A. Williams, Altoona, Pa. Filed Oct. 7, 1893.

514,813. Electric Lock. Robert V. Cheatham, Louisville, Ky. Filed Feb. 7, 1893.

514,817. Armature Connection for Dynamos. Oza Dufault, Spencer, Mass. Filed Oct. 27, 1893.

514,822. Insulating-Joint. Emil F. Gennert, Brooklyn, N. Y. Filed August 10, 1893.

514,823. Telephone Signaling System. Webster Gillette, New York, N. Y., assignor to Alexander S. Williams, same place. Filed July 13, 1893.

514,827. Electric-Railway Conduit. Robert I. Hampton, Athens, Ga. Filed May 25, 1893.

514,845. Electric-Battery Cell. Peter C. Burns, Peru, Ind. Filed June 12, 1893.

514,850. Electric Switch for Railroads. Wm. M. Henderson and Wm. C. Henderson, Philadelphia, Pa. Filed Sept. 16, 1893.

514,849. Electric Cable. Theodore Guilleaume, Cologne, Germany. Filed Mar. 27, 1893. Patented in England Apr. 12, 1892, No. 7,029; in Germany Apr. 13, 1892, No. 65,311; in Italy May 2, 1892, LXII, 220; in Austria-Hungary, Aug. 20, 1892, No. 20,129 and No. 39 499; in Switzerland Aug. 31, 1892, No. 4,859; in Belgium Dec. 31, 1892; No 102,566; in France Mar. 8, 1893, No. 220,891, and in Sweden Mar. 30, 1893, No. 4,280.

514,878. Electrically-Operated Street-Indicator for Cars. Henry C. Barker, St. Louis, Mo., assignor to Jacob Stocke, Jr., and Henry C. Beekman, same place. Filed June 23, 1893.

ELECTRICAL AGE

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CONTENTS.

AT THE CONVENTION.

We give in this issue, on the occasion of the Convention in Washington, a brief history of the city and similar references to the principal public buildings—of which there are many—which will surely be read with much interest by our readers. While the convention is essentially electric, it is not inappropriate to slightly depart, on occasions of this nature, from "shop talk," and give our readers a little change—something else to think about when they are away from business besides coal piles, dynamos, boilers and all the other accessories of an electric light plant. We have not neglected the electrical interests in Washington, however; these receive their share of attention in our columns this week, and while many of the delegates will endeavor to get as much pleasure as possible out of their visit, others will be possessed with an irresistible desire to inspect the electrical industries of the city, making it their religious duty to do so. We have provided reading matter and information for all. The ELECTRICAL AGE trusts that all delegates and their friends will enjoy themselves and return to their respective homes greatly benefitted, mentally and physically.

A STRONG COMBINATION.

One of the most notable events of the year in the electrical world is the association of Prof. E. J. Houston and Mr. A. E. Kennelly as a firm of electrical engineers. Both gentlemen stand at the head of their chosen profession, and their reputations are practically world-wide. Each one possesses great potential energy and the combination of the two forces should produce great results in electrical progress in this country. The ELECTRICAL AGE extends to these gentlemen, individually and collectively, its best wishes for their prosperity.

MR. PREECE'S VISIT TO AMERICA.

In his "Notes of a Trip to the United States and to Chicago," read before the Institution of Electrical Engineers, in London, Mr. W. H. Preece pays a very neat compliment to American electrical enterprise and progress. A visit to the United States, he says, is something like charging an accumulator. It stores the visitor with energy. "When I am discharged, and my adverse criticisms are forgotten," he says, in conclusion, "I shall probably cross the Atlantic again." It may be stated here, that his criticisms of American practice in the various departments of electrical industry, are fair and, in the main, well-founded, although it may be unpleasant to Americans to have their faults pointed out to them. However, we are a great and growing people, and no doubt, when Mr. Preece honors us with another visit, he will not find so much to criticise, but more to commend.

ELECTRIC RAILWAYS AND THE CONVENTION.

The proceedings of the convention will not be devoted exclusively to electric light interests. Electric railways will be considered more or less, and for this reason electric railway managers have received an invitation to be present at the meetings. At first sight it may seem a bit strange to depart from the straight line of electric lighting in the discussions at an electric light convention, but justification for such a course lies in the fact that the two interests are nowadays so closely interwoven that it is quite a difficult matter to consider them apart. So many electric light stations generate power for electric railways and vice-versa, that the two might be termed "twin industries." Electric railway managers will always find it profitable to drop in on the electric light brethren when in convention, and light men will find it to their great advantage to similarly visit the street railway conventions. Electricity is the tie that binds them.

WASHINGTON.

Washington, the convention city, and the capital of the nation, has been the seat of the Federal government since 1800. The city is situated on the eastern bank of the Potomac river, 106 miles from its mouth, and it has a population of about 235,000.

It is not a generally known fact that Washington is unique in being about the only national capital established solely for the purpose of the seat of government, without reference to any aspirations to its becoming the chief commercial and financial centre as well.

Washington is 227 miles from New York city, 39 from Baltimore, and 137 from Philadelphia. The selection of its site was the result of a compromise between the advocates of the present and other locations, and it was made by President Washington in accordance with an act of Congress, passed March 30, 1791.

The aggregate length of the streets and avenues of Washington is 264 miles, and they are wider than those of any other city in the world. There are 21 avenues, bearing the names of various states in the Union, Pennsylvania avenue, 160 feet wide, being the principal thoroughfare. This magnificent avenue runs from the Capitol to the Treasury Department, where it is slightly deflected and then continues to Georgetown.

Massachusetts avenue is over 4½ miles long, running in an unbroken course, 160 feet in width.

The city extends four and one-half miles in one direction, and about two and one-half in the other, and covers an area of about 9½ square miles.

The capitol building is situated on an eminence overlooking the city. In the selection of its site there is quite a story, as regards its result upon the future development of the city. The owners of lots facing that section of the city in front of the capitol held the prices of their property at such high figures, that it resulted in settlers purchasing land in the low and swampy district between the capitol and the Potomac. This is why the anomalous condition exists of the back of the capital facing the city and its front turned away from it.

The capitol is the most conspicuous object in Washington, its lofty white dome being visible from all directions for miles around the city. It is situated very nearly in the geographical center of the city on the great plateau of Capitol Hill, which falls more or less abruptly on the west side. The building itself is built in the purely classic style, with a centre and two projecting wings of great extent. In the north wing is located the Senate chamber, while in that on the south is the chamber of the House of Representatives. The entire length of the building is 751 feet, 4 inches, and its breadth is from 121 to 324 feet in the different portions, and it covers an area of nearly 3½ acres. The dome, which springs from the central portion of the building, is constructed of iron and is 135½ feet in diameter, weighing 3,575 tons. The total height from the ground to the crest of the statue of "Freedom" on the top of the dome, is 285½ feet. This magnificent edifice is acknowledged by the best judges of all countries, as the most impressive structure in the world. It cost $13,000,000. The present building occupies the same site as did the capitol building which was built in 1793, the corner-stone having been laid by George Washington September 18, of that year, seven years before the removal of Congress to Washington. Before the completion of this first capitol, the structure was destroyed by the British Army at the invasion of Washington, in August, 1814.

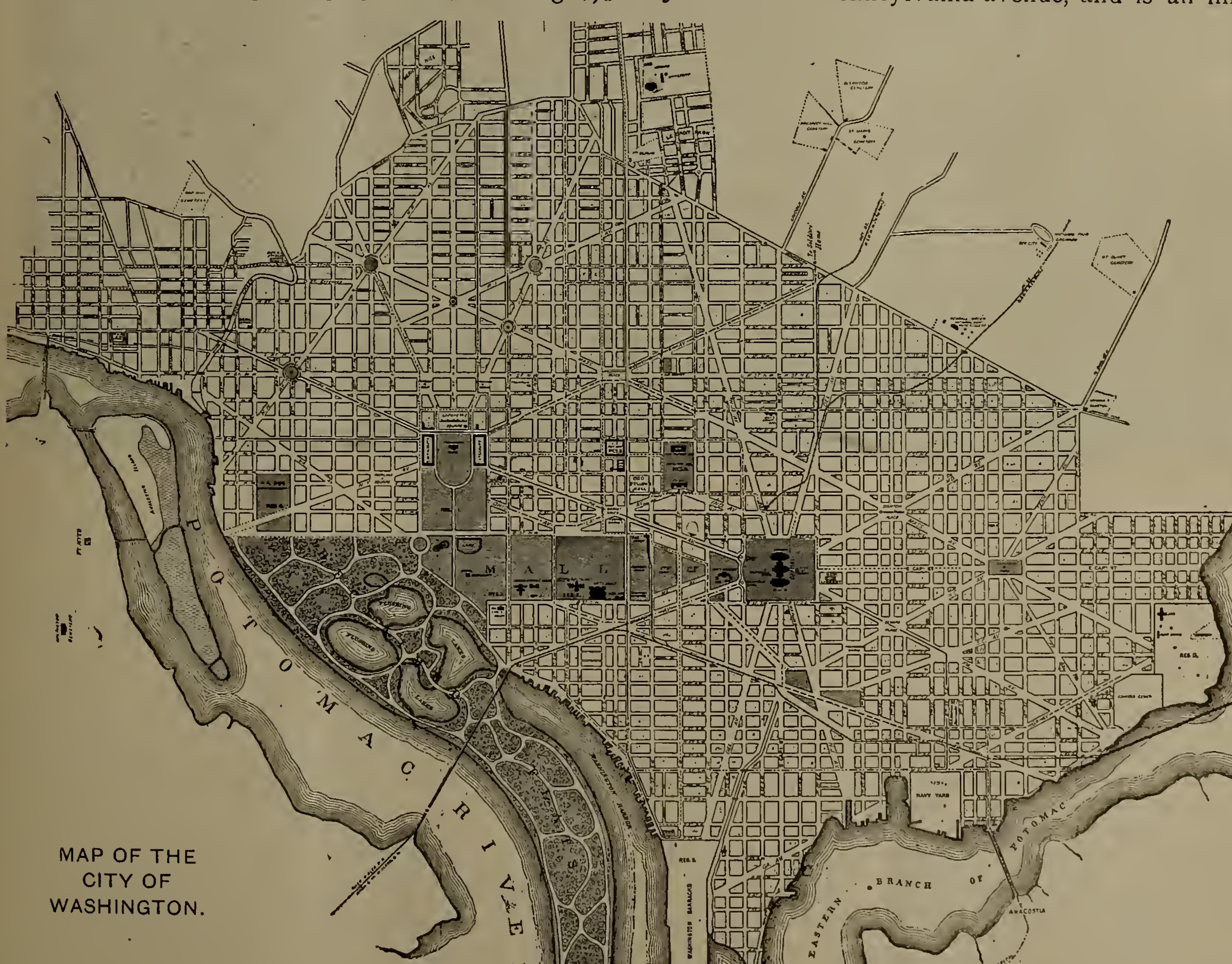
(Levytype Co , Phila.)

UNITED STATES CAPITOL, WASHINGTON.

Among the other points of special interest to visitors in Washington is the great building of the State, War and Navy departments, located on a plot of ground west of the White House. The architecture is of Italian renaissance order. The building is 567 feet long and 342 feet wide, including the projections, covering 4½ acres. It contains 566 rooms and over two miles of corridors. Its cost was very nearly $11,000,000. It is built entirely of granite and was commenced in 1871.

PATENT OFFICE. (Levytype Co., Phila.)

The Treasury department is situated on the corner of 15th street and Pennsylvania avenue, and is an impos-



MAP OF WASHINGTON. (Levytype Co., Phila.)

ing structure of pure Ionic style of architecture. It cost $7,000,000.

The Department of the Interior, commonly known as the Patent Office building, occupies the entire square between F and G streets, and runs from Seventh to Ninth. In architecture it is of the pure Doric order, and it is said to be a model. It is 453 feet by 331 feet, and is approached at the front by large flights of stairs. The Parthenon at Athens furnished the model of the columns, capital and tympanum in this building. Under its roof is located, besides the other departments, the Patent Office, which occupies by far the larger portion of the 191 rooms the building contains. In the Patent Office there are exhibited upward of 160,000 models of inventions. The cost of the Patent Office building was $2,700,000.

The Post Office department building is located immediately opposite the Patent Office building, on F street. It is 300 feet long by 204 feet wide, being of the pure Corinthian order of architecture, The building was erected in 1855 and cost $1,700,000.

The White House stands on Pennsylvania Ave., occupying a reservation of about 20 acres of ground, midway between the Treasury and the building of the State, War and Navy departments. It is 170 feet long by 86 feet wide, with the colonnade of eight simple Ionic columns, and a semi-circular portico in the rear. The grounds are adorned with fountains, flowers and shrubbery, and form a pleasing retreat in the midst of buildings and streets devoted to public business. This building was constructed in 1818-29, and has cost up to the present time, for its erection and maintenance, over $1,800,000.

One of the objects of great interest in Washington is the Washington National Monument, which is the highest work of masonry on the face of the earth, being 525 feet 4½ inches above the foundation, and 592 feet 2 inches over all. The top of the monument is accessible to visitors by an elevator, which runs up the interior of the shaft 500 feet. From the top a most imposing view is had, commanding, on a clear day, an area of over 20 miles in any direction. On December 24, 1799, just after Washington's death, a resolution was passed by Congress for the erection of a marble monument, and Washington's family was requested to allow his body to be placed thereunder on its completion. This plan, however, for various reasons was not carried out. The corner stone of the monument was laid on July 4, 1848, in the presence of 20,000 people, with masonic ceremonies. The chair, apron and implements of the master mason used on this occasion, were those used by Washington in laying the corner stone of the capitol, September 18, 1793. The war and other causes prevented the completion of the monument for many years. It was finally finished and accepted by the government on February 21, 1885, amid impressive ceremonies.

(Levytype Co., Phila.)

VIEW OF PENNSYLVANIA AVENUE, WASHINGTON.

The foregoing is but a brief outline of some of the most prominent institutions in Washington, the limited space at our command rendering it impossible to give a more extended description of them. There are many other points of interest that deserve special mention, but for the above reason, we must forego the pleasure. Delegates to the convention should provide themselves with a guide book of Washington, to go about and visit points of special interest to them individually.

The best guide book of Washington is the one issued by The Levytype Company, of Philadelphia. It is full of fine half tone engravings, and is very complete in facts and figures.

ELECTRIC LIGHT PLANTS.

The Potomac Electric Company, of Georgetown, D. C., is located in Alexandria County, Va., on the Potomac river, three miles from the city of Georgetown. The steam plant consists of one Armington & Sims compound-condensing engine of 275 h. p., three boilers of 80 h. p. each, installed by J. B. Gordon, of Georgetown; one Gordon pump for use in case of fire; one Davidson pump to feed boilers and pump water to the club house, and one Davidson air pump and condenser. The electric plant consists of one Westinghouse alternating current, self-exciting, dynamo of 2,000 volts, with a capacity of 1,250 lights; one Western Electric self-regulating arc dynamo of 50 light capacity.

The office of the company is at No. 1323 Thirty-second street, Georgetown, and the officials are: J. C. O'Gorman, president; George W. Baird, vice-president; M. O'Donnell, general manager; N. Dumont, secretary and H. P. Gilbert, treasurer.

The United States Electric Lighting Co., Washington, has a capital of $1,500,000, and the officers are: A. A. Thomas, president; W. E. Clark, vice-president; S. W. Tullock, secretary and treasurer; A. M. Renshaw, general manager. The company supplies 500 Thomson-Houston arcs and 10,000 Edison incandescents. The engine plant consists of Armington & Sims and New York Safety engines.

ELECTRIC RAILWAYS.

The Rock Creek Electric Railway is six miles in length and double track. It starts from the intersection of 18th and U streets and runs to Chevy Chase, a beautifnl suburb of Washington, in Montgomery County, Maryland. The road-bed is very substantially built, the rails used being 55 pound girder, and a speed of 30 miles an hour is frequently attained. The road crosses two handsome bridges, one being 135 feet high, 750 feet long and 54 feet wide.

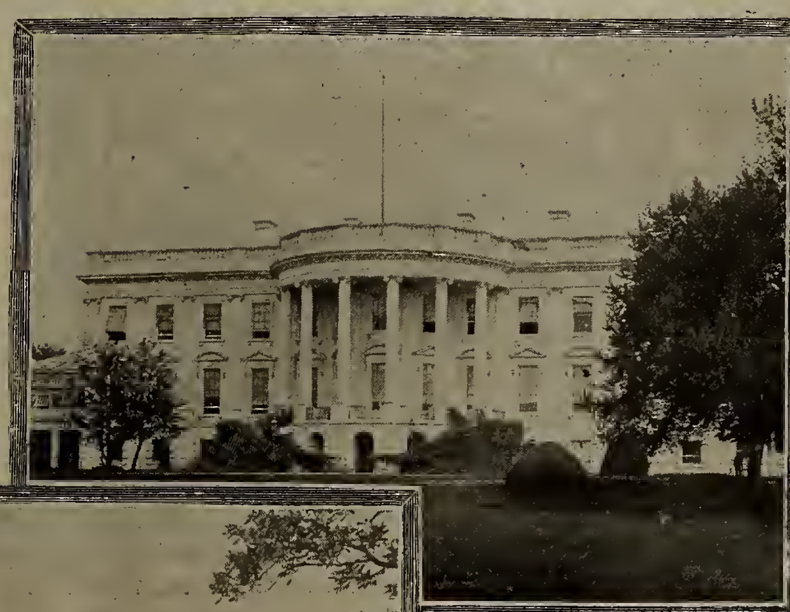
The car-house, which is situated at the further end of the route, is a frame structure 130 feet long by 56 feet wide and 36-feet high, with a king-rod truss roof. It contains every facility and appliance for the rapid handling and examination of cars and motors. Some of the cars are equipped with Peckham cantilever non-oscillating flexible wheel trucks; the others are equipped with Robinson radial trucks, the motors on the cars being of Thomson-Houston water-proof type.

The power-house is of brick, as is also the boiler room. Babcock & Wilcox water-tube safety boilers are used, there being two of them, each of 184 nominal H. P. Chapman gate valves are used throughout the steam installation. The engine consists of one high speed McIntosh & Seymour, tandem-compound-condensing engine, and one Ball & Wood cross-compound, both of 250-H. P. There are four 90 K. W. Thomson-Houston multipolar generators, compound wound and belted direct with the engines by four Schieren perforated electric belts, each 13 inches wide.

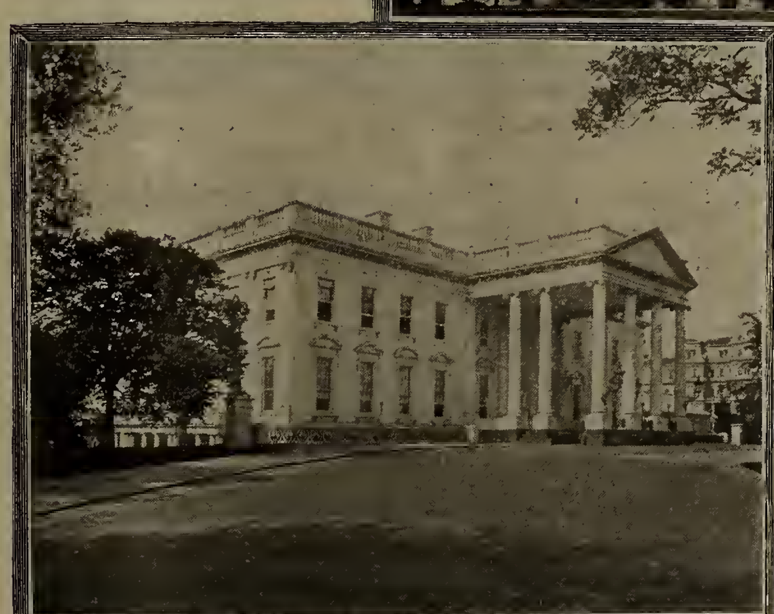
The switchboard is 10 feet high by 11 feet long, and is fully equipped with Thomson-Houston switchboard apparatus.

The overhead line is well constructed, iron and cedar poles being used. The trolley wire is number O, of hard drawn copper, made by the Washburn & Moen Mfg. Company, of Worcester, Mass.

The Washington, Alexandria and Mt. Vernon Electric Railway runs from Alexandria, Va., to Mt. Vernon, connection with Washington being made by railroad and ferry. The line is 10,000 feet in length and crosses Big Hunting Creek on a pile trestle 2,359 feet long. It also crosses another trestle 517 feet long. Wharton



REAR VIEW.



THE WHITE HOUSE.—FRONT VIEW.

(Levytype Co., Phila.)

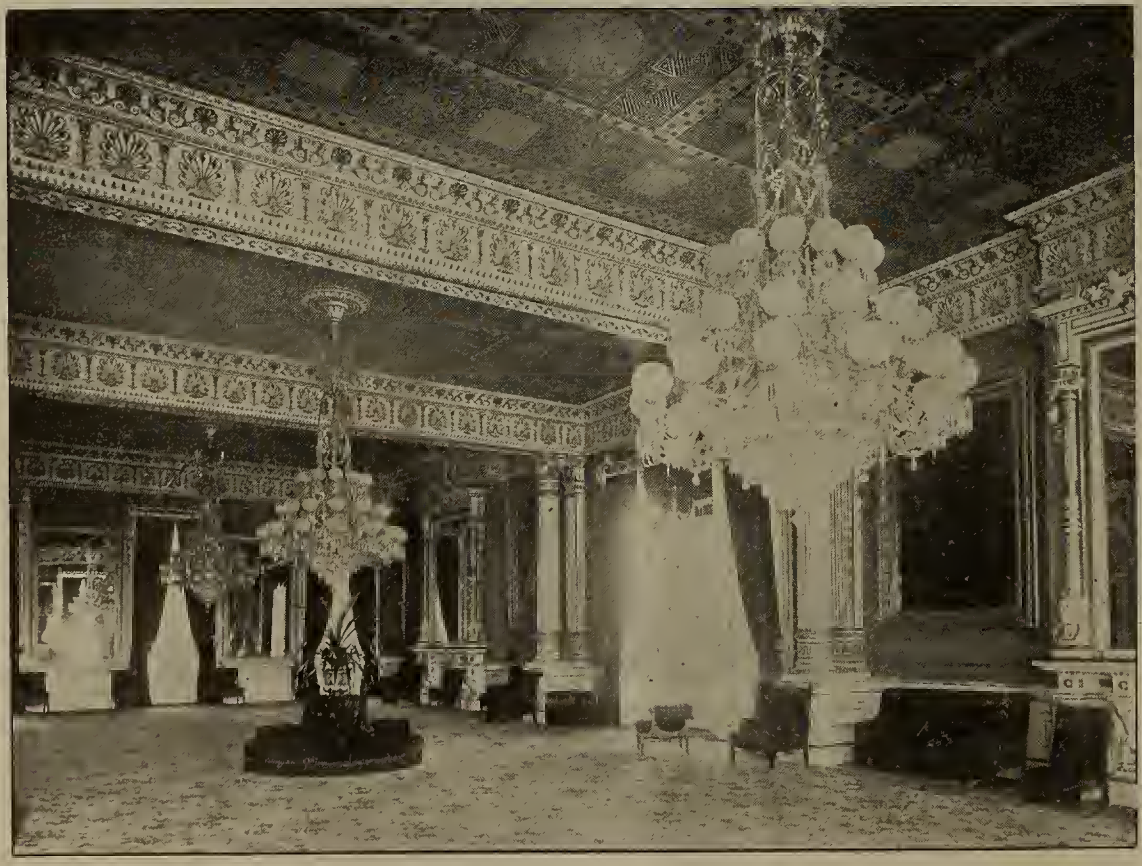
girder rails and Pennsylvania Steel Company's T rails are used throughout in the track construction, and the overhead system is that of the Thomson-Houston Co., the trolley wire number being No. O. The feeders are tapped every 500 feet with number O copper wire. Poles of Michigan pine and cedar are used and the cars are of the J. G. Brill Company's make, each equipped with two Thomson-Houston W. P., 15-H. P. motors, single reduction.

The power is furnished by a duplicate plant, consisting of two 150 h. p. boilers, furnished by W. R. Fleming & Co., of New York, and two 200. h. p. Greene engines and two Edison 200 h. p. generators. The construction of the road-bed and overhead system was done by the Woodbridge & Turner Engineering Company, of New York.

The objections to the overhead trolley system are overcome by the Love underground trolley system, which is now in operation in Washington. This road was started March 2, 1893, and has been in successful operation every day since on a regular schedule, and there has not been five minutes' delay from any failure on the part of the system.

It has been found in practice that the use of a metallic circuit will effect a saving of from twenty to thirty per cent. in the consumption of coal, as it gets rid of the resistance of truck, wheel, rail and bad bonding, the current being fed direct to the motor without loss.

MODEL ROOM, PATENT OFFICE. (Levytype Co., Phila.)



EAST ROOM, WHITE HOUSE. (Levytype Co., Phila.)

The Love underground system consists of an open conduit, both the positive and negative wires being carried in a thoroughly protected place beneath the slot-rail. The yokes for the support of the slot and tram rails are made of cast iron and weigh 260 pounds, and are so arranged that eight three-inch tubes may be placed in the road-bed for use as feed wires or any other electric cables.

They are mounted on concrete foundations, and concrete is used for the bottom of the conduit, while the sides are of cast iron. The depth of the conduit is 20 inches, with a width of 14 inches at its widest part. Manholes are located every 100 feet, and these are connected with the sewer to allow drainage. The metallic circuit conductors consist of 0000 hard-drawn copper wires; the insulators are moulded mica and are attached to the yokes by a special device which allows for expansion and contraction. The conductors, or trolley wires, are cut every 500 feet, and a special device so arranged with heavy compression springs, that expansion or contraction is automatically taken care of at these points. Special plug switches are so arranged at these points that any section of the wires may be cut out, enabling quick location of any trouble and repairs, while the road is in operation.

The trolley is an ingenious mechanical device and always follows the wire as readily on curves as on a straight line.

This line is an extension of the Rock Creek Railway, from Eighteenth street, down U street, to Seventh; the same cars run through from one terminus to the other, the underground trolley being taken out and put in at Eighteenth street to change from the underground to overhead system, and vice versa. This change, however, takes only a few seconds for its accomplishment.

Mr. M D. Law, the well-known electrical engineer, is in charge of the Love system in Washington, and will, no doubt, be glad to see his old friends and explain this system in every detail.

KERITE INSULATED WIRES AND CABLES.

Kerite insulated wires and cables stand among the leaders of goods of this class, for all purposes. They have stood the test of time excellently well and the fact that they are in as great demand now as ever, is conclusive evidence that they possess all the merits that are claimed for them.

Two years ago, six thousand feet of eighteen conductor aerial Kerite cable was placed in the St. Clair tunnel under the St. Clair river, between Sarnia, Ontario, and Port Huron, Michigan, and ever since that time the cable has been subjected to the severe test of steam, etc., and has given perfect satisfaction. The conditions in this tunnel are the most extreme; besides the exposure to steam there is constantly dripping water, but the excellence of the cable is such that these influences have no perceptible deteriorating effect on the cable or the working of the same.

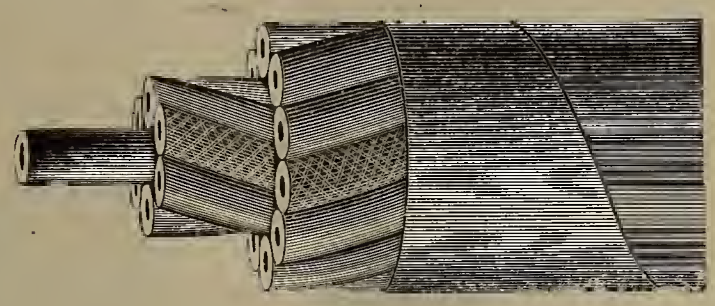
Over 300 miles of eight conductor Kerite Aerial cable have been constructed for and are now in use on the New York Central and Hudson River Railroad. This is said to be the longest length of this class of cable ever put into use.

The exhibition of Kerite insulated wires and cables at the World's Fair was a most attractive one, commanding the admiration of all those interested. This exhibition received the only award at the World's Fair for "High insulation, excellence in material, durability and reliability, under the most exacting conditions."

The qualities of the Kerite insulation are, namely: proof against the corrosive elements in earth, air or water, and the greatest extremes of heat and cold do not impair its flexibility, firmness or insulating properties. Acids act upon it very slowly, and strong solutions of alkalies do not injure it, nor do mineral oils, illuminating gas or roots of plants affect it, and the action of water, either salt or fresh, really improves its insulation. It is therefore durable in all climates and under all conditions, and for these reasons it is claimed to be the most perfect, durable and economical insulation in use.

The Armored Kerite cables for river and harbor use are constructed with the greatest possible skill known to the art, and are now in use by the Western Union, Postal and Great Western Telegraph Companies, and the various telephone companies, and in every case perfect satisfaction is being given.

Kerite underground cables are very extensively used by the leading electrical companies, and the fact that the demand for them is great and constantly increasing



KERITE CABLE.

is substantial proof of their recognized merits. In the manufacture of electric light wire for all classes of aerial electric light work, the wire is covered with two separate layers of Kerite tape, wound spirally in opposite directions, well lapped and semi-vulcanized, which forms an excellent insulation that improves upon exposure to the weather. The tape is covered with an outside braid. Such a wire is perfectly insulated and is thoroughly adapted for running through foliage, as its insulation prevents leakage of current in bad weather.

IN GENERAL.

The Postal Telegraph & Cable Co., of Pennsylvania, has elected the following officers: President, A. B. Chandler; vice-president, E. C. Platt; secretary, C. C. Adams; treasurer, Theodore L. Coupler, Jr.

A telephone company has been organized at Michigan City, Ind., with a capital stock of $10,000, to build a telephone line between that city and Laporte, Ind. It is stated that telephone service will be furnished for $1 per month.

The Cape Horn Telephone Company, of Vancouver, B. C., has been organized with the capital stock of $10,000 to build and operate a telephone line in that section. Incorporators: J. R. Birt. John N. Klein, A. J. Remington, Fritz Braun, W. H. Johnson.

The Inventive Age, of Washington, appears in its February number in a new dress and under a new management. The names of Alexander S. Capehart and Marshall H. Jewell head the editorial column and the paper is much improved in appearance by the change.

The Clayton Air Compressor Works have removed their offices and salerooms from 43 Dey street to the Havemeyer building, 26 Cortlandt street, New York city.

THE NEW "BERGMANN" ALTERNATING ARC LAMP.

One of the distinctive features of the electric lighting industry during the past year has been the marked increase of interest in the subject of arc lighting on alternating current circuits by means of the so-called incandescent arc lamp.

The final establishment of the A. C. incandescent arc lamp at an early date as the most economical means of first-class illumination may be confidently looked for, and the new Bergmann A. C. lamp now being put on the market by the General Incandescent Arc Light Co., of New York, will mark a most important step toward this realization, so important both to the public and electric illuminating companies.

The manufacture of arc lamps for incandescent circuits, both for direct and alternating current, is carried on at present by a number of concerns, and has naturally resulted in an equal number of types of lamps, varying in efficiency, design, workmanship and durability.

From what was shown our representative the other day in the magnificent building at 572 to 578 First avenue, which is the home of the above-mentioned company, we feel quite safe in saying that the company's claim for superiority in all the requisites which go to make up a perfect lamp is built upon good foundations.

As in the case of its direct current lamp, this company manufactures its alternating current incandescent arc lamps in various styles and degrees of ornamentation, from the plainest so-called "Standard" lamp to the most elaborate creations of the metal-worker's art.

The company's handsome illustrated circular No. 7, which can be obtained by mail, gives a fuller account of the claims made for its lamp than we can, of course, reproduce in these columns, but some of them may be briefly stated as follows:—

Simplicity of mechanism, first-class workmanship, absolute steadiness without adjustments, ease of trimming, protection from dust and weather, starting at less than the normal current, requiring no waste of current in resistance, large range of candle-power, improved carbon-holders, etc., etc.

"BERGMANN" ALTERNATING ARC LAMPS.

The company is prepared to send the lamp on trial to any responsible intending purchaser, and as it has thus brought it by meams of these columns to the notice of all who are interested, at the time of the Electric Light Convention in Washington, no doubt it will experience a marked rush for orders and inquiries about these lamps, which we understand it will also have on exhibition during the Convention.

The company will be represented at the Convention by its general sales agent, Mr. S. A. Douglas, who will, of course, be pleased to go into the details and show up all the excellence and beauties of its incandescent arc lamps to his numerous friends who may be expected to be present at that re-union of the various electric light interests.

THE BALL ENGINE COMPANY'S DIRECT CONNECTED ENGINE.

The progress toward the ultimate perfection of electrical machinery is manifested in many ways, but in no way more clearly than in the present use of engines directly connected to dynamos.

This arrangement of engine and dynamo has a two-fold advantage: The first of these is the small floor space occupied. This is an important consideration for central stations, hotels and office buildings in large cities where there is a steadily increasing demand for economy in this direction. Another advantage is in the elimination of wastes of energy by transmission through belts and counter-shafting. With the direct connected engine the frictional losses due to outside causes entirely disappear, leaving nothing but the internal friction of the engine to be accounted for.

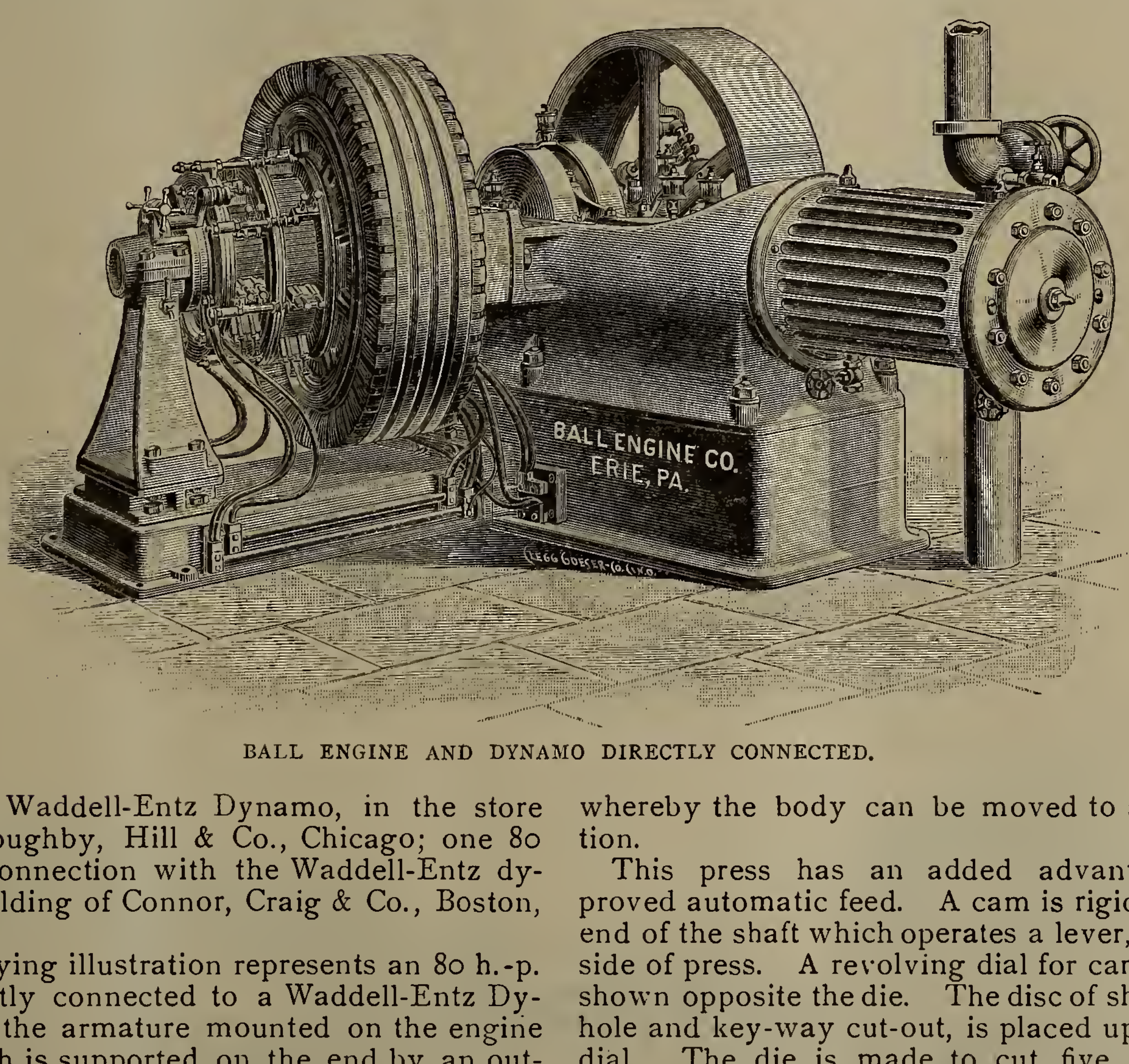
The Ball Engine Co., of Erie, Pa., has made a number of installations in connection with various types of dynamos, among the late ones being two 200 h. p. Cross Compound Engines, directly connected to Siemens & Halske dynamos, in the Lumber Exchange Building, Minneapolis, Minn.; one 125 h.-p. Simple Engine, in connection with Waddell-Entz Dynamo, in the store building of Willoughby, Hill & Co., Chicago; one 80 h. p. engine, in connection with the Waddell-Entz dynamo, in the building of Connor, Craig & Co., Boston, Mass.

The accompanying illustration represents an 80 h.-p. Ball Engine directly connected to a Waddell-Entz Dynamo. It shows the armature mounted on the engine crank shaft, which is supported on the end by an outboard bearing resting on an extended sub-base. This is a remarkably compact, durable and efficient arrangement, and has given the greatest satisfaction in practice.

The distinctive features of this well known engine are: Beauty of design, simplicity and compactness, solidity and strength of frame, large bearings and wearing surfaces, excellence of materials and workmanship.

The engine, therefore, is economical and durable, and being perfectly balanced will run quietly and smoothly under the heaviest and widest varying loads. The regulation is so perfect that the engine will not vary to exceed one per cent. in speed.

Every detail of construction receives the most careful inspection, and every engine is thoroughtly tested before shipment is made.



BALL ENGINE AND DYNAMO DIRECTLY CONNECTED.

POWER PRESSES FOR ELECTRICAL WORK.

We illustrate herewith two power presses made by W. E. Jones, 14 and 16 Water street, Brooklyn, N. Y., which are specially interesting to electric generator and motor builders and users.

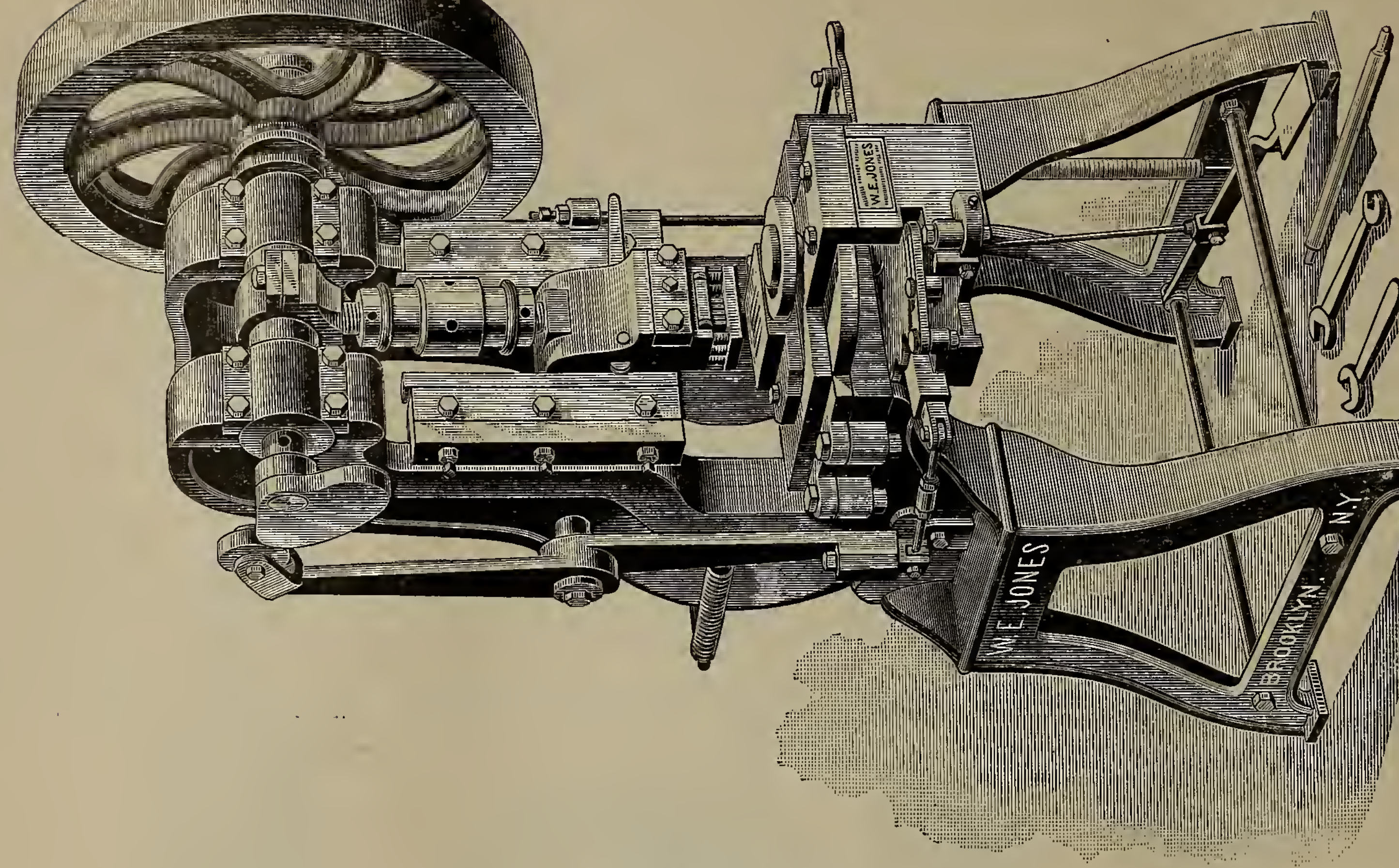
The No. 80 Arc Press is especially adapted to cutting the blanks for armature discs, with centre hole and key-way, all in one operation. This press is made extra heavy, and has an improved clutch, and all the parts are interchangeable. The crank-shaft is made extra strong, with long bearings, and the mandril and bearings are likewise heavily constructed, the connections having split barrels, whereby the mandril can be adjusted to a nicety. It is impossible for the stock to remain in the punch after the slide has gone its full stroke. No springs whatever are required, either in the punch or knock-out.

The No. 45 Adjustable Press with automatic feed and stop motion, is a machine now extensively used in sheet metal stamping and cutting. It is extra heavy and readily adjustable to either the upright or inclined position by means of small rollers inserted in the frame, whereby the body can be moved to any desired position.

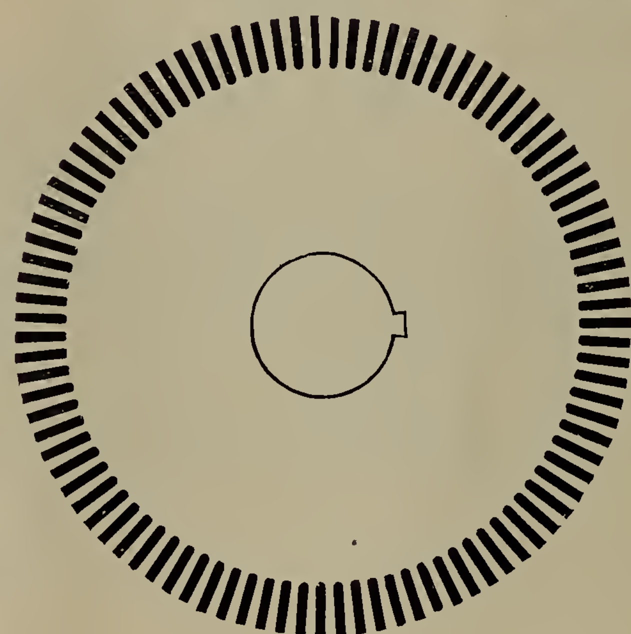
This press has an added advantage in its improved automatic feed. A cam is rigidly placed on the end of the shaft which operates a lever, as shown on the side of press. A revolving dial for carrying the disc is shown opposite the die. The disc of sheet iron, with the hole and key-way cut-out, is placed upon the revolving dial. The die is made to cut five teeth at a time, through the motion of the levers shown on the side of the press.

The dial with sheet iron disc is made to move nineteen times, so that it will cut ninety-five teeth perfectly. This press has the most perfect automatic motion of any press made for this class of work. The press, making nineteen cuts, stops automatically until a new disc is placed on the feed plate and the treadle depressed. All parts are interchangeable, and finished in the highest manner.

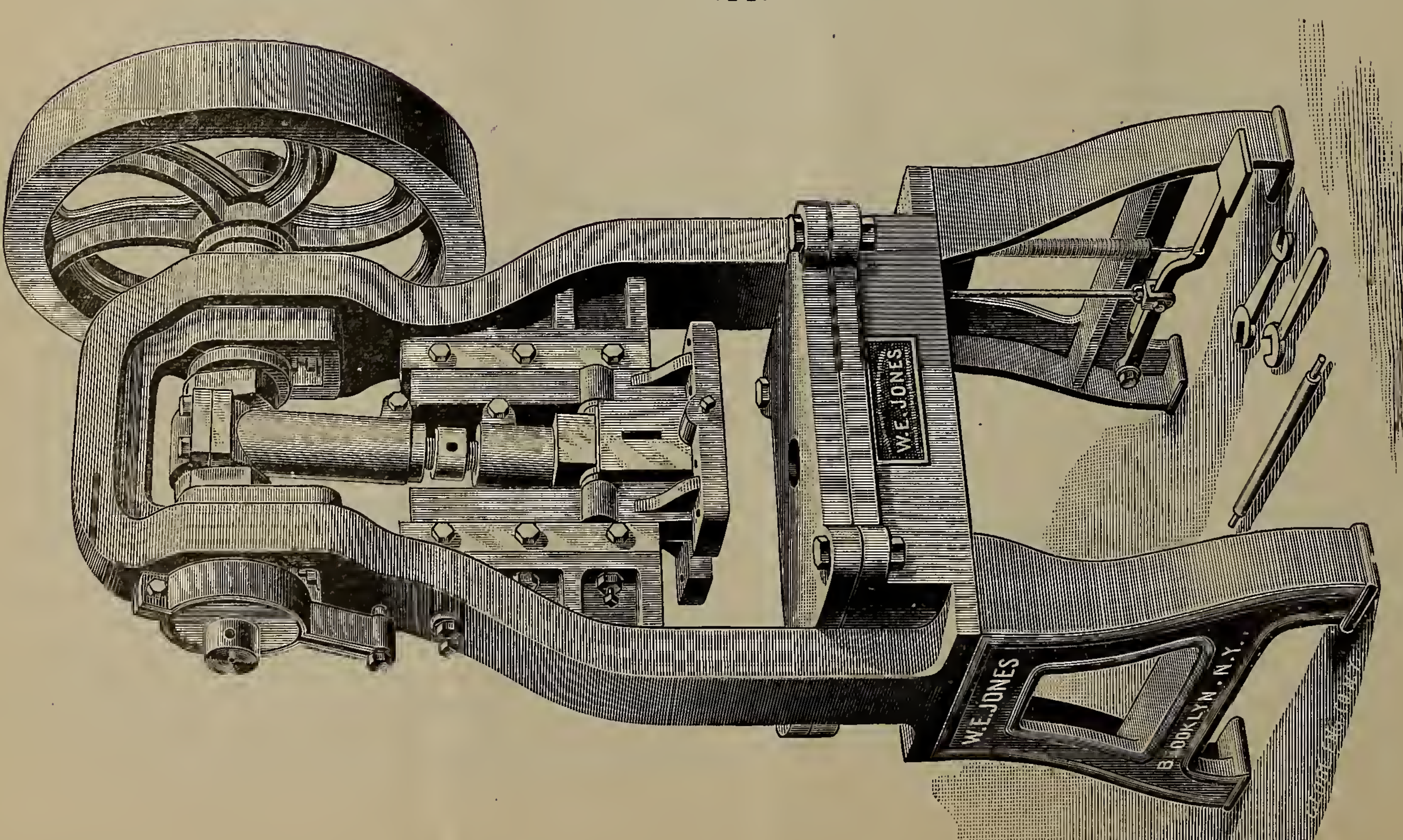
Besides these presses Mr. Jones is manufacturer of dies and special machinery, and he is prepared to give estimates and prepare designs for any style of press or machine for the sheet metal trade, especially for dynamo and motor work.



NO. 45 ADJUSTABLE PRESS.



ARMATURE DISC.



NO. 80 ARC PRESS.

AT THE CONVENTION.

Messrs. Capt. Willard L. Candee and Geo. T. Manson will, as usual, attend the Convention in the interests of the Okonite Company, Ltd., primed with good nature and irrefutable arguments regarding the merit of the Okonite specialties.

The Weston Electrical Instrument Company, of Newark, N. J., will be represented at the Convention, as usual. Business is very good with this well known and progressive concern, and a number of new instruments put upon the market during last year are having a big sale. The Weston electrical measuring instruments are "standards."

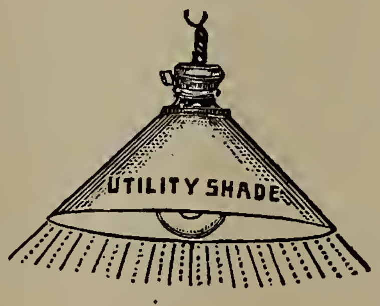
NEW YORK NOTES.

Office of the Electrical Age,
World Building, New York,
February 24, 1894.

The De Mott motors on exhibition and sale at 114 Liberty street, city, are made especially to run by battery power. These motors are wound for very low resistance and take very little current. For fan and small power work there is no better motor made. These machines are designed to be used in any position and are made compactly, so that they can be easily applied to any small power service. The De Mott Motor Company also makes a very excellent primary battery to run these motors. Now is the time to stock up for the spring and summer trade. All desiring first-class goods should call upon this concern.

The Holtzer-Cabot Electric Company, of Boston, Mass., is well represented in this section by Mr. Harry W. Colby, who controls all the territory outside of the New England States, for the sale of the well-known Holtzer-Cabot motors and dynamos. Mr. Colby has several sizes of dynamos and motors on exhibition at his office, 143 Liberty street, city, where he will be pleased to explain their good qualities to all probable customers. Mr. Colby will install these motors and dynamos for all power purposes. His company's small incandescent and alternating fan motors, which took so well last year, are being prepared for a big sale this spring and summer. Mr. Colby is well known in Boston, where he did a large business for the General Electric Company, before accepting the agency of the Holtzer-Cabot Company. He will establish agencies in Philadelphia and Buffalo, and is looking for enterprising men to assist him at these points.

W. D. Holmes and G. W. Walker, comprising the firm of Holmes & Walker, 516 Electrical Exchange, 136 Liberty street, New York, have secured the general agency for the Utility Shade, made in paper and celluloid in any color desired, with fixture attached. The standard goods kept in stock are cone-shaped, in several sizes, but they are made to order in any fancy shapes. They are adapted to any style of socket. The main points of merit of the shades are their light weight, great reflecting power, durability and cheapness; they can be washed and are unbreakable. Mr. Walker, of this firm, is the inventor of the well-known Walker meters.



W. T. H.

Electrical and Street Railway Patents.

Issued February 20, 1894.

514,902. Alternating Current Motor. Charles S. Bradley, Avon, N. Y. Filed Sept. 27, 1892.

514,903. Alternating Current Electric Motor. Charles S. Bradley, Avon, N. Y. Filed Sept. 27, 1892.

514,904. Alternating Current Motor. Charles S. Bradley, Avon, N. Y. Filed Jan. 14, 1893.

514,907. Dynamo-Electric Machine. Charles F. Brush, Cleveland, Ohio, assignor to the Brush Electric Company, same place. Filed Jan. 14, 1879.

514,913. Cushion for Telephone Receivers. Victor A. Cook, Averill Park, N. Y. Filed Nov. 28, 1893.

514,916. Telephone. Daniel Drawbaugh, Eberly's Mill, Pa., assignor, by mesne assignments, to Frank Jones, Portsmouth, N. H., and John R. Bartlett and Henry C. Andrews, New York, N. Y., trustees. Original application filed July 26, 1880. Divided and this application filed Oct. 26, 1880.

514,920. Telephone Transmitter. Philip Fitzsimons, Birmingham, Ala., assignor of one-half to Patrick H. Linnehan, same place. Filed June 14, 1893.

514,925. Electric Cable. Theodore Guilleaume, Mulheim-on-the-Rhine, Germany. Filed Oct. 6, 1893. Patented in France April 14, 1893, No. 220,891; in Belgium, April 14, 1893, No. 104,271; and in Italy Aug. 8, 1893, XXVII, 34,551, LXVII, 473.

514,932. Trolley Wire Support. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed June 30, 1893.

514,933. Transformer. Fred. S. Hunting, Fort Wayne, Ind. Original application filed Feb. 25, 1892. Divided and this application filed July 14, 1893.

514,960. Electric Bell-Alarm. Wm. H. Orpen, Jr., Brooklyn, N. Y. Filed Apr. 29, 1891.

514,972. Electric-Railway System. Nikola Tesla, New York, N. Y. Filed Jan. 2, 1892.

514,973. Electrical Meter. Nikola Tesla, New York, N. Y. Filed Dec. 15, 1893.

514,975. Electrical Annunciator. Nelson M. Watson, Detroit, Mich., assignor to Alfred H. Heath, Wm. B. Heath, and Sarah A. Millard, same place. Filed July 7, 1892.

514,980. Switchboard System. David H. Wilson, Chicago, Ill. Filed Sept. 8, 1893.

514,981. Circuit Making and Breaking Device. David H. Wilson, Chicago, Ill. Filed Sept. 8, 1893.

515,020. Electrical Converter. Andrew L. Riker, New York, N. Y. Filed July 27, 1893.

515,022. Electric-Arc Lamp. Samuel W. Rushmore, Brooklyn, N. Y. Filed Feb. 20, 1893.

515,087. Electric Distribution-Box. Oscar D. Kleinsteuber and Monroe A. Kleinsteuber, Milwaukee, Wis. assignor of one-third to John T. Janssen, same place. Filed June 27, 1893.

515,108. Electrical-Circuit Controller. Romaine Callender, Brantford, Canada. Filed Nov. 2, 1893.

515,109. Electrical-Circuit Controller. Romaine Callender, Brantford, Canada. Filed Nov. 2, 1893.

515,110. Automatic Signaling Transmitter. Romaine Callender, Brantford, Canada. Filed Nov. 2, 1893.

515,115. Automatic Grip-Opener. William P. Courtney, Oakland, Cal., assignor of one-half to Albert Brown, same place. Filed July 3, 1893.

515,125. Arc Lamp. William O. Meissner, Chicago, Ill., assignor to the Washington Electric Company, same place. Filed Sept. 11, 1893.

515,145. Electric Signaling Between Railway Trains. Julius J. Czepull, Lancaster, Pa., assignor of one-half to Emil Meyer, same place. Filed Aug. 8, 1893.

515,157. Safety Car Fender. William J. Ogden, Baltimore, Md. Filed Sept. 7, 1893.

515,170. Automatic Toll-Box for Telephone Pay Stations. Howard C. Root, Brooklyn, N. Y. Filed Dec. 9, 1893.

515,179. Electric Railway Conduit. Morris S. Towson, Cleveland, Ohio, assignor to Albert G. Wheeler, Chicago, Ill. Filed Jan. 6, 1893. Renewed Dec. 28, 1893.

515,189. Electric Time Alarm. John C. Betts, Philadelphia, Pa. Filed Aug. 8, 1893.

515,192. Material for Insulating Electric Wires. Gustave A. Cannot, London, England. Filed Sept. 22, 1893. Patented in England Sept. 1, 1891, No. 14,791; in France Sept. 15, 1891, No. 216,144; in Belgium Sept. 15, 1891, No. 96,398, and in Austria-Hungary April 21, 1892, No. 60,599.

515,198. Safety Car-Fender. Francis De Fontes, Baltimore, Md. Filed Oct. 24, 1893.

515,205. Electric-Arc Lamp. Bruce Ford, Johnstown, Pa. Filed Dec. 8, 1892.

515,216. Dynamo or Electric Motor. Ludwig Gutmann, Pittsburg, Pa. Filed Feb. 13, 1892.

515,238. Trolley-Conductor and Support. Myron D. Law, Washington, D. C., assignor to Albert G. Wheeler, Chicago, Ill. Filed Aug. 29, 1893.

515,241. Rheostat. John B. Lyon, Brooklyn, N. Y., assignor to the Law Battery Co., of New Jersey. Filed Dec. 22, 1891.

515,254. Rheostat. Alton J. Shaw, Muskegon, Mich. Filed Oct. 13, 1893.

515,255. Electric Elevator-Brake. Alton J. Shaw, Muskegon, Mich. Filed Oct. 24, 1893.

515,256. Electric Elevator-Brake. Alton J. Shaw, Muskegon, Mich. Filed Nov. 4, 1893.

515,274. Indicator for Electric Cars. Henry C. Beckmann, St. Louis, Mo. Filed Aug. 17, 1893.

515,280. Rheostat. George A. Brown, Muskegon, Mich., assignor to the Shaw Electric Crane Co., same place. Filed Aug. 19, 1893.

515,281. Electric Elevator-Brake. George A. Brown, Muskegon, Mich. Filed Oct. 13, 1893.

515,286. Electric Steering-Gear. Frank L. Dyer, Washington, D. C., assignor of two thirds to Leonard H. Dyer, same place, and Alexander McDougall, Duluth, Minn. Filed Apr. 17, 1893.

515,289. Wheel-Guard for Cars. David R. Howard, Baltimore, Md. Filed June 16, 1893.

515,297. Electric Igniter for Gas-Engines. Joshua Low and James W. Gow, Steubenville, Ohio. Filed May 13, 1893.

515,304. Rheostat. Alton J. Shaw, Muskegon, Mich. Filed Oct. 13, 1893.

515,308. Electric-Railway Trolley. Charles J. Van Depoele, Lynn, Mass.; C. A. Coffin and Albert Wahl, administrators of said Van Depoele, deceased, assignors to the Thomson-Houston Electric Co., Boston, Mass. Original application filed June 18, 1888. Divided and this application filed Nov. 8, 1890.

PATENTS EXPIRED FEBRUARY 20, 1894.

187,674. Circuit-Closers for Burglar-Alarms. W. H. Sawyer, Philadelphia, Pa. Filed Jan. 16, 1877.

ELECTRICAL AGE

Vol. XIII. No. 10. NEW YORK, MARCH 10, 1894. Whole No. 356

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Copy for advertisements or changes therein should be in our hands before the Saturday pr ceding publication day.

NEW YORK, MARCH 10, 1894.

CONTENTS.

OUR COMPLIMENTS TO MR. FRANCISCO.

The Electrical Age congratulates Mr. M. J. Francisco on his election to the presidency of the National Electric Light Association. Mr. Francisco has the association's interests at heart, and he is a gentleman in every way fitted to fill the important position. He is no theorist, but a man full of practical ideas, and we venture to predict that through his efforts and direction the next convention of the association will be of the most practical character.

WATCH FOR OUR NEXT ISSUE.

Owing to the pressure on our columns of the convention report, we have been compelled to omit from this issue much matter of general and special interest. It will all appear in our next number, however.

PROF. THOMSON IN ANOTHER ROLE.

Another newspaper yarn concerning the alleged combative tendencies of the mind of Prof. Elihu Thomson is going the rounds. This time the professor contemplates purchasing the extensive works of a prominent maker of steam engines in an eastern city, where he proposes to manufacture street-car motors and other electrical apparatus. The American people must, by this time, have a queer notion of the professor's character; he must seem to many of them like a spectre stalking through the land smashing things right and left because he cannot rule the earth. But, in reality, a more perfect exponent of personal rectitude and honor does not exist.

THE WASHINGTON CONVENTION.

It is not often that an organization holds a convention under such favorable circumstances as did the National Electric Light Association in Washington last week. The weather was fine and the attendance and enthusiasm all that could be desired. The programme was diversified, and an interesting one, and for that reason alone those present at the meetings feel well repaid for their attendance. The papers read and topics discussed were of a highly practical nature; and many new facts were brought to light, and will be put into practice in many stations throughout the country. The report of the Committee on Data furnishes some facts concerning the amount of coal used in actual practice to produce a given quantity of electricity, which it will pay every station manager to carefully consider. This is a subject that interests those directly concerned more than any other connected with the production of electricity for commercial purposes. Mr. Vail's paper on the subject of metallic circuits for electric railways is a very able production, and, although it directly concerns electric railways, it has a very important bearing on electric lighting interests. What concerns one interest necessarily concerns the other to a more or less extent. We note with satisfaction the action taken by the convention in the matter of giving a definite value to the candle power of the so-called 2,000 c. p. arc lamp. An average of 450 watts, measured at the lamp terminals, exclusive of any outside resistance, is adopted as the amount of current necessary to maintain such a candle power. With the enforcement of this standard there will not be so much cause for complaint, on account of the deficiency in light, which complaints, it must be acknowledged, are altogether too frequent. The subject of "Meters versus Flat Rates" is one that concerns all station managers, and received some consideration. Nothing more than an expression of views and experiences were given, however, some favoring the one and some the other method of charging for current. The burden of opinion seems, however, to be in favor of the meter. Other topics of equal importance and interest were considered, and no doubt, the interchange of views benefitted all.

SEVENTEENTH CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION.

Washington, D. C.,
February 27, 28 and March 1, 1894.

The convention was called to order by the president, Judge E. A. Armstrong, at 11 A. M., in the G. A. R. Hall.

President Armstrong then read his address He made a strong argument against the growing idea and tendency towards municipal ownership of electric plants. He thought it was against public interests, and should meet with the positive opposition of all electrical manufacturing interests. He denounced the lack of consideration shown by the advocates of municipal ownership for the rights and property of private companies, and protested against the establishment of municipal plants without a fair compensation to those affected.

The present activity, he said, was in the direction of street lighting, but it would be only a question of time when municipal advocates would reach out after commercial lighting. He urged the association to act as a unit to protect private interests, alike for large and small plants. In either case the same principle was at stake.

Several letters of regret from invited guests were then read, including one from Secretary Thurber, to the effect that owing to the absence of President Cleveland from the city, the chief magistrate would be unable to tender the proposed reception to the delegates of the convention. A like communication was read with reference to Mrs. Cleveland's inability to receive the ladies of the convention.

Mr. C. H. Wilmerding of the Committee of Legislation stated that the committee had no report to make. This acknowledgment gave rise to considerable discussion. Mr. C. R. Huntley asked that the committee be discharged, since it had never done anything, and that other means be adopted to accomplish the object for which the committee was appointed

Mr. Clay offered a resolution providing that an attorney be employed to continuously compile a record of legislation, passed and proposed, affecting the electric light interests, such to be supplied to the various members of the association. The discussion was continued by Messrs. Insull, Morrison, Stetson, De Camp and others. Mr. John A. Seely thought that it was the duty of the secretary to perform the proposed functions. The resolution was finally referred to the executive committee.

A report of the finance committee was then read, showing the association to be in a sound condition, financially. This was followed by the report of the committee on "Relations Between Manufacturers and Central Stations Companies," which was read by Mr. Frederic Nichols.

On motion of Mr. W. J. Hammer, the president, was authorized to take necessary action with the view of urging the Post-office Department to amend its recent ruling so that periodical publications of professional, scientific and other similar bodies, be classed as second-class matter. He thought that the ruling of the postmaster-general was a discrimination against periodicals of this character.

Dr. Gatling, the well-known inventor, was then introduced by President Armstrong, and made some interesting remarks on the patent system. The patent system, he thought, should be thoroughly guarded by all inventors, and those engaged in industries based on inventions. The rights of inventors should be protected.

At the conclusion of Dr. Gatling's remarks, the president announced that the "query box" would be introduced at this meeting, and he hoped that all members would take advantage of this excellent method of obtaining information on any desired subject in their line.

After extending thanks to the Metropolitan Street Railway Company for passes, and to the Long Distance Telephone Company for its courtesies in offering the use of its lines, free of charge, to the members, recess was taken till afternoon.

At the afternoon session, Mr. H. M. Swetland presented the report of the Committee of Data, an abstract of which is given on another page. The reading of the report was followed by an interesting discussion which was participated in by Messrs. Stetson, Smith, Burleigh, Nichols, De Camp and others. In the main, the conclusions of the report were agreed in.

Mr. W. H. Harrington, then read a paper "Faults Incident to the Protection of Lighting and Power Stations," an abstract of which paper will be found elsewhere in this issue.

Considerable discussion followed the reading of this paper, the opinion being general that fuses were unreliable and magnetic cut-outs suitable only for station use.

Prof. T. C. Mendenhall, superintendent of the Coast Survey, then made a few remarks, requesting the cooperation of the National Electric Light Association as a body, and the members individually, in securing the passage of an act by Congress, legalizing the electrical units adopted at the International Electrical Congress at Chicago last summer.

On motion, a resolution was adopted favoring the passage of such an act and that the committee on legislation be requested to use its utmost endeavors to further the object of the measure.

President Armstrong at this point made a very sensible recommendation to the effect that a competent engineer be requested to prepare an address to the association on "How Electricity and Electric Power are Generated and Used," the same to be couched in plain untechnical language. The purpose of this was to supply members with matter that could be reprinted and distributed among their customers, for the information of the latter.

After reading an invitation from the Rock Creek Railway Co. to the members to avail of the free use of the company's cars during the convention, the meeting went into executive session and at six o'clock adjourned.

SECOND DAY'S PROCEEDINGS.

Wednesday morning's session began with the reading of a paper by Mr. J. H. Vail on "The Importance of Complete Metallic Circuits for Electric Railways," an abstract of which paper will be found elsewhere in this issue. The paper was generally discussed.

The next topic on the programme was the subject of "Electrolytic Effects of Return Currents." This subject was discussed in a very animated manner. The Electrical welding of joints was not considered good practice by many of the members, but was defended by Mr. Wason, who set forth in a clear manner its advantages and value. Others spoke for and against the method, also on the subject in general, and touching the subject in its telegraphic phase, Mr. Cuttriss pointed out the evils resulting from grounded telegraphic wires.

"Storage Batteries" was the next subject for discussion, and Mr. William Bracken made a strong argument in favor of their use for central stations, power plants and large isolated installations. He was followed by Mr. P. G. Salom, who gave some technical information in regard to the use of storage batteries in electrical stations. An interesting discussion ensued during which Mr. Appleton gave some interesting facts regarding the first central station storage battery plant in the United States, using American made batteries.

Professor L. B. Marks, next explained the technical features of the Howard Incandescent Arc Lamp, which has attracted considerable attention of late. Mr. Charles R. Huntley, of Buffalo, had made some experiments with these lamps and gave a very favorable account of the results. Messrs. Burleigh, De Camp, Nichols, Seely and others took part in the discussion.

At the afternoon session, the members resumed the discussion on the subject of the Howard Incandescent Arc Lamp and considered it in its commercial aspect.

"What Is the Most Economical Size for Arc Dynamos?" was the next subject for consideration. Machines of 100 lights and even higher were, on the whole, considered the most economical size for large stations. The subject was an interesting one, and the opinion seemed to be most unanimous in favor of the machines of the size above named.

The subject of "How to Rate Arc Lamps" was then taken up and discussed by Messrs. Burleigh, Stetson, De Camp, Seely, Anthony, Huntley and others, the sentiment apparently being in favor of the rating of lamps on the watt basis. The matter was, however, referred to a committee with instructions to report at Thursday's session.

After a further discussion on the subject of storage batteries for central stations, the convention took a recess until evening.

The evening session consisted of an illustrated lecture by T. C. Martin and Luther Stieringer on "Electric Lighting at the World's Fair and Some of its Lessons." This event was looked forward to with a great deal of interest by the delegates, and a large crowd was present in the hall to hear what was to be said on this interesting subject.

Messrs. Martin and Stieringer treated the subject in detail in a most interesting manner, giving much information of interest regarding the electrical plants and every detail connected therewith, at the World's Fair. The stereopticon views were especially interesting and made a deep impression on the audience, showing, as they did, the magnitude and artistic development of the already famous work. The illumination of the Ferris Wheel, and the special electric lighting effects, were described and illustrated very effectively. This lecture gave a very good idea of the magnitude of this great undertaking at the World's Fair, giving facts and showing all details, collectively, which told a story that could not be otherwise obtained.

THIRD DAY'S PROCEEDINGS.

The first business of the morning session was the reading of a paper by Mr. A. B. Herrick, entitled, "The Development of Switchboards for Modern Central Stations." An abstract of this paper will appear in our next issue.

Mr. Herrick illustrated his paper with several diagrams, projections on the screen, and switchboard instruments.

In the discussion which followed the reading of Mr. Herrick's paper, Mr. Edward Weston called attention to the desirability and importance of reducing to a minimum, the drop in switchboard instruments and conductors. He also thought it of the greatest importance to express the loss through the various drops in dollars and cents for the benefit of the station manager.

Mr. Charles F. Scott then read a paper on the subject of "Polyphase Transmission," in which he explained in a simple manner the various phenomena observed in alternating current practice. The paper set forth a system combining the advantages of both the two and three-phase systems. Currents generated by two-phase machines, could be distributed as three-phase currents and supplied to three-phased apparatus, or retransformed to the original two-phased current.

Mr. Scott's paper was well received, and judging by the frequent applause accorded, the members were evidently deeply interested in the subject.

The afternoon session was opened with the discussion of Mr. Scott's paper. Professor George Forbes opened the discussion and thought that the system devised by Mr. Scott had the merit of practical value. Professor H. A. Rowland thought that Mr. Scott's work marked a new era in polyphase transmission. The discussion was continued by Messrs. Spencer, Forbes, Stillwell and others.

The committee on the "Rating of Arc Lamps" made its report and recommended that a 2,000 C. P. arc be defined as produced by 450 watts. After some discussion the report was adopted.

The committee on "Rules for Safe Wiring" then made its report, which, after a few changes, was adopted after considerable discussion.

The meeting then went into executive session, and the following named gentlemen were elected for the ensuing year: President, M. J. Francisco, Rutland, Vt.; 1st vice-president, C. H. Wilmerding, Chicago, Ill.; 2nd vice-president, Frederic Nichols, Toronto, Canada. Executive committee: Chas. R. Huntley, Buffalo, N. Y.; A. J. Markel, Hazelton, Pa.; W. W. Carnes, Memphis, Tenn.

Resolutions were adopted thanking Mr. C. O. Baker, jr., Master of Transportation, for his work in connection with the transportation of members to various conventions, and expressing the esteem and appreciation of the association for the work performed by that gentleman in this direction. After tendering thanks to the various street railways and telephone companies for courtesies, the meeting adjourned until Friday morning.

FRIDAY'S SESSION.

The first subject on the programme was the discussion of the topic "Arc Lights on Incandescent Circuits." Mr. L. B. Marks was called upon to open the discussion. During the past few months, Mr. Marks said, he and Mr. C. Ransom had been engaged in the development of what they believed to be an entirely new idea in arc lighting—referring to the high potential incandescent arc. By confining the arc in a very small bulb, filled with carbonic oxide gas, they had been able to reduce the current and greatly increase the potential difference. The application of this system to incandescent circuits disposed of the necessity of running two arc lamps in series, a single arc lamp without an appreciable dead resistance being sufficient to bridge the mains. The advantages which may accrue from the use of the high potential lamp on incandescent circuits were as follows: Saving in energy; saving in cost of trimming; saving in carbons; improvement in the quality of the light; subdivision of the light; cleanliness; no carbon dust or soot; perfect spark arrester.

The subject was discussed at length by Mr. W. S. Barstow, of Brooklyn, Mr. Spencer, Mr. Andrews and others.

The next topic considered was "Meters vs. Flat Rates," and was discussed by Messrs. Nichols, Scott, Burleigh, Carnes, Weeks and others, after which the convention went into executive session, and after the reading of the report of the secretary and treasurer, adjourned.

It is reported that the Canadian General Electric Company at Peterboro, Ontario, has decided to engage in the car-building business. It is also reported that the company's lamp factory will be removed from Peterboro to Hamilton in a short time.

EXHIBITS.

The Ries Electric Specialty Co., Baltimore, was represented by Mr. E. E. Ries, the president, and a full line of samples of regulating sockets. The Ries company is about to put upon the market a new alternating motor.

Gen. E. S. Greeley, the head of The E. S. Greeley & Co., 5 & 7 Dey street, New York, was in attendance at the convention. This was his first appearance at electric light conventions, and he was so well pleased that he declares he will be seen at future gatherings.

Mr. E. H. Heinrichs, of the Westinghouse Electric and Mfg. Co., Pittsburg, Pa., represented his company's interests at the convention, and distributed a neat little book describing the Westinghouse direct current series arc light system.

The Jewell Belting Co., of Hartford, Conn., was ably represented by C. L. Tolles and C. E. Newton. These gentlemeo are regular attendants at conventions, and they know how tn secure business for their company.

Royce & Marean, dealers in general electrical supplies, 1410 Pennsylvania avenue, Washington, kept open house for the delegates, many of whom called to see the fine display of goods carried by the firm. The electric column fan, and other specialties attracted marked attention.

Mr. Geo. T. Moore, New York agent of the Page Belting Co., of Concord, N. H., represented the company at the convention. He presented the delegates with copies of a neat little book giving facts about Page belts, and other valuable information about belts in general. Everyone was anxious to know of Mr. Moore if he proposed to drape St. Gauden's figure on the Page Belt World's Fair Medal.

The Mather Electric Co., Manchester, Conn., the Stirling Co., manufacturers of Water Tube Safety Boilers, Chicago, Ill., and the Berlin Iron Bridge Co., of East Berlin, Conn., jointly occupied room 48, at the Ebbitt, with their exhibits.

The Universal Electric Pull Socket and Switch Co., 27 Beaver street, New York, exhibited samples of its goods in the hall of the Ebbitt House.

The New York and Ohio Co., Warren, Ohio, makers of the well-known Packard Mogul Incandescent Lamps, had one of these lamps, of 500 c. p., in the parlor of the Ebbitt, which made the room as brilliant as sunlight.

The Crouse-Tremaine Carbon Co., Fostoria, Ohio, manufacturers of electric light battery carbons and motor brushes, was represented by Mr. J. Crouse, the president, and Mr. D. Thomson. This company has just placed a large order with the Trenton Electric Light Co., Trenton, N. J.

Mr. Charles E. Bibber, formerly of the Consolidated Electric Manufacturing Co., Boston, is now vice-president of the Cutter Electrical and Manufacturing Co., 27 South Eleventh street, Philadelphia. Mr. Bibber was at the convention looking after the interests of his company, and he is bringing in a large business. The Cutter Company is fortunate in securing the services of one so capable as is Mr. Bibber.

Doubleday, Mitchell & Co., 136 Liberty street, New York, manufacturers of Quick-Break Switches, also selling agents for Flexible Conduit, had an interesting exhibit at the Ebbitt House, consisting of a complete line of Quick-Break Knife Switches and Flexible Canvas Jacket Conduits.

Vallee Bros. & Co., dealers in electrical supplies, 17 N. Sixth street, Philadelphia, were represented by George W. Vallee.

Mr. F. G. Bolles, a Washington agent, represented the J. H. McEwen Manufacturing Co., builders of high-grade automatic engines, Ridgeway, Pa. The New York office of this company is at 141 Liberty street. In this exhibit was included a Kinsman Desk Lamp.

The Iona Manufacturing Co., 336 Congress street, Boston, had an exhibit of various goods, including sockets, cut-outs, switches, Iona and Redding systems of watchman's time registers, etc., in charge of H. G. Issertel, 39 Cortlandt st., New York city.

The Metropolitan Railroad Co., of Washington, presented the delegates with a pass over the company's line during the term of the convention. Mr. Wm. J. Stephenson is president of this company, and his courtesies won for him many friends.

Mr. F. P. Little, of the F. P. Little Electrical Construction and Supply Co., Buffalo, was one of the most popular attendants at the convention. He was aided by Mr. J. F. Kester, the inventor of the Kester Incandescent Arc Lamp, which is made by the Little company. This company's exhibit in the Ebbitt parlor attracted a great deal of attention, the lamps burning with remarkable steadiness. A good many orders were taken on the spot. This company is building up a great reputation.

Messrs. Queen & Co., incorporated, of Philadelphia, attracted great attention in the Ebbitt parlor with their display of "Acme" hot-wire voltmeters, portable switchboard and recording types, as also "Acme" portable testing sets, cable testing apparatus, etc. The "Acme" voltmeters are extremely compact and well made. They are accurate alike for alternating and direct circuits and are dead beat, without the use of a mechanical break—this latter feature being possessed by no other standard alternating current voltmeters. The exhibit was in charge of Mr. J. G. Biddle, manager of the electrical department, and Mr. E. G. Willyoung, electrical expert. These gentlemen were kept busy in explaining the good points of their apparatus, and express themselves as more than pleased with the prospect of numerous orders as a result of this attractive display.

C. J. Hague, of the New Haven Insulated Wire Co., New Haven, Conn., showed a line of his company's new direct-current fan motors. One had a 24-inch fan running at 700 revolutions. Mr. Hague stated that these motors take only 1½ amperes of current at 110 volts. These machines are designed to run on 110, 220 and 500 volt circuits.

Mr. T. J. Murphy, 136 Liberty street, New York, the well-known dealer in marbleized slate for switchboards, etc., held forth on the first floor of the Ebbitt, and distributed fancy paper weights made of marbleized slate. He had a big line of samples of a great variety.

The Cutter Electrical and Manufacturing Co., 27 So. Eleventh street, Philadelphia, had a full line of specialties, including a C-S automatic, arranged to turn off the lights from a hotel guest's chamber, showing the practical operation of the same. Mr. H. B. Cutter, the president and general manager, C. E. Bibber, vice-president, and C. D. Shain, the New York agent, were on hand explaining the valuable features of the various C-S specialties. Their automatic electric door and gas lighter attracted a great deal of attention.

J. Jones, Jr., represented J. Jones & Sons, 39 Vesey street, New York. Mr. Jones distributed samples of "anti-thunderbolt" oil paper for armature and field magnet insulation. This "anti-thunderbolt" oil paper is guaranteed to give twice the amount of service of shellaced and varnished cloth.

Pass & Seymour, manufacturers of electrical china goods, Syracuse, N. Y., had a fine exhibit of the various porcelain pieces made by this company. Mr. A. P. Seymour, the company's designer, was in charge. One of the features of the exhibit was the "P. & S." china insulating joint, which was shown for the first time at a convention. The exhibit of electrical specialties of Pass & Seymour was very large and attractive. The "P. & S." china double pole-switch and three-way double pole-switch, received considerable attention, as also did the "P. & S." china waterproof socket, which is so constructed as to avoid the use of cement on the top, and is thoroughly waterproof and fireproof. Mr. A. P. Seymour was kept busy answering innumerable inquiries regarding his goods and taking orders. "P. & S." specialties are celebrated all over the country and have a very large sale.

Mr. Edward Weston and R. O. Heinrich, of the Weston Electrical Instrument Co,, 120 William street, Newark, N. J., had a very attractive exhibit of the Weston Standard Electrical Instrumeuts. These instruments are celebrated the world over for their accuracy, reliability, serviceability, and their portability is one of their most excellent features. The exhibit included the Weston new potential ammeter. The voltmeters are set on edge, the reading being up and down; consequently the instrument takes up little space.

F. W. Brigham, manager of the eastern sales department, 32 Frankfort street, New York, and D. J. Cartwright, Boston agent, represented the Hammond Cleat & Insulator Co., 15 Custom House street, Boston. They distributed a neat memorandum book, which included a few facts concerning the celebrated Hammond cleats and insulators.

The Standard Underground Cable Co., of Pittsburg, was very ably represented at the convention by Mr. G. L. Wiley, the New York manager, and Joseph W. Marsh, of Pittsburg, the vice-president and general manager. These gentlemen had their headquarters in parlor 47 of the Ebbitt House, where they exhibited a line of samples of the company's various cables and wires for all purposes. The Standard Underground Cables are extensively used for all electrical purposes and their quality is of such high degree that it is hardly necessary to further emphasize the fact here. It is well, however, to state that wherever this company's cables are used, the utmost satisfaction is given.

The Indiana Rubber and Insulated Wire Co., Marion, Ind., was represented at the convention by Mr. Frank W. Brigham, the manager of the eastern sales department, 32 Frankfort street, New York. This company manufactures Paranite insulated wires and cables for underground, aerial, submarine and inside use.

The Phillips Insulated Wire Co., 39 & 41 Cortlandt street, New York, was represented by President H. C. Adams and A. A. Knudson. These gentlemen exhibited in the Ebbitt parlor samples of their "O. K." and new "Ideal" wire. The latter wire is made under the patents of A. A. Knudson and Chas. Cuttriss. The "Ideal" insulation has many qualities superior to rubber, and it will not decompose when exposed to the atmosphere; neither does it oxidize the copper.

Mr. H. J. Gorke, of the Electric Engineering and Supply Co., of Syracuse, N. Y., had a beautiful slate board in the Ebbitt House parlor. The board was completely installed with the various instruments. Among the latter was the new rheostat switch, which does away with the rheostat on the face of the board.

Mr. W. C. Bryant, of the Bryant Electric Co., Bridgeport, Conn., had a fine display of the switches and sockets for which this company is celebrated. The latest specialty is a porcelain-covered 500 volt main line branch block.

Mr. C. A. Hungerford represented the McEwen Engine Co., showing the special features of these engines by the aid of drawings and photographs. Hungerford Bros., 141 Liberty street, New York, exporters and commision agents, represent the McEwen Engine Company in the East.

The W. S. Hill Electric Co., Boston, represented by Mr. W. S. Hill, had an attractive exhibit of switches on a sample board. It included 500 volt, 1,000 ampere switches. These triple contact switches are made to carry as high as 4.000 amperes, and the company is just completing 200 big switches for the Philadelphia Traction Co. F. H. Doane's lightning arrester, and closet switches (to take the place of plugs,) were likewise exhibited.

P. & B. specialties, as usual, were at the front, headed by that affable gentleman, Mr. Frank De Ronde. The Standard Paint Co., 2 Liberty street, the manufacturers of P. & B. specialties, insulating compounds, varnishes, etc., is a very live concern. Its liveliness is, of course, due to the enterprise of those at the head, including Mr. De Ronde himself, and an opportunity is never lost to do the trade a good turn by putting P. & B. goods to the fore. Mr. De Ronde had a stock of excellent P. & B. cigars as well as his compounds. President Ralph L. Shainwald was also present.

Abendroth & Root, the well-known boiler makers, of New York, distributed boiler literature in the red parlor at the Ebbitt, by Benj. R. Western, of the Manufacturers' Advertising Bureau.

The Interior Conduit and Insulation Co., 44 Broad street, New York, was ably represented by Mr. Romaine Mace, and an exhibit of Lundell motors, conduits, etc.

The Metropolitan Electric Co., of Chicago, was represented by voluminous literature on its many specialties and standard goods, including the celebrated P. & B. compounds, for which the company is the general Western agent.

Jordan & McLeod, mechanical and electrical engineers, 631 G street, Washington, had an exhibit of Diehl & Co.'s new ceiling electrolier fan, in the space occupied by the exhibit of the Eureka Tempered Copper Co., of North East, Pa. Mr. J. B. Coffman extended these courtesies to the above-named firm.

F. Della Torre showed the new car heater of the Automatic Switch Co., of Baltimore, Md.

Mr. C. E. Carpenter had an excellent exhibit of the well-known Carpenter Enamel Rheostats. A new device, just brought out, received considerable attention, and which, Mr. Carpenter says, is highly successful. It is a two h. p. motor starter with six points, without enamel, all contained within a space of five inches square by one and one-half thick. It is called the "Leonard Rheostat," and Mr. H. Ward Leonard, of the company, took great pride in explaining the good qualities of this motor starter.

The Goodrich Hard Rubber Co. distributed a pamphlet entitled "Things are not Always What They Seem." But it is safe to say that Goodrich hard rubber goods are more than what they seem to be. They are first-class in appearance and A1 in serviceability and durability. Mr. J. C. Pierrez, of New York office, 65 Reade street, looked after the interests of the company in his well-known energetic manner. Mr. Pierrez is one of the best known men in the electrical trade; he has a host of friends and it is through his enterprise and personal magnetism that the company's goods are so universally popular.

The General Incandescent Arc Light Co., of New York, had several of its celebrated arc lamps in operation at the Ebbitt. A two-light chandelier on the second floor attracted a good deal of attention. Constant current and alternating lamps were distributed among various parts of the hotel. The company was represented by S. A. Douglas and E. Lavens, from headquarters.

Mr. Chas. H. Bowen, of 601 Massachusetts avenue, Washington, is the inventor of an underground electric conduit railway system and exhibited models of the same at the Ebbitt House. Mr. Bowen is the inventor of an overhead and underground traction cable system, also overhead and underground electric propulsion with surface tracks or elevated tracks for surface or suspended cars.

The Buckeye Electric Co., of Cleveland, Ohio, was represented by Mr. Geo. R. Lean, who had a scattered exhibit of the celebrated lamps of this company, both in use and in sample cases.

Gen. E. S. Greeley and Mr. F. A. Magee represented the interests of The E. S. Greeley & Co., of New York. Mr. Magee, as usual, got in some good work for the house.

The Royal Arc Electric Co., of New York, distributed printed matter, giving interesting facts concerning its new system of arc lighting.

The Goubert Manufacturing Co., of New York, was represented by Mr. Frank A. Thayer.

President A. Groetzinger and Col. Shay represented the Chas. Munson Belton Co., of Chicago, and combined business with pleasure.

The H. W. Johns Mfg. Co., of New York, was represented by W. F. D. Crane, who distributed souvenirs made from the company's well-known insulating material. The souvenirs consisted of a set of "chips," and the boxes containing them had printed on outside the assurance "no limit." From this the purport of these chips may be inferred.

The interests of the Belknap Motor Co., of Portland, Me., were looked after by President Brown. This company's motors are rapidly coming to the front.

Mr. Chas. A. Schieren, Jr., and Mr. E. P. Atkinson, of Chas. A. Schieren & Co., the well-known leather belt makers of New York, was at the convention to remind the delegates and others that Schieren belts were unsurpassed.

Mr. E. Cardelli had on exhibition at the Ebbitt House a mast arm and pole for electric lights. This crane is said to have received the first award at the World's Fair. Mr. Cardelli is the inventor of this mast arm and hails from Sumpter, S. C.

Mr. Benjamin R. Western, manager of the Manufacturers' Advertising Bureau, 111 Liberty street, New York, was one of the busiest men about the convention. He is always on hand at these gatherings and is plentifully supplied with literature setting forth the merits of the goods made by his clients. While Mr. Western is always full of business, he can always find a little time to meet his friends on the social scale.

The United States Mineral Wool Co., 2 Cortlandt street, New York, distributed a card with a sample of its corrugated copper gasket.

The American Electrical Mfg. Co., of St. Louis, had an exhibit of its incandescent lamps, Its interests were looked after by Mr. Nahm, the secretary of the company.

C. S. Van Nuis, of New York, of "Ajax" Switch fame, was about the hotel laying plans for future business.

Mr. P. H. Alexander, of the late firm of A. B. C., but now of Baltimore, could not resist the temptation of being in Washington, while so many of his old friends were there. Everybody was glad to see him.

Mr. Charles D. Shain, of 136 Liberty street, New York, was glad to meet his many friends, and his many friends were glad to meet him again.

Mr. George T. Manson, of the Okonite Co., was around the hotel as cheery as ever. Mr. Manson is as highly esteemed by his friends as is Okonite.

Captain W. L. Candee, of the Okonite Co., was present at the convention, wearing his usual genial smile. He and Mr. Manson made a strong Okonite team.

T. C. Warley & Co,, successors to S. W. Lord & Co., manufacturers of Lord patent boiler compound, No. 11 South 9th street, Philadelphia, Pa., exhibited a sample of scale removed from a boiler by the use of this compound.

Mr. Geo. W. Brown, president and general manager of the Belknap Co., Portland, Me., exhibited samples of his company's new composite woven wire and graphite dynamo and motor brush, which is described and illustrated elsewhere in this issue. Mr. Brown closed several orders for dynamos, motors and cyclone mills.

Mr. Henry G. Issertel, 39 Cortlandt street, New York city, had an excellent display of the H. W. Johns Co.'s moulded mica goods and Iona Mfg. Co.'s specialties. He was here, there and everywhere, as is usual with him. He gave away boxes of mica "chips."

Mr. J. R. Coffman made a big exhibit of the Eureka Tempered Copper Co.'s goods, including commutators and commutators sections, copper brushes in woven gauze, also brushes for arc and incandescent dynamos and motors. The company has just brought out its new Eureka Dry Battery, a sample of which Mr. Coffman also exhibited. The Eureka Tempered Copper Co.'s automatic brush holder, and the same company's trolley wheels, were also shown.

Through the courtesy of President Samuel M. Bryan, and electrician and superintendent J. E. Crandell, the Chesapeake & Potomac Telephone Co. extended the free use of the Long Distance Telephone wires to the members and delegates at the convention. The instrument at the Ebbitt House was kept pretty busy.

The Duquesne Electric Supply and Construction Co., Pittsburg, Pa., Mr. N. A. Vandevort, manager, had an exhibit of C. & C. motors and Packard lamps. This company makes construction work a specialty.

CONVENTION NOTES.

Mr J Elliott Smith, superintendent of the New York Fire Department Telegraph, was at the convention.

The alternating arc lamps in the convention hall attracted universal attention. They were the latest fad of the Electric Construction and Supply Co., 18 Cortlandt street, New York. One was of brass, highly ornamented and finished, and two were of the plain (black) design. The absence of noise and steadiness of light called forth encomiums on every hand. Mr. R. B. Corey was one of the biggest men at the convention, literally and figuratively, and his new lamps elicited many complimentary remarks.

Mr. Robert Watson, formerly the New York agent of the Elektron Mfg. Co., of Springfield, Mass., was about headquarters meeting old friends. Mr. Watson is now in the patent law business in Washington.

Mr. M. D. Law, of the Love Underground Electric Railway, was in attendance at the convention, and invited his many friends to take a ride on the road and examine the system, which is now in practical operation in Washington.

Mr. J T. Ridgway, vice-president and general manager of the Trenton Electric Light and Power Co., Trenton, N. J., was at the convention. Mr. Ridgway put in the first Westinghouse alternator in North America, which was in his Trenton plant, back in the eighties. Mr. Ridgway talks of putting in a couple of new boilers and making other additions to his station.

LIST OF ATTENDANTS.

Adams, H. C., New York.
Atkinson, E. P., New York.
Alteigue, L. R., New York.
Appleton, J., Philadelphia, Pa.
Armstrong, E. A., Camden, N. J.
Anthony, Prof. W. A , Manchester, Conn.
Alexander, P. H., Baltimore, Md.
Annear, W., Philadelphia, Pa.
Brady, T. H., New Britain, Conn.
Baker, C. O., Newark, N. J.
Bracken, Wm., New York.
Babcock, C. A., New York.
Beach, R. H., New York.
Beran, T., New York.
Bibber, C. E., Philadelphia, Pa.
Biddle, J. G., Philadelphia, Pa.
Bragg, C A., Philadelphia, Pa.
Burleigh, J. J., Camden, N. J.
Brophy, Capt. Wm , Boston, Mass.
Bryant, W. C., Bridgeport, Conn.
Belyen, Sanford, Philadelphia, Pa.
Brigham, F. W., Boston, Mass.
Brick, Wm. M., Paterson, N. J.
Baldwin, O. H., Pittsburgh, Pa.
Blaxter, G. H., Pittsburgh, Pa.
Boudinot, Geo. S., Washington, D. C.
Buchman, E., Wheeling, W. Va.
Babcock, E. L., Cuyahoga Falls, O.
Belote, Jas. L., Norfolk, Va.
Brown, G. T., Nashville, Tenn.
Buddy, N J., Philadelphia, Pa
Barstow, W. S., Brooklyn, N Y.
Brander, Thos. W., Richmond, Va.
Bosley, A. L., Frederick, Md.
Brown, Geo. W., Portland, Me.
Burns, C. T., Rochester, N. Y.
Barnard, G. A., Salem, O.

Beal, M. A., Rockford, Ill.
Coles, S. L., New York.
Clark, Frank H., New York.
Cuttris, Chas., New York.
Coulthurst, G. H., New York.
Colvin, F. R , New York.
Cassier, Louis, New York.
Corey, R. B., New York.
Carter, George T., Chicago, Ill.
Collins, W. F., Chicago, Ill.
Cummings, E. A., Chicago, Ill.
Clark, Ernest L., Chicago, Ill.
Caldwell, Edward, Chicago, Ill.
Cleverly, H. A., Philadelphia, Pa.
Cutter, H. B., Philadelphia, Pa.
Crossman, T. E., Brooklyn, N. Y.
Carpenter, C. E., Bridgeport, Conn.
Crider, J. S., Pittsburgh, Pa.
Clapp, A. W., Washington, D. C.
Carnes, W. W., Memphis, Tenn.
Candee, Capt. W. L., New York.
Chase, S. H., New York.
Cissel, R. B., Newark, N. J.
Crane, T. N., Newark, N. J.
Chamberlain, W. W., Norfolk, Va.
Cabot, John A., Cincinnati, O.
Coffman, J. B., North East, Pa.
Davis, H. M., New York.
De Land, Fred., Chicago, Ill.
Durborrow, Hon. A. C., Jr., Chicago, Ill.
Darlington, F. W., Philadelphia, Pa.
De Camp, A. J., Philadelphia, Pa.
Dodge, Prof. O., Washington.
Downs, B. B., Warren, O.
De Ronde, Frank, New York.
Doubleday, Chas. D., New York.
Dunlevy, H. H. Wheeling, W. Va.
Eshburn, C. T., New York.
Ellis, C. F., Swissvale, Pa.
Foster, H. A., New York.
Frye, Henry W., New York.
Ferguson, J., Brooklyn, N. Y.
Fairbanks, H. H., Worcester, Mass.
Fellows, W. H., Springfield, Mass.
Foote, Allen R., Washington.
Findley, J. H., Ogdensburgh, N Y.
Foote, J. B , Battle Creek, Mich.
Foote, W. A., Jackson, Mich.
Faber, C. R., Jr., Toledo, O.
Greene, B. E., New York.
Greene, S. D., New York.
Gorke, H. J., New York.
Gregory, C. E., Chicago, Ill.
Gates, J. H., Chicago, Ill.
Gardiner, J. C., Philadelphia, Pa.
Graham, J. P., Altoona Pa.
Greene, W. J., Cedar Rapids, Ia.
Guyser, Joseph, Steubenville, O.
Gage, N. W., New York.
Greeley, Gen. E. S., New York.
Groetzinger, A., Pittsburg, Pa.
Galloway, J. R , Battle Creek, Mich.
Groff, W. E., Harrisburg, Va.
Gwynn, Joseph, Steubenville, O.
Hall, J. P., New York.
Hall, Newton, New York.
Hall, A. M., New York.
Hoover, P. H., Chicago, Ill.
Harvey, A. W., Chicago, Ill.
Hinds, J. S., Philadelphia, Pa.
Howell, W. S., Philadelphia, Pa.
Harrington, E. A., Camden, N. J.
Heinrich, R. O., Newark, N. J.
Hill, W. S., Boston, Mass.
Heinrichs, Ernest H., Pittsburg, Pa.
Herrick, A. B., Schenectady, N. Y.
Hunter, Maurice, Richmond, Va.
Haae, Felix, New York.
Hubbell, R. H., Bridgeport, Conn.
Huntley, C. R., Buffalo, N. Y.
Holliday, E. M., Wheeling, W. Va.
Harris, B. T., Champaign, Ill.
Hunt, W. T., New York.
Hammer, W. J., New York.
Hill, C. S., Boston, Mass.
Holden, A. L., Boston, Mass.
Harrington, W. E., Camden, N. J.
Holmes, R. P., Youngstown, O.
Hawkins, F. M., Rochester, N. Y.
Issertel, H. G., New York.
Insull, Samuel, Chicago, Ill.
Johnston, W. J., New York.
Jackson, G. T., New York.
Jones, Chas. E., Cincinnati, O.
Jennings, John J., Wilkinsburgh, Pa.
Johnley, C., Pittsburgh, Pa.
Jones, A. J., New Brunswick, N. J.
Jackson, Geo. J., Norwich, Conn.
Keefer, E. S., New York.
Kimball, A. H., Boston.
Kellogg, H. G., New York.
Knudson, A A., New York.
Kester, J. F., Buffalo, N. Y.
Keck, T. E., Savannah, Ga.
Kenfield, F. S., Chicago, Ill.
Kirkegaard, G. B., Bridgeport, Conn.
Leonard, H. Ward, New York.
Learned, C. A., New York.
Lovejoy, J. R , Philadelphia, Pa.
Lucas, J. L., Boston, Mass.
Little, F. P., Buffalo, N. Y.
Learned, Waldo A., Newton Mass.
Lyell, John W., Camden, N. J.
Lease, G. R., Cleveland, O.
Law, M. D., Washington, D. C.
Manson, Geo. T., New York,
McDuff, G G., New York.
Moore, G. F., New York
Mace, Romaine, New York.
McLaren, P. L., New York.
McGhie, J., New York.
Martin, T. C., New York.
McKinlock, Geo. B., Chicago, Ill.
Manning, H. S., Chicago, Ill
Martin, A. J., Philadelphia, Pa.
Manwaring, A. N., Philadelphia, Pa.
Morrison, W. J., Syracuse, N. Y.
McIntire, C. H , Newark, N. J.
Maynard, Geo. C., Washington, D. C.
McLaughlin, Beverley, Mass.
Magee, F. A., New York.
Mitchell, P. W., New York.
Murphy, T. J., New York.
Martin, C C., Parkersburg, W. Va.
Mead, Morris W., Pittsburgh, Pa.
McLay, H. Kent, Baltimore, Md.
Markle, A , Hazelton, Pa.
Noonan, J. Paterson, N. J.
Nicholls, Fred, Toronto, Ont.
Nahm, Louis, St. Louis, Mo.
Osborne, W. F., New York.
O'Hara, J. B., Chicago, Ill.
Orford, J. M., New Bedford, Mass.
Phelps, G. M., New York.
Pyle, J. E., New York.
Patterson, A. H., New York.
Parsons, F. B., New York.
Perkins, T. C., New York.

Perriez, J. C., New York.
Phillips, E. F., Providence, R. I.
Price, Chas. W., New York.
Porter, Geo. F., New York.
Pentz, J. A., New York.
Perry, Frank L., Chicago, Ill.
Peck, E. F., Brooklyn, N. Y.
Perry, M. J., Providence, R. I.
Pease, Alfred H., Hartford, Conn.
Price, C. B., Boston, Mass.
Poor, Geo. H., Boston, Mass.
Page, A. D., Harrison, N. J.
Pool, H. W., New York.
Packard, W. D., Warren, O.
Pritchard, S. F., Lynn, Mass.
Pattison, Hugh, Baltimore, Md.
Richards, H. T., New York.
Reed, H. D., New York.
Ransom, C., New York.
Reiman, G. L., Chicago, Ill.
Ritcher, Eugene, Philadelphia, Pa.
Record, E. A., Boston, Mass.
Rhotehamel, J. H., St. Louis, Mo.
Ries, E. E., Baltimore, Md.
Robertson, A. M., Minneapolis, Minn.
Rodman, C. R., Urbana, O.
Redman, Geo. A., Rochester, N. Y.
Ridgway, J. T., Trenton, N. J.
Scheffler, F. A., New York.
Seely, J. A., New York.
Seymour, E. W., New York.
Swetland, H. M., New York.
Smith, H. J., New York.
Stetson, G. R., New York.
Shain, C. D., New York.
Searles, A. L., New York.
Stump, C. E., New York.
Stieringer, L., New York.
Stirn, Louis, Jr., New York.
Stewart, Robert, New York.
Shippy, H. L., New York.
Smith, T. C., Philadelphia, Pa.
Sunny, B. E., Chicago, Ill.
Stockwell, Edward, Chicago, Ill.
Sullivan, M. J., Chicago, Ill.
Shay, J. H., Chicago, Ill.
Salom, P. G., Philadelphia, Pa.
Seymour, A. E., Syracuse, N. Y.
Shaw, A. C., Boston, Mass.
Sarran, E. A., Cincinnati, O.
Scott, C. F., Pittsburg, Pa.
Stillwell, L. B., Pittsburg, Pa.
Shainwald, Ralph L., New York.
Shaw, G. B., Eau Claire, Wis.
Starr, C. A., Halifax, N. S.
Sharp, Joel, Salem, O.
Sweeter, F. D., Wilmington, Del.
Smith, J. Elliott, New York.
Taylor, F., New York.
Thilow, T. B., New York.
Terry, F. S., Chicago, Ill.
Todd, F., Chicago, Ill.
Thebauth, T. E., Chicago, Ill.
Thomas, Maurice W., Richmond, Va.
Tolles, C. L., Hartford, Conn.
Taft, F., Brattleboro, Vt.
Tobes, George, Olean, N. Y.
Townsley, C., Pittsburg, Pa.
Urquhart, D. R., New York.
Vail, J. H., New York.
Van Nuis, C. S., New York.
Vandewoort, N. A., Pittsburgh, Pa.
Van Etten, J. A., Little Rock, Ark.
Van Trump, C. R, Wilmington, Del.
Wright, Jos., New York.
Western, B. R., New York.
Wheeler. S. S., New York.
Wood, E. E., New York.
Waugh, C. T., New York.
Williams, T. H., New York.
Williams, J. R., New York.
Wilkins, E. W., Philadelphia.
Weaver, W. D., New York.
Wilson, C. H., Chicago, Ill.
Wood, M. M., Chicago, Ill.
Webster, N. D., Philadelphia, Pa.
Wilkinson, E. T., Philadelphia, Pa.
Willyoung, E. G., Philadelphia, Pa.
Wiley, G. L., New York.
Wright, Peter, Philadelphia, Pa.
Williams, F. H., Buffalo, N. Y.
Wurts, A. J., Pittsburgh, Pa.
Watson, Robert, Washington, D. C.
Weeks, E. R., Kansas City, Mo.
Worsick, A. E., Montgomery, Ala.
Young, Alden M., Waterbury, Conn.

LADIES.

Armstrong, Miss E. W., Camden, N. J.
Baker, Mrs. C. O., Jr.
Burleigh, Miss J. J., Camden, N. J.
Cumming, Mrs., Philadelphia, Pa.
De Camp, Miss, Philadelphia, Pa.
De Camp, Mrs. A. J., Philadelphia, Pa.
Francisco, Mrs. M. J. Rutland, Vt.
Ferguson, Mrs. James, Brooklyn, N. Y.
Hammer, Mrs. W. J., New York.
Issertel, Mrs. H. G., New York.
Johnston, Mrs. W. J., New York.
Johnston, Miss, New York.
Manson, Mrs. Geo. T., New York.
McKinlock, Mrs. G. B., Chicago, Ill.
Manwaring, Mrs. A. N., Philadelphia, Pa.
Noonan, Mrs. J. Paterson, N. J.
Patterson, Mrs. H. N., New York.
Swetland, Mrs. H. M., New York.
Smith, Miss,
Sullivan, Mrs. M. J., Chicago, Ill.
Seymour, Mrs. E. W., New York.
Wheeler, Mrs. Schuyler S., New York.
Smith, Mrs. H. J., New York.
Willyoung, Mrs. E. G., Philadelphia, Pa.
Wright, Mrs. J., New York.

Race Timing by Telephone.—The skating races for the World's Amateur Championship, held in Stockholm, Sweden, on February 10 and 11, last, were timed by telephone. The course was 1500 metres in length, with a turn, which prevented the starter from seeing the finishing point. By the aid of the telephone the time of the start was communicated to the timekeeper, who stood at the finishing mark.

We are informed that the Edison Electric Light Company, of Reading, Pa., has been leased by the Reading Street Railway Co, and the combined interests will be known hereafter as the Metropolitan Light, Heat and Power Co. The station will be enlarged and a 600 H. P. upright Erie engine put in. It will be coupled direct to the generators.

The lessees of the Colonnade Hotel, Philadelphia, have appealed from the decision of the U. S. Circuit Court, enjoining them from the use of incandescent lamps alleged to infringe the Edison patents.

A few nights ago there was a brilliant display of northern lights, which caused considerable trouble in the operation of the telegraph wires running east and west.

REPORT OF COMMITTEE ON DATA.

(*Abstract.*)

We are requested to furnish this convention with the facts regarding the amount of coal used in actual practice to produce a given quantity of electricity. The information was obtained by correspondence, and furnished the Committee in amperes, volts and hours on each circuit, and the amount of coal used covering this period, including that used for banking fires, etc. The aggregate electrical output for twenty-four hours was then calculated and compared with the total amount of fuel used, giving the watt-hours per pound of coal. All improbable and apparently erroneous reports were discarded, and the tabulated statement herewith comprises intelligent replies from a large number of the electric stations, including many of the leading corporations. The great saving in operating in large units and running continuously is plainly shown by the report which shows 208 watt-hours per pound of hard screenings where about 8,000,000 watts were generated, running full twenty-four hours, as against the report which claims only 30 watt-hours per pound of soft coal, the total output being less than 60,000 watts and the service being furnished only seven hours. The best reports do not compare favorably with the results secured in generating power for manufacturing purposes.

In order to facilitate this comparison, we have prepared a table based on 90 per cent. mechanical efficiency in the engine and the same efficiency in the dynamo :

Then $\frac{746 \times .90 \times .90}{\text{coal per hour}}$ = Watt-hours per pound of coal.

And

Coal per hour per I H. P.	Watts-hours per lb. of coal.
1.5 lbs. should produce	402.84
2 " " "	302.13
3 " " "	201.42
4 " " "	151.06
5 " " "	120.85
6 " " "	100.71
7 " " "	86.32
8 " " "	75.53
9 " " "	67.14
10 " " "	60.43
11 " " "	54.93
12 " " "	50.35
15 " " "	40.28
18 " " "	33.57
20 " " "	30.22

From this estimate of engine and dynamo loss, 1½ pounds of coal should produce 402.24 watt-hours. We have a report from the Chelsea Jute Mills, of Brooklyn, N. Y., covering a period of six days, where an average of 653.3 indicated horse-power was developed from a coal consumption of 1.482 pounds per indicated horse-power per hour, the load varying from 495.21 to 764.96 horse-power.

FAULTS INCIDENT TO THE PROTECTION OF LIGHTING AND POWER CIRCUITS.*

BY LUCIUS T. STANLEY AND WALTER E. HARRINGTON.

In the present state of the art there are two common methods of protecting electric circuits, viz.: By means of metallic fuses and by means of magnetic cut-outs. It is the purpose of this paper to discuss some of the faults incident to these two systems, and, as far as possible, to suggest a remedy. The principal causes which render it impossible to devise a metallic fuse that is absolutely, and under any and all circumstances, a protector to an electrical system are the following :

1. Lack of uniformity in proportioning and mixing the constituent alloys of the fuse, also in the methods of drawing the wire to a uniform geometric cross-section, and in preparing the fuse for the market.

2 Lack of uniformity, in practice, in the actual placing of the fuse, in the following particulars :

a. Length of fuse for a given service.

b. Mass of the terminals used.

c. Position of fuse as to whether it be vertical or horizontal.

d. Environment, whether it be held in suspension, between terminals, or is allowed to lie along its entire length upon a mass of heat radiating material, and whether it be open to the air or enclosed in a chamber.

3. Deterioration caused by—

a. Recurring abnormal currents.

b. Oxidation from various causes.

c. Disintegration from local voltaic action.

4. Impairment of contact at terminals due to loosening of the clamps from temperature expansions and contractions, or to mechanical or electrical causes.

5. The "Peltier" effect.

6. The abuse of acceptable fusing devices, by substituting for the metals designed to be used in them others that are unsuitable.

7. Time element. Practice has demonstrated that fuses rarely, if ever, "blow" in time to accomplish the object for which they are placed in circuit. There is also a wide range of uncertainty as to the constancy of this period of time for any given fuse.

8. Capacity of the ordinary fuse wire to pass current far in excess of its rated blowing capacity for a period of time sufficient, in a majority of cases, to cause damage to some portion of the circuit.

We believe that a careful consideration of the phenomena noted in the foregoing will tend to convince even the most skeptical that, because of the great number and variety of peculiar and irremediable factors thus contributing to an undeniably faulty service, there can be no doubt that the common use of fuse wire cut-outs for the protection of electric circuits—be they lighting or power—in the present advanced state of the art, is not only totally inadequate and inefficient, but actually dangerous, because, in many instances, such practice is accepted as protection.

The magnetic cut-out is commonly defined as *a device which opens the circuit at a set strength of current.*

Although the magnetic cut-out, evolved from vital necessity and remodeled and improved during the past ten years, is today a fairly good and efficient device under favoring circumstances, it is yet far behind the present state of the art, as exemplified in other devices in the same field, and your attention is now called to certain of its imperfections.

The same general principle governs all the various forms produced by the several manufacturers respectively, and consists of—

First—A long throw knife-blade switch operated to open by a trip actuated by the armature of an electro-magnet.

Second—A device for preventing or for blowing out the arc formed at the switch jaws by the breaking of the circuit.

Practically, the principal point of difference between any two magnetic cut-outs of the present day is in the methods adopted for overcoming the destructive effect of the arc, and thus far two methods have been adopted for this purpose, either of which exhibits ingenuity in conception and care in production, but neither of which is efficient except to a minor degree.

(*To be continued.*)

*Abstract of Paper Read Before the National Electric Light Association Convention, Washington, D. C., Feb. 27, 28 and March 1, 1894.

THE IMPORTANCE OF COMPLETE METALLIC CIRCUIT FOR ELECTRIC RAILWAYS.*

BY J. H. VAIL

Any system using ground plates, ground rods or substitutes therefor, or bare return track wire buried in the earth, is constructed primarily to utilize the earth as return circuit; when the earth does not afford good return the current is sure to follow the water pipes, gas pipes or other buried conductors offering the path of least resistance. We now see that these prove to have been only make-shift methods to reduce the cost of construction. We find that the evidence thus produced and the troubles constantly occurring in existing street railway systems are sufficient to show that all methods of grounding the track circuit or connecting to pipe systems should be entirely discontinued; it therefore becomes of vital importance to so construct the electrical railway system as to avoid all electrolytic action on buried systems of metal work that are the property of other concerns.

Having produced the evidence and established the case, let us briefly analyze the matter and ascertain the reason for these results.

The whole case may be stated in the single sentence that *the electric current must under natural laws follow the path of least resistance.* What was intended to be good has proved to be defective electrical work executed in connection with track systems, has not given to that side of the system a perfect path for the travel of the current, the conductivity of the rail circuit being impaired to such an extent that the electric current must force itself through the earth or through metal pipe lines buried therein.

The electric conductors composing a system of distribution for electric railways should be so thoroughly well proportioned as to show the minimum variation of pressure throughout the system, even when the entire number of cars are in operation. This equality of pressure is an important requisite for the economical working of the motors. The writer has tested electric railway systems operating with a station pressure of from 500 to 550 volts, and showing only 300 to 325 volts on various divisions of the system. Here is a direct loss between dynamos and motor car of over *forty per cent.* Is it therefore any wonder that some roads report extraordinary coal consumption? Such loss in pressure indicates radical faults in the original planning of the system and the distribution of copper. When operating under low voltage, the motors demand an increased quantity of current above what should be the normal supply, thus augmenting the heating effect in the armatures and fields, the efficiency of the motors being reduced in corresponding ratio.

A further examination into other features of construction requires some consideration of the bonding of rail joints.

The existing methods of utilizing railway tracks for conducting large quantities of current are faulty in at least three particulars:

First. Restricted conductivity at joint, due to insufficiency of the rail bonds.

Second. Neglecting to properly utilize the track as a conducting medium.

Third. Failure to provide a complete circuit of low resistance.

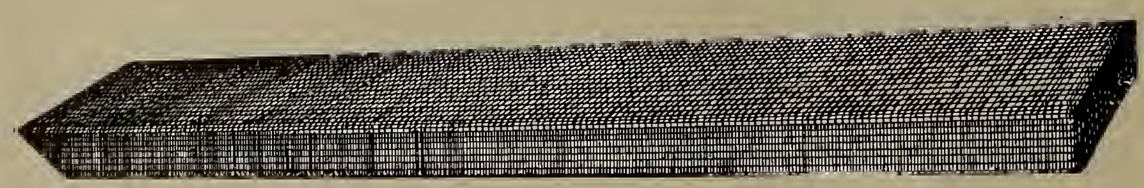
(*To be Continued.*)

*Abstract of Paper Read Before the National Electric Light Association Convention, Washington, D. C., February 27, 28 and March 1, 1894.

WOVEN WIRE AND GRAPHITE BRUSH.

One of the latest improvements in a commutator brush is one composed of woven wire and graphite, which is being put on the market by the Belknap Motor Co., of Portland, Maine. It is made of pure copper wire cloth of a special weave put together in such a way that, while it has great flexibility, it holds its shape permanently.

The inside folds of the wire cloth are treated with a compound of graphite, so that as the brush wears the graphite furnishes the lubrication for the commutator. This brush has all the advantages of the ordinary copper brushes and carbon brushes, for, while it has the required conductivity, at the same time it is very easy on the commutator. The carbon brush has been coming



WOVEN WIRE AND GRAPHITE BRUSH.

into favor because it is so easy on the commutator, but it must be remembered that this advantage is secured at a sacrifice of economy, as the resistance of carbon is fifteen hundred times as great as that of copper, tests having been made showing a drop of twenty-five per cent in the brushes alone, while with the combined woven wire and graphite brush the drop was inappreciable.

Another great saving comes from the fact that no grinding or fitting to the commutator is required, so there is no loss of material or time in this way, and even the stubs of worn-out brushes need not be thrown away, as they can be worked into the centres of other brushes.

The Belknap Motor Co. is receiving most flattering reports from these brushes wherever they have been placed, and they are being used on nearly every type of machine on the market.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL AGE,
FIRST FLOOR, WORLD BUILDING,
NEW YORK, MARCH 3, 1894.

The Long Distance Telephone is the cause of dissatisfaction among stock brokers on the New York Stock Exchange. They complain that for a long time their commissions for stock operations for Philadelphia and Boston concerns have been practically nothing, and they attribute this state of affairs to the quick communication between the arbitrage brokers of the New York Stock Exchange and their clients in Boston and Philadelphia and other near-by cities who are connected by the long distance telephone. The feeling over the matter is becoming rather bitter. The telephone is a far quicker means of communication than the telegraph. The complaint of the brokers is being considered by a committee.

The Board of Electrical Control has granted a franchise to the New York Auxiliary Fire Alarm Company, to place special signal boxes in buildings communicating with the fire boxes in the streets. The Police Department was allowed to build subsidiary subways connecting their wires with the main subways.

Mr. F. A Scheffler, of the New York Sterling Boiler Co., 74 Cortlandt St., has secured the order to furnish two 200 H. P. boilers for the Safety Insulated Wire Company's new factory, on 28th Street, New York City.

W. T. H.

A WELL BALANCED TRIO.

E. F. Gennert, superintendent and second vice-president; J. F. Cunningham, assistant to Mr. Gennert, and F. W. Belmont, secretary, of the E. P. Gleason Mfg. Co., Mercer and Houston streets, New York City, resigned their respective positions on February 1, and have combined their resources and experience for the purpose of carrying on the business of the Wm. Lang Company,

E. F. GENNERT.

123-139 Middleton street, Brooklyn. In the new company Mr. Gennert is vice-president and general manager, Mr. Belmont, treasurer, and Mr. Cunningham, secretary, portraits of all three of which gentlemen are given herewith.

Mr. Gennert was connected with the E. P. Gleason Manufacturing Company for twenty two years, having

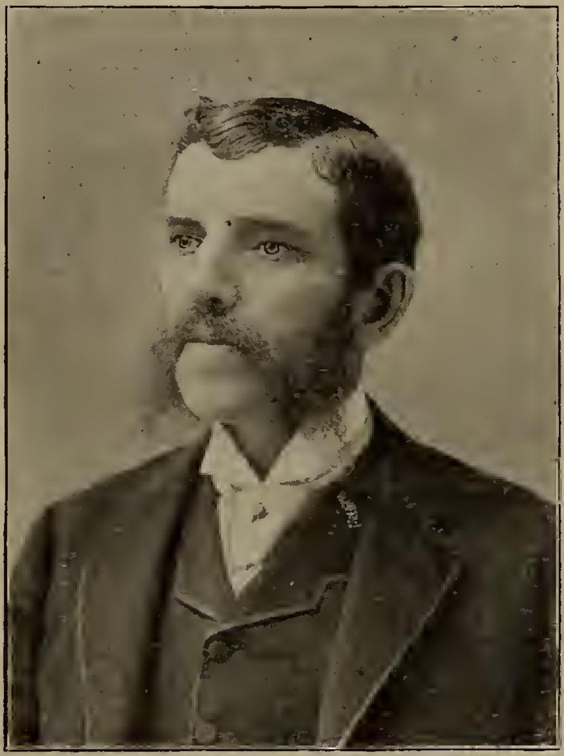
JAS. F. CUNNINGHAM.

gone with them when a young man, and Mr. Belmont has a service record of twelve years, and Mr. Cunningham of sixteen years. Mr. Gennert's skill in draughting is well known to be of a practical turn. He took out some twenty patents on general electrical appliances and incandescent fittings, most of which are standard articles in the trade.

Mr. Cunningham is well known to many local electricians, he having had charge of the special work usually done by the Gleason Co.

Mr. Belmont is an expert accountant, and his financial abilities will be brought into play in his new position.

The Lang Company is now manufacturing an extensive line of metal novelties, and has facilities for turning out all kinds of stamped and cast work in different metals. The company will carry a full line of electric light appliances and incandescent fittings of its own manufacture, and will make to order anything desired in the metal line.



M. J. FRANCISCO, PRESIDENT N. E. L. A.

Object to Placing Wires Underground.—The "Outside Electrical Workers' Union" of Boston, object to the placing of electric wires underground. The Union asserts that the underground system would not only be impracticable, but that it would endanger property.

F. W. BELMONT.

Electric Execution.—Murderer Matthew Johnson, a West Indian negro, was executed by electricity at Sing Sing Prison on the morning of February 26. A current of 1,740 volts was turned on through his body for three seconds, when it was reduced to 400 volts. Death came instantly, with the first shock. The affair was a complete success.

The Baxter Motor Company, of Baltimore, has secured the contract for the equipment of the Pottstown and Ringing Rock Street Railway Company, Pottstown, Pa.

NEW CORPORATIONS.

A company has been formed to build an electric railroad from Rockford, Ill., to Dickson, Ill. Capital stock, \$120,000. Incorporators: James Tickenor, Geo. E. King, and Harry B. Andrews all of Rockford; James C. Ayres, and Fred. G. Jones of Oregon.

The Toledo, Maumee and Perrysburg Electric Railway Co. has been incorporated; capital stock, \$150,000. Among the incorporators are: J. K. Tillotson, Frank Ohl, Dustin Atwood, L. G. Richardson.

The Niobrara River Irrigation and Power Co., of O'Neil, Neb., has been incorporated with a capital of \$2,500,000. Incorporators are: A. U. Morris, J. L. McDonald, H. A. Allen, R. R. Dickinson, J. P. Mann, O. F. Bilgin, T. V. Golden, G. C. Hazleton, Neil Breman, J. A. Testman.

Larchmont Arctic Light Company, to supply light, heat and power for the towns of Mamaroneck, Rye and New Rochelle, Westchester county, N. Y. Capital, \$15,000. Directors: Charles H. Murray and William Murray, Larchmont Manor, and Frank G. Senter, New York city.

TRADE NOTES.

Mr. Charles Wirt has purchased from the Ansonia Electric Co., Chicago, the Wirt Laboratory, together with the stock of Wirt Indicators, and he will in future carry on that business at 56 5th Ave., Chicago, Ill.

The Goubert Water Tube Feed Water Heater, manufactured by the Goubert Mfg. Co., 32 Cortlandt St., New York, was represented at the Washington Convention, by Mr. Benj. R. Western, of the Manufacturers' Advertising Bureau, who distributed literature on the subject of these celebrated heaters. These heaters are economical, efficient and durable; increase the boiler capacity and save fuel and boiler repairs. These are strong recommendations, and are said to be verified in practice.

The Abendroth & Root Mfg. Co., 28 Cliff Street, New York, expatiated on the advantages of its water tube boilers at the Washington Convention, by means of a pamphlet. This boiler was the first of its class to be put on the market. Its first appearance dates back to 1867, and its record since has been an extremely favorable one. It is an absolutely safe boiler, and is said to be the most economical steam generator in the market.

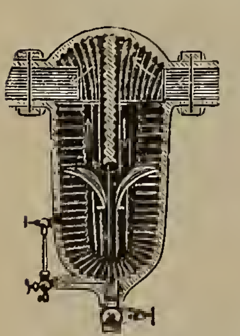
The United States Mineral Wool Co., 2 Cortlandt St., New York City, distributed at the Washington Convention a card to which was attached a small corrugated copper gasket. The copper gaskets made by this company are used on joints in steam, water and hot air pipes, and stop leaks very effectively.

Mr. R. B. Smith, 11 So. 9th St., Philadelphia, Pa., has taken the agency of the Belknap Motor Company, of Portland, Me. Mr. Smith is an electrician of high repute, having installed some of the finest electric light and power plants.

Mr. G. T. Moore of the Page Belting Company, Concord, New Hampshire, has recently sold three wide belts for the Suburban Electric Company, Elizabeth, N. J., one 54 inch double belt for the Union Railway Company, of New York, and a wide three-ply belt for a large New England manufacturing concern. All of these belts are of the company's celebrated "Crown" brand, for which it received "The Highest Award" at the Columbian Exposition.

The Belknap Motor Company, Portland, Me., has been manufacturing dynamos, motors, etc., for two years, and have put out about 1500 h. p. in generators and motors. This company makes the Electric Cyclone Coffee Mills, and has hundreds of them in use in all the principal cities. The Belknap Co. has recently installed 500 lights in the Vermont State Insane Asylum. A forty h. p. generator and four motors of 35 h. p., were ordered for the Kansas State Agricultural College at Manhattan, Kansas, these machines being selected by Professors Hood and Nichols of the College, after the competitive examinations at the World's Fair. The company has also installed a small motor plant in the Maine State College, for which a special machine was built, which can take a direct or alternating current.

The Lodge & Shipley Machine Tool Company, Cincinnati, Ohio, has recently received with others several orders for its celebrated Motor Gear Lathe, also Triple Facing Machine and Engine Crank, Disc Turning and Boring Lathes. This company makes a specialty of machines to rapidly produce work heretofore done in lathes.



ELECTRICAL AGE

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Copy for advertisements or changes therein should be in our hands before the Saturday preceding publication day.

NEW YORK, MARCH 17, 1894.

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ELECTRICITY IN COMPETITION WITH STEAM ROADS.

One of the effects of operating long distance electric lines in competition with steam railroads is shown in Pennsylvania. The Lehigh Valley Railroad and the Central Railroad of New Jersey have reduced their commutation rates between Allentown and Bethlehem, in anticipation of the proposed five-cent fare on the electric line between the same points.

WANT DAMAGES.

It is reported that the General Electric Company has filed a claim for $34,984.53 against the State of New York, for time lost at the company's works in Schenectady, by reason of the high water in the Mohawk river at that place last year. The works were closed three days on account of the inundation.

VASTNESS OF THE TELEPHONE SYSTEM.

In the argument before the committee of the Massachusetts legislature, on the petition of the American Bell Telephone Company for permission to increase its capital stock to $50,000,000, Gov. Long, in behalf of the petitioners, gave some interesting figures which show the marvelous growth and the magnitude of the vast corporation he represented. Since 1885, the company and its licensees have expended no less than $43,000,000 in construction and labor. There are about 500,000 telephones now in use, and in 1893 there were 600,000,000 conversations. The building up of this vast system in the space of 17 years is nothing short of a marvel, and the record of the achievement will furnish one of the most interesting pages in the history of the world's industrial development.

SENSELESS ATTACKS ON THE TROLLEY.

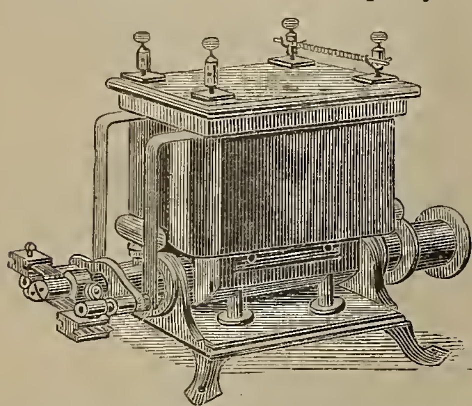
A New York daily paper, which is conducting a senseless attack on the Brooklyn trolley roads, charging all manner of ill fortune to the "trolley," rather gleefully remarks that "perhaps some reforms may be expected" in Brooklyn, since the alleged injury to a Brooklyn city official by a car. Such a statement is an insult to the citizens and the City Council of Brooklyn. It implies that the city fathers have no other interest at stake than their own; that they do not legislate for the good of the people, but for their own good, and that they do not care for the lives of the citizens so long as they suffer no injury themselves. Such utterances should receive the severest condemnation. They are based on malice and falsehood, and serve no good purpose.

OF INTEREST TO CONTRACTORS

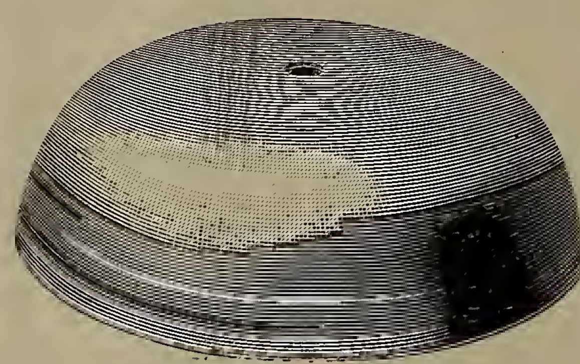
The present issue will be found of special value to manufacturers of electrical supplies and contractors, containing, as it does, a list of extraordinary size of new corporations and possible contracts. New corporations need materials with which to put the organizations into concrete form, and existing concerns, contemplating extensions and improvements, require materials to carry out their plans. We have the best facilities obtainable for receiving this class of information at the earliest possible moment, so as to get it before our readers with the least possible delay. This feature of the ELECTRICAL AGE is a valuable one, and the circulation of the paper is growing with wonderful rapidity on account of it. Business men know a good thing when they see it. "A word to the wise is sufficient."

WALLACE & SONS.

It is with pleasure that we note that the well-known establishment of Wallace & Sons, Ansonia, Conn., and 29 Chambers and 5 Reade streets, New York city, has again been placed on a firm financial basis. Last Fall it will be remembered the stringency of the money market caused the concern to temporarily go into the hands of receivers. The company has since made a settlement with its creditors and the receivership has been vacated. The business of the concern, however, was not stopped on account of the complication ; but was carried on through the receivership period, and the demand for the firm's well-known products has been promptly supplied, as heretofore.



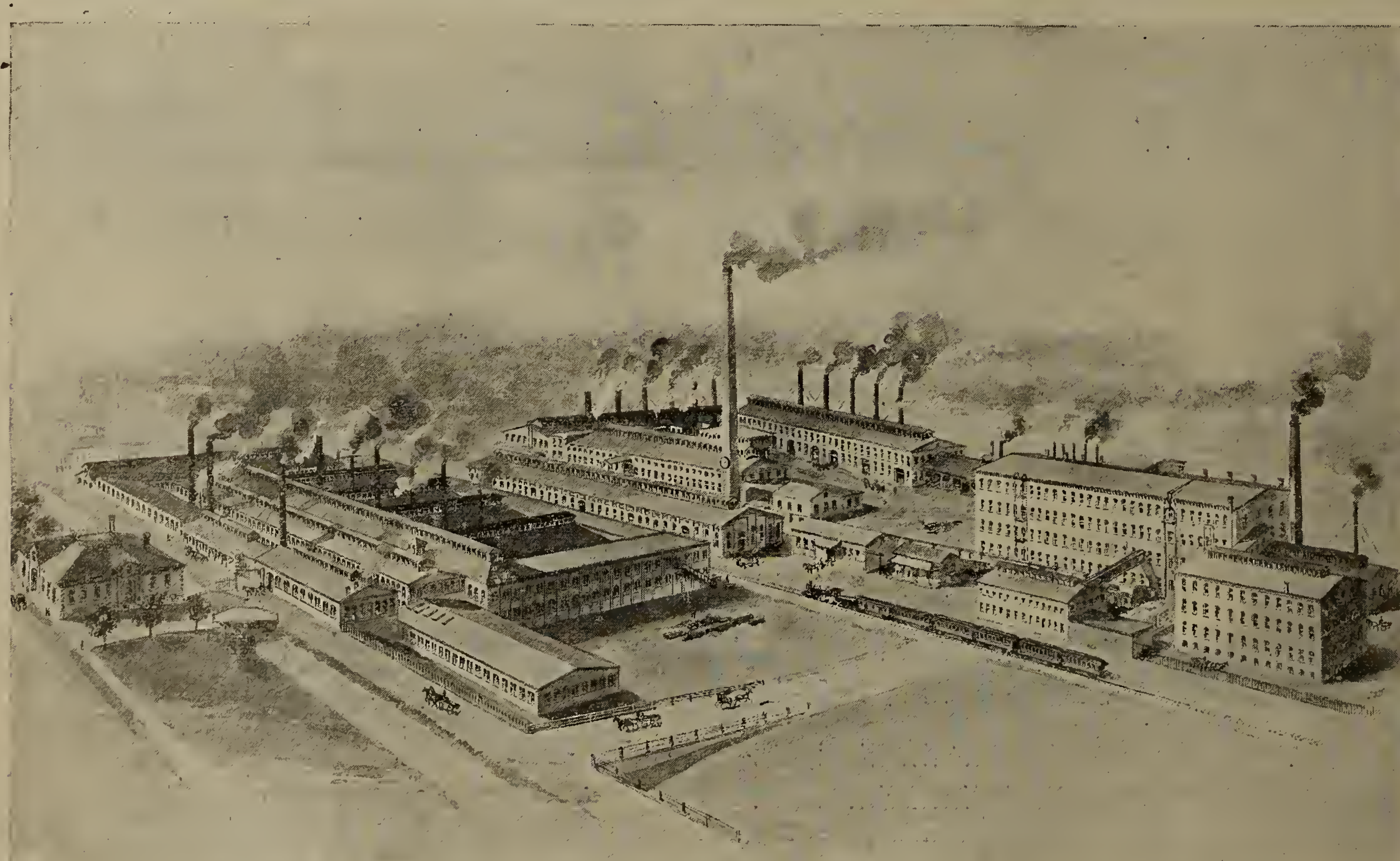
LITTLE JOKER PLATING MACHINE.



WROUGHT BRASS GONG.

ONE-MILE REEL OF WIRE.

Their Brass and Copper Rolling Mills at Ansonia, Conn., are among the largest and most complete of the kind in existence, and their output of copper wire and other articles, composed more or less of copper, is perhaps larger than that of any other similar establishment. The works (see illustration herewith,) cover an area of several acres in extent, and contain the latest improved machinery for the production of the large variety of goods manufactured by them.



BIRD'S-EYE VIEW OF WALLACE AND SONS' MILLS, ANSONIA, CONN.

They make a specialty of Hard Drawn Copper Wire for trolley, long distance telephone and telegraph lines. This wire is made of the best Lake Superior Copper, of the highest tensile strength and conductivity, and is wound on reels of continuous lengths of from one-half to two miles in length according to size and requirements.

Soft Drawn Copper Wire, either tinned or plain, for underground circuits, and copper track bonds with iron or copper rivets are also among the special productions of the firm. Their large facilities for the production of this class of goods enables them to deliver even very large quantities very promptly. Many of the new street railroads now being constructed have contracts with this company to draw their wire, etc.

The Wrought Brass Gong, of which an illustration is given, is designed for electrical purposes and may be used on clocks, bell punches, call bells and for telephone transmitters. They come in various sizes.

We also give an illustration of the Little Joker Plating Machine, made by Wallace & Sons, which is especially adapted to nickel-platers' use. This machine is constructed on simple designs and is very efficient in its operation. The wearing parts are duplicated with ease and duplicates always procurable on short notice. The

INTERIOR VIEW OF WIRE DRAWING SHOP.

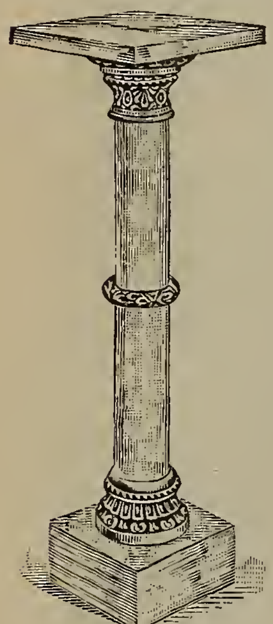
INTERIOR VIEW OF SHEET COPPER ROLLING MILL.

machine is strongly built and durable, and easily taken care of.

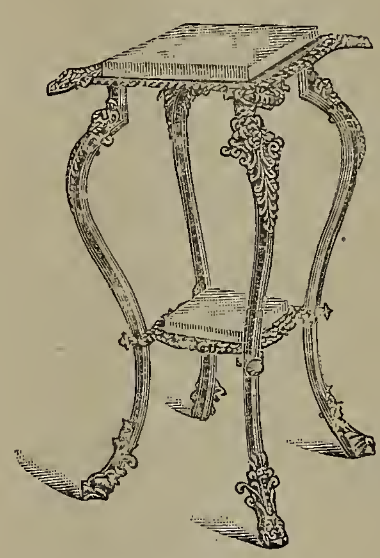
Besides the articles referred to, the firm makes cold and hot rolled sheet copper, bronze and gilding metal, brass in rolls, sheets, rods and wire, German silver resistance wire, round and flat copper rods of all lengths and sizes, dynamo-brush copper, copper and brass rivets of all sizes, etc., etc.

In addition to the Ansonia Works, the firm controls the output of the large plant at Bloomsburg, Pa., where seamless brass and copper tubes are made.

Their Lamp Fixture, Table and Art Goods Department is the largest of the kind in the country, and they



ONYX PEDESTAL.



ONYX TOP TABLE.

manufacture the most complete line from the cheapest to the highest-priced goods of the following: Onyx tables, onyx pedestals, onyx cabinets, onyx banquet lamps, boudoir lamps, onyx jardiniere stands, onyx piano lamps, library lamps, five o'clock teas, chafing dishes, hall lamps, etc., etc. We illustrate one of their medium-priced tables and pedestals. Their show-room at the New York store, the handsomest of the kind in the world, will pay any dealer to visit.

Mr. William Wallace, the well-known old-time electrician and inventor, is the president of this vast industry; his brother, Mr. Thomas Wallace, is treasurer, and Mr. Uri T. Hungerford is the general manager of the business at the New York office.

WATER POWER AT WASHINGTON.

United States Senator Manderson has introduced in the Senate a resolution directing the Secretary of War to investigate and report upon the feasibility and advisability of using the water power of the Great Falls of Potomac River, or any other water power in the neighborhood of Washington, D. C., for the purpose of lighting by electricity the public buildings, grounds and streets of the District of Columbia. The report is to include a general plan of an electric plant at the Falls, and the wires needed for the purpose indicated, also the cost of the same.

Engineers are of the opinion that enough electricity may be generated in this way to illuminate all the public buildings and streets, and even private dwellings in Washington, at a nominal cost, but Senator Manderson's resolution contemplates the use of the current for the purpose of the government alone.

Several persons interested in electrical matters in Kansas City, Mo., have decided to organize an electric club. Messrs. D. A. William and G. E. Claflin have the matter in charge.

PASS & SEYMOUR SPECIALTIES.

The electrical specialties of Pass & Seymour, Syracuse, N. Y., have a name in the trade that is well deserved, as all who are familiar with these goods unhesitatingly acknowledge. The celebrated "Syracuse China" is of

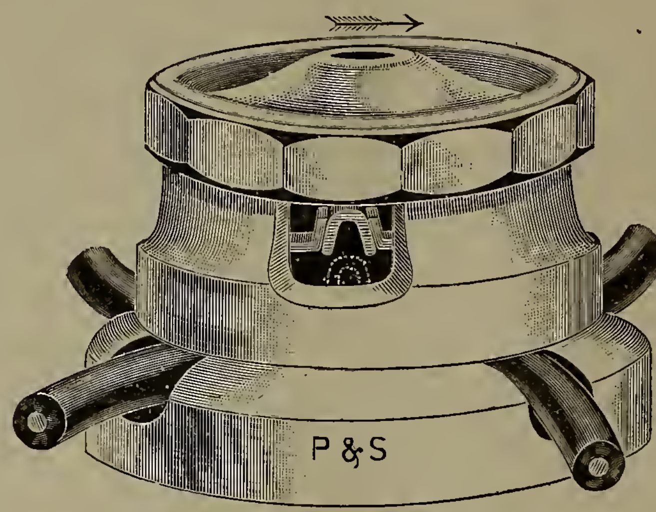


FIG. 1.

course used as the basis for all apparatus made by this firm, and as to its insulating qualities, durability and resistance to fracture, there is no material that surpasses it. All the firm's goods are thoroughly vitrified and unequaled for strength, color and finish.

The firm has a specially designed plant for this class

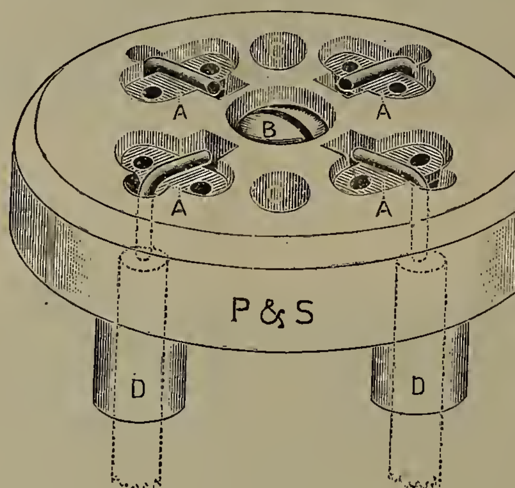


FIG. 2.

of work and has every facility for producing insulating specialties of the most difficult patterns.

At the recent convention in Washington, Messrs. Pass & Seymour brought to the attention of the electrical trade some new pieces, a few of which we illustrate herewith.

Fig. 1 shows the "P & S" All China Double Pole

FIG. 3.

Switch, and Three-Way Single Pole Switch, which is not only neat, but ornamental. This device has a back plate and is designed for outside work.

Fig. 2 shows the back plate for concealed work, the hollow projections, D. D., being intended to extend through the lathing for the purpose of thoroughly insulating the wires.

Fig. 3 is the Pass & Seymour China Insulating Joint, and is said to be the only insulating joint which fills the requirements of the National Insurance Rules It gives a high insulation and effectually resists the action of gas. It is very strong as shown by a test on one of them when a weight of 2,000 pounds was suspended on the joint without breaking or injuring it in any way. It is perfectly fire-proof and the wires cannot come in contact with any of the metallic parts.

Fig. 4 shows the "P & S" China Waterproof Socket. This device is so constructed as to avoid the use of cement on the top, and is both waterproof and fire-proof. It is very neat in

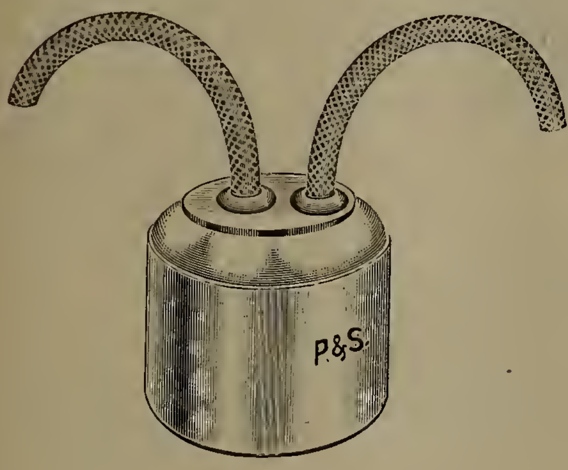


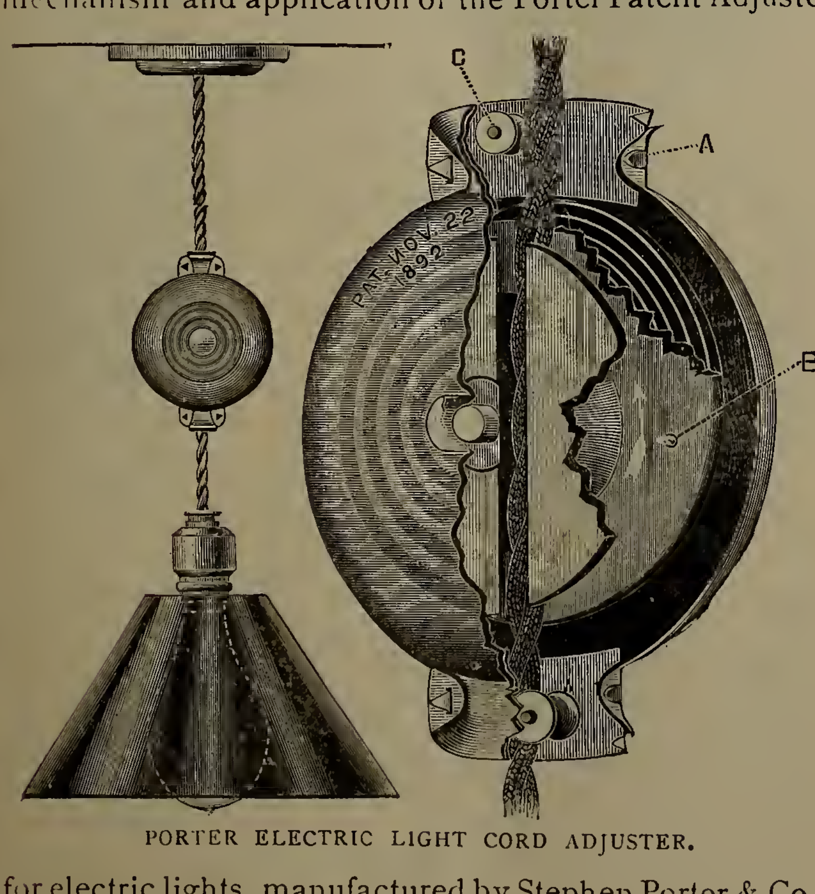
FIG. 4.

design, and strong, and the standard length of wire which goes with each socket is 8 inches. Longer wires, however, can be furnished on order.

Fig. 5 gives a view of a Pass & Seymour Corner Insulater. This device is designed for the protection and insulation of heavy wires when passing around corners or over cornices. A hole is provided large enough for a wire with insulation three fourths of an inch in diameter and it is very strong and heavy.

ELECTRIC LIGHT ADJUSTER.

The accompanying illustrations show the internal mechanism and application of the Porter Patent Adjuster



PORTER ELECTRIC LIGHT CORD ADJUSTER.

for electric lights, manufactured by Stephen Porter & Co., 384 Atlantic avenue, Boston.

This device is a very convenient one, and is designed to lengthen or shorten an electric light cord at will. It can be attached to the cord without disconnecting the latter at any point. On the drum on the inside of the hanger, a slot is cut out in which the flexible cord is placed and tightened by special means. Then after removing a small pin which releases a spring, and placing the cover and fastening it, the device is ready for operation. It acts on a principle similar to that of the automatic shade roller.

This device is very simple in construction, and consequently cannot get out of order, and it is, besides, ornamental. The covering is of finished spun brass,

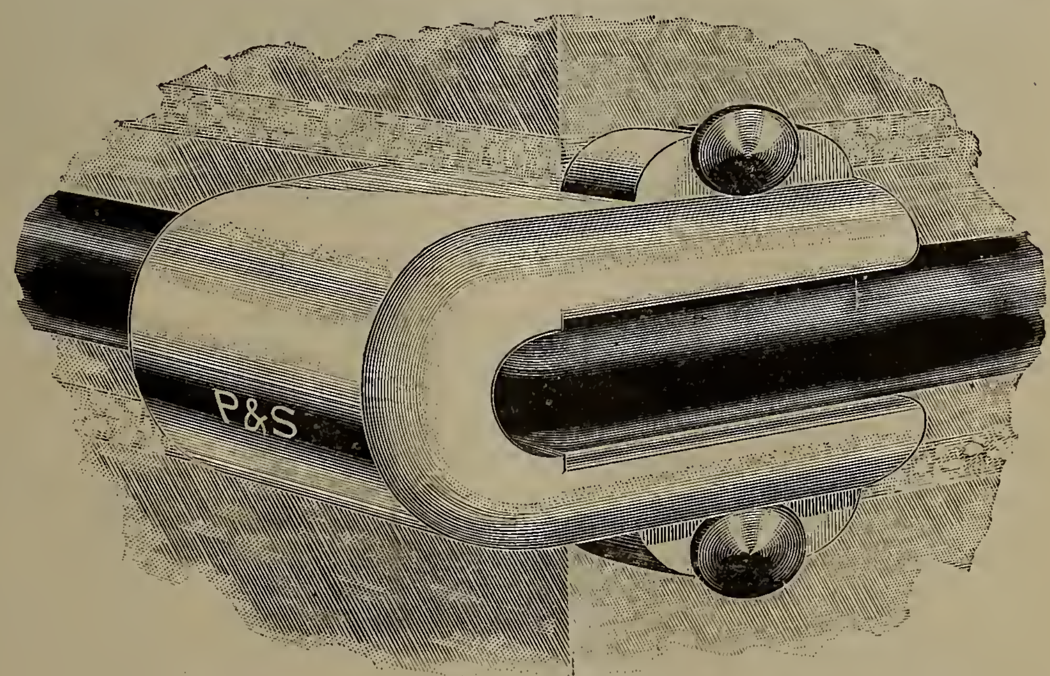


FIG. 5.

and the hanger is very light and compact. Its simplicity commends it to all who have use for a device of this sort.

Our illustrations show clearly how it is used in practice. It can be attached in one minute's time, and has the merit of being extremely cheap and durable.

Mr. Geo. L Colgate, of 136 Liberty street, New York city, is the sole agent for this device, which is meeting with well deserved demand.

PHYSICS OF ELECTRICITY AND MAGNETISM.

At the request of several prominent physicians of New York city, Mr. A. E. Kennelly, of the firm of Houston & Kennelly, Betz Building, Philadelphia, and Vice-President of the American Institute of Electrical Engineers, will deliver a course of 10 lectures on the Physics of Electricity and Magnetism. One lecture will be delivered a week for 10 successive weeks, commencing March 13. The lectures will be held in Mott Memorial Hall, No. 34 Madison avenue, New York city.

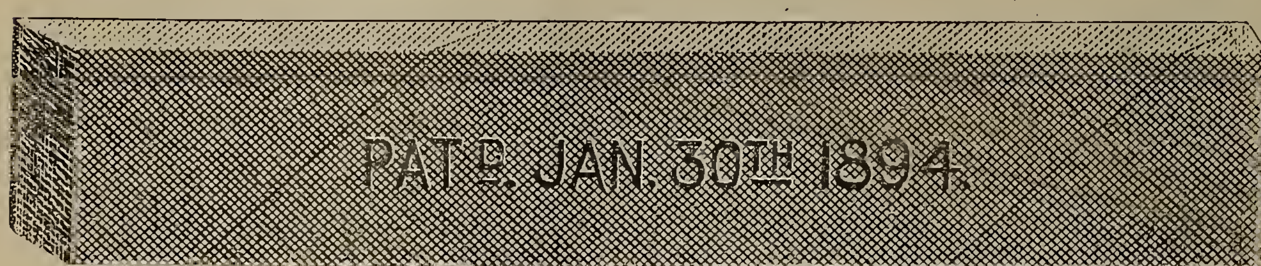
The following is a schedule of the lectures, which will be illustrated with lantern and apparatus :

1. Introductory. Electricity and Electrical Energy.
2. Electromotive Force. Its laws, generation, measurement and control.
3. Effects of Electromotive Force. Energy relations; Stress relations ; Optical and Magnetic relations.
4. Resistance. Its nature, laws and measurement.
5. Electric current. Its nature, laws and measurement.
6. Effects of current in Electrolysis, Cataphoresis, Heating, Illumination, etc.
7. Magnetism Its nature, laws and measurement.
8. Effects of Magnetism ; Magnetic Stress ; Energy, Induction.
9. Alternating current of low frequency.
10. Alternating current of high frequency.

Mr. J. W. Gladstone, of the Edison Mfg. Co., 110 E. 23d street, will assist Mr. Kennelly in the management of the apparatus and lantern.

FLEMING DYNAMO BRUSH.

All who have had practical experience with dynamos will know that in bi-polar or multi-polar machines giving a continuous current, the brushes by which the current is collected are so mounted as to permit of their being shifted round the cylindrical surface of the commutator, at least through some small angle. They will



FLEMING DYNAMO BRUSH.

also be aware that if the position of the tips of the brushes as they press on the commutator be not properly adjusted the result will be "sparking at the brushes."

All sorts and conditions of brushes have been devised by dynamo manufacturers for this important but somewhat neglected part of a dynamo, such as solid copper plates, bunches of wires, carbon pencils, composite brushes made of several ingredients, etc. The brush that we illustrate is of the latest type and at once commends itself to the electrical engineer. It is composed of a continuous strip of high conductivity pure lake copper gauze, the copper wire being drawn to 34 B. W. G. and then woven to a mesh of 3,600 to the square inch. It is claimed that by the process of manufacturing the Fleming Brush, an article is produced that when placed on a commutator in good condition it is absolutely noiseless and sparkless.

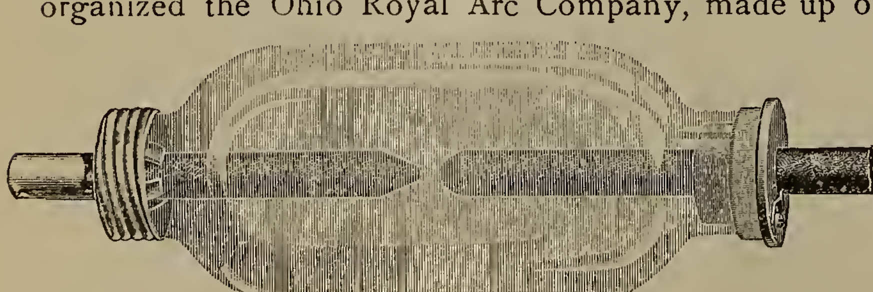
It is also compact and flexible, readily adjusting itself to the surface of the commutator, insuring good contact though bearing lightly and evenly on the segments, thus reducing to a minimum the wear on this part of the dynamo.

A standard of the excellence of this brush may be judged when it is adopted for use by the United States and foreign governments.

Prices and all particulars may be obtained from the International Trading and Electric Co., 40 Cortlandt street, New York.

THE HOWARD INCANDESCENT ARC LIGHT.

Mr. L. E. Howard, of the Royal Arc Electric Company, 143 Liberty street, New York city, has just returned from an extended trip through the western states. He met with a hearty reception in all the cities he visited, by electric light officials. In Cleveland he organized the Ohio Royal Arc Company, made up of



some of Ohio's stalwart capitalists. Mr. Howard secured the endorsement of the Howard system from the fire underwriters of Cleveland, Columbus, and also the New York State Board outside of the metropolitan district. The New York State Board endorsed the Howard system at their meeting, at Syracuse, on the 13th inst. The Howard arc lamp, as illustrated in these columns, consists of an oblong small glass bulb containing the carbons, and filled with carbonic oxide gas. At the top of the bulb is an automatic valve that regulates the gases within the bulb, overcoming any danger from breakage and increasing the life of the carbons, it is said, a great percentage. It is stated that the Howard system, applied to incandescent circuits, disposes of the necessity of running two arc lamps in series, the system as used on ordinary arc lamps being sufficient to overcome the resistance to bridge the mains. The company claims a great saving in energy, cost of trimming, saving of carbons, improvement in the quality of the light, subdivision of the light, cleanliness, no carbon dust or soot, perfect spark arrester.

IMPROVED IRON BOX BELL.

The accompanying illustration show an improved electric bell, (Fig. 1.), which has some meritorious features.

It is provided with improved pivoted armature with double adjustment. The platinum points are so constructed that they are always in position, and it is claimed to be the cheapest bell because it always rings.

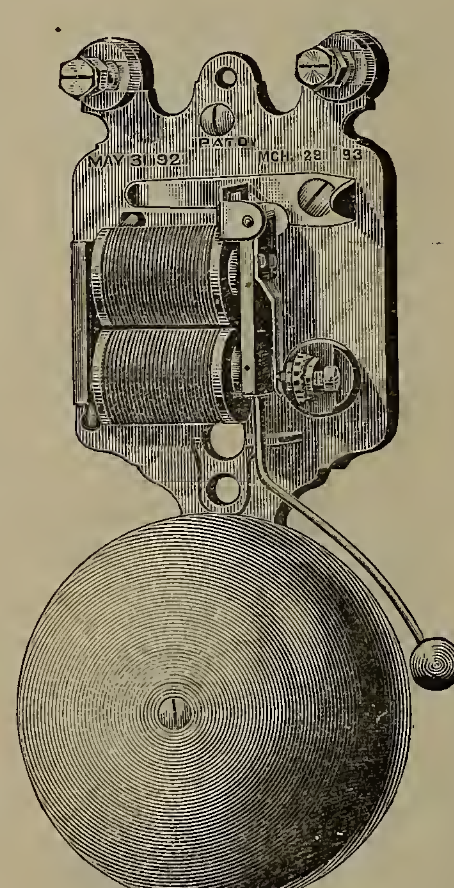


FIG. 1.

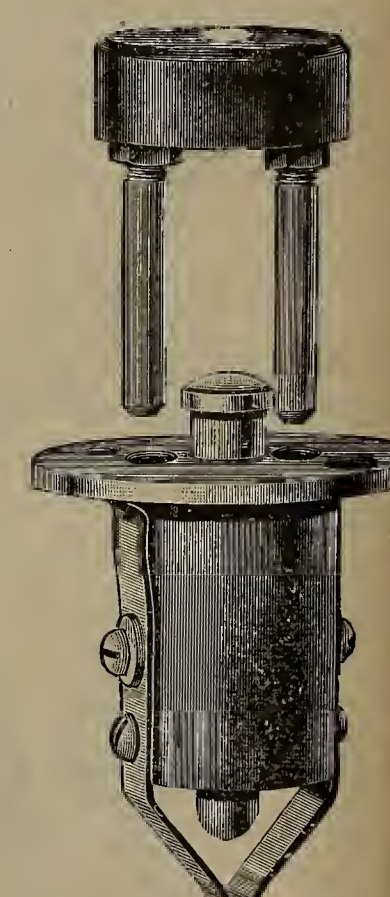


FIG. 2.

It has stood the test of time and is said to be unequalled by any other bell made. All parts are plated.

Fig. 2 shows a combination floor push. The upper part of the device is intended to connect a flexible cord with the floor push so that the bell may be rung from the table or desk instead of using the foot on the floor push. The connections are made with great care, and the flexible cord attachment can be readily attached to and detached from the floor push.

These bells and devices are made by Huebel & Manger, makers of electrical and brass goods, 286 to 290 Graham street, Brooklyn, N. Y.

STREET RAILWAY NEWS.

THE DE VOE CONDUIT RAILWAY.

The accompanying illustrations show a cross sectional view of an electric conduit railway, and the trolley for use in the same, invented by William R. De Voe, of Shreveport, La.

The trolley (Fig. 2) runs through the conduit horizontally, as shown in Fig. 1. It is made of metal, with the exception of the guide wheel, which is constructed of any reliable insulating and durable material, say, lignum vitæ.

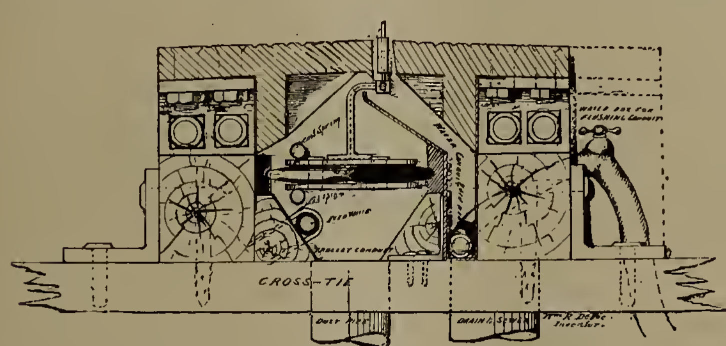


FIG. 1.

On one side of the conduit (the left in Fig. 1) the electrical conductor, in channel form, is placed on an insulating support throughout its length. The collecting wheels of the trolley run in this grooved conductor, while the guide wheel, or wheels, on the opposite side of the trolley run in a similar groove cut out of a metallic rail. The latter groove is designed merely as a guide and partial support for the trolley in its horizontal motion and position.

The trolley is flexible and readily adjusts itself to curves, etc., and is also designed so that an intersecting line may be crossed without breaking contact with the conductor and without changing the position of the trolley, the crossing being adapted to that end.

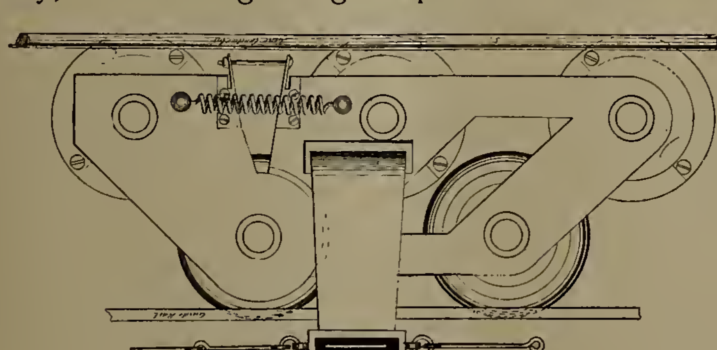


FIG. 2.

The conduit is shallow, and is placed on the top of the cross-ties, no excavating being necessary; its interior is readily accessible, the covering being made in sections. A system of drainage is provided so that no water can collect, all drippings of water, dirt, etc, from the surface being deflected into the drainage chamber. In this way the trolley chamber is protected against the entrance of water and foreign material.

The conduit may be made of rolled or cast iron, or steel, or set on longitudinal stringers of wood, secured by angle plates.

The evident and important merits of this system are, economy of installation and maintenance. No part of the system is subjected to any strain other than that due to the passing of street traffic, and it is claimed by the inventor that the system perfectly meets every requirement of traffic in city streets and municipal regulations.

The office of the inventor, Mr. William R. De Voe, is at No. 433 Temple Court, New York city, where a model of the system can be seen. We have examined this model and it illustrates what seems to be a practicable conduit system.

NOTES.

Mr. Hiram R. Rhoads, president of the Williamsport Electric Street Railway; president of the Central Pennsylvania Telephone and Supply Co; secretary of the Lycoming Electric Light Co., of Williamsport, and interested in numerous other business enterprises, died at his home in Williamsport, Pa, on February 17. The cause of death was heart failure. The deceased was 46 years of age.

A project is on foot in Sandusky, Ohio, to run electric cars over the Baltimore and Ohio railroad tracks from that city to Monroeville, a distance of 12 miles. The realization of this project depends largely upon the decision of the Baltimore and Ohio railroad authorities.

The Citizens Street Railway Company of Little Rock, Arkansas, it is said, will go into the hands of a new management in a few days.

The overhead wires in Philadelphia are being rapidly removed and the poles cut down on Market street.

The Brightwood Railway Company also issued passes to the delegates over its line during the convention. Mr. Charles P. Williams is treasurer of this company.

The Forest Park Electric Street Railroad at Pittsburg, Kansas, and all its property, was sold by order of the court, on February 24, to an eastern syndicate, of which Mr. L. Bidell of the Neosho Valley Investment Company, Pittsburg, Kansas, is the representative. It is proposed to extend the lines to Frontenac.

The Sandusky, Milan and Norwalk Electric Railroad Co. has closed a contract with the American Express Co. for the transportation of express packages to all points along the line between Sandusky and Norwalk. Operations under the contract will begin first of April.

Mr. E. C. Wall, manager of the electric lighting business of the Milwaukee Street Railway Co., has resigned his position and has been succeeded by Mr. C. D. Wyman, of New York.

ANNUAL REPORT.—The annual report of the Central Traction Company, Pittsburg, Pa., submitted a few days ago at the annual meeting, shows total receipts of \$196,040.91, and total disbursements \$195,123.64, leaving a balance of \$917 27. President Whitney in his report stated that the total operating receipts for the year fell off \$3,400, compared with 1892. The operating expenses decreased \$4,300, but the expense of maintenance increased \$6,300, about half of which was directly chargeable to the electric line.

CONSOLIDATED.—The Brooklyn Heights Railroad Company, the Long Island Traction Company, and the Brooklyn City Railroad Company have completed the consolidation of their trolley interests, and in future will conduct their business with one set of officers and probably one head. The directors of the three companies met in executive session February 21, and perfected the arrangement.

FINANCIAL.

The Kansas City Electric Street Railroad Company, of Kansas City, Mo, has increased its capital stock to $200,000.

The Wallace Electric Company, Chicago, Ill, has increased its capital stock to $25,000.

The Consolidated Tramway Company, of Denver, Col., has filed a certificate with the Secretary of State, certifying that the $3,000,000 of its stock has been paid up.

The Chicago Edison Illuminating Company has decided to increase its capital stock from $3,000,000 to $5,000,000; the proceeds are to be used for extensions and improvements.

The Buckeye Electric Company, of Cleveland, Ohio, has increased its capital stock from $250,000 to $500,000.

The North Side Street Railway, at Fort Worth, Texas, operated by a receiver since December 31, 1891, is advertised to be sold to the highest bidder the first Tuesday in April.

LEGAL.

Judgments aggregating $7,939 have been entered against the Saratoga Gas and Electric Light Company, William Foster, Jr., and W. V. Reynolds, in favor of the First National Bank, of Saratoga Springs.

Two judgments were entered February 23 against the La Burt Automatic Electric Block Signal System and Car Coupler Company, of 203 Broadway, one for $341 in favor of Asa J. Stott for salary as salesman, and the other for $2,019 in favor of George B. Lane.

In the case of the People ex rel. the Edison Electric Illuminating Company, of New York, against Edward Wemple, Comptroller of the State, the Court of Appeals at Albany, N. Y., on March 6, gave a decision in favor of the company, the appeal being from an order of the General Term, third department, affirming the decision of the Comptroller and imposing certain taxes upon the company for the years 1886, 1887 and 1888. The opinion is by Judge Peckham and all concur. The court holds that the company was not liable for the tax on capital stock during the years mentioned; that, despite the fact that its payment to the Comptroller of the amounts levied upon it were voluntary, it is entitled to a review of the proceedings levying the taxes, and that the amounts should be credited to current accounts of the company with the Comptroller's office. This reverses the General Term decision, which held that there was no remedy on account of the voluntary payments made. The amount involved was about $3,500.

NEW YORK NOTES.

Office of the Electrical Age,
World Building, New York,
March 10, 1894.

In consequence of the death of Mrs. Josephine D. Smith, who conducted the car lamp and general railroad supply business, at 350-352 Pearl street, New York city, with Mr. Chas. G. Smith as manager, the business has passed into the control of Chas. G. Smith. This house is better known as "Smith of New York." Mr. Smith will continue at the old stand.

Mr. A. B. Laurence, New York manager of the Shultz Belting Co., St. Louis, will move his office to 113 Liberty street, where he will have larger accommodations and facilities for handling the large and growing business of his company. The new location will be more central, and will undoubtedly accrue to the great advantage of the Shultz Belting Co. Mr. Laurence is one of the best known men in the belting trade, and wherever Shultz belts are in use, there satisfaction exists.

The Utility Shade Co., Ottawa, Canada, of which Holmes & Walker, 136 Liberty street, New York, are general agents, has decided to establish a factory in New York for the manufacture of these celebrated shades. These goods are made in cardboard and celluloid in all colors. They are unbreakable and can be washed. Holders are attached to the shades.

The New York Carbon Works, 18 Cortlandt street, city, has moved its office to 41 Cortlandt street, in the Taylor Building.

The Ball Engine Company's New York office, 18 Cortlandt street, on March 10, moved into more commodious quarters at 30 Cortlandt street. F. Schmerber and J. S. Du Vall are the New York managers.

McNamara Bros., Fairhaven, Vt., are extensive manufacturers of slate and Vermont marble for electrical work. The New York office is at 136 Liberty street, with Mr. Geo. W. Zelie as manager. The McNamara slate is especially adapted for switchboards and bases, terminal boards, boxes for cut-outs, etc. It is free from iron ore and magnetic veins and is easily drilled and tapped. This slate is susceptible of a very high finish and is manufactured in imitation of all kinds of wood and marble, and hard rubber. The finishes are baked in, rendering the slate impervious to moisture and makes it very durable.

The annual report of the Commercial Cable Co. shows the gross earnings of the company for 1893 to have been $1,842,346.98; expenses, $784,600.24; balance, $1,057,746.74. During the year, $600,000 debenture bonds were paid and provision made for redeeming the balance, $400,000. The company has contracted with Siemens Bros. & Co., London, for the manufacture and laying of a third cable between America and England, which is to be completed by the middle of July. The existing plant of the company is in excellent condition.

W. T. H.

TRADE NOTES.

Mr. B. B. Downs, room 19, No. 411 Walnut street, Philadelphia, Pa., is the representative of the Packard Electric Co., of Warren, Ohio, also of the New York and Ohio Co., manufacturer of Packard high grade incandescent lamps and Packard "Mogul" lamps, Warren, Ohio.

The adjustable trolley bracket made by James R. Gwilliam, 115 N. 6th street, Philadelphia, is meeting with popular favor. The Lehigh Traction Co. has over 100 of these brackets in use, and G. W. S. Brubaker, of Pottsville, Pa., has several hundreds of them on his electric roads in Pottsville and Norristown. Mr. Gwilliam is daily receiving orders, and has estimates out for thousands of these brackets.

The Southwestern Electric Brokerage Co, Joplin, Mo., has a general line of standard electrical supplies and apparatus. The company gives special attention to the complete installation of light and power plants and makes fine repairing a specialty. All work is guaranteed.

Belden Mica.—The F. E. Belden Mica Mining Co., 12 Broad St., Boston, dedicated its new mill at Rumney, N. H., on March 2. Invitations to attend the event were sent out printed in gold letters upon a square sheet of mica, with a neat bow of red, white and blue ribbons tied to one of the corners.

NEW CORPORATIONS.

The Western Slope Telephone and Supply Co. has been incorporated in Grand Junction, Col.; capital stock, $50,000. Directors: W. P. Clark, C. R. Williams, and C. F. Keene.

The Farmers and Broad Ripple Street Railway Co. has been incorporated in Indianapolis, Ind., with a capital stock of $100,000. Directors: Capt. W. R. Meyers, Judge John C. Green, A. N. Fisher, Henry Mapas, and O. C. Meyers.

The Abingdon Electric Co., Abingdon, Ill. Capital stock, $12,500. Incorporators: C. C. Travis, Annie J. Travis, and C. D. Warner.

The Virginia Senate has passed a bill incorporating the Old Dominion Telephone Co.

A company has been organized to build an electric road between Chestertown, Queenstown and other places in Maryland. Ex-Congressman John B. Brown is interested in the enterprise.

The Rock River Electric Railway Co. has been incorporated for the purpose of building an electric road from Rockford to Dickson, Ill. The principal office is in Rockford; capital stock, $500,000. Incorporators: James S. Ticknor, Geo. E. King, and Harry B. Andrews, Rockford; Jason C. Ayres, Dixon, and Fred. G. Jones Oregon.

Louis R. Comstock Company, Chicago, Ill. Capital stock $20,000, to engage in general electrical engineering and construction; incorporators: Louis R. Comstock, Frederick S. Richmond, Paul V. Cary.

The Atchison Telephone and Electric Light Company, of Atchison, Kan., capital stock, $50,000. Directors: B. P. Waggener, W. P. Waggener, David Kelso, and Ellsworth Ingalls, of Atchison, and O. E. Rumer, of St. Joseph, Mo.

Madison Light and Power Company, Chicago; capital stock, $10,000; incorporators: George M. Shippy, Edward P. Ames, Frank J. Baker.

The Michigan Electro-Automatic Telephone Co. has been organized in Detroit with a capital stock of $500,000; directors: A. Matthews, James A. Jones and George W. Radford.

The Electric Boat Co., at Chicago; capital stock, $100,000; incorporators: Charles D. Wright, Louis D. Wright and John Templeton.

The Eastern Electric Light, Heat and Power Company at Southampton, Suffolk county, to furnish light, heat and power for Suffolk, Queens and Kings counties, N. Y. Capital, $15,000. Directors: John H Adams and Robert B. Roosevelt, Jr., of New York city, and Frank S. Taintor, of Southampton.

The Meredith Electric Light Co., Meredith, N. H., has been incorporated with a capital stock of $7,000.

The Alexandria County Light, Water and Power Co., Alexandria, Va., has been incorporated. Incorporators: James H. Embrey and Chas. B. Bradley, of Washington; John Critcher, R. H. Phillips and H. H. Wells, of Alexandria, and Walter Hinchman and R. H. Lamboon, of New York city.

Newburgh Electric Railway Co., Newburgh, N. Y., to operate a street surface road in Newburgh. Capital, $150,000, and directors Geo. L. Nichols, Geo M. Huyett, Wm. M. Tobias, Henry R Newkirk, Brooklyn; Harry C. Norton, Newburgh, and others.

A company has been incorporated by Albert Brewer, John K. Rohn, and W. H. Dore, in Tiffin, Ohio, for electric lighting and power purposes. A fine plant is to be built therefor in Tiffin.

The Mount Mansfield Electric Railroad has been incorporated in Waterbury, Vermont. The officers are: E. D. Blackwell, president; O. E. Luce, vice-president; L. A. Pike, clerk, and L. E. Moody, treasurer. The road is to run from Waterbury to Mount Mansfield, a distance of ten miles.

The Long Island Electric Railway Co. has been incorporated to operate a street surface railroad between Hempstead and the boundary line between Jamaica and Brooklyn. Capital, $600,000. Directors are: R. Hart, Brooklyn; Chas. H. Mullin, Mt. Holly Springs, Pa; Chas. M. Cooper, J. C. Von Arx, Wm. H. English, New York; Clarence Wolf and Edwin Wolf, Philadelphia.

American Electro-Automatic Telephone Co., Chicago; capital stock, $500,000; incorporators, Cassius M. Upton, Walter F. Render and Samuel D. Snow.

Illinois Telephone Comptroller Co, Chicago; capital stock, $250,000; incorporators, Alfred L. Baker, Henry W. Buckingham, Benton Sturges.

The Electric Power Co., Portland, Maine, capital, $500,000; officers, E. A. Clark, president, of Boston, Mass.; E. C. Ramsdell, treasurer, Cambridge, Mass.

The Heimann Carbon and Insulator Co. has been incorporated at Chicago; capital stock, $500,000; incorporators, August E. Gans, Soloman Heimann and Wm. Henry Osborne.

POSSIBLE CONTRACTS.

The Lackawanna Valley and Passenger Street Railway Co. has secured a franchise in Carbondale, Pa.

Efforts are being renewed in Montclair, N. J., for the establishment of an electric light plant. Mr. Paul Wilcox is at the head of the movement.

Fairfield, Ohio, citizens are talking up an enterprise with a view to building an electric railroad to connect that place with Norwalk, Ohio.

The Plainfield Electric Railroad, Plainfield, N. J., is trying to extend its line to Dunellen and is seeking permission from the town authorities for that purpose.

The Washington, Alexandria and Mt. Vernon Electric Railway Co, Washington, D. C., is seeking permission to extend its line into Washington from Alexandria.

The Consolidated Traction Co., Newark, N. J., has renewed its efforts to secure a franchise for the extension of its lines through Montclair to Caldwell.

Vermillion, Ohio, is talking of establishing an electric light plant.

There is a movement on foot in Springfield, Ill., to organize a consumer's light and fuel company on a co-operative basis.

The Reading Traction Co., Reading, Pa., intends to extend its line to Womelsdorf, a distance of 14 miles.

An electric light plant is to be built by the city of Kalamazoo, Michigan, and plans and specifications will be procured at once. The plant will cost between $35,000 and $40,000.

The business men of Medina, N. Y., are advocating a project for the construction of an electric railway. Capt. Lina Beecher, of Buffalo, is interested.

An electric railway is to be built between Cincinnati and Madisonville.

An electric railroad between Fredricksburg and Culpeper, Virginia, is talked of.

The electric railway in Evansville is to be extended to Howell, a distance of 13 miles.

The Philadelphia Traction Co. has purchased some property on Delaware avenue, Philadelphia, for the purpose of erecting a large power house.

The Virginia Senate has passed a bill giving the Roanoke Street Railway Co. enlarged powers.

Steps are being taken to build an electric railway for freight and passenger service, between Kingston and Ellenville, New York, a distance of 28 miles.

A movement is on foot to build an electric railroad from Quincy, Ill., to some point on the Chicago and Alton Railroad, which runs through the southern tier of townships in Pike County, Ill. Mr. Edward Yates, of Pittsfield, Ill., is interested in the scheme.

It is quite likely that the electric road in Madison, Wis., will be extended to Wingra Park and Edgewood.

The Hartford, Manchester & Rockville Electric Railway Co., Hartford. Conn., will extend its lines to Manchester, this spring, and to Rockville later on, if sufficient inducement is given by the citizens of the latter place.

The Reading and Southwestern Electric Railway Co., Reading, Pa., has decided to extend its lines to Adamstown, which is ten miles southwest of Reading.

There is talk of building an electric railroad between Millhall and Lockhaven, Pa.

A project is on foot at Honesdale, Pa., for the construction of an electric plant on Walempaupack Creek, near Halsey, the company to operate the same being known as the Delaware and Hudson Electric Motor Co. It is proposed to propel canal boats by electricity, and light adjacent towns.

There is talk of building an electric railway from Akron to Cuyahoga Falls, Ohio.

Efforts are being made to secure the right to construct a double track electric railroad from Baltimore to Ellicott City, Md. A bill has been introduced in the Maryland legislature to authorize the City and Suburban Railroad Co., of Baltimore, to undertake this project.

A company has been organized at Bedford, Pa., for the purpose of building an electric road in Bedford and Blair counties, to run from Roaring Spring to Hopewell, Bedford County.

There is talk of building an electric railway between Jefferson and Geneva, Ohio.

It is reported that the Columbia Electric Street Railway Co, Columbia, Ga., will extend its lines and establish a suburban town beyond the southeastern limits of the city.

There is talk of establishing a municipal light plant in Oshkosh, Wis., as the result of a dispute between the Oshkosh Electric Light Co. and the City council, regarding the price of lighting.

New Athens, Ill., is considering the question of electric lighting.

The citizens of St. Louis, Mich., are talking about organizing a local electric light company. This movement is the result of the action of the Edison Company in that place, in the recent shutting off the lights leaving the town in darkness, because of a disputed bill.

The Lewiston (Maine,) Horse Railroad has been sold and the new management proposes to change the motive power of the line from horse to electric; also to extend the line.

An electric railway between Lockhaven and Millhall, Pa., is under consideration.

Florence, Colorado, is talking about establishing an electric light plant.

The South Sioux City Railway Co. will extend its line to the railroad station as soon as possible.

An effort is being made to establish an electric light plant in Woodstown, N. J., for public and private use.

Mr. H. W. Goss, of Amesbury, Mass., is interested in a scheme for the introduction of electricity for lighting and power purposes in Merrimac, Mass.

Plano, Texas, has thrived to such an extent as to warrant efforts towards the establishment of an electric light plant.

Mr. S. J. Lefever proposes to build a new electric light plant in Bloomington, Ill., in the spring, the present one not being large enough.

Capitalists of Southampton, L. I., have organized a company for the purpose of constructing and operating a telephone system on Long Island.

Mr. J. T. Ridgway, general manager of the Trenton Electric Light and Power Co., Trenton, N. J., talks of putting in two new boilers; also making other additions to his plant.

It is stated that an electric light plant and water-works will be erected at Wildwood, N. J.

It is stated that all the street car lines of Dayton, Ohio, will be consolidated and equipped with the electric system.

HAYDEN-BOOKER MFG. CO.

Mr. M. M. Hayden resigned his position as president and manager of the Law Battery Co., 85 John street, city, on February 15 last, and has assumed the management of the Hayden-Booker Mfg. Co., 2140 De Kalb street, St. Louis, Mo., which company has been organized to manufacture battery carbons, zincs, covers and jars. Mr. Hayden's long experience in the battery business eminently fits him to engage in this new enterprise, which is to be conducted on principles which will surely bring success to its promoters. The Hayden-Booker Co. is organized as a manufacturer, and proposes to deal directly with the dealer and consumer, thereby saving the latter two or more profits.

Mr. Booker of the company is a practical carbon maker and he, as well as Mr. Hayden, has given the subject of practical battery manufacture careful study for several years, and the company will be content to let its products speak for themselves.

It will be to the advantage of all dealers to communicate with the Hayden-Booker Mfg. Co., which will deal in all classes of galvanic batteries and everything in the battery line.

Electrical and Street Railway Patents.

Issued February 27 and March 6, 1894.

515 342. Electric-Arc Lamp. George Kirkegaard, Brooklyn, N. Y. Filed June 19, 1893.

515 366. Electrical Railway-Signal. Henry V. Riley and Charles Selden, Baltimore, Md. Filed Oct. 5, 1893.

515,374. Electrical Controller. Elmer A. Sperry, Cleveland, Ohio. Filed Aug. 23, 1893.

515,386. Dynamo-Electric Machine. Jonas Wenstrom, Orebro, Sweden. Filed Mar. 6, 1893.

515,397. Electric Gas-Lighter. John O. Dahlgren, Boston, Mass. Filed Dec. 30, 1893.

515,401. Electric Heater. Austin S. Hatch, Windsor, Canada, assignor of one half to Stephen J. Martin, Detroit, Mich. Filed Mar. 27, 1893.

515,405. Fan-Guard. Alexander W. Meston, St. Louis, Mo., assignor to the Emerson Electric Manufacturing Co., of Missouri. Filed Aug. 1, 1892.

515,432. Primary Battery. Charles J. Hubbell, Boston, Mass. Filed May 31, 1893.

515,448. Fixing Electric Conducting-Wires to Insulators Supporting Same. Rudolf Schomburg, Berlin, Germany. Filed Mar. 29, 1893. Patented in Austria-Hungary Jan 30, 1893, No. 1,582 and No. 1,570 and No. 7,079 and No. 16,019; in France Feb. 2, 1893, No. 227,607; in Belgium Feb. 2, 1893, No. 103,-242; in Italy Feb. 10, 1893, No. 30,502/463; in England Feb. 13, 1893, No. 3,200, and in Germany June 25, 1893, No. 70,199.

515,465. Electrical Glow-Lamp. Herbert Cottrell, Newark, N. J. Filed Mar. 30, 1893.

515,467. Armature for Electric Machines. Waldemar Fritsche, Berlin, Germany. Filed July 1, 1893.

515,473. Regulator for Continuous-Current Arc-Light Circuits. Daniel Higham, Boston, Mass., assignor, by mesne assignments, to the Higham Electric Company, Portland, Me. Filed May 14, 1892.

515,478. Bond for Electric Railways. Julius Meyer, New York, N. Y. Filed Oct. 21, 1893.

515,484. Socket for Incandescent Lamps. Louis Stirn, New York, N. Y., assignor of two-thirds to Julius Somborn, same place, Filed June 22, 1892.

515,485. Lamp-Socket. Louis Stirn, New York, N. Y., assignor of two-thirds to Julius Somborn, same place. Filed Nov. 18, 1892.

515,488. Electric Motor. Constant Doriot, Philadelphia, Pa., assignor to the S. S. White Dental Manufacturing Co., same place. Filed Mar. 11, 1893.

515,502. Secondary Battery. Leslie B. Rowley, Ashland, Wis. Filed Feb 7, 1893.

515,503. Auxiliary Fire Alarm Telegraph System. Joseph Sachs, New York, N. Y., Filed Feb. 15, 1893.

515,531. Switch and Circuit for Telephone Exchanges. Joseph J. O'Connell, Chicago, Ill., assignor, by mesne assignments, to the American Bell Telephone Company, Boston, Mass. Filed Apr. 17, 1893.

515,567. Street Car. Thomas H. Wickes, Chicago, Ill., assignor to the Pullman Palace Car Company, same place. Filed Sept. 27, 1893.

515,572. Conduit Electric Railway. Joseph A. Cassidy and William A. Butler, New York, N. Y. Filed Aug. 24, 1892.

515,581. Safety Car Fender. William R. Fowler, Baltimore, Md. Filed Sept. 27, 1893.

515,606. Incandescent Lamp Socket. Rufus C. Nourse, South Framingham, Mass Filed May 31, 1893.

515,609. Street Car Fender. Walter W. Peay, Toronto, Canada, assignor to John Henry Banes, same place. Filed May 6, 1893.

515,613. Current Collector for Dynamos. Charles R. Roberts, Addison, Pa. Filed Aug. 21, 1893.

515,638. Electric-Alarm System for Railway-Crossings. Adoniram J. Wilson, Port Chester, assignor to the Hall Signal Co., New York, N. Y. Filed Apr. 25, 1893.

515,648. Automatic Electric Railway Signal System. Charles P. Breese, New York, N. Y., assignor to the Hall Signal Co., same place. Filed Mar. 22, 1893.

515,652. Apparatus for Electrically Heating or Working Metals. Charles L. Coffin, Detroit, Mich. Filed Feb. 9, 1893.

515,693. Electric Heater. Samuel E. Nutting, Chicago, Ill. Filed Apr. 27, 1893.

515,709 Telegraphic Instructor. Thomas J. Houck and Harrison M. Browning, Baltimore, Md., assignors of one half to J. Frank Morrison, same place. Filed Sept. 21, 1893.

515,716. Insulated Pipe-Coupling. George Peeples, Philadelphia, Pa., assignor of one-half to the Thackara Manufacturing Company, same place. Filed June 5, 1893.

515,728. Fender for Street-Cars. William H. Brock, Brooklyn, N. Y. Filed Sept. 26, 1893.

Issued March 6.

515,751. Electric Switch-Signal. Thomas L. Dalton and Nelson W. Dalton, Sandy Hill, N. Y. Filed Aug. 5, 1893.

515,755. Electric-Motor. Gano S. Dunn, New York, N. Y., assignor to the Crocker-Wheeler Electric Co., of New Jersey. Filed July 29, 1893.

515,761. System for Signaling and Communication. Thos. F. Gaynor, Louisville, Ky., assignor to the United Fire Alarm and Police Signal Co., of West Virginia. Filed Dec. 30, 1891.

515,762. Electric Signal-Box. Thos. F. Gaynor, Louisville, Ky., assignor to the United Fire Alarm and Police Signal Co., of West Virginia. Filed Feb. 4, 1892.

515,775. Apparatus for Forming Sheds in Looms Electrically. Joseph Kauffmann, Hanover, Germany. Filed Apr. 30, 1892.

515,778. Electric Metal-Working. Hermann Lemp, Lynn, and Walter S. Moody, Chelsea, Mass., assignors to the Thomson Electric Welding Co., of Maine. Filed May 26, 1891.

515,797. Telephone-Receiver. Chas. Selden, Baltimore, Md. Filed Dec. 10, 1889.

515,805. Employes Time-Recorder. Nelson M. Watson, Detroit, Mich., assignor to the Detroit Time Register Co. same place. Filed July 17, 1893.

515,806 Electric-Lighting System. Harvey J. Wells, Osceola Mills, Pa. Filed Aug. 20, 1892.

515,822. Electric Cable. Thos. J. Dewees, Palmyra, N. J., assignor to the Electric Cable Construction and Maintenance Co., Pennsylvania. Filed Dec. 15, 1893.

515,845. Telegraph-Repeater. Wm. E Sloan, Chicago, Ill., assignor of one-half to Chas. A. Knight, same place. Filed July 14, 1893.

515,850. Electric-Arc Lamp. James J. Wood, Fort Wayne, Ind. Filed June 7, 1893.

515,868. Street-Car Fender. Randolph C. Lothrop, Somerville, Mass. Filed Oct. 13, 1893.

515,882. Dynamo-Electric Machine. James E. Maynadier, Taunton, Mass. Filed Aug. 30, 1893.

515,885. Electrical Transmission of Power. Charles F. Scott, Pittsburg, Pa, assignor to the Westinghouse Electric and Manufacturing Co, same place. Filed Mar. 27, 1893.

515,900. Alternating Current Motor. Charles E. L. Brown, Baden, Switzerland. Filed June 13, 1893. Patented in Switzerland, Dec. 21, 1892, No. 5,964, and in France, Dec. 26, 1892, No. 226,685.

515,905. Splice-Covering for Electric Wires. Thomas J. Dewees, Palmyra, N. J., assignor to the Electric Cable Construction and Maintenance Co., of Pennsylvania. Filed July 25, 1891.

515,907. Hanger for Trolley Wires. George Forbus, Williamsport, Pa. Filed Sept. 6, 1893.

515,939. Telephone Exchange System. Edwin Pope, Quebec, Canada. Filed Aug. 3, 1892.

515,940. Telephone System. Edwin Pope, Quebec, Canada. Filed Sept. 2, 1892.

515,960 Automatic Cut-out for Incandescent Lamps. Edward H. Johnson, New York, assignor to the General Electric Co., New York, N. Y. Filed May 17, 1886.

515,962. Alternating-Current Motor. John F. Kelly, Pittsfield. Mass, assignor to the Stanley Laboratory Co., same place. Filed Mar. 27, 1893.

515,969. Regulating-Socket for Electrical Apparatus. Elias E. Ries, Baltimore, Md., assignor to the Ries Electric Specialty Co., same place. Filed Jan. 24, 1893.

515 970. Electric-Current Regulator. Elias E. Ries, Baltimore, Md., assignor to the Ries Electric Specialty Co., same place. Filed Feb. 2, 1893.

515,971. Portable Regulator for Electric Currents. Elias E. Ries, Baltimore, Md., assignor to the Ries Electric Specialty Co., same place. Filed Apr. 4, 1893.

515,977. Alternate-Current Motor. William Stanley, Jr., John F. Kelly and Cummings C. Chesney, Pittsfield, Mass., assignors to the Stanley Laboratory Co, same place. Filed Apr. 1, 1893.

516,025. Electric-Circuit Breaker. David S. Schureman, Rockford, Ill. Filed July 19, 1893.

516,038. Automatic Switch for Storage-Battery Use. Theodore A. Willard, Norwalk, Ohio. Filed July 1, 1893.

516,071. Electric Heating Apparatus. Arthur E. Appleyard, Boston, Mass., assignor of one-half to H. J. Folsom, same place. Filed Jan. 16, 1893.

516,079. Process of Making Incandescent Elements. Theron C. Crawford, New Brighton, and Ludwig K. Böhm, New York, N. Y., assignors to the Sterling Light Co., Trenton, N. J., and New York, N. Y. Filed Mar. 30, 1893.

516,080. Composition for Incandescent Elements. Theron C. Crawford, New Brighton, and Ludwig K. Böhm, New York, N. Y., assignors to the Sterling Light Co., Trenton, N. J., and New York, N. Y. Filed Jan. 23, 1893.

516,085. Ringing Mechanism for Bells. Walter H. Durfee, Providence, R. I., assignor to the United States Tubular Bell Co., Methuen, Mass. Filed Aug. 1, 1892.

516,095. Electric Radiator. Samuel E. Jenkins, Boston, Mass., assignor to the American Electric Heating Co., same place. Filed Mar. 29, 1893.

516,152. Electrical Heater. Adam Cochrane, Lowell, Mass. Filed Jan. 6, 1893.

516,161. Electric-Cable Joint. Thomas C. Loe, New York, N. Y., assignor to the Standard Underground Cable Co., Pittsburg, Pa. Filed Aug. 14, 1893.

516,167. Apparatus for Generating Steam by Electricity. Herbert E. Rider and Joseph H. Lewis, New York, N. Y. Filed Feb. 17, 1893.

516,170. Armature for Dynamo-Electric Machines. Montgomery Waddell and Justus B. Entz, Bridgeport, Conn., assignors to the Waddell-Entz Co., West Virginia. Filed May 13, 1893.

PATENTS EXPIRED MARCH 6, 1894.

188,163. Couplings for Railroad-Train Telegraphs. E. J. McRavey, F. W. McRavey, and J. Schwartz, Milwaukee, Wis. [Filed Apr. 13, 1876.]

188,178. Track-Clearers. M. Pool, Columbus, assignor of one-half his right to W. McCrory, Columbus, Ohio. [Filed Jan. 10, 1877.]

188,179. Fire-Alarm-Telegraph Repeaters. C. H. Pond, Jackson, Mich, assignor of one-half his right to Chas. R. Knickerbocker and D. Gibson, same place. [Filed Feb. 26, 1877.]

188,180. Fire-Alarm-Telegraph Signal Boxes. C. H. Pond, Jackson, Mich., assignor of one-half his right to Chas. R. Knickerbocker and D. Gibson, same place. [Filed Jan. 15, 1877.]

188,181. Fire-Alarm-Telegraph Repeaters. C. H. Pond, Jackson, Mich., assignor to the Michigan Fire Alarm Co., same place. [Filed Feb. 19, 1877.]

188,182. Signal-Boxes for Fire-Alarm Telegraphs. C H. Pond, Jackson, Mich., assignor to the Michigan Fire Alarm Co., same place. [Filed Feb. 19, 1877.]

188,220. Electric Lighting Apparatus for Lamps. Wm. H. Zimmerman, Chestertown, Md. [Filed Jan, 17, 1877.]

ELECTRICAL AGE

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NEW YORK, MARCH 24, 1894.

CONTENTS.

JAPANESE PROGRESS.

Our far away friends in Japan make a very creditable showing in their progress in electrical industry during the year 1893, as set forth by our Tokio correspondent, whose letter will be found on another page. The rapid absorption by the Japanese people of modern ideas and the adoption of modern methods, is nothing short of a marvel. Electricity has done a great deal to advance their knowledge in mechanics and science, and their progress has been rapid and well maintained. Progress will be their motto for 1894.

NO DRESS TRAINS ALLOWED.

It is reported that an order has been issued by the telephone company, in Chicago, prohibiting the wearing of dress trains by the telephone girls. It is claimed by the officials that these appendages kick up a dust which settles in the delicate mechanism of the instruments. We extend our sympathy to the girls. If it is the fashion in Chicago to wear trains, it must indeed seem hard to be compelled to be deprived of the satisfaction which accompanies a knowledge or belief that one is dressed according to the dictates of fashion. The telephone people have a strong argument on their side, and whether or not the Chicago girls will resent this apparent infringement of personal liberty, remains to be learned. Better abbreviate your dresses, girls; just a little, but not enough to expose your feet.

PROF. TYNDALL'S WILL.

An English contemporary reports that the value of the personal estate of the late Prof. John Tyndall is about $109,300 in American money. Measured by the American standard of fortunes, this sum will probably appear to Americans as being rather modest as representing the fortune of one who did so much in the interest of science and mankind. Prof. Tyndall died on December 4, 1893.

FRANCHISE SECURED.

The granting of a franchise to the Cataract General Electric Company, giving it the right to use the canal lands in this state in the distribution of power, seems to have created a good deal of apprehension and suspicion in the minds of many. It is undoubtedly a very valuable franchise, and being given, as it was, on the very eve of the repeal of the law which made it legal, naturally created talk. Electrical companies whose territory may be invaded by the newcomer will probably have something to say, and it is to be hoped that things may be adjusted to the satisfaction of all concerned. But when the company distributes Niagara's power all over the state, and when the people enjoy the benefits therefrom, the franchise question will be allowed to rest.

ANTWERP INTERNATIONAL EXPOSITION.

Elsewhere in this issue is published a notice regarding the International Exposition which is to be held in Antwerp the coming summer. The exposition will be opened on May 5. We have not heard that any electrical concerns in the United States propose to make exhibits there. They have just got through with the World's Fair at Chicago, and many of them have not had time to collect their forces, so it is not likely that American electrical exhibits will cut any figure at Antwerp this year.

THE PETERSEN UNDERGROUND CONDUIT RAILWAY SYSTEM.

Mr. H. Petersen, proprietor of the Petersen Electrical Works, Milwaukee, Wis., has had on exhibition for the past few days, at the Belvedere House, New York City, a working model of his underground conduit railway system, which system has attracted a good deal of attention amongst electrical railway managers and capitalists. Very favorable opinions have been expressed regarding the system, which is considered by many to solve the underground problem.

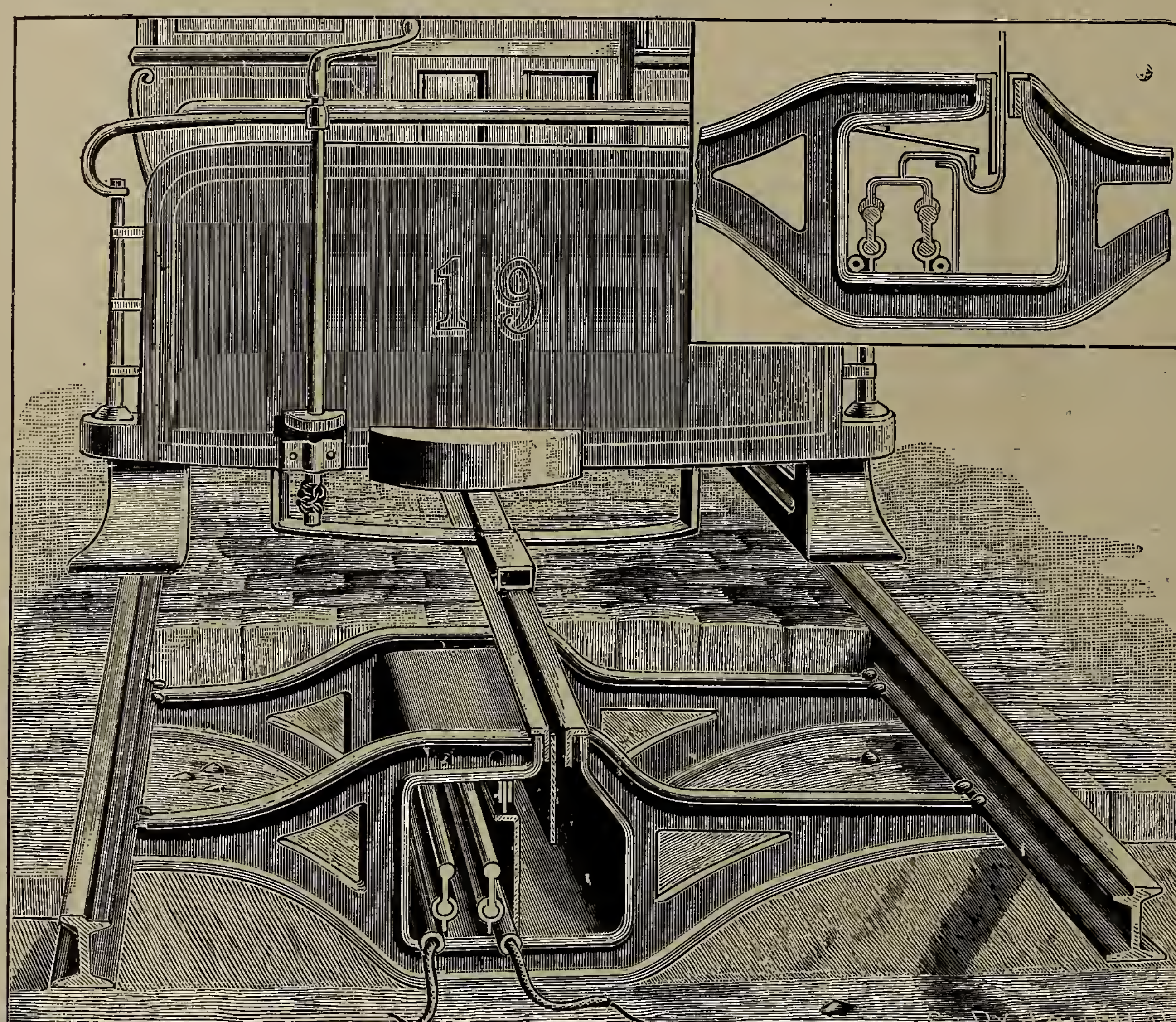
The principal object of the Petersen system is to provide an underground conduit of such construction as to effectually guard against the admission of moisture to that portion of the conduit occupied by the conductors or wires, and to prevent the condensation of moisture on the walls, or the conductors, or the insulated supports for the conductors. The Petersen system also provides for the ready removal of any dirt which may find its way through the slot by which the conduit communicates with the surface of the ground. Another object of the invention is to provide means for maintaining a circulation of dry, cold air within the part of the conduit in which the conductors are located, in order to keep the conductors dry as well as to provide means for regulating the operation of the ventilating apparatus.

This system also provides means for operating the switches upon the tracks as well as adjusting rails within the conduit by means of switches located upon the car and within reach of the motorman, while the car is yet at a distance from the switch, so as to enable the motormen to adjust the switch rails, and the conductors to enable the car to continue straight ahead on the main track or to branch off onto a side track, as may be desired.

The conduit is divided into two or more longitudinal passages or compartments, and the casing of the conduit may be made of any desired or convenient form.

The compartment or compartments in which the conductors are located communicate with the compartment in which the slot is formed by means of longitudinal openings which are ordinarily kept closed by a suitable movable closing device which is engaged by the contact carrying arm as the car advances and opens just sufficiently to permit the passage of the arm and closes immediately after the arm has passed.

A steel broom or brush is attached to the car and arranged to extend down into the compartment which has the slot in its top, and is arranged to continually sweep any dirt that enters this compartment to sewer connections.



PETERSEN'S CONDUIT RAILWAY.

The compartment in which the conductors are located are preferably located out of line with the slot, so that any water which may drip from the sides of the slot will not strike the wall of said compartment or the closing device.

To prevent any condensation of moisture on the walls of the compartment containing the conductors, or upon the conductors themselves or their insulated supports, a circulation of air is kept up in said compartment.

Instead of using trolley wires, this system employs iron or steel contact rails. These rails are divided into sections of about 100 feet in length, or of any other desired distance. Each section of the contact rails, is connected with the two main feeders and provided with a switch and safety cut-out device placed in the manhole, so that in case any trouble should occur, the particular section of the contact rails where the trouble is located can be switched off without interfering with traffic on the rest of the line. By means of the safety cut-out, in case of an accidental short-circuit, the fuse will burn out and thus cut out the section where the trouble occurs. As the iron or steel contact rails are of considerable size in cross section, and are divided into short lengths or sections, they will be sufficiently good conductors for the purpose.

The main feeders are laid in metal pipes but thoroughly insulated, the pipes being an especial protection to the mains.

The contact carrier-arm is provided with two contact shoes so arranged as to embrace the upper part of the contact rails so that they cannot accidentally jump off from the rails. The contact shoes are provided with swivel joints, so as to enable them to take up any unevenness of the conducting rail, and springs serve to keep the shoes in proper contact with the conductors.

A wire extends from each contact shoe up through the hollow arm to the motor, and the opening at each end of the arm is hermetically sealed.

The contact carrier is provided with lever mechanism by means of which the motorman upon the platform may lift the contact carrier out of the conduit at a manhole without delaying the car more than a few seconds.

A NEW METHOD OF AUTOMATICALLY STARTING AND PROTECTING MOTORS.

The Automatic Switch Co., of Baltimore, Md., has developed, patented and placed upon the market an automatic reversible starter for elevator work which is as much in advance of the dash-pot and solenoid starters, as the latter were ahead of the hand controllers.

The accompanying illustrations show both the automatic reversible starter and a new non-reversible starter for pumping and pressure tank work. The operating principle of these new starters is a radical departure from all existing devices for the automatic handling of electric motors, in that it takes from the motor at the time of starting the requisite amount of power to move the resistance controller, thus overcoming the greatest difficulty met in the operation of dash-pot and magnetic controllers, viz: lack of positive movement. By referring to Fig. 1 it will be noticed that the mechanism of the

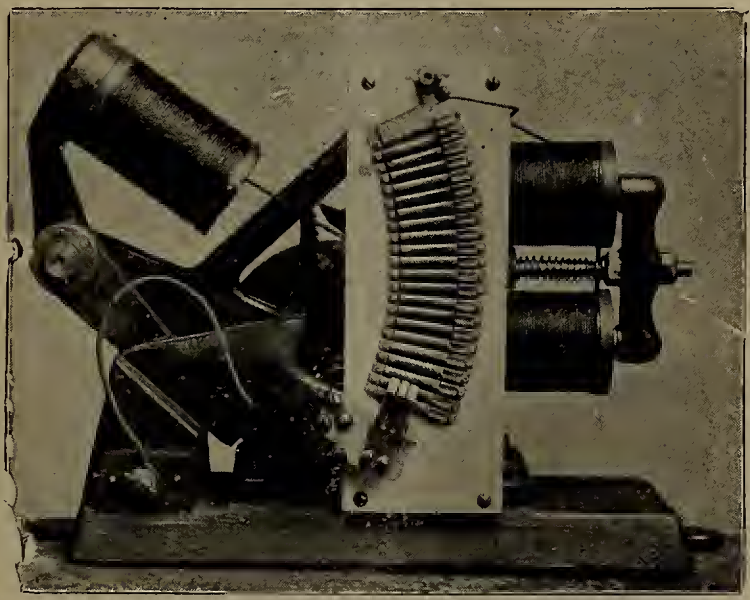


FIG. 1.

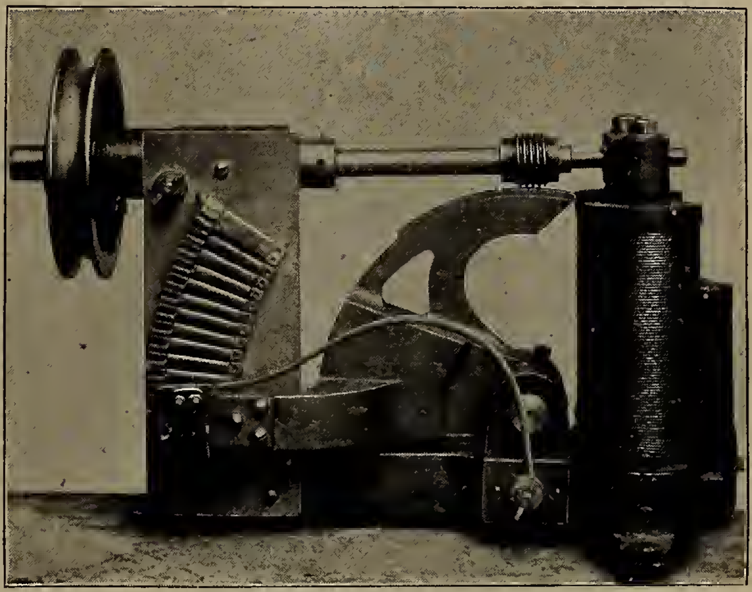


FIG. 2.

With this system, the same cars that are used in connection with overhead wires may be employed by the simple addition of the contact carrier arm which enters the slot, and the same car may be used on either kind of a line.

By this system any form of cable conduit may be utilized for the underground conductors, it being simply necessary to insert and fasten in place the partitions and the movable closing devices, and to run the conductors and the mains or feeders through the compartment thus formed, and this may be very cheaply and easily done without the necessity of tearing up the street or taking up the conduit.

THE ANTWERP EXPOSITION.

At a meeting of the members from New York of the U. S. Honorary Commisioners to the Antwerp International Exposition, held at their offices, 14 & 16 Church street, New York city, on the 14th inst., it was resolved to again call the attention of American manufacturers and producers to the fact that the Antwerp Exposition will open promptly on the 5th of May next. Intending exhibitors (and especially those from the State of New York), are urged to make their applications for spaces or concessions immediately; if possible, before April 1, at the New York headquarters.

The Zanesville, Ohio, Street Railway Company has increased its capital stock from $200,000 to $300.000.

reversible starter consists of a pawl and ratchet operated by an eccentric. This eccentric is driven either by direct connection to the armature shaft of the motor to be started, or the shaft of the starter may carry a pulley to which a belt is run from a small pulley on the commutator end of the armature shaft. The magnets of the starter are energized by the same current which starts the motor, and instantly cause the pawl and ratchet to engage a series of teeth which form part of the lever controlling the resistance, thereby applying to this lever for its operation power from the motor during the time of starting. The lever has only a sufficient number of teeth to cause it to be moved over the resistance contacts, and the pawl merely works free after all the resistance is cut out of the armature circuit, while the ratchet retains the lever in this position during the run of the motor. Interruption of the current from any cause immediately releases the pawl and ratchet, and the lever falls by its own weight to the point of greatest resistance, ready to start the motor with the return of the current.

Fig. 2 shows a non-reversible starter for use in connection with motors running only in one direction, and it differs from the reversible starter in that it is operated by a worm controlled by magnets connected in the motor circuit, the worm being driven by the motor of any suitable power.

These starters are said to be capable of handling motors of any horse-power, for the reason that there need be no limit to size of the contacts carrying the starting current.

THE KESTER ALTERNATING ARC LAMP.

At the recent convention of the National Electric Light Association, in Washington, the Kester Alternating Arc lamp attracted considerable attention by its remarkable performance.

These lamps are designed for 50 and 52-volt circuits, and are made in every detail in a first class manner. No resistance of any kind is required for either 30, 50 or 52 volts, and unless otherwise ordered the manufacturer adjusts the lamps to take nine amperes of current at 28 volts, when run on a 50-volt circuit. They are guaranteed to give entire satisfactation and to operate more satisfactorily than any other alternating arc lamp on

KESTER ALTERNATING ARC LAMP.

the market. The lamps are said to run perfectly steady and when taking nine amperes of current consume 252 watts, the low voltage being attained by the use of an "Economy Coil."

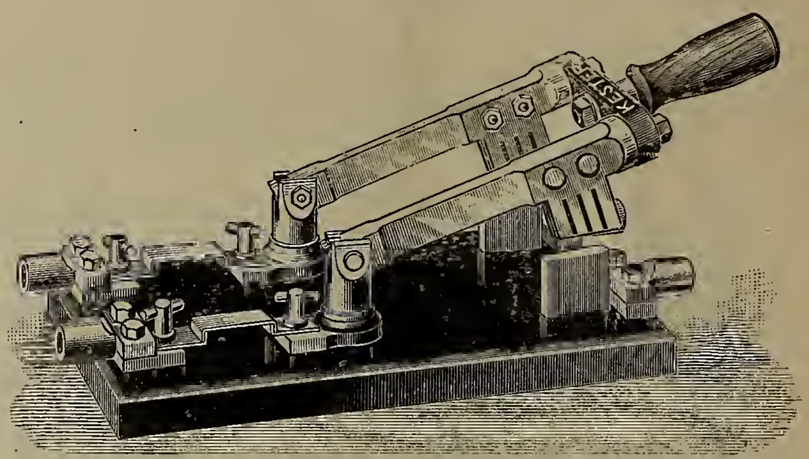
When the carbons are consumed, the lamp is automatically switched out of the circuit, which renders it perfectly suited for all purposes and avoids any waste of current, when the lamp is not burning. There are no springs, dash pots or friction-feeding mechanism used in the construction of these lamps, hence they are very simple in design, and for this reason are reliable in operation. Every part is interchangeable and any one can easily understand the operation of the lamp at a glance.

Any part of the feeding mechanism can be replaced or removed without removing the lamp from the circuit.

F. P. Little Electrical Construction and Supply Co., Buffalo, N. Y., is the sole owner and manufacturer of these lamps, which have already made an enviable reputation.

These lamps are made for all systems of lighting and are said to have the only perfect clutch feed that has ever been put in any lamp on the market. The clutch is one single piece of hard bronze metal, the tension of which is increased and decreased, differentially upon carbon roads. The operation of the lamp is said to be perfect.

The Little Company also manufactures the "Kester" knife switch, an illustration of which is given herewith. These switches are made in capacities from 35 to 1,000 amperes and are made in all styles. The switches of 200 amperes and up, are provided with non-arcing contact caps which make them especially valuable for handling heavy currents or high voltages, and are almost entirely indestructible. This is claimed to be the only perfect switch for high voltages now manufactured.



KESTER KNIFE SWITCH.

The company report that the demand for "Kester" arc lamps and station switches and its other specialties is so great that it has completed arrangements to increase its facilities, either by adding to its present plant, or removing to a more capacious factory building.

The demand for alternating arc lamps is constantly increasing, and the company finds no trouble in disposing of all it can manufacture

FAULTS INCIDENT TO THE PROTECTION OF LIGHTING AND POWER CIRCUITS.*

BY LUCIUS T. STANLEY AND WALTER E. HARRINGTON.

(*Continued from page* 117.)

These two methods may be described as :

First—The auxiliary break method.

Second—Electro-magnetic blow-out method.

Of these two methods probably the balance of efficiency is in a slight degree in favor of the first named, as in order to blow out an arc you must have first established it, and once it exists, no matter how slight the exhibit, it is a fault which is cumulative in almost geometrical ratio.

The efficiency of the first-named method is handicapped by the fact that the auxiliary "break" mechanism, commonly constructed with carbon contact plates and pencils, is fragile, easily and quickly destroyed by the action of "breaking" and, in the case of "breaking" on an abnormal current of great volume, such as would be occasioned by a heavy short circuit or ground, a quantity of insidious, vicious gas of high conductive power is evolved, which may not only cause damage upon the circuit in which it occurs, but may often play havoc with innocent neighboring circuits on a switchboard.

Then again, this auxiliary breaking circuit is not competent to carry its proportion of an abnormal current of any considerable volume, and the result is that, while there may be no positive arc at the main switch terminals, there is always, to a great or less degree, destructive heating effect at these terminals, which exhibits in a cumulative manner globules or teat-like projections of fused metal, which may gradually render the cut-out inoperative or, at least, impair its usefulness.

However, with all its faults, it has proved to be far in advance of the fuse cut-out as a protector to electric circuits, from the fact that *under favoring circumstances* it may be counted upon to perform a given service in a predetermined way, and there can be no doubt that the time is not for distant when this baby, now in its swaddling-clothes, will have been pushed forward to robust maturity, capable in every respect of performing its allotted service automatically and perfectly under any and all conditions of the circuit in which it may be placed.

A magnetic cut-out, which would exhibit a long stride toward ultimate perfection, would be a switch operated to open by the *direct action* of a magnet upon the switch bar in such a manner as to cause the current itself to drive the bridge away from the switch plates, thus insuring the quickest possible response to an abnormal current.

The break at the switch terminals should be protected by a by-path or shunt across the switch terminals, composed of a fuse wire of a carrying capacity sufficient to carry the current for a period of time ample to allow the switch bridge to reach a point of safety, and of a fusing capacity that will cause it to "blow" *instantly* when the switch bridge has thus reached a point of safety.

The magnetic circuit should be so arranged that the point of saturation would be beyond the capabilities of the flux incident to the opening of the switch upon the passage of a current at which it might be set and expected to open. Consequently, when abnormal currents in excess of that at which the switch was set to open, occurred, the result would be an acceleration of movement of the plunger up to the point of saturation, and the *time element* would thus be reduced to a minimum.

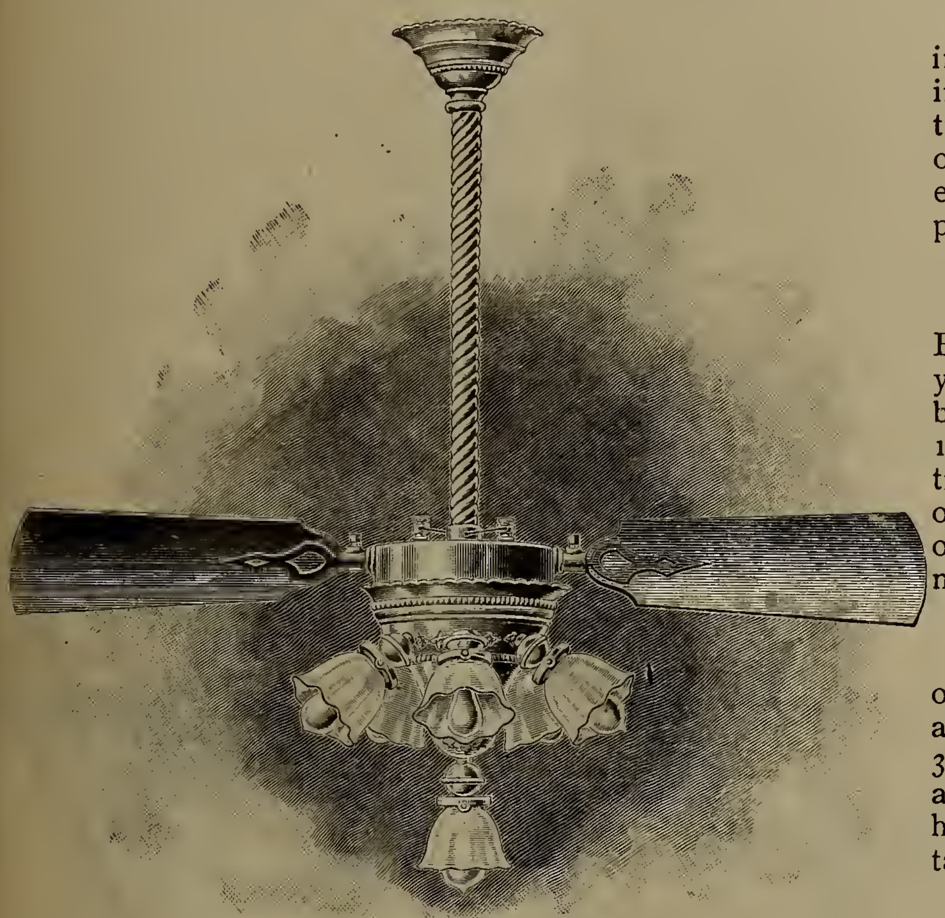
DIEHL ELECTROLIER FAN.

The accompanying illustration gives an excellent representation of an electrolier fan which Diehl & Co., 385 Broadway, New York City, propose to put upon the market the coming season.

The device is for attachment to the ceiling, and the motor which operates the fan is contained within the basket at the base of the suspended column.

Below the basket is a group of incandescent lamps with shades tastely arranged. The lamps may be burned independently of the motor.

This handsome piece of apparatus will no doubt find extensive use in hotels, houses, halls, etc. It is finished in the best possible manner, and the motor is an efficient one.



DIEHL ELECTOLIER FAN.

ELECTRICITY IN JAPAN.

BY S. KATOGI.

The readers of the Electrical Age no doubt will be interested in a general way to know what progress we, in this country, are making in the application of electricity for the use of our people. To give them an idea of what we are doing with electricity, or rather what electricity is doing for us, I will give a résumé of the progress made in this country during the year 1893.

TELEGRAPHY.

Land lines were extended about 25,500 miles, No. 8 B W. G. iron galvanized wire being used. During the year 260 knots of submarine cable were laid. The number of domestic telegrams handled during 1893 was 12,360,000, and the number to and from foreign countries aggregated 103,000. There are 650 main and branch offices in Japan, which compares very favorably with other countries larger in area and more advanced in modern civilization.

TELEPHONY.

At the end of 1893 there were four exchanges in Japan, one each in Tokyo, Yokohama, Osaka and Kobe. The aggregate number of subscribers in all four places was 3,837, and during the year there were 68,450 calls, an average of one every five minutes. Tokyo and Yokohama, and Osaka and Kobe are connected by long distance lines.

ELECTRIC LIGHTING.

There were fourteen electric light stations in Japan at the end of 1893, with five or six more in contemplation, the latter to have capacities ranging from 500 to 2,000 lights. The Tokyo Electric Light Company's plant has a capacity of 19,303 ten candle power lamps, while the capacity of the station in Osaka is 12,171 lights.

ELECTRIC POWER.

There are four mines in the country using electric light and power, the pumping and hoisting being done by electric motors. One power station is operated by water power, the power being transmitted by electricity to the points of application. This plant belongs to the city of Kyoto. In Tokyo two or three printing establishments use electric power supplied by the Tokyo Electric Light Co. The work is carried on at night only.

ELECTRIC RAILWAYS.

About one dozen applications were made for the building of electric street lines during the year, but only one of them obtained the desired permission. This was in Kyoto City. Up to the time of the granting of the right, there was no other street car line in that city. The main objection to electric car lines in Japanese cities comes from the telephone exchange managers.

The existing telephone system employs single wire circuits, there being no metallic circuits. The heavy return currents of electric railways interfere too much with the operation of the telephone, sufficiently to prove an hitherto insurmountable barrier to electric railway enterprise. There are horse car lines in Tokyo City, but this modern convenience does not exist in Yokohama, Kobe, Osaka and Kyoto.

ELECTRIC METALLURGY.

Two electric copper refining factories have been established in Tokyo City, also two or three electrotyping establishments. Two copper refineries were erected at Osaka during the year 1893.

ELECTRICAL MANUFACTURING.

Four reliable electrical manufacturing establishments have been established in Tokyo City. One of them belongs to the government, telephone and telegraph apparatus being made at this factory. Besides those above named, there are numerous other small works in Tokyo City, and in Osaka there are two or three small electrical factories.

ELECTRICAL JOURNALISM.

Japan has three electrical journals, each of which has a large circulation. The *Journal of the Electrical Association*, Tokyo, and the *Journal of Electrical Telegraphy*, Tokyo, have a private circulation, while the *Electrical Friend*, a monthly paper, published in Tokyo, by Mr. S. Katogi, has a public circulation throughout the country. The *Electrical Friend* is a wide-awake journal, and keeps its readers informed on general electrical subjects and inventions made throughout the world. It is of course printed in Japanese characters.

Considerable progress is contemplated during the present year, and we think that at the end of that period comparisons will show that we have made great advances in the use of electricity in all its branches.

THE ELECTRIC LIGHTING OF THE WORLD'S FAIR.

A lecture on the above subject was delivered at Columbia College on March 15, before the New York Electrical Society. The hall was crowded to a degree, and the audience was most appreciative. The lecturer of the evening was Mr. T. C. Martin, who stated that he had had the active co-operation and assistance of Mr. Luther Stieringer, the consulting electrical engineer of the Fair, with whom he had been collecting illustrative material for some time, especially with the object of illustrating night effects with electrical illumination. They had collected such photographs, etc., on all sides, some of the most successful being those of Mr. Oscar H. Baldwin, who had charge of the fine Westinghouse exhibit at the Fair, and who had used non-halation plates. The lecture was illustrated by about 100 slides, of which a large number were of night effects and scenery.

Mr. Martin recapitulated the main statistics of the magnitude of the Fair and its lighting, and contrasted them with those of New Orleans, Paris, and other exhibitions. He described and depicted the boiler plant, power plant, subways, etc., and then took up the various buildings, paying special attention to Electricity with its Tower of Light, and Scenic Theatre.

The Stieringer electric fountains and the other electrical features of the Fair were next considered in an entertaining manner, and judging from the frequent applause the lecture was deeply appreciated.

Personal.—Mr. Edward M. Smiles, formerly of the Edison Mfg. Co., New York, has gone to Buffalo, to take charge of the interests of the North American Phonograph Co. for Western New York and Canada.

HAMMOND CLEATS AND INSULATORS.

We illustrate herewith some of the goods manufactured by the Hammond Cleat and Insulator Company, 15 Custom House street, Boston, which were very advantageously exhibited at the Washington convention.

Figure 1 shows the Hammond two-wire cleat, which is made in one piece of the finest grade glazed porcelain, and furnishes the quickest and easiest method of wiring. It holds the wires firmly without injuring the

FIG. 1.

insulation, and as the wire binds on the insulator and not on the retaining points, all breaks are avoided. Short screws are used in holding the cleat in place. Nails with washers can be used instead of screws at an actual saving in labor and cost. The company supplies leather washers for this purpose.

Figure 2 represents the Hammond Company's Fused Rosette. The rosette and fuse are in one piece with solid back, making it fire and water-proof. It can be used for moulded or cleated work, and there is no possibility of a loose contact. The fuses are attached to an interchangeable slide independent of all the other connections.

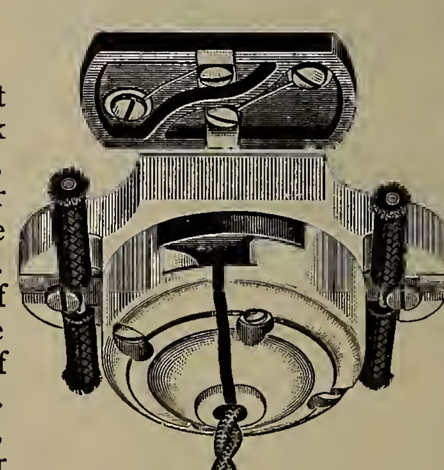


FIG. 2.

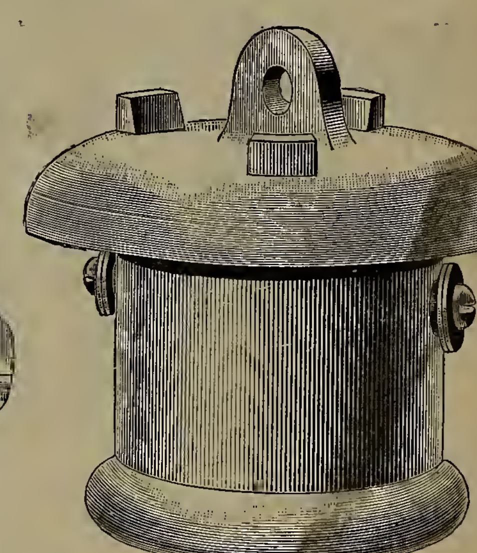


FIG. 3.

The water-proof socket made by this company is shown in Figure 3. This device is made of glazed porcelain in one piece, and insures perfect electrical connections under all conditions, no cement being required; no short circuiting is possible. This socket is adaptable to any of the standard systems.

Referring to the use of leather washers in putting up cleats and insulators, it may be noted that in one instance a customer saved a large amount on a contract by the use of these simple devices. The company has just got out a new catalogue, which fully illustrates and describes all its goods.

It is reported from Chicago that the female operators in the Telephone Exchange in that city have been ordered not to wear dresses with trains, because they raise dust from the floor. The dust, it is said, lodges in the delicate mechanism of the telephones.

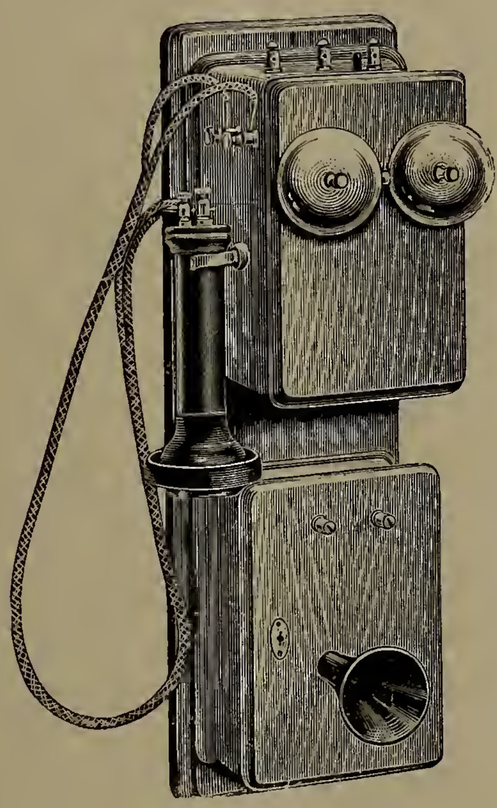
TELEPHONE OUTFITS.

The accompanying illustration shows telephone outfit No. 3, made by the Manhattan Electrical Supply Co., No. 32 Cortlandt street, New York city, which is meeting with a large sale and giving satisfaction in practical operation.

Under favorable circumstances these instruments work well on lines of 100 miles or more, although they are not recommended for such long distances. On lines 10 miles long or under, they work very satisfactorily and are said to be unsurpassed by any other magnetic telephone in the market.

The mouth-piece is mounted on the door of the transmitter, and the magnets of this instrument are so arranged that the vibrations of the diaphragm are amplified, and the speaker's voice is reproduced at the distant end in very clear tones.

The outfit is provided with a magneto call, and a receiver of the standard form. The case of the receiver is made of hard rubber, and is not easily broken.



TELEPHONE OUTFIT NO. 3.

In some of the outfits manufactured by this company, an automatic switch of the company's patent is provided. By the operation of this switch the telephone receiver is cut out of the circuit when it is not being used and is hanging up on the hook, and the act of removing it from the hook cuts it into circuit.

These telephone outfits are made in a thoroughly first-class manner, and are giving the best of satisfaction to those using them.

The telephone instruments furnished by the Manhattan Company are suitable for exchanges, and the company is prepared to give estimates on complete exchange installations.

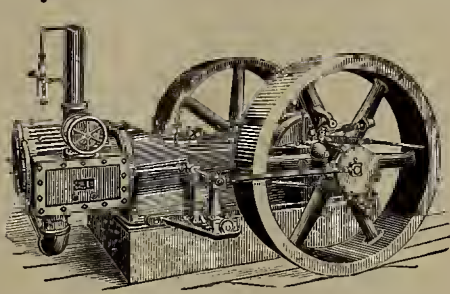
The company manufactures and carries a large line of general electrical supplies and has a reputation through the excellent workmanship and reliability of its goods.

ELECTRIC LIGHTING STATISTICS.

The National Statistical Association, Washington, D. C., of which Mr. Allen R. Foote is vice-president and manager, is sending to every central station manager a blank to be filled out by such officer, giving various data concerning the business of the company so reporting. This data will be properly recorded and tabulated and preserved for, and furnished to the clients of the company for their information and use. The business of collecting data of this character is so extensive that the association, with its large and unequalled facilities, claims that it can do this work for the benefit of its clients at much less cost to the clients than any one individually could do. Besides it frees station managers from the incidental annoyances in connection with the work of collecting such statistics. No doubt the work of the National Statistical Association will meet with hearty favor by electric light and power managers, since the latter have frequent use for data of this character. The subject of street lighting prices is one that concerns every electric light station manager, and the collection of these statistics will be of extreme value to those directly interested.

BALL ENGINE CO., OF ERIE, PA.

F. Schmerber and J. S. DuVall, managers of the New York office of the Ball Engine Co., of Erie, Pa., are nicely settled in their new quarters at 30 Cortlandt street, New York city. This office was formerly occupied by the Babcock & Wilcox Boiler Co. Messrs. Schmerber & DuVall have fitted the place up in a first-class manner, and neat carpets cover the floor. The two members of the firm are well pleased with the outlook for business and feel sanguine of their success in giving Ball engines an extraordinary boom in this section of the country.



CROSS-COMPOUND BALL ENGINE.

These two gentlemen are excellently qualified to carry on this important business. Mr. Schmerber is an experienced engineer and contractor and is thoroughly familiar with the mechanical part of the business in every detail. Mr. DuVall manages the office business. The firm undertakes the installation of steam plants, prepares designs, etc., making electric light work a specialty. Both gentlemen are well and favorably known in the electrical trade, and no doubt they will meet with considerable success, if energy and honesty will bring it.

The Pacific Postal Telegraph Cable Company is making preparations to extend its wires through Colorado and Southern California to San Francisco. The distance to be covered is 1,200 miles, and the proposed extension will cost $400,000.

The Chicago City Council has passed ordinances giving the Chicago City Railway Company permission to lay a double track railroad to be operated by horse or the overhead trolley system on Sixth-third street, from Cottage Grove avenue to State street. Other ordinances were also passed for like lines on part of Wallace street, and a cable conduit on Twenty-first street, between State street and Wabash avenue. The company was given permission to use overhead wires on lines on various other streets in the city.

A fly-wheel of one of the engines of the electric light central station at Scranton, Mass., burst a few days ago, and did damage to the station to the amount of $1,000.

STREET RAILWAY NEWS.

NEW POWER HOUSE IN NEW HAVEN.

The new power-house of the New Haven Street Railway Company, at the corner of Ferry and River streets, New Haven, Conn., is about completed. The new house with its equipment has cost about $150,000, the machinery being of the latest and most improved type. It is the largest plant of the kind in the State, and is regarded by experts as a model. The building is 80 feet on River street, 250 feet on Ferry street, and is built of brick. The car-house is located on the first floor. It is 80 by 100 feet, and has a capacity for 30 cars. The remainder of the floor is to be used as a repair shop and boiler room. The boiler plant consists of two Scotch boilers, built by the Bigelow Boiler Works of New Haven, and each has a capacity of 250 horse power.

The generating plant is on the second floor; the engine, which was built by the California Engineering Company of Chicago, being of 500 horse power. It is of the compound type and the fly-wheel weighs 14 tons, its diameter being 14 feet, with a face of 42 inches.

There are two Thomson-Houston multipolar generators of 300 horse power each. The power is transmitted to the generators by cotton rope, one and one-eighth inches in diameter and 1,900 feet long. An auxiliary pulley is used for the purpose of regulating the tension of the ropes.

The switchboards, of which there are two, are 10 feet high and constructed of slate. The engine room is 80 feet square.

Electric Railroads in Maine.—There are nine street railroads in Maine, with an aggregate mileage of 76.14. Total earnings of these street railways for 1893, $416,222. Number of passengers carried, 7,600,062. Total expenses for operation, $318,867. The Portland street road being the largest, its expenses were $170,000. The Fryeburg being the smallest, the operating expenses were $355.

The Fairhaven & Westville Railroad Company of New Haven, Conn., has closed a contract with the Westinghouse Electric and Manufacturing Company of Pittsburg, Pa., for an electric equipment for that line.

It is reported that Mr. A. L. Johnson, of the Johnson Steel Company, Cleveland, Ohio, has secured the control of the entire street car system of Allentown, Pa.

A strike occurred on the Steinway Street Railway, Long Island City, N. Y., March 15. The trouble was settled after a few hours' suspension of operations.

It is reported that the Nassau Electric Railroad Co., of Brooklyn, has made a contract with W. A. Boland, of Boston, to construct 100 miles of street railroad through Brooklyn and suburban towns. It is stated that T. R. Wilson, of New York, Tom L. Johnson and A. L. Johnson of Cleveland, and P. H. Flynn of Brooklyn, are interested in the new railroad.

The Northeast Electric Railway Co., of Kansas City, Mo., has gone into the hands of a receiver, Mr. Robert Gillham being appointed to that office. The action, it is said, was precipitated by the Westinghouse Electric & Mfg. Co., of Pittsburgh, demanding a payment of a large amount due on account of rolling stock.

A Good School.—*The Street Railway Employees Magazine*, which is published every month in Detroit, has an electrical department, in which the principles and practice of electric railroads are clearly described. This is an excellent feature, since street railway employees, as a rule, are not overburdened with such knowledge. The more they learn of these things the more valuable will they become to themselves and to their employers.

The Waco Electric Railway and Light Company, Waco, Texas, was placed in the hands of a receiver on February 27. The assets are said to be $300,000 and liabilties $200,000.

FINANCIAL.

The Edison Illuminating Co., of Palestine, Texas, has been placed in the hands of a receiver. Liabilities, $6,500, and assets, $15,000.

The Franklin Electric Co., of Passaic, N. J., has been sold out to satisfy a claim of $1,000 for rent. Its nominal capital is $5,000,000.

The Western Union Telegraph Co., on March 14, declared its usual quarterly dividend of 1¼ per cent. payable April 18. The financial statement for the quarter ending March 31 (March estimated), shows a decrease in the net revenue of $534,434, as compared with the same period in the previous year.

The annual meeting of the General Electric Co. will be held at Schenectady, N. Y., at noon, April 10, next.

OKONITE DESK CLOCK.

We have received from the Okonite Company, 13 Park Row, New York city, a very unique paper weight. It consists of a section of a five-sided prism of glass, on one face of which is a small clock. In the centre of the face of the clock is the well-known Okonite trade-mark, and on the circumference is printed the assurance "the best is always the cheapest." The face of the clock is 2½ inches in diameter. The Okonite Company is celebrated for its propensity for surprising the trade with novelties. Capt. Willard L. Candee, H. Durant Cheever and George T. Manson are full of enterprise, and it is due to their energy that the reputation of the company is so well established.

New Publications.—We have received a copy of the first issue of the *Electrical and Street Railway Reporter*. The appearance of this new publication, which has been heralded for some time past, has already met with considerable favor. It is the purpose of the publishers of the *Reporter* to give financial, industrial, statistical and electrical reports and an electrical directory. The paper is published monthly, and every six months a directory edition will be issued. The first number bears evidence of great pains in its make-up. It is well printed and has an extremely neat appearance. The policy of the paper, as indicated in the leading editorial, will be entirely independent, and the publishers will "endeavor to report matters just as they are, without fear or favor." Mr. Gilbert G. McDuff is the business manager, Newton Hall, assistant manager, and George F. Porter, secretary and treasurer.

Milo G. Kellogg of Hyde Park, Ill., has commenced suit for an accounting in the Superior Court, against the Western Electric Manufacturing Company and its successor, the Western Electric Company of Chicago. Kellogg claims to have invented a telephone switchboard, which he says the company now controls without compensation to him.

THE IMPORTANCE OF COMPLETE METALLIC CIRCUIT FOR ELECTRIC RAILWAYS.*

BY J. H. VAIL.

(*Continued from page* 118.)

For electrical purposes we cannot regard the joint plates and bolts as of any permanent value; the contact is electrically imperfect, the metal surfaces oxydized and under constant movement, due to passing cars pounding the rail joints.

The rail sections are in many systems of ample conductivity to carry more than the requisite current, provided they are perfectly bonded and properly connected by feeders with the dynamos.

We must, therefore, bond the rail joint in such a *mechanical* manner as to maintain perfect *electrical* contact, and with sufficient metal to restore at the joint nearly the full conductivity as of the rail itself; and at the same time to give the existing joint plates their present freedom of motion.

It has been found that a system of track with faulty rail bonds will give a shock to animals and, possibly, to human beings, should the same be brought into actual contact in such a manner as to complete through them the broken circuit.

It will be readily understood how difficult it is to maintain proper inspection of the electric bonding where the bonds are covered up by the street pavement.

Under such conditions the ground circuit and the bonding escapes inspection until excessive coal consumption, loss of current and other troubles force themselves upon the attention of the street railway management.

Observation proves that a faulty rail bond will show its location in winter by heating, due to high resistance, and if snow be present on the ground around the joints the snow is partially melted, thus indicating location of fault.

Having carefully analyzed the whole matter, I feel justified in recommending that we must adopt the complete metallic circuit as the standard for the best electric railway practice. This can best be obtained by the following method:

First. By so bonding the track as to render the *rail joints* of as low resistance and nearly equal conductivity to the rails, and to execute this work so as to maintain this improved condition; and

Second. The track system must be supplied with insulated feeders leading direct from the bus bars in the station to predetermined points of the track system, and thus offer a perfect low resistance path for this side of the electric circuit, the same as is obtained with the trolley line and the overhead system. All of these features and improved methods have been put in practice by the writer.

The only proper system is one that affords a well insulated and complete metallic circuit of low resistance, that will give an ample path for the complete unrestricted circulation of the entire current from pole to pole of the dynamo, thus offering no inducement for the current to follow such conductors as gas or water pipes, but, as it were, actually robbing the earth of any desire to carry the current.

I am not recommending extravagant methods, but only such as are deemed essential for economy, and of a practical nature for reducing expenses and augmenting dividends. The item of cost cannot properly be urged as an objection, because where the whole construction requires a large investment, *every detail* of the work should be so executed as to be *permanent* and *enduring*. If the details are carefully analyzed it will be found that the cost of frequent reconstruction, maintenance and renewals of rail bonds and bare wire amount to an excessive rate of interest on original investment, and would soon pay the small additional cost to build a complete metallic circuit. The superior service obtained from a complete metallic system of low resistance with the proper application of insulated track feeders will, within a brief period, more than refund a reasonable interest on the investment through the saving of fuel alone, not counting other economies in renewals and maintenance. The track feeder system will be far less costly than the double trolley system.

The writer has observed on some roads that large quantities of copper for return circuits have been placed at great expense, apparently without a proper conception of how to obtain the best results. Frequently a far less amount of copper, judiciously applied for improved distribution by the feeder system, would give superior equalization of pressure at reduced cost.

If for the movement of cars singly or in quantities at a high rate of speed the electric current is to be distributed uniformly over an electric railway system, the subject must be handled with as much scientific accuracy as is always used for a perfect system of incandescent lighting, in order to obtain equal distribution and free flow of current in both sides of the system.

The writer has fully and completely provided for all contingencies in the following manner:

First. By a careful study of the conditions under which a system will be operated; these important points being ascertained with reasonable accuracy, the requisite supply and distribution of current for the service is determined, and the system of conductors arranged to meet the requirements. For the proper supply of electric current, the important *underlying principles* of the feeder system must be *thoroughly* understood.

Second. The conductivity and current-carrying capacity of the track system is calculated, and a system of insulated track feeders is provided, leading from the switchboard in station and connecting at predetermined points, and with a calculated fall of potential.

Each feeder must be determined for its maximum current requirements at a stated drop in potential. The actual work required of the feeder and number of track feeders necessary is determined upon such facts as:

The cars in service—their weight, speed and headway; the position of power station and the geographical lay of the railway system; the weight of rails, and whether double or single track, and the amount of load concentrated on sections of track between feeder junctions.

The carrying capacity or conductivity of the sum total of all the feeders of the system will be found to give complete and ample circuit for the free flow of the entire current required, and to take care of extra heavy traffic and blockades at any point.

The parallel track main is only applied in sections of systems extending over very large territories and long distances.

The conductivity of the rails is calculated with as much care as the overhead system, and when the track needs reinforcing, the purpose is accomplished by laying a thoroughly insulated main line (not a bare line) and making frequent sub feeder connections bonded to the track. If used at all this main will be of large size.

Such a system, accurately worked out, will show by actual test with instruments on the cars a surprising equality of electro-motive force throughout a large territory.

A very careful test has been made with instruments on moving cars, throughout a system covering forty miles of streets, with double tracks, equal to eighty miles single track. The readings showed—maximum volts, 512; minimum volts, 420. Average of electromotive force over entire system, 460 volts, the electromotive force in station, at bus bars, being 520 volts. The feeders were calculated for ten per cent. drop. The actual average drop from dynamo to motor does not exceed twelve per cent.

This will be found to result in *reduced* fuel consumption, *better* working of the motors, a most satisfactory *reduction* in repair accounts, and an improved *general economy* of the entire system.

In the system of distribution secured by the above method, the use of ground plates, rods or other insufficient methods is needless; the current travels only over the paths provided for it, and electrolysis of gas and water mains is entirely obviated.

NEW CORPORATIONS.

The Brooklyn Electric Light Company was incorporated at Eau Claire, Wis., on March 8, with Fitch Gilbert, president; R. E. Rust, vice-president; George T. Thomson, secretary and treasurer. They will own and operate a plant at Brookville, Ind.

The Berks & Dauphin Traction Company has been organized at Harrisburg, Pa., for the purpose of building a trolley line from Harrisburg to Philadelphia by way of Reading.

Falls Electric Light Company has been incorporated at Chagrin Falls, Ohio, with a capital stock of $10,000, for the purpose of lighting that town. The incorporators are citizens of the place.

The Virginia Senate has passed an act incorporating the Alexandria County Light, Water and Power Company, Alexandria, Va.

The Bellefontaine Light and Power Company, Bellefontaine, Ohio, has been incorporated with a capital stock of $25,000.

The William Publishing and Electric Company, Cleveland, Ohio, has been incorporated with a capital stock of $50,000.

The American Electric Battery Company, of Des Moines, Iowa, has been incorporated. Capital stock, $250,000. L. W. Goode is the secretary of the company.

Ideal Light and Power Company, at Chicago; capital stock, $10,000; incorporators, Will E McKee, James H. Garrett and John R. Morgan.

The Bessemer Light, Heat and Power Co., of Braddock, Pa., has just been organized.

The Central Missouri Telephone Co., of Clarksburg, Mo., has been incorporated with a capital of $50,000. Incorporators are: J. E., F. B,, and J. H. Lander.

The Electric Power Sites Co., in Buffalo, has been incorporated with a capital of $1,000. The directors are Henry E. Smith, H. C. Palmer, S. B. Simpkins and Wm. Vesey, Jr., Buffalo.

POSSIBLE CONTRACTS.

The Electric Railroad Company, Meriden, Conn., is trying to secure permission to double track a portion of its lines.

Efforts are being made in Cochran, Ga., to establish an electric light plant in that town.

The citizens of Brinkley, Arkansas, are making an effort to secure electric lights and water works.

The Rockville (Conn.) Electric Company proposes to put in a new steam plant.

The citizens of Kent Island, Md., are anxious to have an electric road.

Bellevue, Iowa, a few days ago had an election to decide whether electric lights and water works should be established there. Those with progressive ideas won the day and the victory was celebrated by the booming of cannon, torch-light processions and other exhibitions of delight. Even the ladies took part in the parade, and speech-making and fireworks helped to give vent to the joyous feelings of the citizens.

The Ironton (Ohio) Street Railway is to be changed to electricity, and there is talk about a railroad between New Boston and Hanging Rock, Ohio.

Negotiations are in progress to extend the electric railroad in Norristown to Ambler, Pa., and other points east in that vicinity.

The Commercial Telephone Company of St. Mary's, Ohio, has been granted a franchise. Incorporators of the company are: Guy Huffman, Sol Bamberger, T. E. Hollingsworth, A. F. Hursch, and A. C. Buckler.

The Dayton (Ohio) Electric Railway Company has purchased a large tract of land on which a central power house will be built.

The Kenosha (Wis.) City Council has granted a franchise for a street car line to F. M. Kringle.

The Hestonville, Mantua and Fairmount Passenger Railway Co., Philadelphia, will introduce the trolley system on its lines without delay. It will issue $750,000 bonds for the purpose.

The Street Railway Company of Springfield, Mass., will probably extend its lines in Chicopee Falls.

The Hartford & New Haven Horse Railroad Company has decided to change its motive power and generally overhaul the lines.

Mr. Elwood T. Hance, of Detroit, has secured a franchise from the township of Springwells, Mich., to run an electric railway from the city limits to the Dearborn line. The name of the new company to operate the line is the "City Suburban Traction Company."

The Suburban Traction Company of South Orange, N. J., has applied to the West Orange township committee for a franchise to extend its lines on certain avenues and streets in West Orange.

A Valuable Franchise.—The Cataract General Electric Company has, according to information from Albany, secured a franchise to use canal lands for the distribution of electrical power all over the State, and in consideration of this franchise the company will furnish power for the propulsion of canal boats at the rate of $20 per year per horse-power. It will also light all the locks and bridges and furnish power for the operation of the locks. This contract was made under the special act passed last year, authorizing that electrical experiments be made on the canal. There seems to be more dissatisfaction in some quarters at the giving of this franchise. A bill had been introduced in the Senate at Albany to repeal the act under which the franchise was given, and it is claimed that the friends of the Cataract Company used every endeavor to defer action on this bill in order that the contract might be made with the State before the law was repealed.

New Static Machine. — Mr. Charles Plumb, a manufacturing and electrical engineer, 89 Erie street, Buffalo, N. Y., has brought out an electro-static machine, which is said to be very efficient. It has been examined by several physicians, who were very favorably impressed with its action. Mr. Plumb calls his invention the Accumulating Influence Machine.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL AGE,
FIRST FLOOR, WORLD BUILDING,
NEW YORK, MARCH 17, 1894.

Mr. G. H. Stout, well known in the electrical trade, is now connected with the firm of A. B. McHenry & Co., 113 Walnut street, Philadelphia, and 1110 Havemeyer Building, New York city, general brokers in electrical and steam plants, etc. Mr. Stout is one of the pioneers in the electrical business, and organized the old firm of Stout, Meadowcroft & Co., of 25 Ann street, New York city, which firm carried on an electric light business, and made a big run of small lamps for decorative purposes. Mr. Stout is an electrical engineer of large experience and understands fully the details of the business in every branch.

The C. & C. Electric Co., manufacturer of dynamos and electric motors, has removed its general office to 143 Liberty street, New York city. The old establishment was at 402 & 404 Greenwich street.

Mr. Walter K. Freeman, well known among electrical people, has opened an office at 136 Liberty street, New York city, and will deal in electrical machinery and supplies.

Mr. Addison A. Cardwell, representative of the Berryman Feed Water Heater and Purifier, the Advance Water Heater and the Economic Boiler Tank and Feed Pump, has opened an office at 30 Cortlandt street, New York city. He is already doing pretty well with these popular heaters.

Van Derwerken, Rickerson & Brainerd have purchased the plant of the Mason Electric Co., at 8 and 10 Fifth avenue, Brooklyn, N. Y. They occupy the whole building, which comprises four floors above ground and a cellar. The salesroom is on the first floor. The firm has a prominent electrician in charge of its affairs.

Mr. James H. Mason, of primary battery fame, has opened an Electric Exchange at 943 Fulton street, Brooklyn, N. Y. Mr. Mason carries a line of electrical supplies, batteries, telephones, phonographs, and makes a specialty of phonographic entertainments.

Mr. Lewis O. Brewster has recently taken the agency for the Belknap Motor Co., Portland, Me. His office is at 136 Liberty street, Room 324.

Mr. F. DeRonde, the popular manager of the Standard Paint Co., 2 Liberty street, city, is in Boston this week closing up some big contracts.

Every one is asking for light on the new mica compound, about which there has been some talk lately.

Mr. Lansing Morse, the storage battery expert, has brought out a new battery. Mr. Morse says he can prove that all present storage batteries now in use are not constant, and will wear out in a short time. There is a big opportunity for capitalists to make money with Mr. Morse's new battery.

T. G. Ellsworth, general purchasing agent, 67 Reade street, is said to be placing excellent orders for telephones.

C. E. Chapin, resident buyer, 136 Liberty street, is taking orders for telephone outfits complete, transmitters and magnetos. He is manufacturers' agent for everything in the electric light, electric railway and electrical supply line.

Mr. J. C. Pierrez, of Hard Rubber fame, 63 Reade street, is taking big orders for telephone receiver cases. He is a "hard rubber" for bargains in his line.

Stanley & Patterson, 32 Frankfort street, general electrical supplies, are shipping telephones daily to all parts of the world.

W. A. Vail, resident agent for the La Roche Electrical Works, is placing a large number of estimates for alternating and direct current lighting plants, and is closing a good number of orders.

C. S. Van Nuis, 136 Liberty street, the "Ajax" of the Electrical Exchange, is switching off his old lightning arrester, and placing it on the market in an improved form.

W. T. H.

CHICAGO ELECTRIC WIRE.

The India Rubber Comb Company, 9 & 11 Mercer street, New York City, agents for the Chicago Electric Wire, has received a testimonial letter of which the following is a copy:

THE BRUSH ELECTRIC ILLUMINATING CO. OF NEW YORK.
New York, March 7, 1894.

The India Rubber Comb Co., 9 & 11 Mercer street,
New York City.

DEAR SIRS—In reply to your letter of recent date, inquiring as to our experience with the rubber insulated cable furnished by the Chicago Electric Wire Co., Wilmington, Del., we would say that we have been using the cable in our business since the fall of 1889, and it has given us entire satisfaction in every respect.

Yours truly,
BRUSH ELECTRIC ILLUMINATING CO.
By Wm. L Pomeroy, President.

The India Rubber Comb Company has sold to the Government thirty miles of seven-conductor submarine cable. This cable is now being put down at Willet's Point, N. Y., where it is to be used in the torpedo service.

Electrical and Street Railway Patents.

Issued March 16, 1894.

516,188. Electric Railway. Mark W. Dewey, Syracuse, N. Y., assignor to the Dewey Corporation, same place. Filed July 6, 1889. Renewed Apr. 28, 1890.

516,198. Automatic Heat-Regulating Apparatus. Chas. F. Goodhue, Boston, Mass. Filed May 11, 1893.

516,204. Magnetizing-Coil. John D. Ihlder, Yonkers, N. Y. Filed Nov. 18, 1892.

516,205. Cable-Hanger. Adolph E. Johnson, Wakefield, Mass. Filed July 6, 1893.

516,212. Electric Perforating Pen. Aaron D. Lewis, Canton, Mo. Filed July 15, 1893.

516,213. Alternating-Current Motor. Robert Lundell, Brooklyn, assignor of two-thirds to Edward H. Johnson, New York, N. Y. Filed July 30, 1892.

516,217. Rheostat. Herbert McNulta, Bloomington, Ill. Filed May 1, 1893.

516,239. Electrical Protection for Safes. Charles F. A. Sturts, San Francisco, Cal., assignor of one-half to William J. Schroth, same place. Filed Apr. 11, 1893.

516,240. Electrical Protection for Windows. Charles F. A. Sturts, San Francisco, Cal., assignor of one-half to William J. Schroth, same place. Filed Apr. 11, 1893.

516,253. Secondary Battery. Edwin R. Whitney, Manchester, N. H. Filed Feb. 4, 1893.

516,263. Electric Motor. Oliver F. Conklin, Dayton, Ohio, assignor to the Dayton Fan and Motor Company, same place. Filed Jan. 9, 1893.

516,266. Street-Car Fender. Thomas Davies, Toronto, Canada. Filed May 18, 1893.

516,298. Dynamo Electric Machine. Frank J. Crouch, Portland, assignor of two-thirds to C. P. Houston and W. L. Houston, Junction City, Oreg. Filed Feb. 27, 1893.

516,312. Process of Electric Metal-Working. Hermann Lemp, Lynn, and Walter S. Moody, Chelsea, Mass., assignors to the Thomson Electric Welding Company, of Maine. Original application filed Oct. 20, 1890. Divided and this application filed May 26, 1891.

516,336. Car-Lighting. Willard M Miner, Plainfield, N. J., assignor to the American Manufacturing and Engineering Company, New York, N. Y. Filed Nov. 7, 1893.

516,337. Method of and Apparatus for Forming Grids or Plates for Secondary Batteries. John M. Pendleton, New Brighton, N. Y. Filed Mar. 2, 1891.

516,341. Safety Device for Electrostatic Measuring-Instruments. William E. Ayrton and Thomas Mather, London, England. Filed Sept. 7, 1893. Patented in England, Sept. 24, 1892, No. 17,093.

516,374. Closed-Conduit Electric Railway. Frederick L. King, Chicago, Ill. Filed May 5, 1893.

516,379. Switch for Secondary Batteries. Hermann Müller, Nuremberg, Germany. Filed Dec. 27, 1892. Patented in Germany May 17, 1890. No. 59,323 and July 23, 1891, No. 62,229, and in England Feb. 4, 1891, No. 2,040, and Dec. 7, 1891, No. 21,369.

516,408. Safety Car-Fender. George Q. Seaman, Alexander Wilson, and William Jones, Brooklyn, N. Y. Filed July 14, 1893.

516,433. Telephone-Toll-Station Instrument. William T. Gentry, Atlanta, Ga. Filed Apr. 6, 1893.

516,447. Commutator for Electric Machines. Camillo Olivetti, Ivrea, Italy. Filed Apr. 29, 1893.

516,478. Electric Lock. John R. Donnelly, Fairfield, Me. Filed Mar. 30, 1893.

516,484. Regulating Socket for Incandescent Lamps. Morris D. Greengard, St. Louis, Mo. Filed May 18, 1893.

516,487. Electric-Current Regulator. Charles D. Haskins, Brooklyn, N. Y., assignor to the Western Electric Company, Chicago, Ill. Filed Apr. 1, 1889.

516,492. Electric-Trolley Device. Charles Knapp, St. Louis, Mo., assignor to Ashton G. Bean and Herbert O. Rockwell, same place. Filed Nov. 20, 1893.

16,495. System of Car Lighting, Heating, &c. Isaac N. Lewis, Fort Wadsworth, N. Y., assignor to the Lewis Electric Company, of New Jersey. Filed July 15, 1893.

516,496. Car-Lighting. Isaac N. Lewis, Fort Wadsworth, N. Y., assignor to the Lewis Electric Company, of New Jersey. Filed Sept. 6, 1893.

516,497. Self-Regulating Dynamo. Isaac N. Lewis, Fort Wadsworth, N. Y., assignor to the Lewis Electric Company, of New Jersey. Filed Sept. 6, 1893.

516,498. Electric Switch. Isaac N. Lewis, Fort Wadsworth, assignor to the Lewis Electric Company, New York, N. Y. Filed Oct. 12, 1893.

516 500. Electro-Mechanical Gong. Morris Martin, Malden, assignor of one-half to John C. Edwards, Boston, Mass. Filed Aug. 8, 1893.

516,503. Motor. Geo. H. A. Meyer, Hartford, Conn. Filed Aug. 19, 1891.

516,506. Interior Telephone System. Thos. McCoubray, New York, N. Y. Filed Dec. 4, 1893.

516,508. Electric Heater. Jeremiah O'Meara, New York, N. Y. Filed Dec. 22, 1892.

516,516. Electric Motor for Street Cars. Wm Baxter, Jr., Baltimore, Md. Filed Apr. 4, 1891. Renewed July 8, 1893.

516,524. Suspended Electric-Fan Motor. Julian F. Denison, New Haven, Conn., assignor to the Backus Mfg. Co., Newark, N. J. Filed Jan. 9, 1893.

516,552. Telegraph Apparatus. Josiah A. Parker, St. Louis, Mo., and Leland L. Summers, Chicago, Ill; said Summers assignor to said Parker. Filed Feb. 23, 1893.

516,553. Armature for Dynamo-Electric Machines or Motors. Wm. B. Sayers, Glenwood, Bearsden, Scotland. Filed Apr. 26, 1892.

516,565. Electric-Railway Supply System. James F. Cummings, Detroit, Mich., assignor of one-half to Eugene M. Engleman, Milwaukee, Wis. Filed Sept. 22, 1892.

516,574. Electric-Arc Lamp. Fred. L. McGahan, Indianapolis, Ind. Filed Jan. 2, 1892.

516,596. Electrical Railway Signal. Ira L Green, Kittanning, Pa., assignor of five-sixths to Geo. M. Fox, Wythington Reynolds, and Christopher C. Shadle, same place, and Marcus D. Wayman, Ford City, and James M. Patterson, Sharpsburg, Pa. Filed July 22, 1893.

516,598. Electrical Railway Signal. Ira L. Green, Kittanning, Pa., assignor of five-sixths to Geo. M. Fox, Wythington Reynolds, and Christopher C. Shadle, same place, and Marcus D. Wayman, Ford City, and James M. Patterson, Sharpsburg, Pa. Filed July 28, 1893.

516,626. Closed-Conduit Electric Railway. Edward H Brown, Salem, assignor to the Magnetic Electric Co., of West Virginia, Boston, Mass. Filed Apr. 22, 1893.

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Copy for advertisements or changes therein should be in our hands before the Saturday pr ceding publication day.

NEW YORK, MARCH 31, 1894.

CONTENTS.

BROMINE LAMPS.

Prof. Wm. A. Anthony, on March 21, read a paper before the American Institute of Electrical Engineers, entitled: "On the Effect of Heavy Gases in the Chamber of an Incandescent Lamp." The professor had made several tests to determine the effect of vapor of bromine in the bulb, and these tests led to the conclusion that "when bromine vapor was present in the chamber in proper quantity, the lamp as compared with a vacuum lamp could be run at a higher efficiency without blackening or increase of resistance, therefore without loss of candle-power, and with an increase in its *useful* life."

THE WESTINGHOUSE MOTOR EQUIPMENTS IN BOSTON.

An important announcement comes from Boston to the effect that the Westinghouse Electrical and Manufacturing Co. had secured a contract to deliver to the West End Railway Co. 200 or more electric motors for the equipment of new summer cars. The General Electric Co. has, for several years, held the eastern field against most all of its competitors, and the success of the Westinghouse Company in capturing this desirable contract is significant. It is stated that the West End Co. has, for the past month or more, been making a practical test of the Westinghouse motor, with the result above stated. The Westinghouse Company has also secured contracts for the equipment of several other roads in the Eastern states, and, it is reported, will be especially energetic in its efforts to secure more eastern business. The securing of the West End contract is certainly a great victory for the Pittsburg concern.

A TELEGRAPH PALACE.

We give in this issue an extensive description of the telegraph and electric light plants in the new building of the Postal Telegraph-Cable Company, in this city. This building, in every respect, represents the latest development in architecture and the other arts and sciences that combine to make a complete establishment of this character. The electric light installation is one of the most complete and substantial that can be found anywhere. It is planned on lines that have been developed by years of hard study, experience and cost, and there is not a detail in the construction that has not been given the same care and thought. This plant is an example of the perfection that has been attained in the art, and shows that when such an installation is properly planned and executed, by responsible parties, every element of danger is absolutely non-existent. Such plants are object lessons for the insurance underwriters. The telegraph plant is the most modern in the country. Many new features have been introduced with a view to facilitating the handling of the company's large and rapidly increasing business, and the completeness of the installation reflects great credit upon the enterprise and progress of the officials of this comparatively young concern. While the company as an organization is young, it is managed by men who have grown gray in the telegraph service. These men know just how to establish and operate a first-class telegraph company, and the Postal Company is a brilliant example of what push, experience and brains will do in conjunction with capital. The Postal Company's wires cover the greater portion of the area of the United States, and extensions are constantly being made to existing lines. A long line is now being built from a point in Western Colorado, to connect with a point in Southern California. This will give the company a through Southern route between the Atlantic and Pacific coasts, in addition to its Northern route over the Canadian Pacific road.

THE POSTAL TELEGRAPH-CABLE CO.'S NEW BUILDING.

The elegant building of the Postal Telegraph-Cable Co., on the northwest corner of Broadway and Murray street, New York, is receiving its final touches preparatory to its occupancy. The executive offices of the Company will be moved from the present quarters, No. 1 Broadway, to the new building on April 2, and on April 9 the main operating department will be opened for business. Everything in this department is practically ready now, but in order to make the change with the least possible friction, the opening has been deferred one week. This will give ample time to have everything in trim.

This building is a veritable telegraph palace, its completeness being unequalled by any similar establishment in the world. Everything that human ingenuity and skill could devise to facilitate prompt and reliable telegraph service has been adopted.

Everything in the minutest detail is modern and new, and much credit is due the officials of the company for the enterprise shown in the development and consummation of this vast undertaking.

The Postal building is 14 stories high, with a frontage on Broadway of over 70 feet, and a depth on Murray street of 156 feet. At the rear there is an L 30x50 feet.

The frame is of steel and the walls to the fifth story are of a fine quality of Indiana limestone; the upper stories being of gray brick, with terra-cotta trimmings to correspond.

The interior finish is in keeping with the handsome exterior, and no efforts have been spared to make all of the fittings and arrangements of the latest and most improved design.

The sub-basement is 12 feet deep, commodious, well lighted and artificially ventilated. Here are located the engine and dynamo rooms; the boiler-room is in the extension of the sub-basement, and is 14 feet deep. The heating apparatus and the two dynamo plants for lighting the building and furnishing current for the wires are of the latest improved designs and arranged with regard to convenience and the comfort of the men in charge. The basement is used for the supply department of the company and for storage-rooms, and is equipped with every facility for packing and handling material.

On the first, or ground floor, are the receiving and delivery departments of the company, and a number of booths and stands for business purposes.

POSTAL TELEGRAPH-CABLE CO.'S NEW BUILDING.

The second to the tenth and the fourteenth floors, inclusive, will be rented to private concerns for offices.

The eleventh floor is retained by the Company for its executive offices and for the executive offices of the Commercial Cable Co.

The general operating department occupies the entire twelfth floor. And here again the arrangements have been made with a view to attain the highest facilities for handling the business and to provide for the comfort of employes. The ceiling is 18 feet high, and the exposure on the east, south, west, and part of the north sides insures perfect light and ventilation.

The thirteenth floor accommodates the general clerical force, and also contains coat-rooms, lavatories, etc., for the operating and clerical departments.

The building is equipped with the most complete private dynamo plant in the United States, which furnishes current for the telegraph wires, electric lights and for swift running electric elevators of the latest design.

As a whole, the building is one of the best examples of modern architecture in the city, and in convenience of arrangement, excellence of construction and beauty of appearance is second to none.

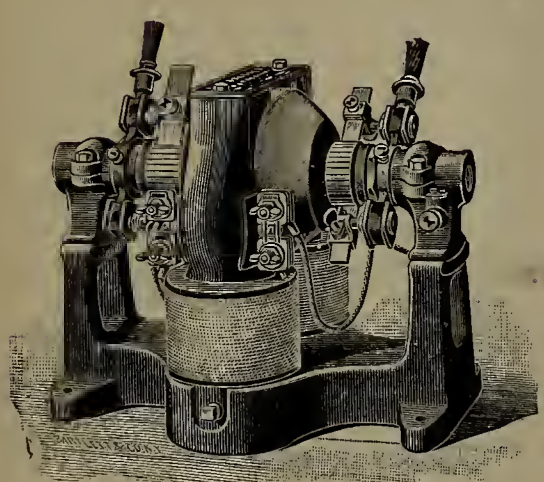
In the operating room there are 308 sittings for operators at the instrument tables, and each desk is so constructed as to provide a space for a typewriter. This arrangement avoids the necessity of using the ordinary typewriter table, which takes up so much room. The typewriter space is obtained by cutting out a square section of the table top and constructing a box like compartment, three or four inches deep, into which the typewriter is placed. The desks are made entirely of cherry, highly finished.

On each desk is a standard, supporting a box in which is placed the "sounder." This box is in the shape of a quarter of a cylinder, one of the plane sides being open for the admission of the sounder, and to allow the sound waves to issue. The box is revolvable, so as to permit of the opening being turned toward the receiving operator's ear. These devices, called "resonators," are modifications of similar ones used by the British telegraph service. At one end of each box a brass rack is provided into which the operator places the messages as they are received, to be collected by the attendant.

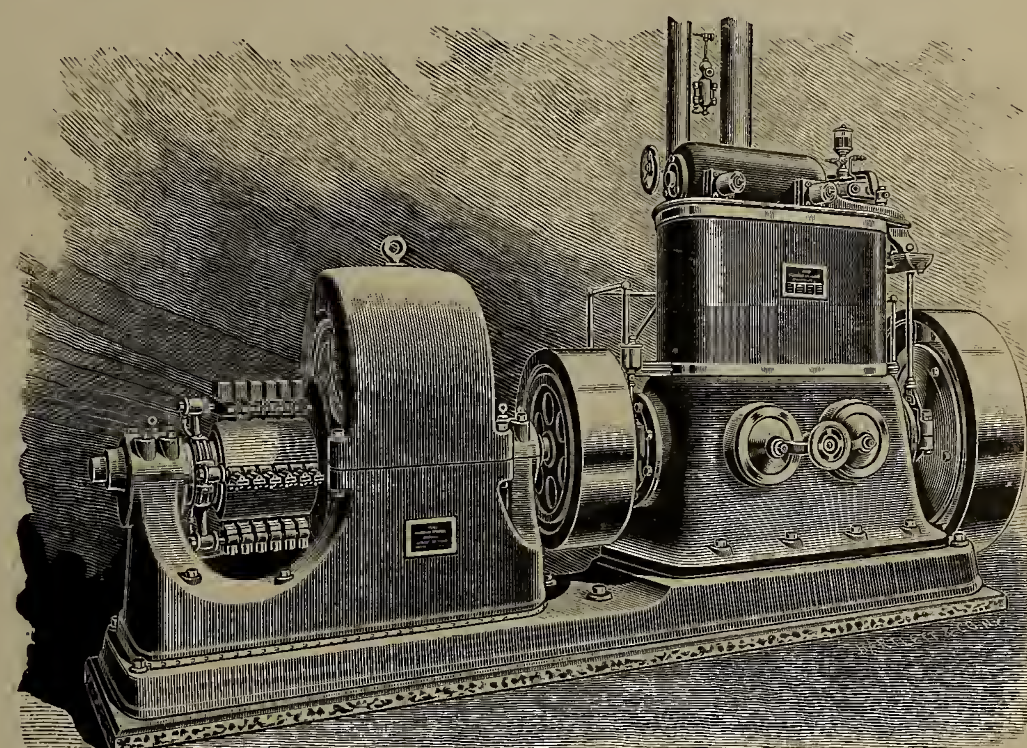
Heretofore it has been the general custom to make the instrument tables large enough to accommodate four, six or more sets, and divide the sections by means of glass partitions placed crosswise and lengthwise of the desk. In this new office this latter practice has been completely abandoned. No partitions whatever are provided, the officials arguing that they are not necessary, especially where the sounders are placed in a box and the sound confined except in the direction of the operator's ear. Doing away with the heretofore considered indispensable partition is an entirely new departure, and exemplifies the enterprise, and the desire of the company to avoid ruts, and do things in a common-sense manner.

The desks are provided with finest electric light standards with porcelain shades. To the standards are attached wire baskets in which the messages are placed, also cards for the purpose of designating the particular wires with which the instruments on the desk are connected.

The telegraph instruments are all entirely new and of the latest improved patterns. They were supplied by the Western Electric Co., and J. H. Bunnell & Co., of New York, and consist of "single wire" sets, a large number of quadruplexes, duplexes and repeaters.



CROCKER WHEELER MOTOR-DYNAMO.



WESTINGHOUSE DIRECT CONNECTED ENGINE AND DYNAMO.

On the top of each desk is provided a fireproof fuse box for the various main wires. These boxes were made by J. L. Hayes of Pittsburg, Pa., and are very neat in appearance. By the removal of the cover, which is easily done, a new fuse can be inserted on any wire very quickly.

The switchboard is an elegant specimen of workmanship and mechanical skill. There are eight sections in the main board, with space for two more, giving a present capacity for 400 wires. The loop switch, which is independent of the main wire switches, although an integral part of the system, has a capacity of 372 "legs." The switchboard is of marbleized slate with rubber bushings, and is thoroughly fireproof, several new features being introduced in the construction, with this object in view. The board being fireproof, and the wires being insulated with fireproof material, the possibility of damage by fire at this vital part of the vast system is infinitely remote. The switchboard was made by the Western Electric Company.

No batteries are used in this great establishment. Current is supplied by motor-dynamos made by the Crocker-Wheeler Electric Company of New York. There are ten of these machines, the motors being wound for 110-volt currents, while the dynamos are rated at different capacities according to the length of the circuits to be operated. The lowest potential is 40 volts and the highest 375, the intermediate potentials being 85, 130 and 200. There are two machines for each potential, one giving a negative and the other a positive current. Each machine is independent of all others.

The motor-dynamos receive their driving current from the electric light generators, which consist of three 100 H. P. 110-volt Westinghouse machines, directly connected to Westinghouse "Kodak" (upright) engines. These generators are located in the basement.

The item of wire in an establishment of this magnitude is a very large and important one. It is calculated that about 100 miles of wire were used in the building for the telegraph system alone. It is all of the Safety Insulated Wire & Cable Company's make, and was selected on account of the excellent reputation this company's goods bear for insulation and service. The wires are run in interior tubing supplied by the Interior Conduit & Insulation Company, and the New York Insulated Wire Company, the tubing of the latter company being of the well-known "Vulca" brand. The wires from the switchboard to the instruments are run under the surface of the floor through special iron gutters. These gutters or channels are closed on top with an iron cover, which are removable for the purpose of giving easy access to the wires.

In front of the switchboard are placed long double-deck tables for repeaters, and above the switchboard is located the distributing gallery. Here all messages are sent after being collected from the desks on the floor, and properly assorted for distribution to other parts of the room to be forwarded to their destination.

The messages are carried to and distributed from the gallery by means of a pneumatic tube system which ramifies throughout the room. This system is a great improvement on all other carrier systems, and has the very important additional advantages of being very substantial and free from all possibility of getting out of order.

When a message carrier is inserted in the end of a tube, the closing of the tube lid admits the compressed air behind the carrier, forcing it to the other end of the tube, where it drops out unobstructed into a basket. As the carrier emerges from the end of a tube it closes an electric circuit for an instant, which energizes an electro-magnet at the starting-point. This magnet releases the catch to the lid of the tube, and the lid drops by gravity, which, in doing so, closes the valve of the air supply pipe to prevent its escape.

There are 13 tubes diverging from the gallery to all parts of the room. At both ends of each tube there is an air supply pipe, which admits of sending a carrier in either direction,—from any of the outlets on the floor to the gallery, or vice versa There being 13 tubes there are necessarily 13 outlets in the room. The tubes are so distributed as to cover the entire area of the floor at regular intervals of space.

The electrical feature of the system is the invention of Mr. F. W. Jones, the company's electrical engineer, and it renders the pneumatic system to a large extent automatic. Without this electrical attachment the system would be quite impracticable in this service, which requires quick and reliable action. Under each tube outlet is provided a wire basket to catch the carries as they drop out.

Besides the 13 tubes about the room there are four similar ones which run to the city department on the ground floor. The pneumatic tube system is known as the Miles system.

Time is distributed throughout the room by a master clock and electric dials, on the Howard system.

In the basement is located the distributing board. This board is used to provide connections between the subway cables and the wires to the switchboard in the operating room. Six cables enter the room from the subways Three carry 78 conductors each, two 63 conductors and one 104, making a total of 464 wires. The distributing board is constructed of iron and slate, and is absolutely fireproof.

The building is provided with six Sprague electric elevators, two express and four general. They work with remarkable smoothness and are operated with great ease. The elevators were installed by the Sprague Electric Elevator Co., of 15 Wall street.

The steam and electric generating plant is on the Westinghouse system and was installed by Mr. E. W. Seymour, manager of the New York office of the Westinghouse Electrical and Manufacturing Company. There are three 75 K. W. generators of 125 volts, directly connected to 100 H. P. Westinghouse compound upright engines. These machines are used for lighting the building and the telegraph service. For power purposes, such as operating elevators, etc., there are two 120 K. W. dynamos of 240 volts each, driven by 160 H. P. engines of the same make.

The electric light plant is one of the finest to be found anywhere in the country. The switchboard is arranged to control the light, power, telegraph and Edison street circuits, each department having a section of the main board.

The board is made of Tennessee marble, which was supplied by the Penrhyn Slate Company, of New York city. The feature of the board is the back connections. All the feeders are bunched and the connections are of the most substantial kind. All feeders are lead-covered and run under the floor in iron ducts to the switchboard. The switchboard instruments are placed on the face of the board, all the connections being made in the back. There are two magnetic cut-outs for each dynamo, one for each pole, there being ten in all. Besides these there are two for the Edison street circuit, which system is to be used only in case of emergency. On the face of the board, besides the electrical instruments, are a steam gauge, a vacuum gauge and an Edson Recording Gauge.

The lighting of the building is done on 18 separate circuits, and the wiring is on the two-wire system. "Vulca" tubing is used throughout for the electric light work, thousands of feet of it being laid for this purpose. All of the instruments on the switchboard are of the Westinghouse Company's make, except the voltmeters and ammeters, which were supplied by the Weston Electrical Instrument Company, of Newark, N. J.

The building will be lighted by 3,500 incandescent and arc lamps, and the wire used throughout for the lighting, as for the telegraph service, is of the Safety Insulated Wire and Cable Company's make, about 130,000 feet of No. 14 wire alone being used for the lamp and other circuits, outside of the feeders.

The fixtures and electroliers were supplied by the Central Gas and Electric Fixture Company, 230 Canal street, New York city. Edison incandescent lamps will be used throughout the building. Mr. P. Lemaire was the contractor for the electric lighting and the work was superintended by Mr. E. Nielsen.

The Postal Telegraph-Cable Company was organized January 25, 1886. The officers of the company are A. B. Chandler, president and general manager; W. H. Baker and George S. Coe, vice-presidents; E C. Platt, treasurer; Theo. L. Cuyler, assistant treasurer; John O Stevens, secretary; C. P. Bruch, assistant secretary; George R. Williamson, auditor; Francis W. Jones, electrician.

The company's existing lines extend from Maine to

(*Continued on page* 154.)

"LET THERE BE LIGHT."

BY F. PLANTE.

Referring to the numerous accidents on the various railroads and the lamentable loss of life resulting therefrom, it is a fact that a very large proportion of these accidents are directly attributable to the indistinct view of signals or lights, owing to fog, haze or thick weather. From the first introduction of steam as a motive power but little improvement has ever been made in headlights or in the lanterns doing service as tail-end lights of passenger or freight trains.

Steamers navigating our coasts, rivers and harbors are now mostly provided with electric search lights, enabling them to thread their way with safety at night through intricate channels and pick out buoys and land-marks by which they lay their course in all conditions of the weather. Our streets, public buildings and stores generally are made brilliant with electric lamps. Railroads alone remain stationary in the now universal progress of illumination. Whilst I do not advocate the use of electricity for train lights, the blinding glare being an insurmountable objection, I maintain that the general principles of a search light can be adapted for steam and surface railroads.

The Scott Electrical Mfg. Co., 89 Liberty street, New

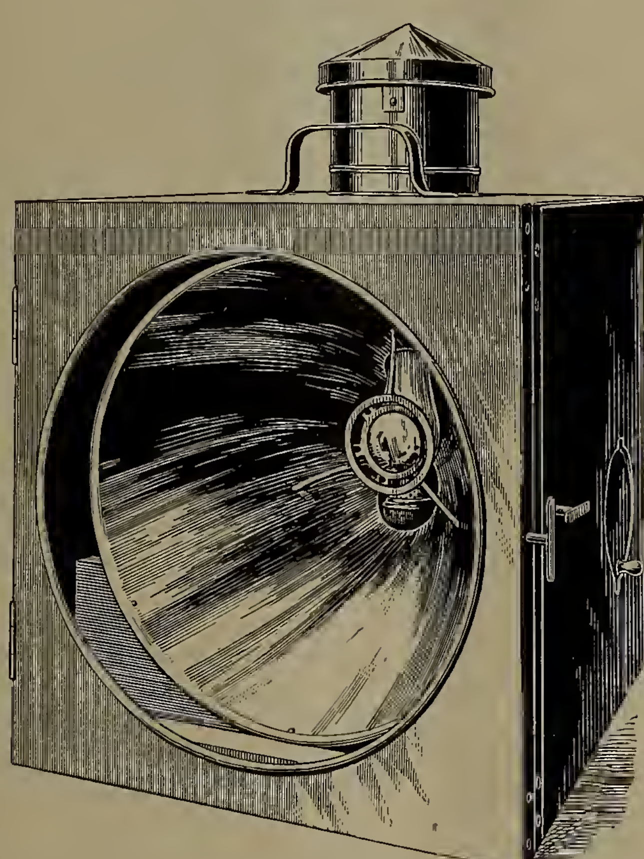


FIG. 1.

York city, have perfected such a lamp on the lines of their well known Huntington Search Light.

As will be seen from the illustrations, the apparatus consists of a parabolic reflector of peculiar construction and powerful condensing lenses in focus with an oil lamp. Fig. 1 shows the lantern complete. Fig. 2 shows the reflector and lenses and lamp securely mounted on a sliding base fitting the outside case.

From tests made on the Central Railroad of New Jersey and on the Delaware, Lackawanna and Western Railroad, the beam thrown by this lamp was clear and distinct and of great penetrating power through fog and haze, and it is the possession of this qualification that makes it of such value to railroads, trolley lines and cable cars.

The lamp is made in various sizes from the 7" reflector for surface roads to the 16" locomotive headlight.

DEVELOPMENT OF SWITCHBOARDS FOR MODERN CENTRAL STATIONS.*

BY A. B. HERRICK.

In the designing of central stations a great deal of attention has been given by electrical engineers to the subject of switchboards. Too much attention cannot be well directed to this branch, both in regard to the concentration and the consequent reduction in the space which it occupies, which leads to reduction in first cost. Care also has to be given in combining and placing the apparatus in such a way that the cost of attendance will be as small as possible, besides always having in view methods to give the greatest flexibility possible to the system.

In regard to the location of the board, the universal modern practice, both abroad and at home, is to place the switchboard in a gallery or in some elevated position, where the attendant has full observation of the operation of the different units under his charge, and can judge, in the case of any peculiar behavior of the generators, the proper remedy to be applied, and be prepared to take the unit off the circuit if necessary.

There is another marked general tendency in switch-

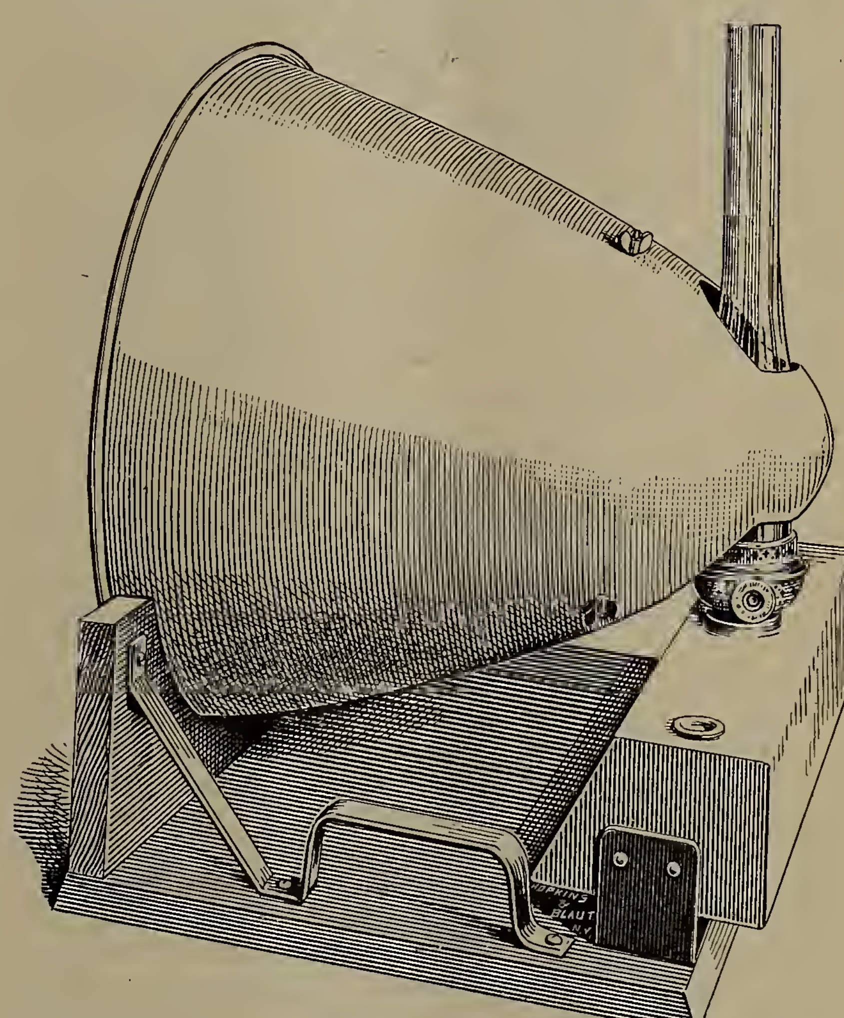


FIG. 2.

board construction, that is, to make the whole structure absolutely fireproof. There is no reason why a central station should contain any combustive material other than the necessary waste and oil.

In the case of low equal potential distributing systems, especially in the three wire feeder and main system, the switchboard arrangements bear a very important relation to the satisfactory operation of the system. The advance in this line has been so marked in the last few years, that it will repay us to review the past history of the low potential systems of distribution in a few words, and to seek clearly the causes that have made it necessary to introduce the modern novel methods to in-

*Abstract of paper read at the National Electric Light Association Convention, Washington, D. C., February 27 and 28 and March 1, 1894.

crease the economy of operation in production and an effective distribution of the current.

In order to distribute the current at a high economy by means of the feeder and main system, it is necessary to place the station at the average centre of distribution.

Different methods have been adopted in the past in order that the station may deliver its currents to the mains at an equal potential; in other words, artificial means have to be used to bring the varying centre of distribution to the station.

The first means resorted to was to introduce into various feeders an artificial adjustable resistance, to compensate for the unequal losses occurring in the feeders. This method has become obsolete in good practice. The immediate remedy was to put in more copper in the form of new feeders and larger mains, but as the low potential systems have been expanding over large areas to include a greater number of customers, it has again become necessary to deliver current at the station ends of these feeders at different potentials to compensate for the unequal loading of the system.

When the units in the station were small, they could be divided up on the different busses with comparatively high economy, but, as central station business has expanded, units had to be adopted both for economy and first cost per kilowatt, higher economy in current production, and to obtain a larger kilowatt output per square foot floor space. With the introduction of these large units two conditions confront the engineer; one, it was necessary to run the unit at nearly the maximum output, in order to get the maximum efficiency of the generators and engines combined; and the other, to deliver this current at two or more potentials to different groups of feeders.

Several different methods are now used to effect a higher economy in the delivery of the current to the busses. Mr. Barstow, General Manager of the Brooklyn Illuminating Company, has devised the well-known "booster" system. This method works out very well where three potentials are required. The medium potential bus in this case is fed by the units operating the station; the current is delivered from the medium bus to the high potential bus through the armature of a dynamo whose field is separately excited. The current in passing through this armature has its initial potential exalted, and the amount of this increased potential is controlled by a field regulator. The currents supplying the bus of lower potential than the medium bus also flows through an armature, but in this case the armature is rotated as a motor and has its initial potential reduced. In the three wire system, two "boosters" are required for each potential, and it is the usual practice to couple these boosters together, making one continuous line of shafting, to which is also coupled a motor for the purpose of keeping the boosters up to full speed and making good the losses due to transformation and unequal loading of the high and low busses. The losses inherent in the booster systems are those occurring from friction, armature losses, and field excitation.

A method has been devised by which to obviate some of these losses. A dynamo can be used to produce on a single armature two or more potentials.

After having thus reviewed the methods of producing different potentials in the station we come to the modern switchboard, which has required very careful thought on the part of the engineer to make both simple and easy. Following the natural operation of the switchboard, provisions made to take care of the field circuits are the first requiring our attention.

In the introduction of the modern multipolar machine, great attention was necessary in the field circuit arrangement; and the proper method of exciting dynamos is still an open topic. Two methods are commonly used, each having its own peculiar advantages and specially applicable to different systems—the Self-exciting, Bus-exciting. The advantages and disadvantages of these methods are as follows:

In self-exciting method the field terminals are connected to the brushes. The advantage of this is, that the field gradually dies away as the dynamo slows down, and when the dynamo has stopped the field has entirely disappeared. The danger of a sudden discharge of the field, which would submit the field winding to a strain, on account of the high potential induced, or breaking down the armature is thus avoided. The disadvantages of this method are, 1st:—the slowness with which the dynamo builds up its own field, as the dynamo frequently runs at full speed for some time before it developes sufficient electro-motive force to be connected to the system; 2d.—the possibility that the field may build up reversed. This may be caused by the sudden discharge of the field by a short circuit, or even by proximity to another dynamo.

In the bus-exciting method the fields are connected to the station mains or busses. The advantage of this method is, that the field is instantly made and the dynamo can be connected into the system as soon as it is up to speed. The polarity of the field is always the same and cannot be reversed. In bus-exciting of large multipolar dynamos the taking of the field off the bus introduces into a system of low potential a high potential discharge, which submits the field insulation to a strain which can be avoided in several ways. One method is by having a special switch, which, before severing the fields from the bus, connects the fields in such a way that it is divided into two halves, the electromotive forces of discharge are opposed against each other and consequently die away without having any effect. The disadvantages of the bus-exciting method are, 1st.—that in case the system is short circuited sufficient potential cannot be generated to burn out the short circuit; 2d.—if the dynamo is operated on a different bus from which it is excited full output of the machine cannot be obtained in case the exciting potential is lower than its working potential.

AMERICAN STREET RAILWAY ASSOCIATION.

The next meeting of the American Street Railway Association will be held in Atlanta, Ga., on October 17, 18 and 19 next. The programme includes reports on the following named subjects:

"Can the T Rail be Satisfactorily Used on Paved Streets?"

"Suburban Electric Railways."

"Mail, Express and Freight Service on Street Railway Cars."

"A Standard Form for Street Railway Accounts." By H. I. Bettis, Atlanta.

"The Best Method of Treating Accidents and Complaints."

"Street Car Wheels and Axles."

"The T Rail Construction of the Terre Haute Street Railway Company." By M. F. Burke, Superintendent.

"Street Railway Mutual Fire Insurance." By Louis Perrine and the Secretary.

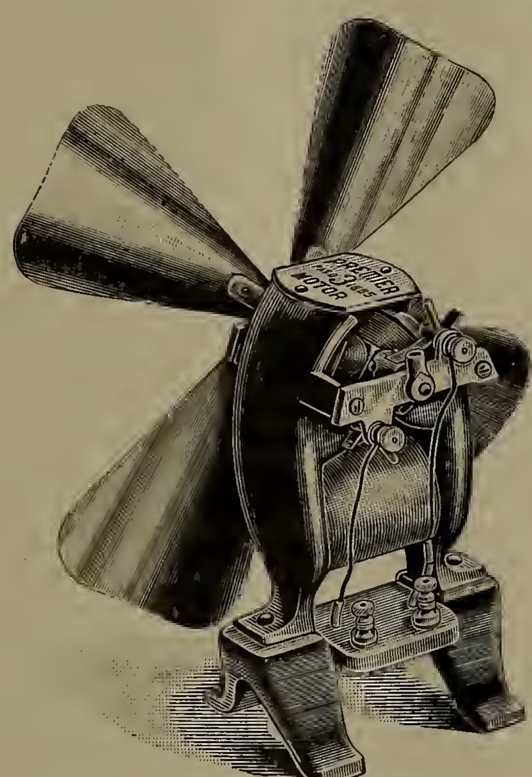
A discussion will take place on "Transfers and Commutation," to be opened by C. K. Durbin, of the Denver Tramway Company, Denver, Col.

The convention headquarters will be at the Aragon Hotel, and Machinery Hall, at the Exposition grounds, will be available for exhibits.

NEW FAN MOTOR.

The accompanying illustration represents a new ten-inch fan motor, manufactured by M. R. Rodrigues, 17 & 19 Whipple st., Brooklyn. The fan is balanced and weighs only two and one-half ounces. Four to six cells of improved Premier Demott blue-stone battery will operate the fan at a good speed, on one charge, for over 250 hours.

Mr. Rodrigues has a successful method for the prevention of copper deposit on the porous cup, and shows at his factory six cells that have been in use over two months, charging two storage cells. The cups are as clean as they were when first set up. The batteries have been tested, and it is said that no difference in output is noticeable. Indeed it is claimed that they are in better condition than at first. Other tests have proved the efficacy of this method of preventing copper deposit.



NEW FAN MOTOR.

Three cells of Premier have been running a No. 3 motor, with an 8-inch fan, over 300 hours, but Mr. Rodrigues is content to guarantee the cells for 200 hours.

ROBERTSON-THOMPSON INDICATOR.

Probably there is no more important piece of apparatus used in connection with a steam plant than the engine indicator. It is of the utmost importance to the engineers of such plants to know the efficiency of the engine, and it is equally important to have an indicator that will make a reliable record of the same.

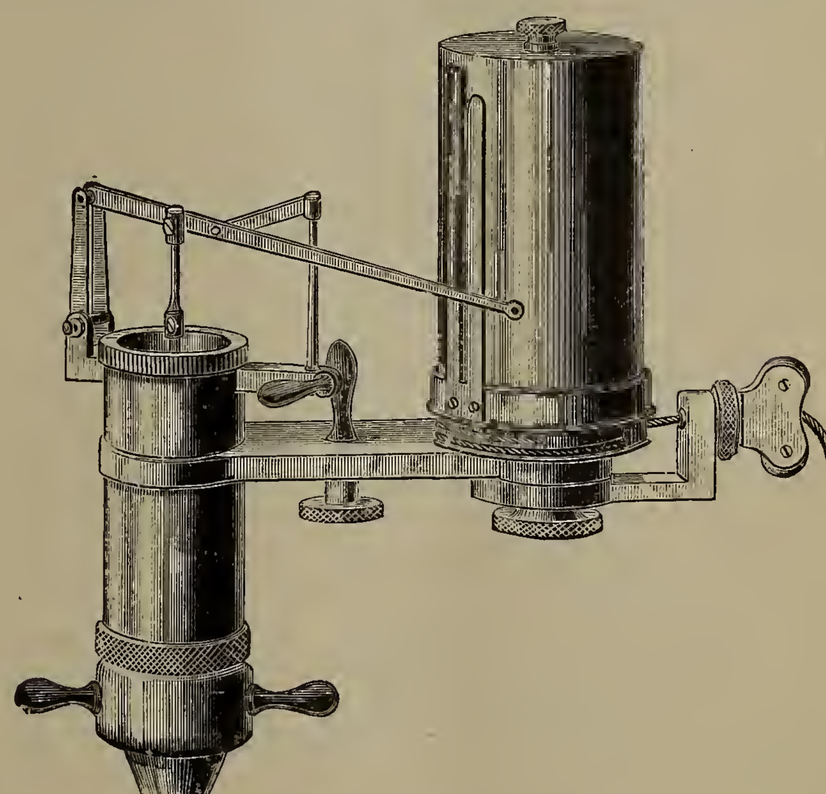
The indicator illustrated herewith is a standard-size instrument with piston one-half inch in area. It is constructed in the best manner and of the best material, and is guaranteed by the makers to be as accurate as any similar instrument on the market.

The parallel motion is said to be the most accurate made and is secured by a controlling lever attached to the pencil arm, governing it directly. The pivots are free from any appreciable lost motion, and will, with ordinary usage, remain so indefinitely, and should any eventually appear, the accuracy is affected only to an extent equal to it.

It will be noticed that the two links are parallel with each other at all points of the stroke, and that the ower pivots of these links are always in a straight line with the pencil point. By substituting the controlling lever for the imaginary link, it forms an exact pantograph, without depending on the piston rod for a guide. A point of great importance in this instrument is the movement of the pencil, which coincides with that of the piston at all times.

The piston rod is made of hollow steel, and the swivel rod attached thereto permits of the adjustment of the pencil to any height on the drum. The drum is one and three-fourths of an inch in diameter, and is as light as consistent with ordinary use. The spring can be adjusted for any speed by quarter revolutions.

The cord can be led in every possible direction by use of the guide pulley, shown in the illustration. The instrument can be readily changed from right hand to left hand, and is perfectly adjusted to any high speed engine.



ROBERTSON-THOMPSON INDICATOR.

This instrument is said to be giving universal satisfaction. It is handled by Hine & Robertson Company, 68 Cortland street, New York city.

LEGAL.

The Circuit Court of the United States, for the district of Massachusetts, on March 13, 1894, rendered a decision in the case of Charles W. Holtzer vs. the Consolidated Electrical Manufacturing Company, et al., in favor of the plaintiff. This suit was brought against the defendant for infringement of the patent on the Holtzer cylinder battery. The infringement was on the manufacture of the carbon cylinder in one piece.

A suit involving $5,000,000 has been filed in the United States Court at Toledo, Ohio, by the American Electric Co, of Toledo, against the Central Union Telephone Co., the Bell Telephone Co., and the Western Electric Co., of Chicago, for appropriating a multiplex switchboard invented by Mr. Carney of Toledo, who used to be in the Bell Company's employ, but says he got no adequate return for his invention.

Large Contract.—It is reported that the General Electric Company has signed contracts with the Cataract-General Electric Company of New York for supplying the latter with $100,000 worth of machinery. This is to supply the electric power by which it is proposed to propel the boats on the Erie Canal from Buffalo to Albany.

USEFUL INFORMATION.

HOW TO DETERMINE THE STRENGTH OF MAGNETS.

Gilbert gave some directions for determining the strength of "loadstone" which, with proper modifications, could be advantageously used to ascertain the comparative power of magnets. "All loadstones," he says, are tested for strength in the same way, viz: with a versorium (rotating needle) held at some distance; the stone that at the greatest distance is able to make the needle go round is the best and strongest.

"Baptista Sorta," he informs us, "also rightly determines the power of a loadstone by thus weighing in a balance. A piece of loadstone is put in one scale and an equal weight of another substance in the other, so that the scales are balanced. Then some iron lying on a board is brought nigh, so that it shall cleave to the loadstone in the scale, and the two bodies cohere perfectly at their points of attraction; into the opposite scale sand is poured gradually till the scale in which is the loadstone separates from the iron. By weighing the sand the force of the loadstone is ascertained."

This information was given to the world in 1600, and suggests a rough-and-ready means of ascertaining approximately the strength of a permanent or an electro-magnet. All things being equal the comparative pulling power of two magnets could be determined by weighing the force by sand in the scale. The scale method of course is not accurate, but by proper care quite fair results should be attained.

The measurement of the power of the "loadstone" by its ability to turn the magnetic needle, will be recognized as involving the principle of the galvanometer, which is the instrument now used for all electrical measurements, though in modified forms and known by various names.

COMMERCIAL EFFICIENCY.

The commercial efficiency of an electric machine is the ratio of the power delivered by it to the power required to drive it. In a dynamo, for example, the commercial efficiency means the ratio expressed in watts or H. P. of the current generated and delivered by it to the mechanical horse-power required to drive the machine. Thus if it requires a 10 horse-power steam engine to run a dynamo that delivers a current of 6,714 watts, or 9 H. P. [746 watts = 1 H. P.], the dynamo is said to have a commercial efficiency of 90 per cent. The same calculation is applicable in the case of an electric motor, the difference being that the motor is driven by electric power and delivers mechanical power; while, in the case of the dynamo, mechanical power is applied and electric power delivered.

The mechanical power is measured by a friction brake, or a dynamometer, and the electric power is measured by an ammeter and a voltmeter. The ammeter measures the current in amperes, and the voltmeter in volts. Thus, if in a given case the ammeter shows that there is a current of 10 amperes, and the voltmeter registers a potential difference of 74.6 volts, we have 746 watts, because watts = current, in amperes, multiplied by the potential difference or voltage. This operation is usually expressed by the formula $W = E C$.

Ten amperes of current $\times$ 74.6 volts = 746 watts, and as 746 watts = 1 H. P., the current in this case is said to be of one horse-power.

THERMO-ELECTRIC CURRENTS.

Many attempts have been made to apply thermo-electricity to practical use, but so far, with only moderate success. A thermo-electric pile, as compared with other methods of generating currents, possesses several great advantages, viz.

1. No consumption of material takes place in the pile itself.
2. Little attention is necessary, the action being set up by lighting a gas jet or other heating arrangement.
3. It can work continuously for long periods without detriment.

Its disadvantages, however, outweigh the advantages, and are thus enumerated:

1. Inefficiency, only about 5 per cent. of the energy of the fuel consumed being actually utilized in producing the current.
2. Very low difference of potential, which necessitates he use of a very large number of elements to obtain even a moderate electro-motive force.

Thermo-electric currents have been used for electro-plating with a fair degree of success.

Thermo-electricity offers an inviting field for further research.

AURORA BOREALIS.

Lemström made some experiments in Lapland, with a view to determining the cause of the aurora. He showed that the aurora is due to currents of positive electricity illuminating the atmosphere in their passage from the higher regions to the earth.

It requires an electro-motive force of at least 1.49 volts to decompose water.

EXPERIMENTS WITH TELEPHONES.

An interesting experiment, says the *Scientific American*, is transmission by telephone of the vibrations of a tuning-fork at one end of the line to a tuning-fork at the other end of the line. The mouthpieces and diaphragms are removed. At one end of the telephone line a tuning fork is supported on a resonator with one of its prongs very near, but not in contact with the pole of the telephone magnet. A tuning-fork of the same pitch is vibrated in front of the telephone magnet at the opposite end of the telephone line. The fixed tuning-fork is made to vibrate by the variations of magnetism produced by the current induced in the transmitting telephone by variations of magnetism produced by the vibration of the fork at the transmitting end of the line.

By means of two telephones, one with a diaphragm, the other without, the speed of machinery may be indicated at a distance. The telephone without the diaphragm is placed with the pole of its magnet very near the iron arms of a revolving wheel, or it is placed near a wooden wheel carrying a number of armatures. As the wheel revolves, the arms or armatures in passing the pole of the telephone produce changes of magnetism which induce electric pulsations in the winding of the telephone magnet. These electric pulsations affect the strength of the magnet of the distant telephone, thus causing the diaphragm to vibrate, producing in the telephone a musical sound, the pitch of which depends on the speed of the machinery. The pitch being ascertained by comparison with a pitch pipe or similar instrument, the speed is found by a very simple calculation.

By attaching to the mouth-piece of a telephone a cork having in it two perforations, in one of which is inserted a small glass tube drawn down so as to form a gas jet, having an aperture as fine as a cambric needle, while in the other perforation is inserted a right-angled tube for receiving a small rubber gas tube, a manometric flame apparatus is constructed in which the vibrations of the receiving diaphragm will be shown by vibrations of the gas flame, these vibrations being analyzed by means of a revolving or swinging mirror, according to the well-known method. Probably the best material for fastening the perforated cork in the telephone mouthpiece is beeswax.

NEW YORK NOTES.

Office of the Electrical Age,
World Building, New York,
March 24, 1894.

Mr. B. Otis Hoge is the New York manager of the Graton & Knight Mfg. Co., the well known tanners and belt makers, Worcester, Mass. These belts are well known in the trade, and the company's interests are in good hands in New York. Mr. Hoge's office is at 121 Liberty street, New York.

The Manhattan General Construction Co., whose offices are at No. 50 Broadway, New York city, and Equitable Building, Baltimore, has been appointed sole agents of the Buckeye Electric Co., for New York and vicinity and Baltimore and vicinity.

Mr. Chas. W. Holtzer, of Holtzer-Cabot & Co , Boston, Mass., paid the Electrical Age office a visit last week. The Holtzer-Cabot Co. recently brought out an alternating ceiling motor and fan, which is meeting with great favor in the trade.

Messrs. Walker & Holmes, 136 Liberty street, New York city, have secured the contract to fit out the magnificent building of the Home Life Insurance Co., on Broadway, throughout with the celebrated Utility lamp shade. These shades are made of celluloid, in any desirable color, and are unbreakable and washable. Messrs. Walker & Holmes are having great success with these shades.

The New York and Eastern Telegraph and Telephone Company has presented a petition to the Board of Aldermen in Brooklyn, for a franchise to build lines and carry on business in that city.. It proposes to furnish telephone service at 25 per cent. less than the present rates, furnish the various city departments at one-half of what is now being paid, and give to the city 5 per cent. of its net earnings.

During the year 1892, the City of New York received from street railways for franchises, $232,917.60, and in 1893, $230,025.51.

The gross earnings of the Edison Electric Illuminating Co., of New York city, for the month of February, were $124,058.25, an increase of $18,279.97. over the receipts for the same month last year. The operating expenses were $51,072.60 ; net earnings, $72,985.64, an increase of $18,002.57.

Vanderwerken, Rickerson & Brainerd, 8 and 10 Fifth avenue, Brooklyn, have just issued a neat catalogue of their primary batteries for power and light, and other electrical specialties. This firm handles telephones, transmitters, Mason's battery, battery-power motors, fans, etc.

Robert Brass & Co., 123 Middleton street, Brooklyn, general machinists, make special machinery, also dies for stamping of all kinds of metal, etc. They also make a full line of tools and cutters for milling machines. The firm is composed of Robert Brass and Paul Grotz. Both these gentlemen have had large experience, and are familiar with all the requirements of the business.

The William Lang Co., 123-139 Middleton street, Brooklyn, is very busy and is making preparations to place some excellent incandescent electric light specialties upon the market very soon. This company manufactures gas-fitters' supplies, gas sign letters, brass pipe work, etc. It was recently reorganized with Mr. E. F. Gennert, vice-president ; F. W. Belmont, treasurer, and J. F. Cunningham, secretary. All these gentlemen are well known in the electrical trade. The Lang Company is making a feature of electric light specialties.

The Manhattan Electric Supply Co. has removed its sales department to the ground floor, No. 32 Cortlandt street, city. This change was made necessary on account of the limited space occupied by the company at No. 36 Cortlandt street, and will no doubt be much appreciated by buyers of the company's goods. The Manhattan Company has just issued a pamphlet describing a number of styles of electric telephones manufactured by it, which pamphlet is now ready for distribution.

The Interior Telephone Co., Mail & Express Building, reports a big business. This telephone system, which is for factory, office and salesroom and general use, is a great convenience to a busy house.

Your correspondent lately met the old supply man, W. H. Gordon. Mr. Gordon reports an active business in insulated wire for general service. He is making his headquarters at 29 Broadway.

The New York State Senate has passed a bill extending the term of office of the Board of Electrical Control, New York City, for three years.

The General Incandescent Arc Light Company, 57?-578 First Avenue, 33d and 34th streets, New York City. has issued a handsome catalogue and price-list of its celebrated standard lamps, ornamental lamps, series lamps, chain lamps, and Bijou lamps. The catalogue is handsomely illustrated and is gotten up in an artistic manner.

Mr. David Chalmers, assistant to the Receiver of the A. B. C. Co., of New York, gave the Electrical Age a call last week. Not to know Mr. Chalmers is a misfortune.

The New York office of the National Water Tube Boiler Co., of New Brunswick, N. J., has been moved to 74 Cortlandt street, City. This was necessary in order to provide better facilities for the handling of the largely increasing business. Mr. Arthur Loretz, Jr., is the manager of the New York office, and he will be pleased to meet his friends and customers at his new address.

We have received an invitation from the Ball & Wood Company to be present at their works at Elizabethport, N. J., on Saturday afternoon, March 31, to inspect their new vertical engine of 600 H.-P., previous to its shipment to the Chicago Edison Co. The engine is new in design and is said to possess some novel features.

W. T. H.

NEW BOOK.

Reference Book of Tables and Formulas for Electric Street Railway Engineers. By E. A. Merrill, Author of "Electric Lighting Specifications." New York: The W. J. Johnston Company, Ltd. Flexible Morocco, Price, $1.00.

It is the object of this reference book to meet a practical need by collecting and arranging in a concise, logical order those tables and formulas which are in constant use by the electric street railway engineer in making estimates, ordering material, on construction work etc. Not only has considerable care been taken in selecting and checking material compiled directly, but several original tables and formulas have been added, especially in the sections on calculations; further, many tables and formulas have been extended and modified to meet the conditions imposed by street railway work.

Fire.—The repair shops of the Cleveland Electrical Co , Cleveland, Ohio, were destroyed by fire on March 21. Loss $50,000, covered by insurance. The car barns were saved.

POSSIBLE CONTRACTS.

The Manayunk and Roxborough Inclined Plane Railway Company of Philadelphia has been granted permission to use the trolley system.

The Columbia Electric Light Company of Philadelphia has been granted permission to lay conduits in streets within its present district.

The Huntington Street Connecting Railroad Company and the Philadelphia Traction Company, of Philadelphia, Pa., have been granted permission to construct a railway and use the trolley system thereon.

The business men of Canal Fulton, Ohio, are agitating the question of establishing an electric light plant.

Marblehead, Mass., has voted to establish an electric light plant in that town.

Mr. Stevens and Mr. Kinney of Windsor, Ohio, are interested in a project to build an electric road from that place to Conneaut, O.

Mr. W. H. Bosley of Baltimore is interested in a project for building an electric railroad in Queen Anne's and adjoining counties in Maryland.

The citizens of Corunna, Mich., are considering a plan to light the town with electricity generated by water-power.

An electric railroad from Warren, N. H., to the summit of Mt. Moosilauke is talked of, a distance of ten miles.

The Oberlin Street Railway Company, Oberlin, Ohio, will survey a route for an electric railroad from Wellington, Ohio, to Oberlin and Vermillion.

It is reported that preparations are being made to build an electric road from Toledo to Detroit, Mich. Mr. P. J. Jackson, of Detroit, is interested in the scheme.

An electric road may be constructed between Essex and Ivoryton, Conn.

The Harrison Bell Telephone Co. intends to build a telephone plant in Kalamazoo, Mich.

The Baden and St. Louis Railway proposes to change its system from horse to electricity.

The Hartford, Conn., Common Council, has given the Hartford Street Railway Co. permission to equip all its lines with the overhead trolley system.

The Harrodsburg Electric Light Co., Harrodsburg, Ky., has decided to offer its entire plant at auction on May 1.

There is a probability of introducing electricity as the motive power on the Middletwon, Conn., Street Railway.

NEW CORPORATIONS.

The Citizen's Telephone Co., Cumberland, Md. Officers: President, L. D. Rohrer; secretary, John T. Edwards; treasurer, E. H. Welsh; attorney, F. Williams.

A company has recently been incorporated in Virginia to purchase and use the water-power at the Great Falls of the Potomac, for the generation of electric power. Incorporators: Oliver D. Barrett, N. G. Ordway, Paul Butler, J. B. Cotton, Frank L. Washburn and others.

The St. Lawrence River Power Co. Buffalo, N. Y. Officers: Chas. C. Conroy, president; Wm. F. Creed, first vice-president; Wm. Hemming, second vice-president; Chas. F. Witcher, secretary and treasurer; George B. Burbank, chief engineer.

The Houston and Suburban Street Railway Co., of Houston, Texas. Capital $10,000; directors: A. Christeson, Wm. A. Wilson, Jr., and E. W. Cave.

(*Continued from page 148.*)

California, and cover the Middle and Southern States very completely. Lines are being built rapidly throughout the Southwest, and connection is now being made between La Junta, Col. and Mohave, Cal. This line will give the company a southern route to California, the northern route being over the Canadian Pacific railroad and down the Pacific coast from Victoria to San Francisco and San Diego. The company works in connection with the Commercial Cable Company, thus securing extensive European connections.

The Postal Company at the present time has about 35,000 miles of pole line and about 145,000 miles of wire. It has 3,500 offices in the United States and new ones are constantly being opened as the lines are extended.

HOW TO WIRE BUILDINGS.

Every professional and practicing electrician, architect and student should be familiar with the latest and most approved practice in the wiring of buildings. Augustus Noll's book on "How to Wire Buildings," is the only work published on this subject, and is extremely practical. Everyone should have a copy. Price, $1.50. Address the Electrical Age, World Building, New York.

PERSONAL.

Mr. H. A. Haselden, electrical engineer, has been admitted to the firm of Chas. H. Page & Co., consulting electrical engineers, Worcester, Mass. The new firm will hereafter be known as Page, Haselden & Co.

A Washington dispatch states that the Ordnance Bureau of the Army has decided to use the electric light as a means of coast defence, and experiments will be made to determine what class of light is best suited for the purpose. The Ordnance Bureau recently purchased the big search that was exhibited at the World's Fair by a German firm, and this light will be mounted at Sandy Hook soon and experiments conducted.

Vice-Chancellor Van Fleet, of Newark, N. J., on March 7 granted an order restraining the directors of the Edison United Phonograph Company from holding an election at Orange, N. J., on the application of Colonel Gouraud, of England, and Thomas A. Edison. The question involved is the failure to register certain stock held by Messrs. Gouraud and Edison, thereby disqualifying the votes on this stock. The election was postponed for two weeks, and in the meantime the vice-chancellor will hear arguments in regard to the votes in dispute.

Electricity in Agriculture.—The United States Senate committee on agriculture has made a favorable report upon Senator Peffer's bill to establish an electrical experiment station for the purpose of determining whether electricity can be profitably applied as a motive power in the propulsion of farm machinery. The bill places the station and proposed experiments in charge of the Secretary of Agriculture and appropriates $10,000 for the first fiscal year.

The Oshkosh (Wis.) electric light plant is to be sold at auction. The sale is brought about on a petition by the Massachusetts Loan & Trust Company, which holds a trust deed to protect $100,000 worth of bonds.

The annual election for directors of the 2d Ave. Railroad Company, of New York City, will be held at the company's office on April 2.

The car sheds of the Missouri Railway Co., St. Louis, were struck by lighting on March 22, setting fire to the buildings. Eleven motor cars and forty-eight trailers, together with the building, were completely destroyed.

Book—Messrs. Frederick Warne & Co., New York, have now ready a new edition, the fourth, of "Electricity Up to Date," by John B. Verity, with many new illustrations and a new and very interesting chapter on Electric Cooking and Heating. The price of this book is 75 cents. It and all other books on electrical and kindred subjects can be obtained at the Electrical Age Office, World Building. New York.

Encyclopædia Britannica.—We have received a copy of Volume 1 of the World's Fair edition, Encyclopædia Britannica, which is published by the Educational Publishing Co., 315–321 Wabash avenue, Chicago, Ill. This work is adapted from the ninth edition of the Encyclopædia Britannica for the use of American readers, to which is added about 4,000 biographies of distinguished people. The volumes of this work are of a very handy size for reference, and are gotten up in a first-class manner, typographically. The price of the set is very low, and there is no reason why every family should not possess a set of these valuable books of reference.

Electrical and Street Railway Patents.

Issued March 23, 1894.

516,642. Magneto-Telephone. Henry A. Chase, Boston, Mass., assignor to Albert Watts, same place. Filed Aug. 12, 1893.

516,643. Magneto-Telephone. Henry A. Chase, Boston, Mass., assignor to Albert Watts, same place. Filed Aug. 12, 1893.

516,641. Police-Signal. Michael J. Burns, Lowell, Mass., assignor to The Gamewell Fire-Alarm and Telegraph Company, New York, N. Y. Filed Oct. 26, 1893.

516,651. Automatic Speed-Regulator for Electric Motors. William Hochhausen, Brooklyn, N. Y. Filed Nov. 26, 1889.

516,653. Gravity-Battery. Lorenzo F. Lary, Pottersburg, Ohio. Filed May 23, 1893.

516,666. Electric-Railway System. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed May 29, 1891.

516,689. Incandescent Lamp. George C. Swan, Brockton, Mass., assignor of two-fifths to Frederick C. Russell, same place. Filed Dec. 30, 1893.

516,713. Electric Device for Pumping Oil-Wells. Harry F. Waite, New York, N. Y. Filed Sept. 28, 1893.

516,731. Electric Railway-Switch. Charles M. Fitch, South Norwalk, Conn., assignor to the Fitch Excelsior Switch Company, of New Jersey. Filed June 17, 1893.

516,732. Commutator. Edward R. Francis, Minneapolis, assignor by mesne assignments, of one-half to John N. McGibben, Sauk Centre, Minn. Filed May 13, 1893.

516,740. Electric Appliance for Horses. George R. King, Dallas, Tex. Filed Mar. 18, 1893.

516,777. Telephone-Switch. Alfred Stromberg and Andrew Carlson, Chicago, Ill. Filed Sept. 21, 1893.

516,784. Electric Motor. Philip Wuest, Jr., Philadelphia, Pa., assignor to Christopher J. Heppe and Florence J. Heppe, same place. Filed May 16, 1892.

516,791. Car-Truck. Norman C. Bassett, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed June 5, 1891.

516,792. Dynamo-Electric Machine or Motor. Norman C. Bassett, Lynn, assignor to the General Electric Company, Boston, Mass. Filed Aug. 31, 1893.

516,793. Rotary Broom. Norman C. Bassett, Lynn, assignor to the General Electric Company, Boston, Mass. Filed Sept. 7, 1893.

516,794. Armature for Dynamo-Electric Machines. Louis Bell, Boston, Mass., assignor to the General Electric Company, same place. Filed Mar. 17, 1893.

516,795. Armature for Induction-Motors. Louis Bell, Boston, Mass., assignor to the General Electric Company, same place. Filed Apr. 3, 1893.

516,796. Regulation of Multiphase Systems. Louis Bell, Boston, Mass., assignor to the General Electric Company, same place. Filed June 15, 1893.

516,797. Coil for Dynamo-Electric Machines. Louis Bell, Boston, Mass., assignor to the General Electric Company, same place. Filed Nov. 13, 1893.

516,800. Incandescent Lamp and Method of Manufacturing Same. Henry D. Burnett, Lynn, and Samuel E. Doane, Swampscott, assignor to the General Electric Company, Boston, Mass. Filed Mar. 17, 1893.

516,801. Guard and Shade-Holder for Incandescent Lamps. Geo. W. Demmick, Lynn, Mass., assignor to the General Electric Company, of New York. Filed Nov. 23, 1892.

516,804. Method of Transmission of Electricity. Jonathan P. B. Fiske, Lynn, Mass., assignor to the General Electric Company, of New York. Filed May 3, 1893.

516,805. Transmission of Electricity. Jonathan P. B. Fiske, Lynn, assignor to the General Electric Co., Boston, Mass. Original application filed May 3, 1893. Divided and this application filed Oct. 19, 1893.

516,806. Block System for Electric Railways. John W. Gibboney, Lynn, assignor to the General Electric Co., Boston, Mass. Filed Oct. 12, 1893.

516,807. Motor-Armature. John C. Henry, Westfield, N. J. Filed Aug. 25, 1892.

516,808. Overhead Electric Railway. John C. Henry, Westfield, N. J. Filed Mar. 8, 1893.

516,818. Electric Motor. Walter H. Knight, Lynn, assignor to the General Electric Co., Boston, Mass. Filed Sept. 15, 1893.

516,819. Incandescent Electric Lamp. Edward R. Knowles, Middletown, Conn., assignor to the Schuyler Electric Co., of Connecticut. Filed Dec. 9, 1892.

516,820. Socket for Incandescent Electric Lamps. Edward R. Knowles, Middletown, Conn., assignor to the Schuyler Electric Co., of Connecticut. Filed Dec. 9, 1892.

516,821. Electric Search-Light. Edward R. Knowles, Middletown, Conn., assignor to the Schuyler Electric Co., of Connecticut. Filed Jan. 9, 1893.

516,822. Alternating Electric-Arc Lamp. Edward R. Knowles, Middletown, Ct., assignor to the Schuyler

516,823. Electrical Measuring-Instrument. Edward R. Knowles, and Lewis T. Robinson, Middletown, Ct., assignors to the Schuyler Electric Co., of Connecticut. Filed Feb. 25, 1893.

516,824. Electric Signal-Lantern. Edward R. Knowles, Middletown, Ct., assignor to the Schuyler Electric Co., of Connecticut. Filed Apr. 17, 1893.

516,825. Electric-Arc Lamp. Edward R. Knowles, Middletown, Ct., and Edwin H. Park, Milbury, Mass., assignors to the Schuyler Electric Co., of Connecticut. Filed May 25, 1893.

516, 826. Electric-Arc Lamp. Edward R. Knowles, Middletown, Ct., assignor to the Schuyler Electric Co., of Connecticut. Filed July 17, 1893.

516,827. Commutator Connection. Charles A. Lieb, New York, N. Y., assignor to the General Electric Company, Boston, Mass. Filed July 18, 1893.

516,829. Cooling Electric Apparatus. Walter S. Moody, Lynn, assignor to the General Electric Company, Boston, Mass. Filed July 1, 1893.

516,831. Starting and Controlling Device for Electric Motors. Joseph W. Moore, Boston, Mass. Filed Nov. 25, 1893.

516,834. Series-Parallel Controller. Edward D. Priest, Lynn, assignor to the General Electric Company, Boston, Mass. Filed Dec. 1, 1893.

516,835. System of Electric Distribution. Edwin W. Rice, Jr., Swampscott, assignor to the General Electric Company, Boston, Mass. Filed Mar. 6, 1893.

516,836. System of Electrical Distribution. Edwin W. Rice, Jr., Swampscott, assignor to the General Electric Company, Boston, Mass. Filed May 5, 1893.

516,838. Milling-Machine. John Riddell, Saugus, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Aug. 26, 1892.

516,839. Means for Measuring Electric Currents. Lewis T. Robinson, Middletown, Conn., assignor to the Schuyler Electric Company, of Connecticut. Filed Aug. 24, 1893.

516,840. Electrically-Operating Pump. Cyrus Robinson, Lynn, assignor to the General Electric Company, Boston, Mass. Filed Oct. 11, 1893.

516,843. Electrical Hoisting Apparatus. Hollon C. Spaulding, Boston, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Feb. 12, 1890.

516,845. Method of Constructing Commutators for Dynamos or Motors. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Jan. 24, 1891.

516,846. Regulation of Alternating Currents. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed June 9, 1891.

516,847. Means for Regulating Alternating Currents. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed July 1, 1891.

516,848. Armature-Winding. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company, of New York. Filed Nov. 16, 1892.

516,849. Alternating Current Electric-Motor. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company, Boston, Mass. Filed June 17, 1893.

516,850. Electrical Transformer. Elihu Thomson, Swampscott, assignor to the General Electric Company, Boston, Mass. Filed June 28, 1893.

516,853. Commutator-Connector. Ora N. Turner, Lynn, assignor to the General Electric Company, Boston, Mass. Filed June 14, 1893.

516,855. Electrical Measuring-Instrument. Elmer G. Willyoung, Philadelphia, Pa., assignor to the Queen & Company, of Pennsylvania. Filed June 23, 1893.

516,876. Conduit for Electric Railways. Herluf A. F. Petersen, Milwaukee, Wis. Filed Mar. 10, 1893.

516,878. Electric Cigar-Lighter. Joseph Sachs, New York, N. Y. Filed Feb. 2, 1893.

516,879. Fire Telegraphy. Sydney J. Sanford, Barrie, Canada. Filed Feb. 3, 1891. Patented in Canada, May 3, 1893, No. 42,805.

516,892. Incandescent Lamp. Rudolf Langhans, Berlin, Germany. Filed Apr. 18, 1892.

516,903; Railway Signaling and Switching Apparatus. John D. Taylor, Chillicothe, Ohio. Filed Dec. 14, 1892.

516,916. Electric Motor. Clyde J. Coleman, Chicago, Ill., assignor of one-half to Charles Odell, same place. Filed Jan. 21, 1893.

516,917. Electric Motor. Clyde J. Coleman, Chicago, Ill., assignor of one-half to Charles Odell, same place. Filed Jan. 21, 1893.

516,934. Street Car. Peter M. Kling, St. Louis, Mo. Filed Aug. 14, 1893.

516,935. Railway Car. Peter M. Kling, St. Louis, Mo. Filed Dec. 13. 1893.

516,956. Electric Elevator. Robert Watson, Washington, D. C. Filed Nov. 13, 1893.

516,982. Telephone. Anthony C. White, Boston, Mass.; Fannie A. White, administratrix of Anthony C. White, deceased, assignor to the American Bell Telephone Company, same place. Filed Nov. 8, 1893.

516,987. Elevator. William M. Frisbie, New Haven, Conn. Filed Oct. 24, 1892. Renewed Feb. 17, 1894.

517,000. Electrically-Operated Railroad Turn-Table. Howe E. Danzenbaker, Philadelphia, Pa., assignor of one-half to Charles F. Kindred, same place. Filed May 29, 1893.

517,009. Extension Electric Chandelier. Arthur McLean, Ansonia, Conn., assignor of one-third to William G. McLean, same place. Filed Aug. 7, 1893.

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NEW YORK, APRIL 7, 1894.

CONTENTS.

EARTHING WIRES.

We publish in this issue an article on "Ground Wires," by Mr. David Flanery, of Memphis, Tenn., who was for many years superintendent of the Western Union Telegraph Company in New Orleans. Mr. Flanery's communication bears evidence of abundant learning on the subject about which he writes. He advances a theory for the interferences, break-overs, and "what is improperly called *induction* on telegraph, telephone and other electrical circuits." Just what function the earth performs in a grounded circuit is a question that has not yet been satisfactorily settled, but by investigations and making public the results thereof, as Mr. Flanery has done, the problem may not long retain the mastery over us. Let us hear from some one else on this interesting subject.

GREAT POSSIBILITIES.

In a communication from Mr. John M. Batchelor, printed on another page in this issue, that gentleman makes some suggestions respecting the rapid transit problem in and about "Greater New York" that, by reason of the magnitude of operations involved, and the far-reaching effect of the same, may bewilder the mind of the average street railroad magnate. While the scheme involves a vast expenditure of money and bold enterprise, the probable results would justify the effort.

Mr. Batchelor suggests that street railway companies build the proposed bridges between the two cities, across the East River, and control the same as far as street car traffic and franchises are concerned. He contends that it is essential for the complete development of outlying districts that the journey thereto shall be made continuously, without change. He is right on that point. Most any one would sacrifice a little to live in a locality that can be reached without a change of cars, rather than dwell in a section to reach which a change from cars to ferry, or vice versa, is necessary. New York City is very hard up for living room, and the only solution of the difficulty is to go over to Brooklyn and other Long Island communities, and to New Jersey. State pride demands that the citizens of New York city should reside within the state, but in order to realize this, better transportation facilities must be provided between the two great cities flanking the East River, and the outlying districts. This can be done only by a continuous railroad ride, and one fare. There is certainly a great promise in this direction for street railway capitalists, and they should not be slow in considering the suggestions laid down.

UNDERGROUND CONDUIT RAILWAY IN NEW YORK CITY.

If it is true as reported, that the Metropolitan Traction Co. has shown a preference for the Siemens and Halske underground conduit railway system, and has decided to experimentally adopt the system on one of its branch lines, it makes a great step towards the solution of the problem confronting city street railroad managers. A good deal of talking has been and still is indulged in over this subject, and considerable hesitation seems to exist about making the attempt to try a presumably first-class system. Up to this time we know little about practical underground conduit systems for these reasons, and it is encouraging to note that the Metropolitan Traction Co. has "taken the bull by the horns" and proposes to settle the question on its own account. There is more virtue in deeds than in words. The only fault we have to find against the contemplated action of the company is that it did not select some American system. There are plenty of good systems right here at home, just as good, at least, as the one favored, and we believe American enterprise should have been given more encouragement.

THE WALKER MANUFACTURING CO.

This concern, which has for many years enjoyed the reputation of being without an equal in the construction of cable railway equipments, power transmission plants, and all classes of very large machinery, has now added to its extensive business an electrical department.

The company now enters the market ready to supply electric generators for both direct and alternating currents of any capacity, from 150 to 5,000 horse power, with an electro-motive force varying from 500 to 10,000 volts; and a complete line of electric motors for both direct and alternating current work.

These new machines—both generators and motors—are constructed for street railway use, ordinary power transmission, mining, and a special line in which the company anticipates large developments in the near future, extra large alternating machines for long distance

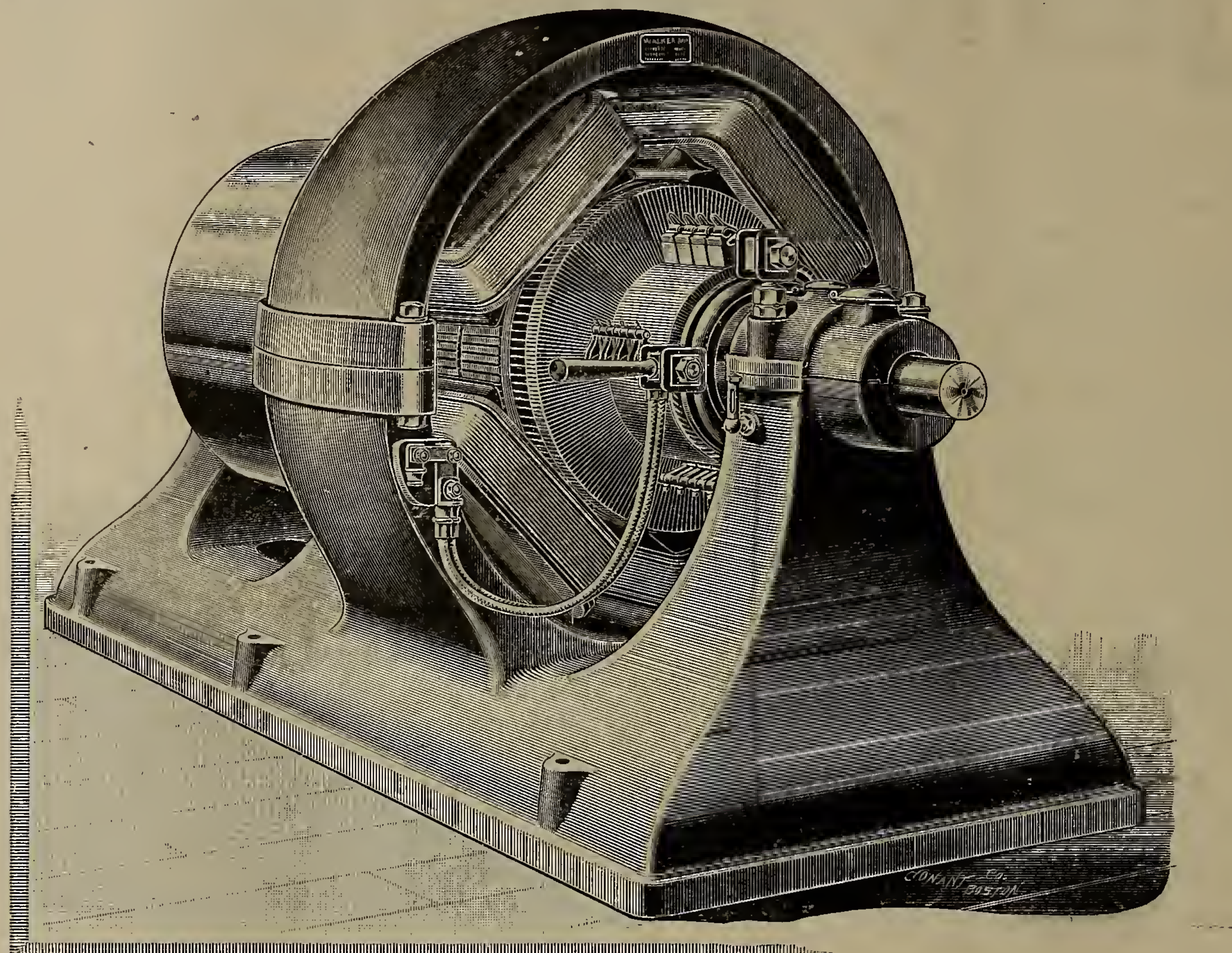


FIG. 1—STREET RAILWAY GENERATOR OF 250 H.P.

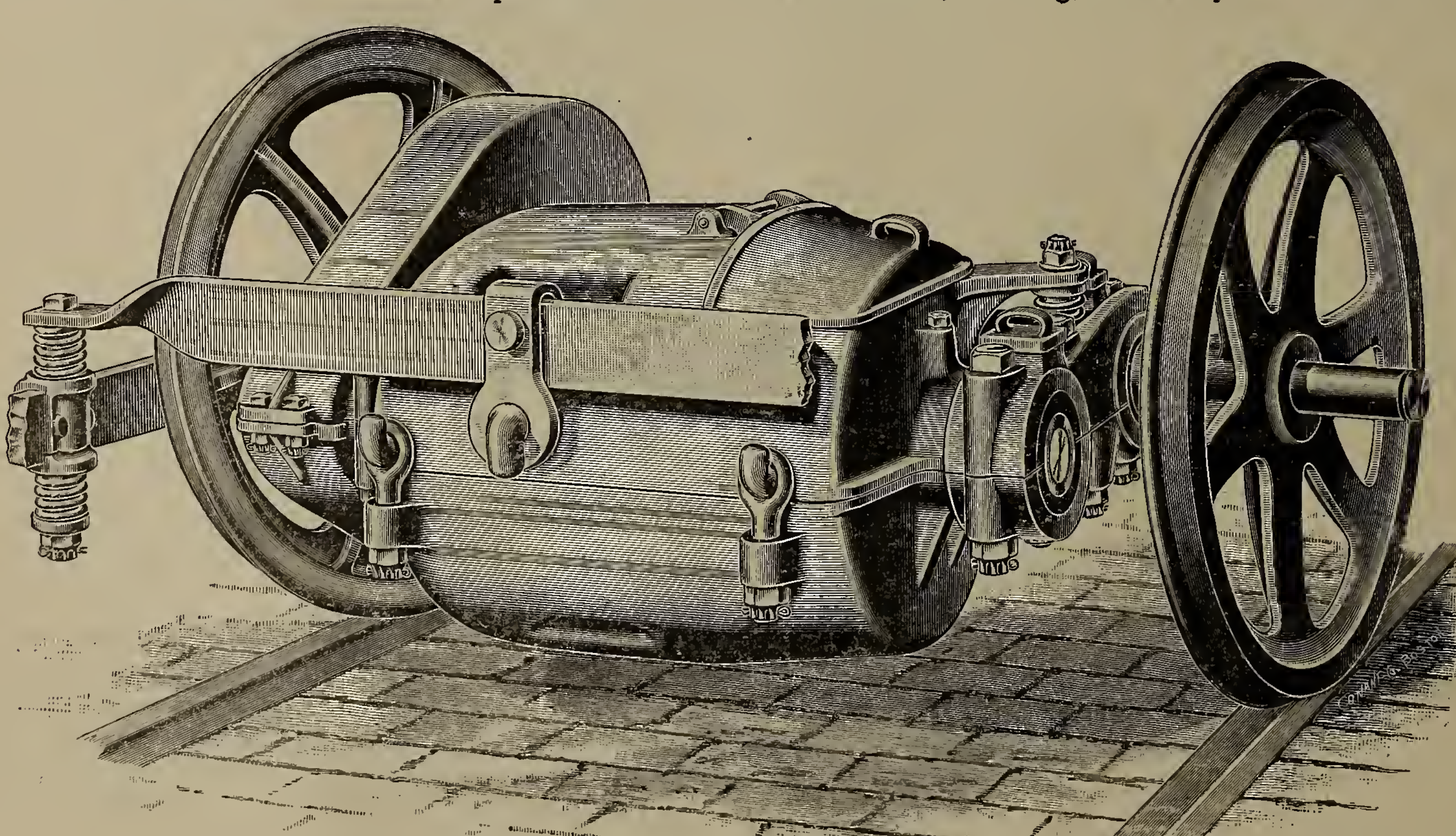


FIG. 2.—STEEL MOTOR, "SPRING MOUNTED," WEIGHS 1,600 POUNDS, INCLUDING GEARS AND GEAR HOUSING.

transmission of power. Street railway companies throughout the world, who are so well acquainted with the excellent work uniformly executed by this firm, will need but the assurance that especial attention has been given to the peculiar requirements of street railway engineering to guaranteethat the highest degree of excellence, in both mechanical and electrical construction, will be attained.

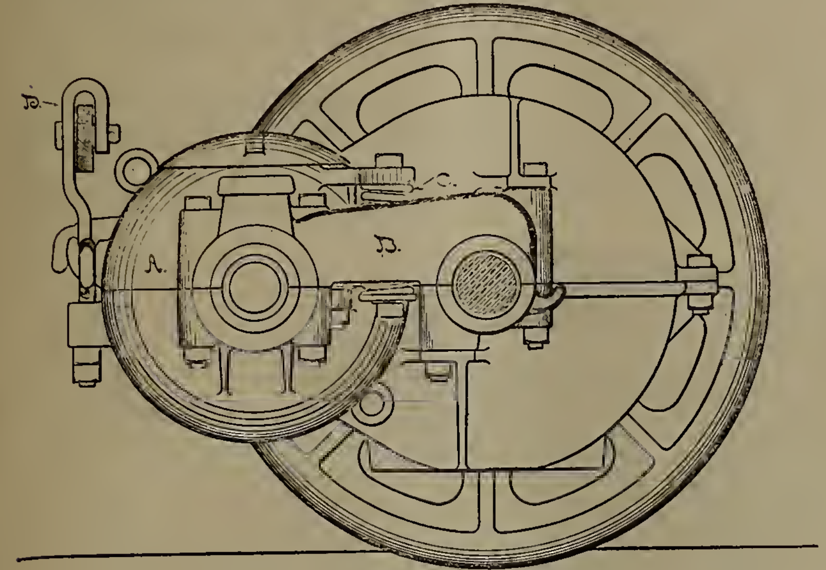


FIG. 3.

The plant of the Walker Mfg. Co. is one of the largest and most complete in the country, and is modern in all its equipment. The buildings cover about 250,000 square feet of ground, are constructed of brick, iron and glass, and are situated on the shores of Lake Erie, at Cleveland, Ohio.

The machine shop consists of three long bays, each containing a 30-ton travelling crane, which moves through its entire length. Iron galleries at either end are fitted up as winding rooms and for the manufacture of insulating materials.

The testing room is equipped with switchboards and resistances for testing generators, brakes for testing motors, and a 1,000 horse power engine will be erected immediately for testing the large multipolar direct-coupled generators.

The tracks of the L. S. & M. S. R. R. enter the testing room below the floor level, and all machines can be lifted by the large cranes from the testing racks directly to the cars.

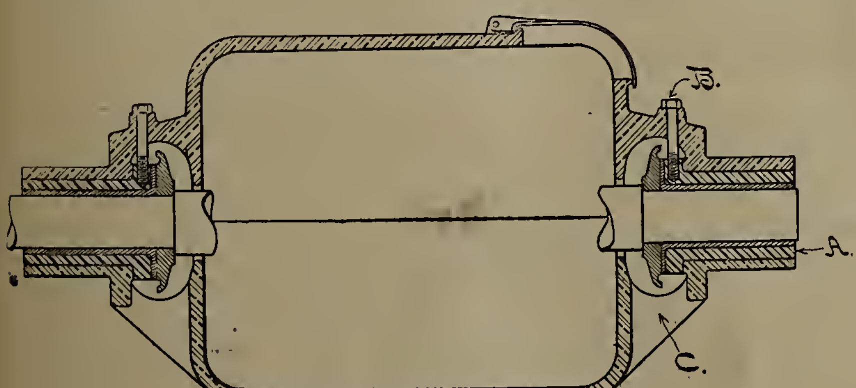


FIG. 5.

The pattern shops occupy a large two-story building completely fitted up with modern wood-working machinery.

Two large foundries occupy another building, and are perfect in their equipment. They contain four mammoth cupolas, spacious core ovens, numerous travelling cranes, from five to thirty tons' capacity each.

Fifty tons of iron can be poured at once into a single mould, which enables the company to cast their large machines in fewer parts, thereby attaining greater rigidity.

The generator for street railway and direct current power transmission shown in Fig. 1 is of 250 horse power of the well-known four-pole type, slow speed. The frame is cast in one piece with three bearings, which are of ball and socket self-oiling type. The field magnets are of wrought iron and are wound with enough copper to allow them to run perfectly cold.

The armature is series wound and insulated entirely with mica. With these two path windings—the only

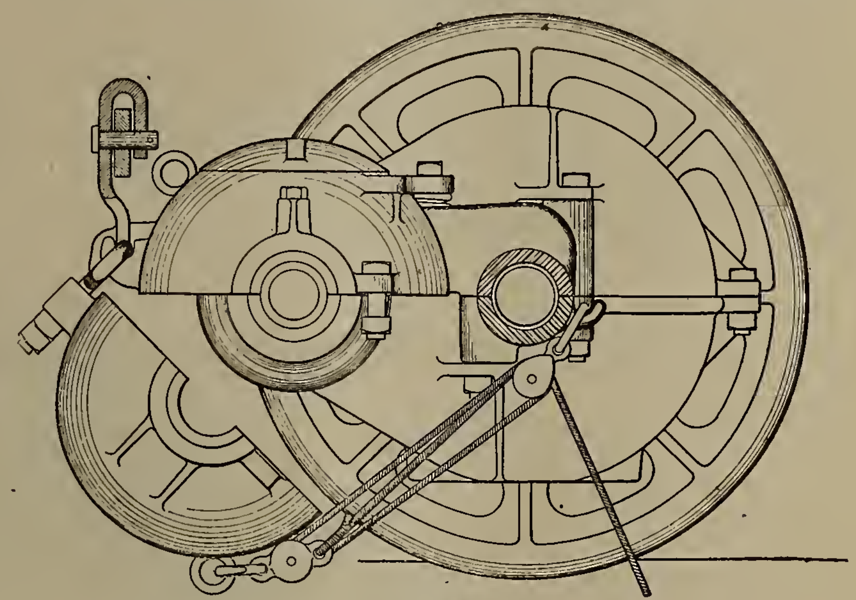


FIG. 4.

kind used by this company—there can, it is claimed, be no unbalanced armatures, no sparking, and no heating. The windings are entirely below the surface of the armature, which is iron-clad, with no binding wires. There are no joints in the windings, except where the wires connect with the commutator bars, and the insulation throughout the entire machine is sufficient to withstand at least ten times its normal requirements.

The armature and commutator are thoroughly ventilated, as a current of cool air passes all through the interior of the machine. The commutator is excessively large and runs cold in regular operation. The small machines of this type are belted machines, and the larger ones are usually built on the engine shaft.

Street car motor experience has taught street railway men that the greatest cost in operating roads by electric motors has been the repairs made necessary by the rapid deterioration of the track and rail-joints. The only way to correct this evil is to entirely disconnect the motor itself from iron to iron contact with the axle

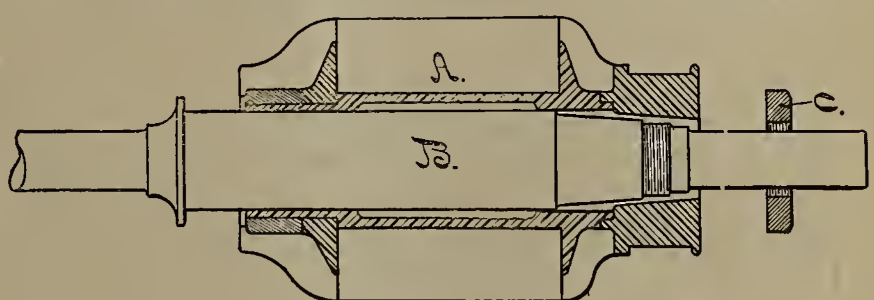


FIG. 6.

and prevent not only the hammer blow due to the weight of the motor but the inertia blow due to the unyielding mass of the motor. Attempts have been made to accomplish this by suspending the motor at or near the centre of gravity. This eliminates the weight, but not the inertia blow, which is the most serious. This has forced those interested to the conclusion that the perfect motor must weigh as little as possible, be extremely strong in mechanical construction, should work to 25 horse-power without heating, and not be in any way attached to the axle and wheels, except through springs which will do away with the hammering of the track to the greatest possible extent. This method of suspension gives the freedom of movement necessary for the removal of strain in rounding curves. The motor being built by the Walker Manufacturing Company, combines these suggestions of practical experience. It is a four-pole steel motor, weighing 1,200 pounds, has an easy capacity of 25 horse-power, will run at any speed up to 25 miles an hour, is controlled by a series-parallel controller, of superior type and great simplicity, and is not attached to the axle in any way, except through yielding supports.

Fig. 2 shows the general form of the motor, mounted upon 30-inch wheels and ordinary truck, portions of the truck being cut away to enable the motor to be more readily seen. The motor is entirely water and dust tight, the only opening being the lid over the commutator, which enables the two brushes to be easily reached. The frame is in two parts and made of steel. desired, from below; or, if the motor should not be over a pit, the upper half may be swung up and the armature removed from above.

The bearings are entirely outside of the motor casing or frame, as shown by Fig. 5. They are solid shells, A, filled with the best babbitt, and are supported by the bolt B. The grease, which comes out between the end of the thrust collar and the inner end of the bearing, falls to the ground through the opening, C, which is 4″ x 2½,″ and cannot be clogged. No grease can get into the motor.

Fig. 6 shows a section of the armature; the core, A, of which is built on a separate sleeve, which receives the shaft, B.

The commutator is on a tapered portion of the shaft,

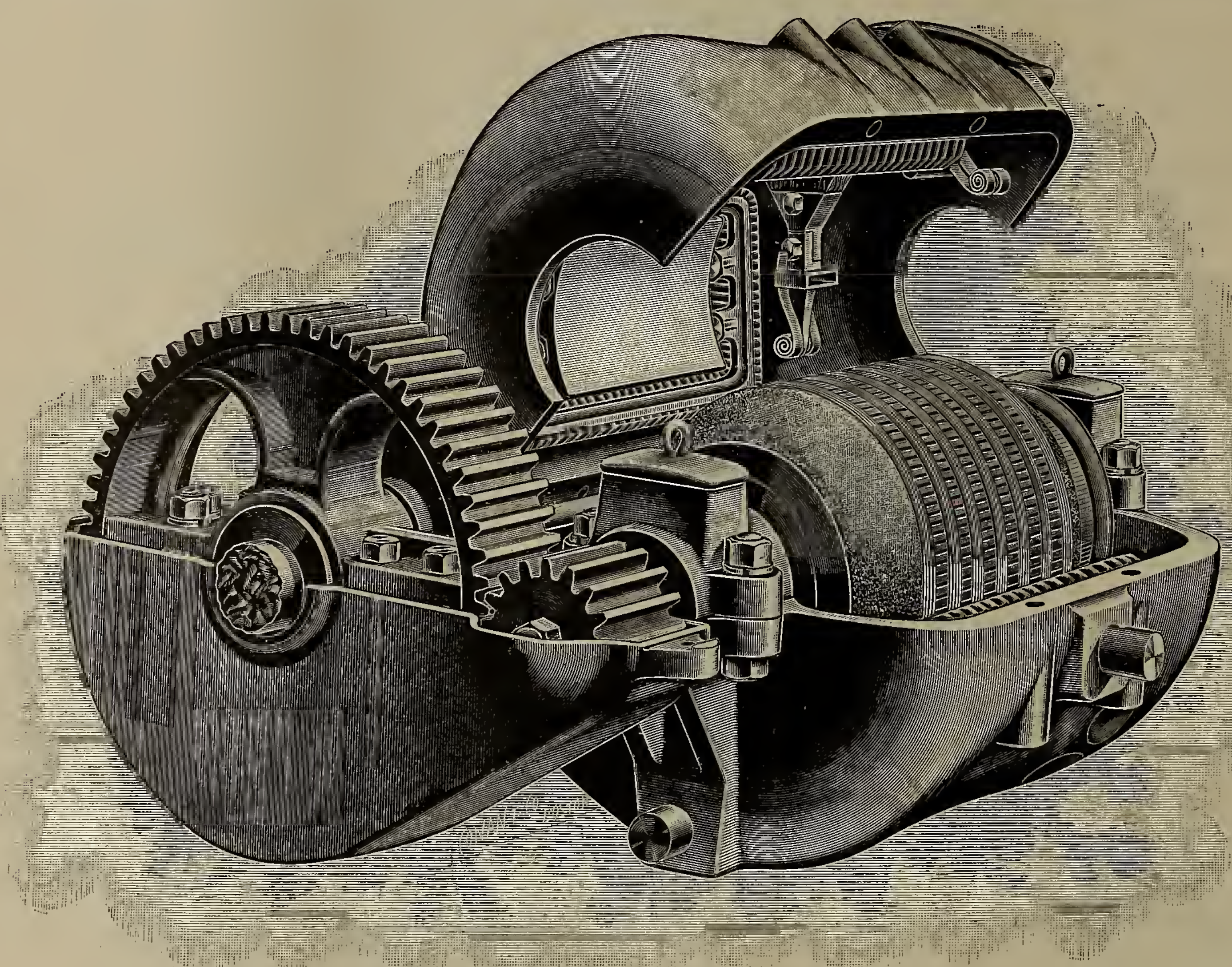


FIG. 7.—35 H. P. CAST-IRON MOTOR.

The gear housing and commutator lid are of malleable iron. Both gears and pinions are of steel. The shaft is large, being 3½ inches in diameter and 2½ inches in the bearings. The bearings are very long and arranged for thorough lubrication with grease. The efficiency of the motor is 90 per cent.

For the better understanding of the flexible support and other important points, detail illustrations are shown.

Fig. 3 shows an end elevation of the motor with one wheel taken away. The motor is supported at the rear by spiral springs, C, between lugs on the frame and the arms of the "U" and at the front, and is supported by a swinging arm from the ordinary spring truck bar, D. With this suspension the motor rides freely on springs, readily adjusting itself to varying conditions, without bringing a strain or shock on any part. The gear centres are always maintained because of the "U" shaped frame.

Fig. 4 shows how the lower half of the frame is made to swing down while the armature remains in place, one man being able to let it down and replace after inspection and cleaning. The armature may be removed, if the same as the pinion, and can be more easily drawn off for refilling.

This motor contains all the long-tried constructional points which experience has proven to work well, and the weak points existing in motors of other types have been eliminated. Being flexibly supported, it will remove all trouble with rail-joints, as in practice the motor runs as quietly as the old horse-car. Not even the gear noise is heard, as the gears are enclosed in air-tight housings and run in oil.

The excellent workmanship, for which the Walker Company is famous, tells greatly in this class of machinery.

Fig. 7 shows the cast-iron motor of 35 horse-power motor for heavy work—weight, 2,500 pounds. This motor is intended for heavy street railway work, where very large cars or trains of cars are used. It is made of cast-iron, and has an efficiency of nearly ninety per cent. It is built on the same general type as the steel motor, but is not spring mounted, being journalled on the axle like all other makes. This motor is exceedingly small and light for its output, being of about the same weight as other makes of 25 horse-power capacity.

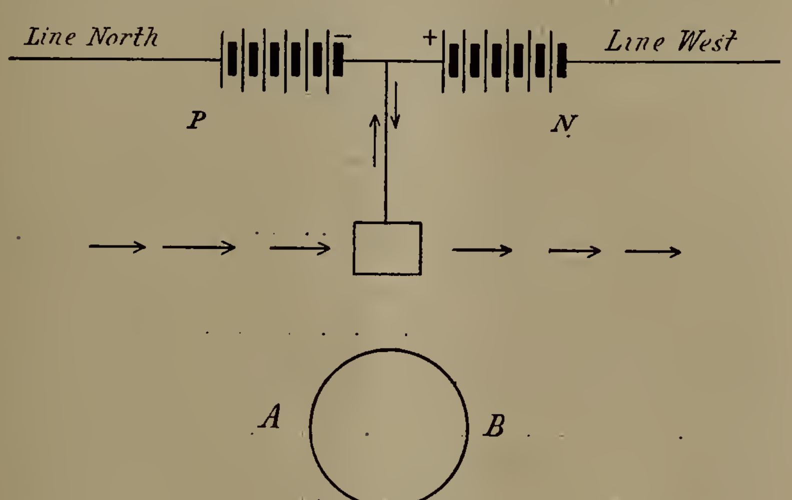
It will operate on 30″ wheels with plenty of clearance.

The designs are already completed for large motors to operate elevated trains, or suburban and interurban railways which will be run at high rates of speed.

GROUND WIRES.

BY DAVID FLANERY, MEMPHIS, TENN.

My attention has been called to an article in the Electrical Age on the subject of ground wires, their mode of construction and the resistance of the earth in the electric circuit. Nearly all the old telegraphers know my ideas on the subject, but as the old theory still prevails and the number of workers in electricity having vastly increased, it occurs to me that an explanation of the role of the earth in the circuit as well as the history of my idea would be of interest and also of profit to the electricians of the present time. First as to the construction of the ground wires as described in the article referred to: it was faulty and unscientific in using a copper plate at one end and a tin plate at the other end, as the principle of contact electricity or contact E. M. F. was violated. (See Jenkin, Ayrton & Perry, Gordon and others on this principle.) Both plates should be of the same metal, preferably copper, sunk deep in moist ground and surrounded by powdered sulphate of copper. No other metal, for the reason given above, should be put in around or near the plates. The plates for ordinary telegraph or telephone work should be about three feet square, with the ground wire well soldered to it. For other work the plates should be proportionately larger. Such a plate I consider to be superior to any gas or water pipe connection. The resistance of the earth in such a construction is about 90 ohms. Du Moncel, and his experiments and tests were many, gave it as equal to 7 miles of wire, ($7 \times 13.5 = 94.5$) but as all installations may not be as complete as his or the one above described, 100 ohms may be regarded as a safe figure and known as a constant.



FIGS. 1 AND 2.

As to my idea of the role of the earth in the circuit, I will begin by giving its history and, briefly as I can, its development. When I was learning telegraphy, the common theory, which still largely prevails, that the current passes from the positive pole of the battery along the wire and into the ground at the distant station, and thence back through the earth to the negative pole, was accepted by me without question and necessarily so, because I knew nothing about electricity and there were not many near or afar who knew much more. But before the close of my second year in the business, I came to be of the opinion that the theory was untenable, if not absurd. The occasion of this change or conclusion was this: I one day visited a repeating station—a set of repeaters were then the great wonder and mystery of the art, or science, if you prefer—there were two batteries of the Grove form at this station, one working the through circuit, and the other a side line, and their poles were connected to one and the same ground wires, as shown in the accompanying diagram.

Now, theoretically, the current of one circuit went north from the positive pole and returned through the earth and up the ground wire to the negative pole; and on the other circuit the current went down the ground wire through the earth to the western station and back over the line to the negative pole of the western battery. The difficulty that suggested itself was the passage simultaneously of a positive current from battery down the ground wire and of a negative current up the same ground to the northern battery. I could not then explain what the action was, but I declined to entertain any longer the old theory. Some years later, when I was more experienced and had learned something of mechanics and science, I came to the conclusion that where the currents were equal, instead of following the routes described they simply balanced, and when both circuits were closed no electricity passed into the ground, but that the earth supplied to the western station a quantity of electricity equal to what had been given to it by the northern station; and that when the currents were unequal the difference passed into the earth and was supplied to the proper station in like manner. But whether this quantity was conducted by the earth or not I was undecided. Some years later, when several telegraph wires were attached to one ground wire, and ramified out to all points of the compass, and when electricity was emerging from the fog, I came to the conclusion that no electricity under any circumstances passed through the earth in the manner laid down in the old theory. What does take place is illustrated as follows:

Consider a lake A, B, with a lift and force pump a, A, which forces the water through an overhead pipe across the lake to B, where it falls into and is diffused with the great body of water in the lake, and its identity is lost—not a drop of it even getting back to the pump. This is a perfect example of the action in the electric circuit; the battery is the pump, the pipe is the wire and the water is the electricity in the earth. You may cut the ground wire in a large office and the work will go on as before. I have seen it done frequently. There will be a distribution over all the wires, some getting more than is needed and some less, depending on the number of keys open at the same instant, but the difference will hardly be noticed until all keys are open at once; then the first one that closes will have no circuit, but the next one that closes will find a circuit for itself and also forms one for the key that closed first. Things could not work satisfactorily in this way, the ground or a common return wire is necessary. But this illustrates the principle.

I have also stated and I hold that electricity cannot be taken from the earth at any point unless an equal quantity is put into it elsewhere, both actions being simultaneous. The earth and all terrestrial matter, whether solid, liquid or gaseous, contains electricity in a quiescent or latent form—the ether. There is an analogy in a correlated branch of science. In *Astronomy and Astro Physics*, for November, Prof. Sidgreaves, of Stoneyhurst, (Eng.), discussing the Constitution of the Sun, lays down the following propositions: "All the heat of dissociated matter is absolutely latent, dissociated matter cannot part with heat; it has its fill and can receive no more; it can only receive what comes to it. * * * * * The potential energy of dissociated matter is very great, responding to its great latent heat. Dissociated matter can neither exert nor suffer pressure; for pressure fails together with ability to communicate heat by contact." (Note p.p. 228–29). In electrical language: All the electricity of matter is absolutely latent; matter cannot part with electricity; it has its fill and can receive no more; it can only transmit what comes to it. The potential energy of matter is very great responding to its great latent electricity. Matter can neither exert or suffer pressure, for pressure fails with ability to communicate electricity by contact. Now there is but one word in this requiring modification or explanation to bring it in conformity with my theory; that is the word "transmit," and it is not unlikely that the learned astronomer would explain his meaning as being in accord with Prevost's theory of exchanges, that is, a transmission that is not conduction—a transmission such as I have illustrated above by the pump and pipe.

This theory of mine is the only satisfactory explanation I can find for the earth's action, for the interferl ences, break-overs, and what is improperly called induction on telegraph, telephone and other electrica- circuits.

I explained this trouble and proposed the use of a return wire as a remedy for it nearly twenty years ago, but the remedy is not in all cases a specific; it is not complete. This is owing to "resistance" and "retardation," which make it impossible to simultaneously give at one point and take from the earth at another point equal quantities of electricity; and so the charge is distributed statically, for an instant, and is superimposed upon all the wires attached to the common ground wire. This distributed charge is called induction. But induction under the circumstances is inadequate to produce the effects; it is better described as overflow, for the effects are felt in wires widely separated from the one to which the charge is given.

When an isolated source sends a high pressure or high potential charge into the earth, the earth having its fill and being unable to suffer pressure, relief is found in an upward stroke, as in the case of atmospheric electricity or in a distribution over other wires.

If I have given the true cause of these troubles and it is realized in the proper quarters, it may not be long before a specific remedy is found.

TESTING HYSTERESIS IN IRON.

A correspondent of the London *Electrical Engineer* gives the following method of comparing different samples of iron plates for transformers and armatures in the determination of hysteresis. The test depends on the rise of temperature of the samples when subjected to an alternating field.

Two solenoids on wood frames, and identical in every respect, are coupled in series on an alternating circuit. Into each of these a core is put, consisting of a definite weight of iron plates, insulated from one another with paper, and having in the centre a piece of wood with a slot for a thermometer. One of these cores is prepared of plates which are considered standard, and the other of the plates to be tested. Readings of the thermometers are taken at intervals, and the one which shows least rise of temperature is considered the best iron. The induction in the iron can be varied both by varying the E M.F. on the coils and by varying the weight and number of plates in the cores. The whole apparatus is so simple that it can be worked by an intelligent apprentice.

The Safe carrying capacity of a wire changes under different circumstances, being about forty per eent less when the wire is closed in a tube or piece of molding than when bare and exposed to the air, when the heat is rapidly radiated.

A NEW ALTERNATING SYSTEM.

Walter K Freeman, the well-known electrical engineer, formerly connected with the National Electrical Manufacturing Company, Eau Claire, Wis., who were operating under his patents, has made arrangements to have his alternating current system manufactured in the East and is prepared to furnish estimates for central station apparatus. His new alternator is a splendid looking machine.

Wiring Rules.—We have received from Mr. W. J. Hammer, chairman of the special committee of the National Electric Light Association, on the Rating of Arc Lamps, an advance copy of the standard rules adopted by the National Electric Light Association at its last convention. The book has 32 pages, and has been reduced to convenient pocket size. The rules are supplemented by the report of the committee above named, and a convenient glossary of electrical terms. It is proposed to place the rules in the hands of the various electric light and power companies, architects and others throughout the country and secure, as far as possible, their universal adoption. An index to the rules and requirements is given in the front of the book, and will be found very convenient for quick reference.

BOOK CATALOGUE.—Part II.

Bottone. The Dynamo: How Made and How Used—a Book for Amateurs	1 00
Bottone's How to Manage the Dynamo	60
Bottone's Electricity and Magnetism (Library of Popular Science)	60
Bottone's Guide to Electric Lighting	75
Bottone's Electro-Motors. How Made and How Used	50
Boult, W. S. Comprehensive International Wire Table	2 60
Bower, G. S. and Webb, W. Law Relating to Electric Lighting	5 00
Buckmaster, J. C. The Elements of Magnetism and Electricity. Revised, Corrected and Enlarged by Chas. Lees	80
Brennan. A Popular Exposition of Electricity with Sketches of Some of its Discoveries	75
Brannt's. Metal Workers' Handbook	2 50
Badt and Carhart. Derivation of Practical Electrical Units	75
Brewer Cipher Co. Cipher Code for Telegraph (10.000 words) 2 vols., per set	5 00
Caillard's Electricity—the Science of the Nineteenth Century. A sketch for general readers. 310 pages, 41 Illustrations	1 25
Carhart. Primary Batteries	1 50
Cavendish. Electrical Researches	5 00
Clarke & Sabine. Electrical Tables and Formulæ for the use of Telegraph Inspectors and Operators	5 00
Clark's Mechanical Engineer's Pocketbook of Tables. Formulæ, Rules and Data	3 00
Classen, Dr. Quantitative Chemical Analysis by Electrolysis	2 50
Connelly, Wm. Electrical Papers on Technical Telegraphy	1 25
Cook. Magnetism and Electricity	40
Crofts, Alfred. How to Make a Dynamo	1 00
Crocker & Wheeler. The Practical Management of Dynamos and Motors (cloth)	1 00
Crosby & Bell. The Electric Railway in Theory and Practice	2 50
Culley. Handbook of Practical Telegraphy	5 50
Cumming. Electricity Treated Experimentally. For the Use of Schools and Students,	1 50

Street Railway News.

The Peekskill Surface Electric Railway Company, which is to run from Peekskill to Lake Mohegan, N. Y., a distance of nine miles, will use the new Leonard motor made by E. A. Hewitt & Co., Cleveland, O. The road is single track, and will begin operations with ten motor cars and five trailers. The cars will be equipped with Peckham standard 6-A trucks. Mr. C. J. Field, of the Field Engineering Company, New York, will construct this road, which will be finished by July next. The officers of the company are, G. W. Linch, president; John B. Doerr, vice-president and treasurer; and William Delaney, director and general manager. Mr. Linch is now secretary and treasurer of the 10th and Christopher Streets road, New York City, and Mr. Delaney is a well-known horse dealer in 24th street, New York City. Mr. Delaney will take up his residence in Peekskill. Mr. N. G. Foshay, editor of the *Peekskill Democrat*, is also interested in the road.

The Tiffin & Fostoria Electric Railway, the Tiffin Electric Railway and the Tiffin Street Railway Companies, Tiffin, Ohio, have consolidated their interests and the new company will operate under the name of the Tiffin Interurban Consolidated Railway Company.

A strike was inaugurated on the Robinson street car lines in Toledo, Ohio, on March 22. This action was determined on at a meeting of the Toledo division of the Amalgamated Street Railway Employees of America, the cause being the discharge of four men who are members of the association, and who claim that their dismissal was on account of their membership. The company refuses to recognize the association, and several efforts to establish amicable relations between the two interests failed on that account. The strike has since been settled.

The fight in Newport, R. I., over street car rails on certain streets in that city, has assumed a deeply interesting phase to the citizens. The committee on streets and highways of the Common Council recommended that the rails be ordered taken up, because the railroad company had violated the ordinance, but the resolution for the purpose of carrying the recommendation into effect was lost in the Common Council. The objectors to the rails will now carry the matter to the Supreme Court.

The Warren (Ohio) Street Railway Co. intends to extend its lines this spring.

On complaint of Russell B. Harrison, the federal court has appointed a receiver for the Queen City Electric Railway Co., of Marion, Ind.

Willing to Accommodate the Public.—A street car conductor in Philadelphia could not collect all the fares on his car on a recent occasion, on account of its crowded condition. When the explanation was submitted to the superintendent, that official immediately manifested extreme solicitation for the welfare of the people and thought that more cars must be put on to accommodate all.

Large Contract.—The Winchester Avenue Electric Railroad Company, New Haven, Conn, has given a contract to the J. G. Brill Company, Philadelphia, for forty-eight car trucks of the latest improved pattern.

AN OPPORTUNITY OF A LIFETIME.

BY J. M. BATCHELOR.

The prompt business methods of the Nassau Street Railway of Brooklyn, in constructing its new electric lines, rails for which are arriving daily, and the first earth dug on March 29, suggest the possibilities for further electric service in this vicinity.

"Greater New York" demands that bridges over the East River shall at once be constructed for through lines to all parts of Brooklyn, even if the tracks be elevated through the more thickly settled portions of the city.

This field for profit, if these undertakings are controlled by electric people, are as large as any in immediate prospect. The profits of the Brooklyn system in operation prove that conclusion with marked emphasis.

Bridges across Blackwell's Island are of easy construction, and the convenience they would afford New York city's overflowing population would be of the highest degree, as they with through electric service would permit reaching Brooklyn's outlying districts in half an hour or less.

There is no city in the country that is growing so fast as New York, when "Greater New York" is considered as a whole, and some immediate provision must be made to retain this population in the State, a large part of which is now being driven into New Jersey, merely on account of an easier accessibility.

If New York lines would interchange tickets with a service over a bridge and through Brooklyn, the opportunities of obtaining low cost homes in the latter city would be so great that "Greater New York" would be more than likely to receive a boom in a still greater ratio of increased population.

As New York itself is now situated, people being forced out of it by the narrow and cramped quarters and the high rents ordinary people are compelled to pay, it remains for electrical enterprise to take advantage of this opportunity, not only to make money by laying tracks in the most populous part of the whole country with an enormous business already at hand, but to obtain a permanent income in the growth that an accommodating and quick service would permit.

The bridges are necessary to this business, as the great drawback to living across a body of water is the changes from one system of travel to another. If the electric companies themselves build the bridges, they can then easily control through traffic, and prevent any after annoyance, political or otherwise, due to leasing rights of transit. While the cost may be large in the aggregate, the field and opportunity is larger. There is ample warrant for the construction of not less than three such bridges at different points at once, and, if all in the hands of one company, the returns should be enormous.

It is only a question of a short time before "Greater New York" is an accomplished fact, as Brooklyn is and has always been the bedroom of New York, and there is no good reason why the two cities should be separated in politics any more than in business relations.

The possibilities of extending Brooklyn as a part of New York city are enormous; lands on the outskirts can be had for a song, and no drawbacks to immediate construction of homes and business establishments exist in any direction away from the East River. One of the drawbacks to Brooklyn is, that it is not named New York, but this drawback should no more exist here than in the case of London, where both banks of the Thames are under one name and administration.

"Greater New York" will not only help Brooklyn but will give weight, influence and wealth to New York, matters which New York cannot afford to see conveyed to other parts of the country merely because its present territory is narrowed down between two rivers.

THE ELECTRICAL PARLORS OF BROOKLYN.

Mason's electrical parlors, 943 Fulton street, Brooklyn, N. Y., are in the heart of the best portion of the city. Mr. Mason carries a very large stock of the best electrical supplies, and in one of his fine show windows is a little electric car in practical operation, which attracts a great deal of attention. In the other show window is one of Frederick Pearce's turn-tables and motor. The turntable carries a McCreary portable lamp with flexible bracket, and fine polished electric letter boxes, bells, pushes, etc., and is supplied with power from Mason's famous battery.

Mr. James H. Mason, the inventor of the well known Mason primary battery, is the manager of this business and is making himself deservedly popular. He has one of Edison's latest improved phonographs, with ear tubes for a dozen or more people. This feature of the establishment is very popular.

Mr. Mason is making batteries for general electrical service, electric light and power being a specialty. He has large manufacturing facilities, and carries a large stock of electrical supplies of all kinds. Being in the best section of the city, it would pay the leading motor and fan manufacturers to put in a stock here on consignment. Manufacturers of all kinds of salable electrical goods would also do well to see Mr. Mason with this object in view, as he evidently has established a foundation for a successful business.

TELEPHONE COMMISSION.

An effort is being made in Massachusetts to have a Telephone Commission created by the legislature for the purpose of supervising telephone companies. According to information that reaches us the advocates are greatly in the minority. The commission idea is in danger of being carried to extremes in some quarters of the country, and the opponents of the movement in Massachusetts are making a strong argument against it. They object to a commission on the ground that it might result in crippling the service. Governor Long says the legislature is a commission itself, and can be reached if it is desired to correct a wrong. He does not favor the appointment of a telephone commission, neither does Governor Russell.

TELEPHONE NOTES.

Attorney General Olney believes that the suit of the United States against the American Bell Telephone Company, in regard to the Berliner patent, will come up for hearing about the first of May next.

Mr. Phil. Collins of Benton Harbor, Mich., has secured franchises allowing him to operate an independent telephone system in that city. It is stated that he will put the system in operation at an early date.

The Great Southern Telephone Company, it is reported, will extend the Long Distance lines from Washington to New Orleans by the way of Richmond, Atlanta, Charleston, Savannah, Macon, Mobile, Birmingham and other principal southern cities.

The Western Union Telegraph Construction Company has petitioned for the right to erect and equip a telephone system in Savannah, Ga.

The Kansas City Electrical Works, Kansas City, Mo., has made an assignment to Elmer N. Williams.

NEW CORPORATIONS.

The Des Moines, (Iowa), Electric Mfg. and Supply Co., has been incorporated with a capital of $50,000. J. E. Bruner is president, and W. L. Bales, secretary.

The North Baltimore Water and Electric Co., North Baltimore, Ohio; capital stock, $80,000.

The Huntsville Electric Light and Ice Co., Austin, Texas; capital stock, $6,500. Incorporators: T. H. Ball, J. G. Ashford, T. C. Gibbs, C. G. Barrett, R. S. Rather, J. W. Thomason, C. H. Robinson, B. A. Eastham, and W. S. Gibbs.

The Home Telephone Co, of Bloomington, Ill., has been incorporated with a capital stock of $30,000. Incorporators: James E. Taylor, Owen Scott, A. B. Hoblit, F. M. Funk, John T. Lillard, C. C. Demotte, B. M. Kuhn.

The Pacific Automatic Telephone Exchange, of Tacoma, Wash., has been incorporated with a capital of $100,000. Among the incorporators are R. B. Lehman.

The Kensington Rapid Transit Bridge Co., of Pittsburgh, Pa.; capital stock $20,000. Directors: Samuel E. Moore, Bernard Rafferty, Joseph P. Cappeau, Curtis C. Hussey, and G. Kaufman, of Pittsburgh. This company intends to operate an electric railroad between Creighton and Parnassus, Pa.

Peotone Electric Co., Peotone, Ill.; capital $6,000. Incorporators: Henry A. Rathje, John W. Stocker, John Fedde, and Michael Collins.

LEGAL NOTES.

The Sioux City (Iowa) Railway Company's equipment and franchises will be sold on foreclosure in favor of the Fidelity Loan and Trust Co., of Sioux City, trustee for the first mortgage bonds in the amount of $525,000.

The United Electric Railway, Nashville, Tenn., will be sold at auction on Wednesday, April 18. The sale will be made in pursuance of a decree in favor of Richard Wiggin, a bond-holder of the road, and is made without the equity of redemption.

Thomas A. Edison and Col. Geo. E. Gouraud have asked for the appointment of a receiver for the Edison United Phonograph Co. Mr. Edison says that the stock of the company is used for speculation. The company, however, denies that such is the case, and that it is perfectly solvent.

THE LAW BATTERY CO.—Our sincere thanks to the Law Battery Co., for the glass pen sent us with their compliments and for the purpose of relieving to some degree our editorial labors. Rays of sunshine do occasionally penetrate the editorial sanctum, and this kind remembrance is one of them. It is refreshing to know that there are left in the world some sympathetic souls, and when we wield this pen, we will think of the giver. The Law Battery Co. has a knack of getting up new and useful things for its friends and it shows the spirit of this company, which is to always keep to the front.

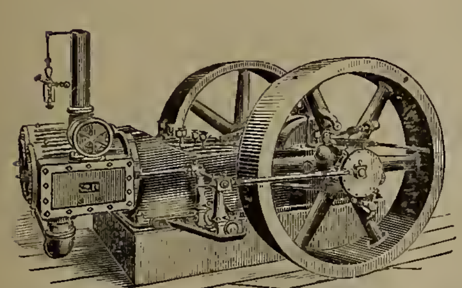
ELECTION.—The Brush Electric Company, Cleveland, Ohio, on March 26, held its annual meeting. The annual report indicates a prosperous business during the past year. The old board of officers was re-elected, with one exception—Mr. S. M. Hamill was elected second vice-president. The other officers are: president, W. H. Lawrence; first vice-president, C. A. Coffin; treasurer, B. F. Miles; general counsel, W. B. Bolton; secretary, A. H. Hough.

BALL ENGINE CO. OF ERIE, PA.

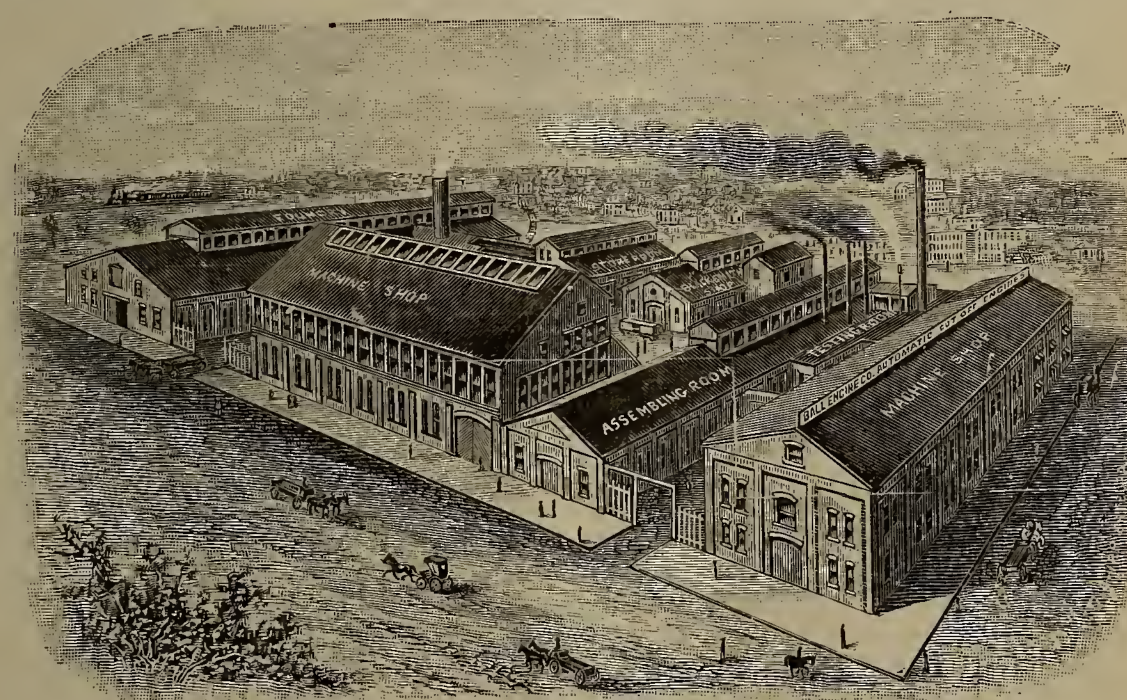
Among the many makes of prime movers to be found on the market, probably none is better known than the Ball Engine, manufactured by the Ball Engine Company, of Erie, Pa. Ball engines are very popular in electric light and electric railway stations, and from the fact that they are in constant demand for these and other power generating purposes, is evident that the engine is fully able to maintain its reputation.

The Ball engines are made single cylinder, cross compound, tandem compound and triple expansion, either horizontal or vertical, and up to the present time no less than 200 engines with an aggregate of 32,835 H. P. have been sold to ninety-five electric railways in the United States.

The characteristics of the Ball engines are massiveness and strength, beauty of design, superiority of finish, limited floor space, economy of fuel and perfection of regulation. They are designed especially for electric lighting and railway service. The engine generally used for railway work is the cross compound, of from 200 to 600 H. P. This type of engine is made in sizes up to 1200 H. P. The tandem compound engines vary in power from 100 to 700 H. P., and the single cylinder engines are designed for heavy duty.



CROSS-COMPOUND BALL ENGINE.



WORKS OF BALL ENGINE CO., ERIE, PA.

One of the features of the Ball engine is the governor, which is said to be the best of its kind for electric railway service. The company claims for it, best regulation, uniformity of action, economy, durability, noiselessness of operation, and it is specially valuable in street railway work, where the loads are suddenly and frequently changed. The valves of the engine are always steam tight, and take up their own wear by a telescopic movement.

A glance at the list of street railways using Ball engines shows that many of the roads have duplicated their orders for these engines many times over.

The Brooklyn Street Railway Co., Cleveland, Ohio, had, up to January 1 last, no less than twelve Ball engines in operation.

The New York office of an establishment of this magnitude is of course a very important branch of the business, and the selection of competent rep esentatives is no easy matter, inasmuch as everything depends on the ability of the persons selected. The Ball Engine Co. has, however, been peculiarly fortunate in the selection of its representatives in this city, and through their extensive acquaintance in the trade, Messrs. F. Schmerber and J. S. DuVall, who jointly look after the company's interests at 30 Cortlandt street, New York, are succeeding in getting a good number of orders for engines, and laying their plans for the future disposition of many more. Both these gentlemen have had large experience in the business that they are now engaged in, and are amply capable of managing the company's affairs in the most satisfactory manner possible.

Erie, Pa , where the works of the Ball Engine Company are located, is one of the largest manufacturing towns in the state, and the company's plant is one of the largest establishments in the city, covering four acres of ground. Between 400 and 500 skilled mechanics are employed by the company, and each department of the works is under the care of a competant superintendent.

All through the dull season the company has had sufficient work to keep the shop running full time, and at present has a considerable number of orders for large size engines. The company is now bringing out a vertical engine for either direct or belt connection. These engines are manufactured in different sizes, ranging from 100 to 1200 H. P. and are built single cylinder, cross compound and triple expansion.

OBITUARY.

J. L BARCLAY.

It is with regret that we note the death of Mr. J. L. Barclay, of Chicago, who was one of the best known men in the electrical business. Mr. Barclay died in Pittsfield, Mass., on March 26, whither he had gone on business. He was there taken sick with appendicitis; an operation was performed, but blood poisoning set in later, with fatal results.

Mr. Barclay became known to the electrical trade through his connection with Holmes, Booth and Haydens of New York. He was afterwards connected with the Sprague Electric Railway & Motor Company, and later with the Westinghouse Electric & Manufacturing Company. About a year ago he became connected with the Walker Manufacturing Company of Cleveland, Ohio, as western representative, with head-quarters in Chicago. Mr. Barclay was of English birth and about 35 years of age.

Ten turns of wire carrying one ampere will produce the same magnetic effect as one turn carrying ten amperes. This is a very important law to remember.

Iron, nickel and cobalt, in the order named, are the best conductors of magnetic force. All other substances offer high resistance to magnetic action.

GARVIN UNIVERSAL CUTTER AND GRINDER.

The accompanying illustration shows No. 3 Universal Cutter and Tool Grinder, manufactured by the Garvin Machine Company, Laight and Canal streets, New York city.

This machine is designed for grinding solid and shell reamers, either straight or tapered, milling cutters of all shapes up to fourteen inches in diameter by six inches face, and dies or other surface work within a range of six by nine inches.

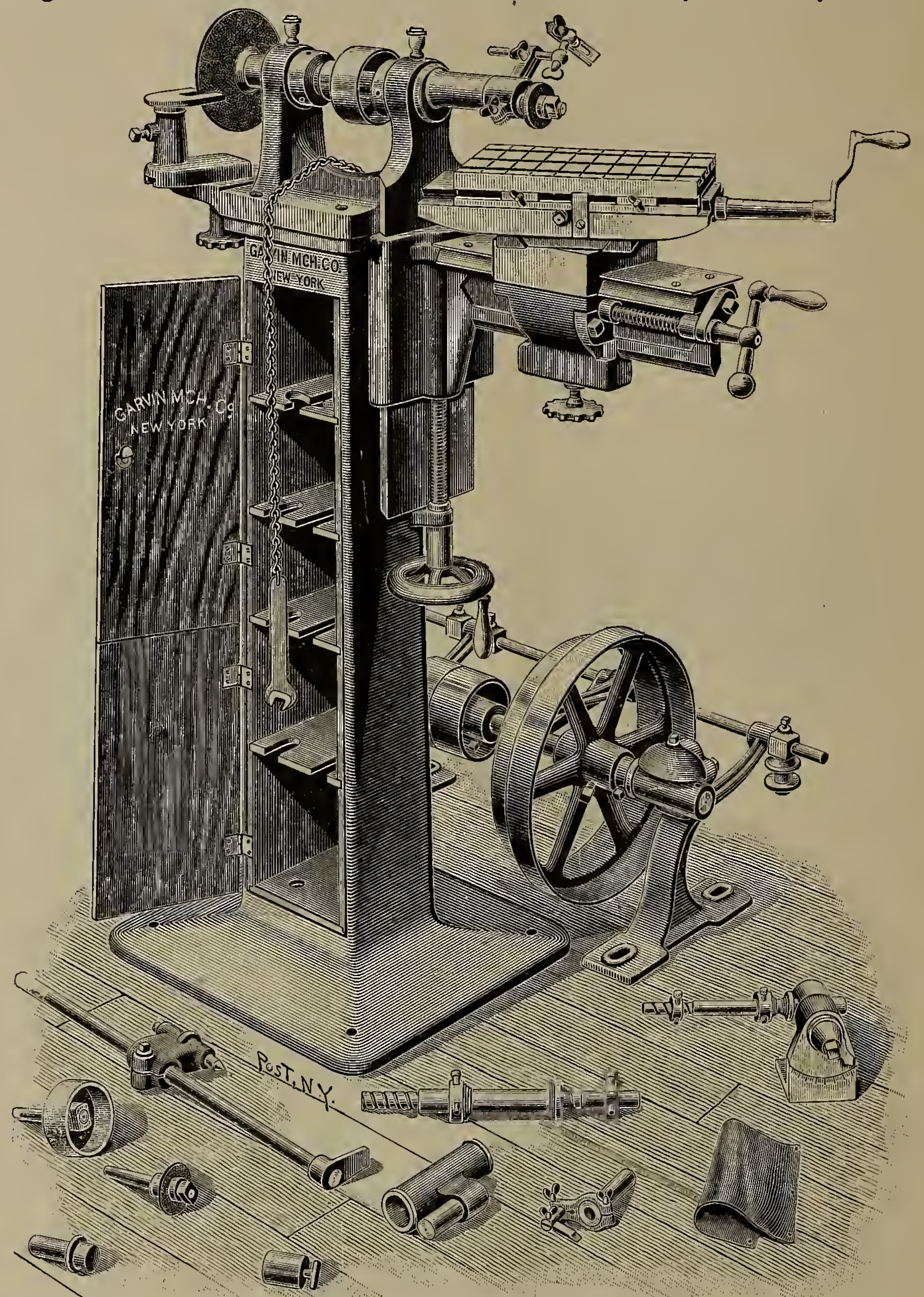
In bringing out this machine, it was the Garvin Company's desire that it should embody such important features as simplicity in construction, strength, durability, accuracy, ease of adjustment and operation, and it is claimed that these objects have all been attained. The machine represents several years' experience and a great deal of careful study and exhaustive tests, and the company unhesitatingly recommends it and guarantees the utmost satisfaction in use.

The head stock and slide for knee are cast in one piece, and is of such form as to insure greatest rigidity. It is mounted on a hollow pedestal base, provided with wooden shelves and doors, for the storing of tools, etc. The spindle is of steel, hardened and ground, and is driven by a two-step cone for an inch and a quarter belt. The front bearing is large and prevents vibration, and it is also fitted with a dust cap, which prevents entrance of foreign substance. The spindle also extends beyond the rear bearing and is arranged to carry emery wheels of eight inches in diameter or less. An adjustable rest is provided for this wheel for convenience in grinding tools.

Upon the knee is mounted a sliding platform, accuratety fitted and having an adjustment of six and one-quarter inches in line with the spindle. It may be secured in any desired position.

The grinding table is mounted on this platform and is provided with three T slots, two adjustable stops and two actuating shafts placed at right angles to each other, and squared to fit the same crank wrench.

The Universal Cutter head is for use in connection with the grinding table, to which it can be bolted in any position. It carries a rotating clamp stud having an index moving in a graduated arc of 90 degrees, which is readily adjusted to any angle. This stud carries the different cutter arbors, reamer centres, sockets, studs, etc.



UNIVERSAL CUTTER AND GRINDER.

Train Lighting.—A test was made a few days ago on the Chicago, Milwaukee & St. Paul railway of a new system of lighting railway cars by electricity. The system is said to be the invention of William Biddle, of Brooklyn, N. Y. The dynamo is driven by one of the axles through gearing connection at a ratio of 3 to 1. The dynamo is wound to give a current of 40 amperes at 28 volts and charges storage batteries from which the current for the lighting is derived. An automatic switch is turned when the direction of the car is reversed, so that the charging current is always the same.

BALL & WOOD'S NEW VERTICAL ENGINE.

On the afternoon of March 31 a large party of electrical and mechanical engineers visited the works of the Ball & Wood Co., at Elizabethport, N. J., manufacturers of the well-known Ball & Wood engines, to inspect the 600 H. P. vertical engine made by the firm for the Chicago Edison Company. The engine was working under steam, and its action was very favorably commented on by the practical engineers present. It has several novel features, which are said to increase the efficiency of the machine. All those present examined the engine critically, especially the valve gearing, and it was the general opinion that this feature was a very ingenious one. The engine worked with remarkable smoothness, and promised to be well adapted for the purpose for which it was designed.

Lecture.—Mr. Joseph H. Gerry will deliver a lecture before the Department of Electricity, of the Brooklyn Institute of Arts and Sciences, on "Systems of electric signalling as demonstrated at the Columbian Exposition, including time signalling, train dispatching, regulating timepieces," etc. The lecture will be illustrated by models and lantern slides.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, March 31, 1894.

The Metropolitan Electric Equipment Co., 10 and 12 Chambers street, New York city, reports a good condition of business, with bright prospects. This company is contractor for the building or partial equipment of buildings on the system of the Edison Electric Illuminating Co., of New York. Estimates are furnished and orders executed for wiring, fixtures, dynamos, motors, engines, pumps, elevators, etc. Mr. James F. Hughes is the general agent, and Mr. S. E. Miller of the company is always willing and ready to talk business and glad to see his friends.

The United Electric Light and Power Company's station at the foot of East 29th street, New York city, was damaged by fire on the morning of March 26. The fire was kept confined to the second floor, but the dynamos on the floor below were damaged by water, causing the extinguishing of the lights in the districts covered by the circuits thus affected. Damage $15,000.

J. Jones & Son, wholesale electrical supplies, 39 Vesey street, New York City, report some heavy orders for anti-thunderbolt paper. This paper is said to be a most efficient and lasting insulating material for electric generators and motor armature and field coils, and for general electric work. It resists heat, oil, water and dampness, and does not crack or tear when folded or formed to the work. The firm will move to 67 Cortlandt street, on May 1.

Stanley & Patterson, 32 and 34 Frankfort street, New York city, have just issued a very neat catalogue and price list of their general electrical furnishings and supplies. This firm carries a very large line of electrical goods, and is agent for Paranite insulated wires and cables.

Mr. W. R. Brixey, 203 Broadway, New York, of "Day's Kerite" fame, is filling four contracts for submarine Kerite cables. The cables called for vary from 2,700 feet to two miles in length, and they are to be used by local telephone and electric light companies and telegraph companies in the West. Business is reported very good in Day's Kerite wires and cables.

Mr. C. J. Field, of the Field Engineering Company 143 Liberty Street, New Yoık City, is the consulting engineer for the new electric light plant in Flatbush, Long Island, N. Y. Three 100 H. P. Ball & Wood tandem compound-condensing engines will be installed.

The Safety Insulated Wire and Cable Company, 254 W. 29th street, city, informs us that the Public Lighting Commission of Detroit, Mich., has awarded that company the contract for all the underground electric light cables to be used. Other manufacturers of cables submitted bids for this contract, and the Safety Company naturally feels flattered over its success in securing the same.

"General" Godfrey of the New York Insulated Wire Co. is now in Chicago, where he has just arrived from the Pacific Coast. He reports business in good condition. We are glad to learn that the General is looking so well. All his friends are looking for his return to New York.

Mr Fred. Angell, an old time and noted wire salesman, is in town. Mr. Angell's vigor remains undiminished, and he is able to hustle in the orders as of yore. Some big insulated wire company would do well to look him up and secure his services. W. T. H.

PERSONAL.

Mr. Thos. F. Clohesey, electrical engineer, formerly of Kansas City, Mo., has opened an office in the Johnston Building, Cincinnati, O. Mr. Clohesey has had large experience in his line and has a wide circle of acquaintances who will wish him success.

FINANCIAL.

It is stated that the Westinghouse Electric and Manufacturing Company's net earnings for January last were over $125,000, and have been at this rate for the past twelve months. It is expected that the annual report in May will show that over 15 per cent. has been earned on the total capitalization. It is figured that this company is now earning more money than the General Electric Company, and the following comparative statement is given for the information of those interested :

Capital.	Westinghouse.	General Electric.
Bonds...........	$692,000	$10,000,000
Preferred stock ..	3,600,000	4,000,000
Common stock ..	5,400,000	30,000,000
Total	$9,692,000	$44,000,000

The Wells Engine Company, 91 Liberty street, New York city, has been organized under the laws of the State of Kentucky, with a capital of $500,000, with shares of $100 each. The company has preferred 500 shares of the common stock to 10 per cent. When the stock has been paid 10 per cent. the common stock is entitled to 6 per cent., and both classes share in any excess earnings. The company controls the patents on the Wells engine which, in actual practice, is said to show a gain of about 33⅓ per cent. in economy and a reduction of more than 50 per cent. in the cost of maintenance. It also occupies one-half less space and is especially well adapted for electrical purposes, mills, factories and steamboats, and, as an air compressor, it is said to be unequalled. The company does not propose to engage in the manufacture of the engine, the object being to dispose of rights to manufacture upon royalty.

The directors of the North Hampton Street Railway Co., North Hampton, Mass., have voted to increase the capital stock from $150,000 to $225,000 for the purpose of extending the lines to Williamsburg, Mass.

"IDEAL" INSULATED WIRE.

Prof. Henry Morton, of the Stevens Institute of Technology, Hoboken, N. J., recently submitted a sample of "Ideal" insulated wire to the "ozone" test. He reports that the sample "shows no injury whatever by ozone, and may therefore be regarded as of the highest quality, so far as its resistance to atmospheric influences is concerned."

The insulation of "Ideal" wire was tested by Mr. E. G. Willyoung, electrical engineer of Queen & Co., Philadelphia. The test was applied to two coils, each 25 feet in length. The coils had been immersed in a water bath for over two months, and when pressed together (in the bath) by a ten-pound weight, showed a drop of only 1 part in 996 due to leakage. This showed that the resistance of each thickness of insulation was 8,000,000 ohms, or about 40,000 ohms per mile. The voltmeters used in the test were standardized D'Arsonval galvanometers.

The Phillips Insulated Wire Co., 30 41 Cortlandt street, New York, manufactures this wire, and the officers of the company are particularly elated over Prof. Morton's report, which has just been received.

TRADE NOTES.

Messrs. Vallee Bros. & Co , 17 N. 6th street, Philadelphia, will, about April 15, remove to 617–619 Arch street. They will have for their new quarters two large floors, each 30x160 feet, which will give them increased facilities for the more satisfactory handling of their large and rapidly growing business. It is their intention to carry a full line of electric railway, telephone and telegraph supplies, as well as their well known line of electric light supplies, which will also be largely increased. The firm is getting out a new catalogue of its various supplies

The 100 H. P. Climax Boiler, which was exhibited at the World's Fair by the Clonbrock Steam Boiler Works, Brooklyn, N. Y., manufacturer of these boilers, will be used in connection with the 600 H. P. vertical engine made for the Chicago Edison Company by the Ball & Wood Co. This engine was exhibited to a large party of engineers at the works of the Ball & Wood Co., in Elizabethport, N. J, on March 31, an account of which is given in another column.

We have received a copy of a neat little catalogue just issued by the Lodge & Shipley Machine Tool Company, Cincinnati, Ohio. This company manufactures machine tools for the rapid production of lathe work and its products are used largely in the manufacture of electrical machinery.

The Rhode Island Automatic Electric Light Company of Providence has been dissolved.

Electrical and Street Railway Patents.

Issued March 30, 1894.

517,017. Incandescent Electric Lamp. Richard P. Ashwell, Newark, N. J., and Geo. W. Tuttle, New York, N. Y. Filed Aug. 11, 1893.

517,018. Secondary Battery. Geo. L. Ballard, Toronto, Canada. Filed Apr. 27, 1893.

517,028. Electric-Railway Trolley. Frank S. Church, Detroit, Mich., assignor of one-half to Wm. F. H. Edwards, same place. Filed Apr. 17, 1893.

517 042. Electrode for Arc Lamps. Salomon Heimann, New York, N Y. Filed Sept. 15, 1893.

517,069. Electric Lamp. Frederick C. Rockwell, Hartford, Conn. Filed Nov. 6, 1893.

517,100. Electric Switch. Jacob S. Gibbs, Hartford, Conn , assignor to the Perkins Electric Switch Mfg. Co., same place. Filed Oct. 4, 1893.

517,120. Safety Cut-Out for Electrical Apparatus. Hermann Lemp and Merle J. Wightman, Hartford, Conn., assignors to the Schuyler Electric Co., of Connecticut. Filed July 31, 1886.

517,134. Apparatus for Supplying or Removing Storage Batteries. William E. Worthen, New York, N. Y. Filed Aug. 5, 1893.

517,162. Electrical Measuring Instrument. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Mar. 24, 1893. Renewed Feb. 27, 1894.

517,163. Electrical Indicator. Arthur E. Kennelly, Orange, assignor to Thomas A Edison, Llewellyn Park, N. J. Filed Oct. 26, 1892

517,166. Trolley-Catcher. Levi G. Mowry, Buffalo, N. Y. Filed Dec. 11, 1893.

517,169. Electric Appliance for Dumb-Waiters. James H. Roberts, Brooklyn, N. Y. Filed Sept. 11, 1893.

517,214. Electric Ventilating-Fan. Charles W. DeMott, Brooklyn, N. Y. Filed Apr. 17, 1893.

517,243. Single-Line Telephone System. John I. Sabin and William Hampton, San Francisco, Cal. Filed Mar. 13, 1893.

517,253. Galvanometer. Elmer G. Willyoung, Philadelphia, Pa , assignor to the Queen & Company, of Pennsylvania. Filed June 23, 1893.

517 258. Electrical Railway. Benson Bidwell, Philadelphia, Pa., assignor of one-half to Charles F. Bidwell, Indianapolis, Ind. Filed Jan. 8, 1885.

517,263. Telephone Switch. Frank R. Colvin, New York, N. Y. Filed Dec. 6, 1893.

517,299. Electric Calling Apparatus David Hall Rice, Brookline, Mass. ; Charles M. Williams, Lowell, Mass., and Walstein R. Chester and Lepine Hall Rice, executors of said David Hall Rice, deceased. Filed Feb. 11, 1892.

517,402. Electrical Keyboard. Charles E. Allen, Salem, Mass. Filed Dec. 29, 1893.

517,419. Electrical Apparatus for Controlling Signals. Michael B. Leonard, Richmond, Va. Filed June 17, 1893.

RE-ISSUES.

11,408. Electric Elevator. Frank E. Herdman, Winnetka, Ill., assignor to the Premier Steel Company, of Indiana. Filed Nov. 27, 1893. Original No. 466,037, dated Dec. 29, 1891. [Division A]

11,409. Electrically-Operated Elevator. Frank E. Herdman, Winnetka, Ill., assignor to the Premier Steel Company, of Indiana. Filed Jan. 23, 1894. Original No. 466,037, dated Dec. 29,1891. [Division B.]

② ELECTRICAL AGE

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CONTENTS.

GENERAL ELECTRIC'S REPORT.

The annual report of the General Electric Company shows a healthier condition of things than was expected in some quarters, and the stockholders will be gratified to learn that the company's affairs are now being conducted on a more solid and business-like basis. A good many errors in accounting have been remedied with very beneficial results, and taking it all in all the report is of a decidedly encouraging character. Licensee companies are receiving greater consideration at the hands of the parent company, and in order to promote greater harmony between the two interests, the latter company has reduced the price of apparatus during the past year, believing that its own interests lie in advancing the interests of the licensees in every way. Regarding the lamp patent, the company's counsel hopes that the courts will so construe the law that the lamp patent will run its full term in spite of the complication caused by foreign patents.

THE BUSINESS OUTLOOK.

It is gratifying to note the more buoyant feeling that exists in the electrical trades. Everyone seems to be full of hope—in fact most all believe—that a general revival of business will be coincident witn the return of spring. The reappearance of the vernal season, which is emblematical of youth and life, naturally turns our thoughts into brighter channels; but we opine that the more cheerful feeling among business men is not altogether a sentimental one; it seems to be based on more substantial grounds. It is undeniable that consumption has been greater than production for the past few months, and it does not require any philosophical argument to demonstrate that (the truth of this proposition being conceded) a point will be reached when the production must be increased to replenish the exhausted supply. That point has been reached. Consumption has been materially lessened in consequence of the hard times, it is true, but the production has been less in proportion, and it is this fact that inspires so much hope in the trade. The delay of Congress in taking action on the tariff question is undoubtedly hanging like a millstone on the neck of enterprise and progress, but in spite of this incumbrance the outlook is more cheerful, and we sincerely trust that the hopes of all may be realized.

THE VALUE OF TECHNICAL KNOWLEDGE.

In a recent address before the Institute of Electrical Engineers, London, Mr. W. H. Preece reviewed the progress making in electrical industries in this country, as observed by him during his visit to this country last year to attend the International Congress. Among other interesting things, he stated that technical knowledge among American telegraphers was very meagre as compared with that possessed by English operatives. It is well known that the English government fosters and maintains technical educational institutions, where telegraphers can acquire a scientific knowledge of the principles of and apparatus used in telegraphy. Such a wide diffusion of technical knowledge can result in no other way than for the benefit of the service. That this is true is evident from the remarks made at the recent presentation of prizes at the Telegraphers' School of Science, in London, to successful students. It was there stated that one of the results of technical education among the operating staff was the lessening of the cost of maintenance. This is but natural, and the American telegraph companies would be furthering their own interests to encourage in every way possible the study of electrical science by their operators—we mean, of course, as far as telegraphy is concerned.

ELECTRICAL SIGNAL SYSTEM FOR CABLE RAILWAYS.

One day, a few months ago, the grip of a cable car on the Broadway line in New York City became inoperative by reason of a broken strand of the cable becoming entangled with the grip. All efforts to release the cable and stop the car were unavailing, and after the helpless car had collided with several vehicles, doing considerable damage and scaring many people out of their wits, word was telephoned to the power-house to stop the cable, and the stoppage brought the system to a dead standstill. This occurrence, the first of the kind in New York, opened the eyes of the people and street railway officials. It demonstrated that there was positive danger in operating cable roads in crowded streets, unless some efficient means were provided to secure a stoppage of the cable engine at once in case of like or similar accidents.

This experience on the Broadway line was a valuable lesson, and the officials of the Third Avenue line, which line was at the time in process of transformation from horse-power to cable, profited thereby. They determined to equip their new cable line with a system of signals, calculated expressly to meet such contingencies. The idea was to place signal boxes along the line of the road at stated intervals, and recording apparatus at the power houses so that the engineer at the latter localities could, without delay, be apprised of any accident on the line requiring the stoppage of the machinery. Obviously such a signaling system had to be electric. One had to be invented, as there was a necessity for it, and Mr. Frederick Pearce, of 79 John street, New York, perceiving the existence of a necessity, and recalling the saying that "necessity is the mother of invention," at once set his inventive faculties to work, and with the aid of his vast experience as a manufacturer and designer of electrical machinery, in due season evolved the system below described and illustrated. This system has been introduced on the Third Avenue Cable line, from end to end, and as to its efficiency, any one at all familiar with electrical apparatus can see

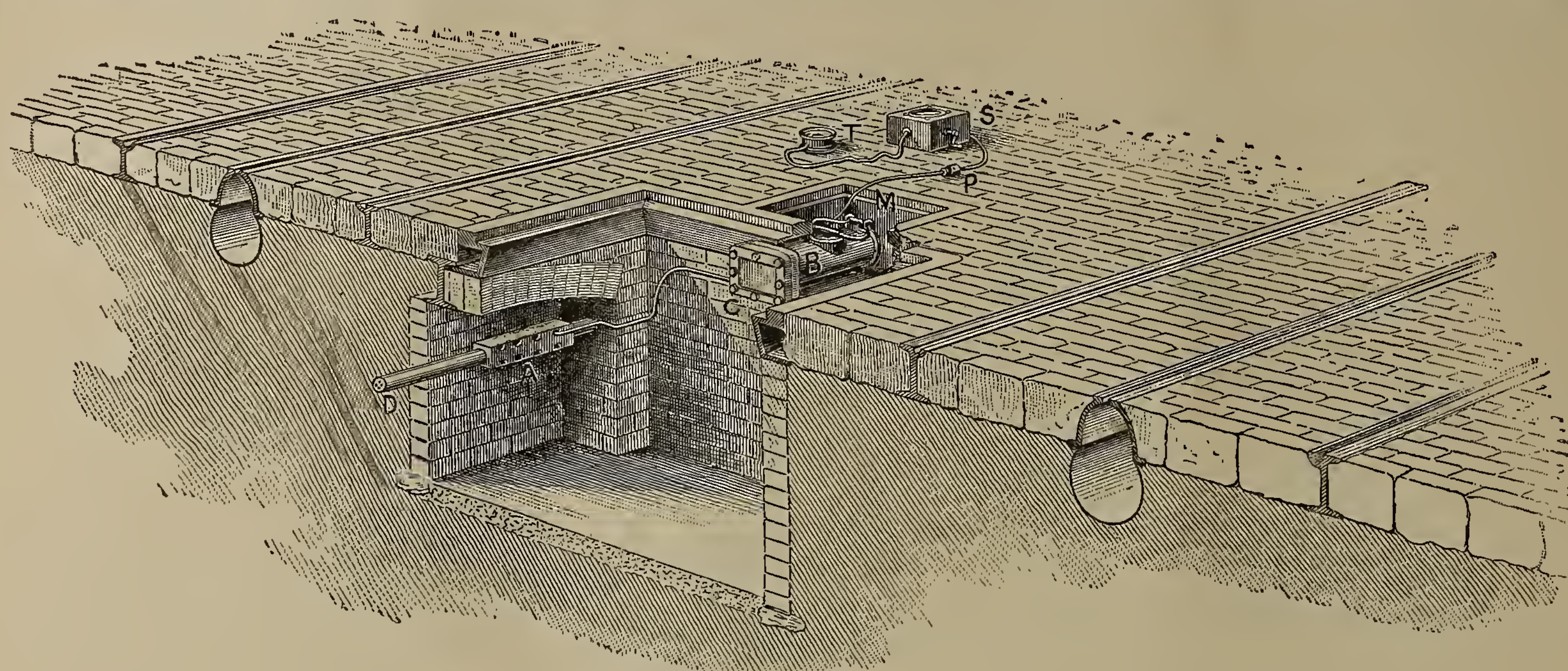


FIG. 1.

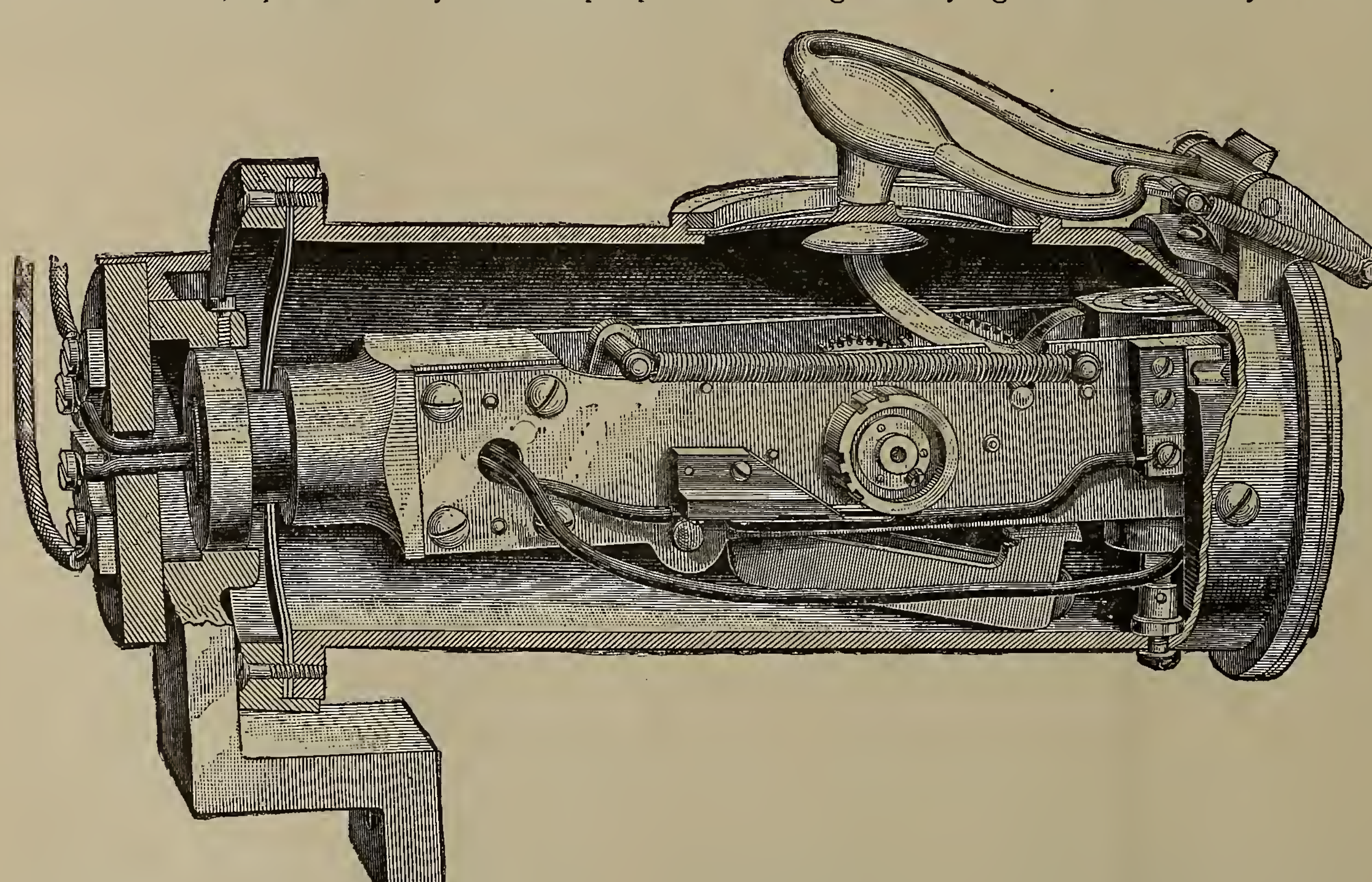


FIG. 2.

from the illustrations and description that it cannot be otherwise than efficient. The system, in brief, provides means for signaling both of the two power-houses from any point of the road where a signal box is located.

These signal boxes are placed below the level of the street in manholes, as shown in Fig. 1. The manholes are located about every two blocks apart, and are covered with an iron lid, which can be lifted easily. On lifting the cover a metallic case called an "Automatic" is disclosed, having a handle on the top. The interior of the case and the handle are shown very clearly in Fig. 2. The act of pulling up the handle sends a single signal to the power-houses which indicates that the cable running in the section from which the signal came, must be stopped at once.

There are two power-houses on the Third Avenue line, one at Bayard street and the Bowery and the other at Sixty-fifth street and Third avenue. Each is equipped with a signal box, which includes the proper apparatus for receiving and recording the signals. By reference to Fig. 3 it will be seen that the cables are run in three sections, the Bayard street station engine operating one, and the Sixty-fifth street station the other two. In order to distinguish the signals as they are received—that is, to determine which section of the cable the signal applies—two gongs are provided, one large and one small. When the large gong is sounded, it means that the Sixty-fifth street cables are concerned and the engineer in the Bayard street station knows that it does not refer to his part of the system. The smaller gong is his signal and when it rings he acts accordingly. In the Sixty-fifth street station, the up and down cables are distinguished in the signals by the dropping of an annunciator, indicating "up" or "down," as the case may be. Thus the engineer knows which of the two cables to stop.

Referring to Fig. 2, when the conductor or person sending the signal raises the handle of the Automatic, it sends the one signal to the power-houses as before referred to. The act of raising the handle of the Automatic, practically winds up its mechanism, so that when the handle is depressed to its normal position, the mechanism is tripped and a signal is sent to the power-houses, indicating the number of the box whence it came. Thus the engineer is informed of the location of the trouble, and at once dispatches the wrecking wagon to the scene. The wagon carries with it a telephone which can be attached to the Automatic, so that conversation may be carried on between that point and the power-house. After the trouble has been remedied, the proper signal is sent to the power-house by means of the Automatic, to notify the engineer to start the cable again.

The Automatic consists of a bronze cylinder, nine inches long and about three and one-half inches in diameter. In one end the electrical conductors enter and connect with the mechanism within the box, as shown in the illustration. The box is so constructed that its rear end is allowed a little free motion, and in the act of raising the handle the box is lifted a short distance, which results in the separation of contact pieces within the box. This separation of the points is what causes the one signal to be sent to the power-house. The act of lifting the handle, as before explained, winds the gear movement, which is tripped and the box signal sent as soon as the handle is depressed. Should, by any chance, the person manipulating the Automatic, fail to depress the handle sufficiently to trip the train gear, provision is made to secure this result by the replacing of the cover of the manhole. Referring to the illustration of the Automatic, it will be seen that on the handle is a lug, which, when depressed on the diaphragm by the force of the manhole cover, presses against the trip handle, which starts the mechanism in motion.

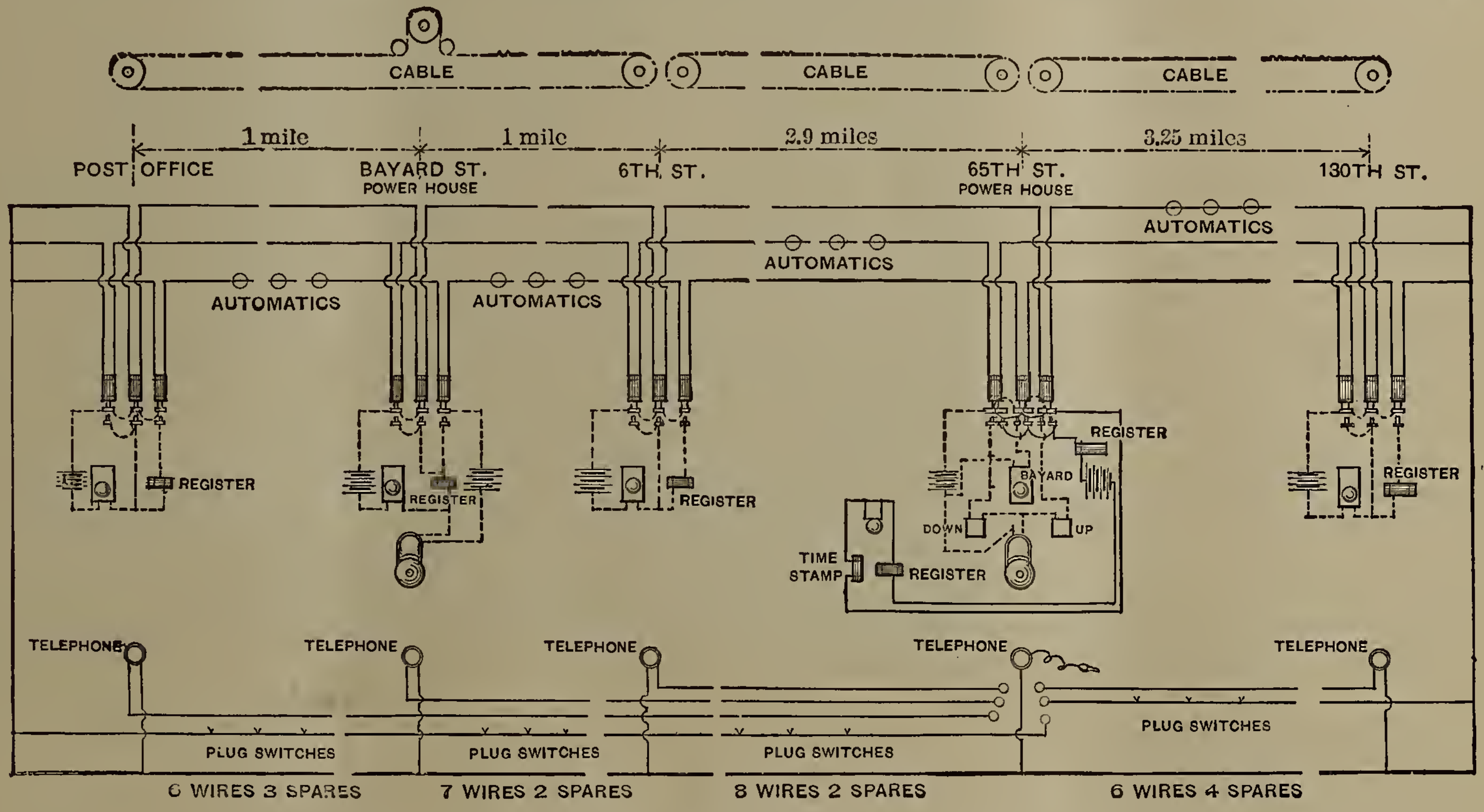


FIG. 3.

The toothed wheel shown on the side is the make-and-break contact wheel, which transmits the signal to the power-house. Each box is provided with a make-and-break contact wheel, different to all the others, which is to distinguish the individual boxes.

A small dash pot is provided at the free end of the cylinder so as to prevent injury to the mechanism by too violent use of the handle. All of the mechanism in the Automatic is securely protected against dampness and dust and everything is strongly made to insure durability of service.

Fig. 3 is a diagram of the street wiring and the wiring of the two power-houses. The system includes five telephone stations, the second station from the right hand end representing the central station office, which can be communicated with in the usual way from any Automatic along the line.

Signals received on the registers at the power stations are printed on tape with the date and time of their receipt.

It is evident from what has been said above that any code of signals can be used on this system, permitting the transmission of a wide range of intelligence, and with the addition of the telephone unlimited conversation can be carried on.

This signal plant is operated on the closed circuit system. This system was adopted so that any accidental break would instantly make itself known at the power-house by sending in a signal.

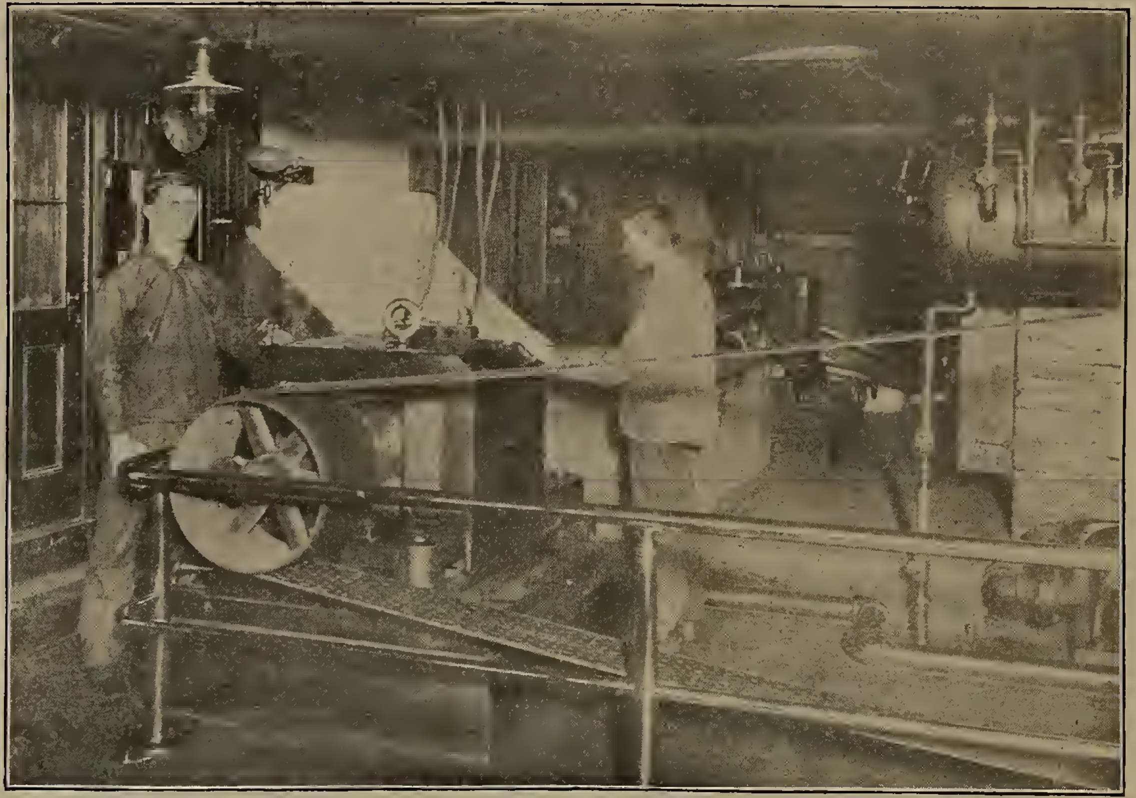
This system is remarkably simple in its design, and its ease of operation practically places the power-houses under the control of the conductors and motormen on the line at all times.

THE COTTON EXCHANGE LIGHT PLANT.

One of the most complete and compact isolated electric light plants in New York City is that in the Cotton Exchange, cor. of Broad and Beaver streets. It was installed by the P. Claus Dynamo Company of New York City.

There are two Claus dynamos each of 600 lights capacity. Each dynamo is driven by a Straight Line engine of 50 H. P. running at 280 revolutions, the speed of the dynamos being 700 revolutions. The dynamos are set on heavy stone foundations, the stones surmounting concrete beds each four feet thick. This foundation is so solid that there is an entire absence of vibration.

The brushes on the dynamos are of woven wire and were supplied by Cherry & Younglove of Syracuse, N. Y. The switchboard was installed by the P. Claus Dynamo Company, and is of marbleized slate. It contains Weston ammeters and volt meters, and five Baehr switches of 100 amperes capacity and five of 300 amperes. From the board, seven distribution circuits diverge, the main feeders being Habirshaw flexible cable No. O. These cables run through Interior Conduit & Insulation Company's brass armored tubing. Schieren perforated belts are used on both machines.



ELECTRIC LIGHT PLANT, COTTON EXCHANGE, NEW YORK.

The steam generating plant consists of a horizontal tubular boiler made by George Fox of New York, and installed by Baker, Smith & Company.

The building is lighted by 900 lamps and is wired on the two-wire system.

Mr. W. A. Cromwell, custodian of the building, has charge of the plant and states that it has given the very best of satisfaction and is first-class in every way. No trouble whatever has ever been experienced. The plant is remarkable for its compactness, and as it is well maintained, its attractiveness is preserved.

Laws of Resistance.—The resistance of a conductor is proportional to its length, and inversely proportional to its area of cross section. Example: a wire two miles long will have twice the resistance of one one mile long, and a wire half an inch thick has four times as much resistance as a conductor one inch in diameter. When a wire of small resistance and an insulator of great resistance are employed upon a line, the highest excellence is secured, since the lower resistance in the former the better the transmission, and the higher the resistance in the latter the less the waste of current.

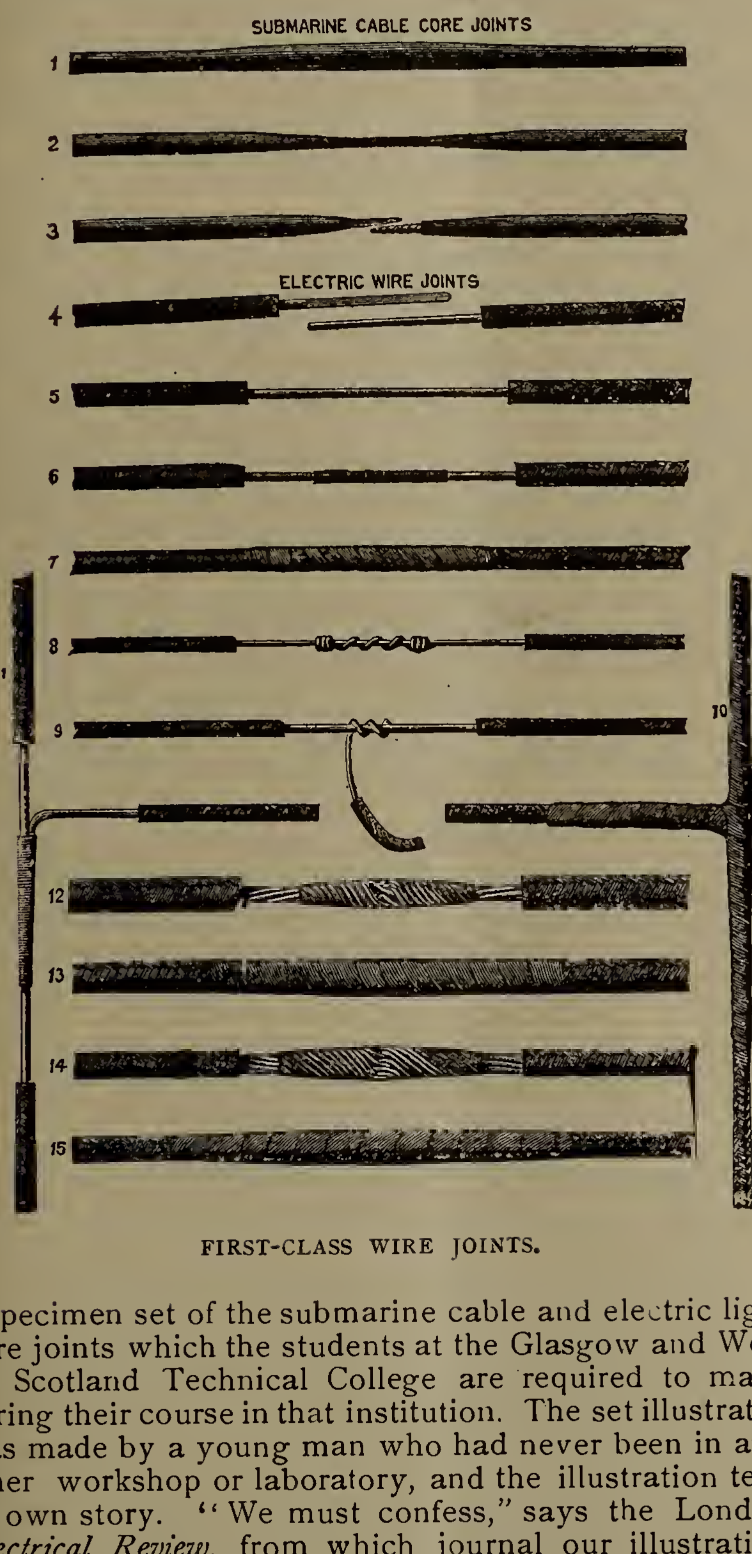
THE ANTWERP HYDRO-ELECTRIC INSTALLATION.

The installation of the works which the Hydro-Electric Company has carried out at Antwerp for the distribution of electricity is based on a system of Prof. Francois Van Rysselberghe. The *Engineer*, London, states that the system consists, first, in the employment of water under pressure, distributed without appreciable loss, the pressure being obtained either from a natural fall or from steam-pumps distributing water under a pressure of 52½ atmospheres; secondly, in the creation of centres of production or distribution, permitting of the employment of this water under pressure for various industrial purposes, or its use at these centres for the generation of electricity. It is for effecting this transformation of the hydraulic power into electric energy at various stations or centres that the special motors and machinery have been designed by M. Van Rysselberghe, and for the operation of which the pumping machinery, distributing arrangements, and accumulators have been designed. A special hydraulic turbo-electric generator has been designed for use in these district stations. The Rysselberghe motor makes it possible, it is said, to maintain a uniform potential throughout any part of the mains in service within about two volts of the 110 volts used on the circuit. The system then differs from those hitherto employed in that it requires or employs both hydraulic and electrical methods in the distribution of power by electricity, or electricity for lighting purposes, and its author considers that the advantages secured are of great importance. The system provides a public hydraulic power supply system for small or large consumers, and the supply to work-people working in their own houses is expected to afford a large demand. At all events, it is for the employment of this hydro-electric system that the company already referred to has established works at Antwerp.

The length of distributing pipes will be about 7½ miles, and on this length there will be 10 district central stations for the production of electric current, one of which has been at work in the Place Verte since 1892 Each of these stations will send electric current to a radius of 500 metres, or 1,640 feet, and the underground mains will have a length of nearly 10 miles.

HOW TO MAKE WIRE JOINTS.

Every electrician knows the importance of having perfect wire joints. Imperfect connections cause endless trouble and annoyance, to say the least, and very often lead to serious consequences. Many electric wiremen who undertake important contracts are frequently deficient in their knowledge in the art of making wire joints. For the information of those and others interested, we give the following illustration, showing



FIRST-CLASS WIRE JOINTS.

a specimen set of the submarine cable and electric light wire joints which the students at the Glasgow and West of Scotland Technical College are required to make during their course in that institution. The set illustrated was made by a young man who had never been in any other workshop or laboratory, and the illustration tells its own story. "We must confess," says the London *Electrical Review*, from which journal our illustration and facts are obtained, "that if all joints were as well made, there would be more room for congratulation, and less for fault finding."

Light and Power Wires.—The standard rules of the National Electric Light Association require that lighting and power wires must not be permitted in the same circuit with trolley wires with a ground return, except in street railway cars, car houses and power stations. The same dynamo may be used for both purposes, provided the connection from the dynamo for each circuit shall be a double pole switch so arranged that only one of the circuits can be in use at the same time. Switches constructed for 50 and 100 volts potential must not be used upon railway circuits.

DEVELOPMENT OF THE INCANDESCENT ELECTRIC LAMP.*

BY J. W. HOWELL.

The amount of light which a given burner yields in an incandescent lamp depends upon its temperature. The efficiency of the lamp depends upon the amount of energy which must be constantly supplied to the burner to maintain its temperature. The worse the heat-radiating power of any burner, the less rapidly it is cooled by radiation, and the less the energy necessary to maintain its temperature or candle-power, as the energy supplied must equal the energy dissipated. The efficiency of a given burner depends upon the amount of surface which yields each unit of light—the greater the surface per unit of light the less the efficiency.

Consider two burners of the same size, one having been treated and the other not. The treated burner, being the worst radiator, will yield a given amount of light with less energy or at a greater efficiency than the non-treated one. Consequently, if a treated and an untreated burner are to be made of the same candle-power and efficiency, the treated burner must have a larger surface than the untreated one. Assuming that two burners are at the same temperature when they are yielding the same amount of light, per unit of surface, we conclude that a treated burner is operated at a lower temperature than an untreated one at the same efficiency, and, being at a low temperature, it should give a longer life, be more stable, and maintain its candle-power better. Thus the hydrocarbon treatment increases the stability of a burner, by reason of the character of the surface which it gives, as well as by the hardness and density of the deposited carbon.

This deposited carbon has a much lower specific resistance than any other form of carbon available for incandescent-lamp filaments. This is a great advantage in making low-resistance burners and a disadvantage in making high-resistance ones.

The inventor of the hydrocarbon treatment process did not understand that a bad radiating surface was desirable, but urged the good radiating power of carbon as one of its advantages over platinum. In 1879, Alfred Niaudet, a French physicist of deservedly high repute, compared the radiating power of carbon and platinum to the detriment of the latter, for use in incandescent lamps. In 1874 Wild, the director of the Russian imperial observatory, made the same comparison and drew the same conclusion. Exactly the opposite is the fact. If a stable coating of bright platinum could be applied to a carbon burner it would be better in this respect than the coating given by the hydrocarbon treatment.

Thus far we have considered the incandescent lamp as an apparatus for converting electricity into light, without any reference to its relation to the system of distribution by which the lamps are supplied with current. With the exception of Lane Fox, no inventor of lamps prior to Edison appears to have considered the qualities which successful distribution requires in a lamp. No carbon-burner lamp, before Edison made his, had the characteristic so essential to multiple-arc distribution, namely, high resistance. The lines along which inventors previous to Edison had travelled precluded the possibility of their making high-resistance carbon-burner lamps. No lamp chamber used by them was capable of successfully maintaining the high vacuum necessary to render filamentary high-resistance burners stable. The short, thick carbon burners which they used wasted away quite rapidly, and certainly a filamentary

*Abstract from *Engineering Magazine*, April, 1894.

burner would have been consumed in a short time. Reasoning with a knowledge of the performance of lamps previous to Edison's, anyone would be justified in pronouncing a filamentary burner a probable failure. Indeed, Edison's filamentary burner was made possible by Edison's all-glass lamp chamber. There was practically no superfluous material in it to give off gases. Being closed at all points by the fusion of the glass, it would protect a vacuum indefinitely, and the duration of the lamp in use was limited by the stability of the carbon-burner. The tendency of invention from Starr to Sawyer and Man had been to fill the lamp chamber with mechanism. Edison went directly to the root of the matter, stripping the lamp of all unessential parts. The lamp made by Edison in 1880 and the lamp made today are different in details of manufacture only. Their appearance and general characteristics are the same.

An incandescent lamp is simply an apparatus for converting electricity into light. The laws which govern the lamp are the well known laws of heat, light and electricity. No new law has been discovered in connection with incandescent lamps. Edison was, I believe, the first to correlate these laws, and to make a lamp which, because of its harmony with these laws, was stable.

The multiple-arc system of distribution is the ideal one for operating incandescent lamps. It was by making his lamps of such high resistance and such small radiating surface that it could be used on such a system that Edison made his lamp a commercial success. But if we consider the lamp without any reference to any system of distribution, a very high resistance lamp is inferior to one of lower resistance. The systems of distribution in general use today use lamps of two general voltages—115 and 55. The 115-volt lamps are of very high resistance. The 55-volt lamps are of lower resistance, and are superior to the 115-volt lamps. When this fact is more fully appreciated, lower-voltage lamps will be more generally used. By using lower-voltage lamps we can get the benefit of the advantages of the increased stability which these lamps have, and this will enable us to use lamps of fewer watts per candle than are required by the higher-voltage lamps.

The greatest development of the lamp since 1880 has been in its efficiency. The first lamps commercially installed by the Edison Company required 6 watts per candle to operate them, whereas now well-regulated stations use lamps requiring only 3 watts per candle; thus each horse-power produces twice as much light now as it could have produced in 1880. Progress is still being made in this direction. Every improvement in the quality of a lamp allows it to be operated at a higher efficiency, and it is in this direction that we look for future improvements.

DEATH OF M. JABLOCHKOFF.

M. Paul Jablochkoff, the well-known inventor of the electric candle, which was at one time extensively used in Paris and other European cities, died in Saratoff, Russia, on April 5.

Mr. Jablochkoff was born September 14, 1847, at Serdobsk (government of Saratow), Russia. He studied in the Military Engineering College at St. Petersburg until 1866 and then went to the Military Galvano Technical School. In 1871 he was appointed Director-General of the Moscow-Koursk telegraph lines, and it was while he held this position that he developed a deep interest in electric lighting. M. Jablochkoff's first experience in practical electric lighting was in 1872, when he undertook the task of lighting the railways over which the Emperor traveled. The lighting of the tracks was decided upon after the Nihilist Propaganda, which inspired terror throughout the empire at that time. In 1875 he left the Imperial telegraph service, and has since devoted himself exclusively to scientific pursuits. In 1876 he started for the Centennial Exhibition in Philadelphia, but got no further than Paris. At that time there was in London an exhibition of scientific apparatus, and M. Briguet sent him to London as a representative of the firm at the exposition. For eight months after he returned to Paris he carried on experiments in electric lighting, which resulted in the production of the well-known Jablochkoff "candle." This invention gave an immense impetus to electric lighting, and a company was formed to work the patent. In May, 1878, the first practical application of the Jablochkoff "candle" was in the lighting of the Avenue de l'Opera, Paris. Electric candles were soon afterwards used in Rome and on the Thames embankment, London.

M. Jablochkoff's fame was not altogether brought about by the invention of the candle. He took out several other important patents besides the electric candle, which may be enumerated as follows: Distribution of currents by means of induction coils; an incandescent kaolin lamp; distribution and division of the electric current by means of condensers; voltaic battery consuming coal; alternating current dynamo; sodium battery, and an auto-accumulator. The patent on the distribution of currents by means of induction coils has been held to be the master patent for transformer-distribution, and his system of distribution and division of the electric current by means of condensers was used at the Paris Exposition in 1878.

CENTRAL STATION LIGHTING.*

BY PEDRO G. SALOM.

The advantage of using storage batteries in central station lighting may briefly be summed up as follows:

(I.) They effect a substantial saving in operating expenses.

(II.) They increase the factor of safety.

(III.) They permit of a material extension of distribution without increasing the size of the power plant.

(*I.*) *As to the saving in operating expenses.*

As the question of economy is largely the determining factor as to the advisability of introducing a battery, let us examine more at length the means by which this is effected.

(a) By taking care of the crown of the maximum load when all the generating machinery is taxed to its utmost extent.

(b) By dispensing with one shift of labor in taking care of the entire minimum load.

(c) By permitting the operation of large units exclusively.

(d) By operating all the units at their maximum load and hence at their maximum efficiency.

As to the maximum load. Owing to the peculiar nature of electric lighting it frequently happens that the number of units generated at the maximum load is not more than a few per cent. of that of the total average load, and the total load is only a few per cent. in summer and rarely above forty per cent. in winter of the total possible output of the plant.

The first requisite, therefore, in determining whether a battery can advantageously be introduced in any given central station, and if so what its size or capacity shall be, is to have diagrams of the load curves.

The next important factor is the number and size of the units employed at the station. From these data we determine what has very appropriately been called the load factor, and then it is easy and simple to calculate

*Journal of the Franklin Institute, April, 1894.

the size of the battery required to give the most economical operating results Once the size of the battery is determined, we can calculate the saving effected :

(a) By dispensing with a night shift

(b) By diminishing the consumption of coal for a given output.

(c) By the saving effected in operating a few large units of one size, instead of a number of small units of various sizes.

(d) By the saving effected in operating each unit at its maximum efficiency.

(e) By the additional revenues from increase of total output taken from battery at time of maximnm load.

As the item of labor in small stations is frequently as high as twenty-five per cent. of the operating expenses, the saving effected by dispensing with a night shift is not inconsiderable.

By operating large units exclusively there is also a material saving effected both in labor and in the much higher efficiencies of large over small units.

Again, as the coal bill is the largest item of expense, amounting in some cases to more than fifty per cent. of the total operating expenses, any saving effected in this item is of paramount importance, and is reflected at once in the decrease of operating expenses.

The question of mechanical efficiency with varying loads has not been as carefully studied with each type of engine as its importance deserves, but Prof. W. Cawthorne Unwin, F. R. S., has shown that the decrease of mechanical efficiency for light loads has a serious effect on the economy of working with a variable load, and that with a load varying from 100 to 25 per cent. the efficiency decreases from 85 to 40 per cent.

While it is impossible to say in a general way what the exact saving would be from the introduction of a battery of sufficient size to permit of operation of all the units at maximum load (since the load is not the same in any two central stations), the results prove that in central stations equipped with storage batteries the operating expenses are diminished as much as 30 per cent.

(*II.*) *As to the factor of safety.*

In case there is a derangement or breakdown of the generating machinery, or where the steam pressure cannot be kept up to a sufficiently high point to operate all the units at maximum load, the elasticity of a storage battery permits of an immediate discharge rate enormously in excess of its normal rate. In other words, a battery designed for a given output could in emergencies be safely called upon for one-half hour or more to deliver a current three times as great as that for which it was designed.

This is a fact of vital importance, and one which any central station man will at once appreciate, for in any direct system of transmission there is always the liability of a derangement or breakdown of one of the links in the chain, whereas in a central station equipped with a storage battery the manager can depend on the battery to take the load of an individual unit until such time as the derangement or breakdown can be remedied or repaired. Moreover, it frequently happens, where the business of a central station has increased since the original introduction of its generating machinery, that the boiler capacity at maximum load is so taxed that it is difficult to maintain steam pressure sufficient to operate all the units at once, in which case, if a battery is employed, recourse may be had to the battery until such time as the engineer shall be able to keep steam up to the required pressure.

(*III.*) *As to the question of distribution.*

The advantages of the use of storage batteries under this head follow as a corollary from what has been said in the previous paragraphs, but the application is much wider than has been previously intimated. For example, when a central station has supplied the demand within a given radius of economical distribution and a demand arises for electric light or power immediately adjacent to and outside of this given radius of distribution, it is possible to supply this demand by having sub stations of storage batteries. These may be charged by a speeial wire at comparatively high pressure during the day, thus increasing the average load of the central station, and their charge distributed at night from the sub-stations at the regular pressure. The central station is thus enabled materially to increase its revenues without increasing its original power plant. An economy is effected also in this method of distribution by decreasing the size of the feeders to the outlying districts, since it is possible to charge the batteries used at a comparatively low rate for ten or twelve hours, whereas by direct lighting the feeders would have to be large enough to carry the entire load of the sub-station at its maximum output, which might only last for two or three hours.

In addition to the saving effected in operating expenses, the use of a battery may be made to yield additional revenues in proportion to the amount of current supplied to the circuit over and above what the direct system, at the time of maximum load, could supply without increasing the size of the power plant.

From what has been said above it is evident that central station lighting is one of the most important fields of usefulness of the storage battery and one which has hardly yet been touched upon.

The same arguments apply with increased force to its application in a power house for electric traction. Here the variation in the load is between such wide limits and of such a sudden character as to render it impossible to operate the power plant on anything like an economical basis.

In all such cases, by the introduction of a sufficiently large battery, the load curve, instead of resembling a stroke of lightning as it does at present, could be perfectly equalized, enabling the power plant to operate at full load and maximum efficiency.

ERIE CANAL TRACTION CO.

Articles of incorporation of the Erie Canal Traction Company were filed with the Secretary of State at Albany, on April 4. The objects for which the company is formed, including the nature and locality of its business, are as follows: It is to produce, purchase, sell, and distribute power in the form of electricity or otherwise, for the propulsion or traction of boats and vessels upon the Erie Canal; to lay, build, and erect all machinery, storage batteries, conductors, and other apparatus of every kind incidental to the said business, and to furnish, sell, and distribute along the line of the said canal, and in the cities and villages adjacent thereto, power for any purpose incidental to the said business. The capital is placed at $100,000, with power to increase to $4,000,000. The principal business office will be in New York city, and the duration of the company is fixed at fifty years.

The directors for the first year are: George G. Haven and Richard S. Hayes, of New York, representing the Metropolitan Traction Company of New York city; the Hon. Thomas C. Platt of Owego. Adrian Iselin Jr., of New York, Baron Louis A. Von Hoffman of New York city, Alfred S. Heidelbach of New York city and Charlton T. Lewis of New York city, and Secretary and Treasurer of the Cataract General Electric Company. The incoporators of the company are: Frank W. Hawley, Vice-President of the Cataract General Electric Company, and the gentlemen named as directors.

Charles T. Lewis, counsel for the Cataract Electric Company, stated that the Erie Canal Traction Company was an auxiliary to the Cataract Company, and would be the operating company for the Cataract Company if the contract of the latter corporation with the State should go through. Mr. Lewis said that the form of electric motor had not been determined upon. The Cataract people were experimenting with various motors. A most interesting experiment as yet undetermined was with regard to securing a distribution of electric force over long distances but maintaining the maximum power at any given point on the line of transmission. It has not been decided whether the Cataract Company would secure its power from the Niagara Power Company or not. The company had the privilege of manufacturing its own power or obtaining it from any company. The probability was that the power would be obtained from the Niagara Power Company.

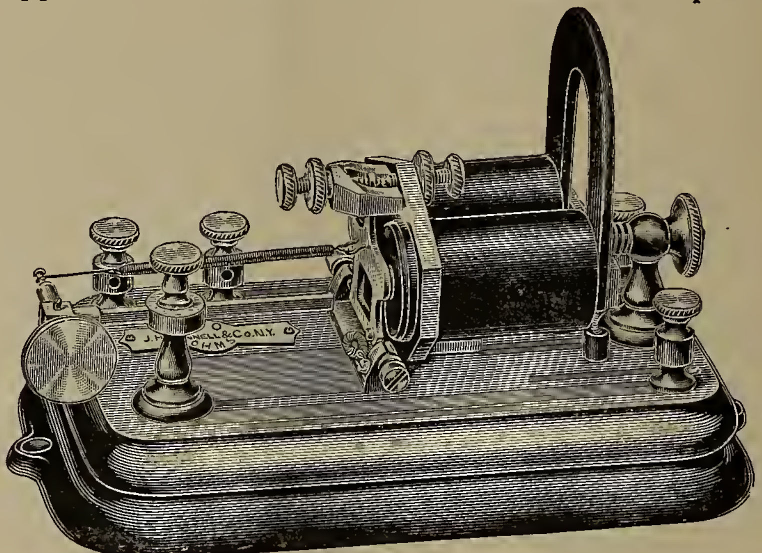
The Electrolysis of Alkali Salts.—It has been observed by Arrhenius that when an alkali salt is being electrolyzed in aqueous solution, mercury forming the cathode, some time elapses before the hydrogen makes its appearance. This suggests that hydrogen is not the primary result of the electrolysis, but is due, perhaps, to the secondary action of the water of the solution upon the alkali amalgam, produced in the first instance by the discharge of the positive ion, *i. e*, the alkali metal. The interval of time which elapses from the turning on of the current to the first appearance of the hydrogen increases very slowly as the strength of the current diminishes, and when the current is maintained constant at $\frac{1}{20}$ ampere, increases as the concentration increases, and as the temperature decreases. For equivalent solutions of electrolytes, having the same positive ion, this time is practically constant. Theory indicates that the electromotive force required for electrolysis increases at the outset with the amount of electrolytic products already separated. But when secondary reactions take place, preventing the continuous accumulations of these products if the electrolysis goes slowly, the electromotive force required for electrolysis is determined almost solely by these secondary reactions. Evidently if the result of the secondary actions is the same as it is in the case of alkali salts, the electromotive force required for the decomposition will be practically the same also. Recent experiments have shown that this is approximately the case. If they are confirmed, there will be no necessity for assuming the primary decomposition of the water.—*Electrical Review*, London.

Engineer's Report.—We have received a copy of the report of the City Engineer, Omaha, Neb., for the year ending December 31, 1893. It is one of the most elaborate works of the kind we have ever seen. Among the various maps of the city, illustrating the different classes of engineering work, is one giving the location of electric and other lamps. There are 197 electric street lights on the Thomson-Houston system.

The Telegraphers' School of Science.—This school, which was started in the Central Telegraph Office, London, in 1876, with the object of imparting to telegraphers a scientific knowledge of the apparatus and lines with which they are in the habit of working, met for the 17th annual prize distribution, in March last. The success of the school has been fully demonstrated, and similar societies have been organized in many of the large towns throughout the country, with various degrees of success. One of the results of the London school, as shown in the report of the managers, was that the cost of supervision in the telegraph service had been sensibly lessened.

SPECIAL RAILROAD RELAY.

The accompanying illustration shows a special railroad relay recently brought out by J. H. Bunnell & Co., 76 Cortlandt street, New York city. It is an ordinary relay wound to 50 ohms and has a permanent magnet attached to the electromagnet cores, at the yoke. The instrument is designed for crowded railway wires and other lines where many relays are worked in a single circuit, and it is stated it gives better service on such lines in bad weather than can be obtained by the use of 150 ohm relays of the ordinary construction. The influence of the permanent magnet causes the relay armature to act with greater promptness in heavy weather, and this, in connection with the fact that the line equipped with these instruments has consequently



BUNNELL & CO.'S NEW TELEGRAPH RELAY.

much lower resistance, constitutes an important advantage in favor of these new relays. These instruments are used on the West Shore railroad circuits with the very best results. These particular lines in unfavorable weather, with the ordinary 150 ohm relays, are very difficult to operate, but with the special railroad relay work is carried on with much greater facility.

Legal.—The electric railway and lighting plant of the Consolidated Electric Company, St. John, N. B., has been sold at auction under an order of the equity court. The price brought was $92,000, the successful bidder being E. C. Jones, local manager of the Bank of Montreal. It is thought that Mr. Jones represents a Montreal syndicate and that the road will be put in first-class shape immediately.

Telephone Rates.—The Wisconsin Telephone Company, Milwaukee, Wis., has issued a circular to its subscribers stating that hereafter a charge of two cents a call, for all calls in excess of 1,000 a year, will be made. The year will be divided into quarters, and at the end of three months each subscriber whose telephone has been used more than 250 times during the period, will receive a statement showing the number of extra calls. It is stated that strenuous objections will be raised by the subscribers to the increased tax.

The Mid-Winter Fair.—We have received from Mr. William F. C. Hasson, the well-known electrical engineer of San Francisco, Cal., a copy of a beautifully colored lithograph, giving a bird's-eye view of the Mid-Winter Fair, San Francisco.

Personal.—L. H. Rogers, the old storage battery and railway man, has taken the management of the Sperry Electric Company at Cleveland, Ohio, which company is under the control of the Brush Electric Company.

WHITE-CROSBY COMPANY.

The White-Crosby Company, incorporated under the laws of West Virginia, will on May 1 next take charge of the business of J. G. White & Company, electrical engineers and contractors, 29 Broadway, New York City. Mr. O T. Crosby will be president of the new company, J. G. White vice-president and general manager, and G. H. Walbridge, who has been associated with Mr. White for several years, will be secretary and treasurer. The headquarters of the White-Crosby Company will be in the Equitable Building, Baltimore, Maryland, and the present New York office at 29 Broadway will be maintained as a branch office. A branch office will also be opened in The Rookery, Chicago. The New York office will be in charge of Mr. A. G. Greenburg, who is now head of the insulated wire department of the Washburn & Moen Manufacturing Company, Worcester, Mass., and the Chicago representative will be Mr. J. F. Esterbrook, who is well known in the electrical trade.

It was decided to make Baltimore the headquarters for several good reasons. It is a good place to reside in on account of the equable climate, low rents and cheap markets. For these reasons the employes of the company can live better in Baltimore, where they can have permanent homes for their families. The company has in Baltimore ample room for storing cars, wagons, engines and other construction equipment, tools, etc., as well as better accommodations for its horses. It will also maintain a large and well stocked store room and will carry such material as is likely to be needed in carrying out its contracts

Both Mr. Crosby and Mr. White have a very large acquaintance in Baltimore among the leading street railway and business men, and this will be valuable to the prosperity of the company. Mr. White, during the last two years, closed contracts in Baltimore amounting in all to about $800,000, of which over $500,000 was for overhead construction work alone, including material and labor. He has now in course of construction, or about to be taken, some contracts which will be completed by the new corporation. It would therefore be necessary for the company to have offices in Baltimore, for at least one year, under any circumstances.

Mr. H. H. Harrison will be general manager of the supply department, which will be conducted in such a manner, as to enable the company to have on hand, or secure promptly, all material needed for carrying out its contracts, and also for supplying street railway companies in Baltimore, Washington and other places, with such material and supplies as they may require.

Mr. J. G. White was graduated A. B. by the Pennsylvania State College in 1882, and after one year's post-graduate work in various engineering studies, went to Lehigh University in the fall of 1883, to study mining engineering. After one term he decided to study electrical engineering, and for that purpose went to Cornell University, January 1, 1884. He held the fellowship in electrical engineering at this college during the college year 1884–85. Mr. White was then offered the charge of the Department of Physics in the University of Nebraska, which position he occupied for two years, resigning it to engage in practical electrical construction and engineering, in the summer of 1887. Mr. White then organized and became president and general manager of the Western Engineering Company, which installed a number of electric-lighting plants and electric railways throughout the West, and which company was sold to the Edison United Manufacturing Company in 1890. Mr. White then came to New York and accepted a position with the Edison Company, under an arrangement by which he was to have the exclusive agency of railway construction for that company in the United States on a commission basis. On August 1 of the same year, when the Edison General Electric Company was formed, the policy of the company was to put all employes on salary. Mr. White then resigned and organized the present business under the title of J. G. White & Company, and has continued the same up to the present tlme.

Mr. O. T. Crosby was born in Louisiana and passed most of his boyhood in Brookhaven, Miss., from which place he entered the U. S. Military Academy in 1878, graduating four years later second in rank in a large class. On receiving his commission as an officer in the engineering corps, he was stationed at Willets Point, N. Y., and after two years' service there was sent to New Orleans on river and harbor duty.

In May, 1887, he obtained a six months' leave of absence, but soon after resigned and joined the Sprague Railway & Motor Company, later assuming the position of superintendent of that company. He retained this position for about two and a half years, and then went with the Weems Electric Railway Company. It was then that he made the well-known experiments in high speed railroading, at Laurel, Md., which gave us so much information on atmospheric resistance, and which placed him prominently before the public. Mr. Crosby then joined the staff of the Thomson-Houston Company, and after the consolidation remained with the General Electric Company, assuming charge of the railway department. He took a prominent part in the development of the street railway business of the company.

Mr. G. H. Walbridge is a graduate of Cornell, class '90. After leaving Cornell he entered the employ of the United States Electric Light Company at Newark, N. J He resigned his position with this company to enter the employ of J G. White & Company in the summer of 1891 and has been with them continually since then.

Mr. Esterbrook is a graduate of Yale College, scientific department, and has had considerable experience as assistant engineer of the Chicago district of the General Electric Company, and also as engineer of the South Chicago Street Railway Company.

Mr. Greenburg is a graduate of Princeton College, and has had considerable experience in electrical matters with the Thomson-Houston Electric Company, Ft. Wayne Electric Company, Washburn & Moen, and other concerns.

The new corporation hopes to extend its business as general contractors, special attention, however, being given to electric railways, electric lighting and electric transmission of power.

ANNUAL REPORT OF THE GENERAL ELECTRIC COMPANY.

The second annual report of the General Electric Company, issued a few days ago, is for the year ended January 31, 1894. It shows that grave mistakes were made in the estimates of the values of accounts, securities and inventories of merchandise submitted at the last annual meeting. These mistakes arose through the multiplicity of the district offices, which have since been practically abolished, except as mere sales offices.

During the winter and spring of 1892–3 some of the companies in which the Thomson-Houston Company had large interests became unduly expanded, and the stringency of last summer caused them to suffer greatly. This expansion was unknown to the directors of the General Electric Company at the time, and they have now reduced the entire holdings of the Fort Wayne

Electric Company and the Northwest Thomson-Houston Company to a valuation of $1 each.

The directors say that the business management has now been concentrated at Schenectady and all factory operations are directed from there. There has been a shrinkage of $2,382,012 in apparatus and materials.

During the six months ended January 31 the debt was reduced by $6,750,000, of which $4,050,000 represented amounts received from railway and illuminating properties The direct obligations are now about $750,000, less $400,000 cash on hand and the indirect, that is, paper discounted under endorsement, guarantees, etc., $750,000. The company is now doing business for cash or on short credits to desirable customers.

The consolidated balance sheet shows assets as follows:

Patents and franchises	$8,159,265
Manufacturing plants	3,941,129
Real estate (not including factories)	323,685
Stocks and bonds of manufacturing and local companies	5,490,964
Cash	591,143
Notes and accounts receivable (face value $14,984,697.42)	8,934,159
Inventories at factories and sales offices	4,834,793
Work in progress	1,198,343
Profit and loss	12,454,968
Total	$45,928,449

The directors do not believe that it will be possible for some time to come to do as large a business as was done by the company prior to the panic, although a gradual improvement has been apparent in the last two months. The street railway business, which to a considerable extent was formerly done through syndicates and promoters, many of whom have become embarassed, promises to be smaller than during the previous year. Arc lighting business is also reduced, largely because of the inability of local companies to secure capital with which to extend their business for the purpose of carrying out municipal contracts. The business of the company with respect to incandescent lighting, which is to a great degree performed by strong and conservatively-managed local companies, is in a more healthy condition, and has not suffered so severely.

The business in plants for the distribution of electrical power is promising, and many important installations are in progress. The application of electricity to various mining purposes, such as hauling, hoisting, drilling, etc., is increasing. The future in this respect is promising. The increase in the number of local lighting and railway companies is shown by the following table:

	Feb. 1, 1892.	1893.	1894.
Total number of local companies operating incandescent and arc lights	1,158	1,277	1,479
Total number of railway companies	214	435	541

Stress is laid in the report upon the importance of encouraging licensee companies. To this end the price of apparatus has been reduced, and licensees will continue to receive all possible benefits that can prudently be given to them.

The Telephone in India.—On the night of the 18th of February, the telephone was tried for the first time between Calcutta and Nagpur, India, a distance of 760 miles. The wire used for this line weighs 300 pounds to the mile, and is of copper. The experiment proved that telephone communication was perfect, although the contiguous telegraph wires interfered somewhat with the operation of the telephone instruments.

Street Railway News.

STREET RAILWAY ASSOCIATION OF CONNECTICUT.

On April 3, representatives of various street railway companies in Connecticut met in New Haven and organized the Street Railway Association of Connecticut. The object of the association is the protection and improvement of street railways represented in its membership. The association also established a bureau of information concerning street railway practice. The headquarters will be in New Haven, and meetings will be held monthly, at which papers on street railway topics will be read.

New Management.—Messrs. W. C. and Dayton Hall have purchased an interest in the Atlanta Traction Company, Atlanta, Ga., and the company will begin the construction of several miles of new railway. The deal took place on March 29, and the following officers were chosen: Dayton Hall, president; W. C. Hall, vice-president; W. L Seddon, secretary. The company will build several suburban lines, and proposes to build tracks on several of the principal streets of the city, not at present occupied.

Consolidation.—The various street railway systems entering and running through Chester, Pa., have been consolidated under one management, which will hereafter be known as the Chester Traction Company. The company has applied for a charter with a capital of $500,000. The companies concerned are the Chester & Media, the Chester, Darby & Philadelphia and the Union Railway companies.

The citizen taxpayers of Henderson, Ky., have petitioned the Common Council of that place to consider the subject of establishing a municipal electric light plant. The citizens' committee is composed of the following-named gentlemen: B. G. Witt, I. Loeb, James E. Rankin, Dr. Ben Letcher.

The Edison Electric Light Company, of Fall River, Mass., has increased its capital stock from $90,000 to $150,000.

The Gallipolis (Ohio) Electric Light and Power Company; capital stock $18,000.

GENERAL ELECTRIC DIRECTORS.

The annual meeting of the stockholders of the General Electric Co. was held in Schenectady, April 10. A large majority of the stock was represented at the meeting. The directors elected were: Oliver Ames 2d, C. A. Coffin, T. Jefferson Coolidge, Jr., C. H. Coster, Thomas Edison, Eugene Griffin, F. S. Hastings, Henry L. Higginson, D. O. Mills, J. Pierpont Morgan, and H. McK. Twombly. It was voted to increase the Board of Directors from 11 to 13, and the two vacancies thus formed will be filled by the board at a meeting to be held within a week, at which time the officers of the board will also be elected. The date of the annual meeting was changed from the second Tuesday in April of each year to the second Tuesday in May, in order to give the officers of the company more time in which to make up the details of inventory and go more carefully into the scrutiny of the company's assets in making up the annual report.

POSSIBLE CONTRACTS.

The Woonsocket Street Railway Company, Woonsocket, R. I., on April 2, held its annual meeting for the election of officers and directors. The following named gentlemen were elected for the ensuing year: President, James P. Ray; Secretary, Willard Kent; Treasurer, Walter Whittlesey; Superintendent, Herbert M. Young; Executive Committee, the President, Treasurer, and E. K. Ray. It was voted to apply for franchises for extensions of the company's lines in Cumberland, North Smithfield, and Lincoln.

The county commissioners at Elyria, Ohio, have passed a resolution granting a franchise for twenty-five years to any responsible corporation that will construct an electric street railway from Elyria to Lorain, within nine months after the granting of the franchise.

The directors of the Norwalk Horse Railway Company, Norwalk, Conn., have decided to equip their road with electricity. Mr. A. S. Hurlbutt of Westport, Conn., has the improvement in charge.

NEW YORK NOTES.

Office of the Electrical Age,
World Building, New York,
April 7, 1894.

A special meeting of the stockholders of the Edison Electric Light Company, Brooklyn, will be held on April 19, to vote on the proposition to increase the capital stock of the company from $2,500,000 to $3,000,000. City street lighting and increasing commercial lighting require that more capital shall be available.

Mr. H. McL. Harding, the New York representative of the Walker Manufacturing Company, of Cleveland, Ohio, has moved his office to the new Postal Building, corner Broadway and Murray street.

The H. W. Johns Manufacturing Company, 87 Maiden Lane, New York City, has issued its catalogue for April on "Insulation." This company handles Vulcabeston, moulded mica trolley line insulators, weather-proof sockets, etc. The catalogue is fully illustrated.

The executive offices of the Commercial Cable Company have been removed to permanent quarters in the Postal Telegraph Building, 253 Broadway, corner Murray street. The company's offices are elegantly fitted up.

Vanderwerken, Rickerson & Brainerd, 8 & 10 Fifth avenue, Brooklyn, report an active trade in telephones, transmitters, batteries, etc. This firm carries a large stock of electrical goods, including Mason's Primary Battery. The V. R. B. telephone transmitter is said to be one of the best long or short distance telephones in the market. It is stated that it will transmit speech distinctly 1,000 miles. It is non-infringing and is sold outright.

The New York office of the Buckeye Engine Company has been removed from 18 Cortlandt street to 39 and 41 Cortlandt street, where larger and more commodious quarters are enjoyed. The company's new vertical compound engines for electric light and railway service are specially adapted for direct connection to dynamos. They range from 150 H. P. to 1,200 H. P. and over, and are guaranteed to work as economically as any compound engine on the market, and to run with superior regulation. Mr. H. T. Porter is the sales agent for these engines in New York.

Mr. W. H. Fleming has severed his connection with the International Trading and Electric Company of this city. The Manhattan General Construction Company, of 50 Broadway, New York, and 753 Monadnock Building, Chicago, has made arrangements with him to act as selling agents for his patent woven wire gauze dynamo brush. All orders and inquiries relating to prices and sizes of brushes in stock ready for immediate delivery should therefore be addressed to them.

J. Jones & Son, 67 Cortlandt street, city, has bought from the receiver of Alexander, Barney & Chapin, the balance of the stock now in his hands. The firm is offering these goods to the trade at bargain prices. The value of the stock purchased was over $10,000, which was paid in cash.

The Stirn Universal Electric Company, 27 Beaver street, city, manufacturers of pull socket and switches, reports an active business in these goods. These sockets and switches have many meritorious features and are rapidly acquiring popularity.

Our representative, during the past week, met Mr. F. A. Williams, who represents the Safety Insulated Wire & Cable Company, of New York. Mr. Williams is now supervising the laying of the big underground cable in Newark, N. J., for the police department. He has had a long experience in the installation of electrical plants, which particularly fits him for these exacting duties. He is at work early and late in Newark to see that everything is perfectly done in connection with the delicate work of laying cables. Mr. Williams had a good deal of interesting experience in installing Sprague railway plants, in the early days of the business.

H. B. Coho & Company have been appointed contractors for all apparatus manufactured by the Mather Electric Company, in New York city and vicinity, and New Jersey. This firm also handles the Waddell-Entz Company's direct connected generators, and intends to make a special drive in small storage battery plants for country residences. They will install complete plants of this class including gas engines, dynamos and batteries. A large stock of switches, ammeters, etc., designed by the Mather Electric Company, are also kept on hand and the firm is offering all these goods at low prices in order to make room for new stock.

Contracts.—The City Railroad Company, Dayton, Ohio, has given out several contracts for the necessary equipment in the introduction of the trolley system on its lines. The General Electric Company will supply 15 car equipments complete, each of 25 H. P. "G. E. 800" motors will be used. The Washburn & Moen Manufacturing Company got the contract for the trolley and feeder wire for the entire system. The iron poles will be supplied by the Electric Railway Equipment Company, of Cleveland, Ohio, and Brown, Lee & Company, of Detroit, will supply the octagonal wooden poles.

The Fort Wayne Electric Company, of Fort Wayne, Ind., has just closed a large contract to put in the city electric light plant at Austin, Texas. This contract will keep the works busy for some time to come. W. T. H.

ELECTRICAL AND STREET RAILWAY PATENTS.

ISSUED APRIL 3, 1893.

517,427. Process of Manufacturing Active Material for Secondary Electric Batteries. Wilhelm A. Boese, Berlin, Germany. Filed June 27, 1893. Patented in England July 6, 1892, No. 11,532; in France Oct. 11, 1892, No. 211,658, and in Belgium Oct 11, 1892, No. 101,693.

517,432. Incandescent Lamp. Augustus C. Carey, Lake Pleasant, Mass. Filed Feb. 3, 1894.

517,450. Electric Burglar-Alarm. John Frame and Robert B. Morden, Cooper, Iowa. Filed Dec. 26, 1893.

517,452. Insulating Compound. Adolf Gentzsch, Vienna, Austria-Hungary. Filed Oct. 7, 1893.

517,455. Secondary Cell or Battery. Geo. B. Henry, Hartford, Conn. Filed June 21, 1893.

517,480. Electric Synchronizer for Clocks. Henry S. Prentiss, Elizabeth, N. J., assignor to the Prentiss Clock Improvement Co., New York, N. Y., and Jersey City, N. J. Filed Nov. 3, 1892.

517,498. Electric Train Lighting and Braking System. Geo. W. Swartz, Florence, Ala. Filed Sept. 1, 1893.

517,502. Circuit-Maker. Joseph Weaver, Canandaigua, N. Y. Filed Sept. 30, 1893.

517,531. Induction Electric Railway. Chas. E. Roehl, St. Joseph, Mo. Filed May 4, 1893.

517,535. System of Elevated and Surface Railways. Chas. H. Barrows, Willimantic, Conn. Filed May 17, 1893.

517,549. Conduit Electric Railway. Willie C. Keithly, San Francisco, Cal., assignor of one-half to Jo Gordon and Herbert F. Dugan, same place. Filed Sept. 17, 1892.

517,564. Microphone. Wilhelm Deckert, Vienna, Austria-Hungary. Filed Mar. 1, 1893. Patented in France Nov. 28, 1891, No. 217,736; in England, Dec. 9, 1891, No. 21,565, and in Austria-Hungary, Mar. 7, 1892, No. 49,855 and No. 2,654.

517,565. Motor-Car Truck. Wm. A. Dutton and Jacob F. Pfetch, Cleveland, Ohio. Filed Nov. 20, 1893.

517,571. Car-Truck. James L. Hardie, Chester, Pa., assignor of one-half to John J. Leary, same place. Filed May 16, 1893.

517,582. Electric Switch. Robb Mackie, New York, N. Y. Filed Aug. 7, 1893.

517,591. Insulating-Tube. Miner Robinson, Newton, Mass. Filed Jan. 6, 1894.

517,621. Insulator. Louis McCarthy, Boston, Mass. Filed July 15, 1893.

517,634. Pin for Insulators. George H. Winslow, Pittsburg, Pa. Filed Oct. 25. 1893.

517,638. Car-Fender. Carl P. Anderson, Boston, Mass. Filed Nov. 25, 1893.

517,660. Girder-Joint for Railroad-Rails. James M. Price, Philadelphia, Pa., assignor to the Price Railway Appliance Company, of Pennsylvania. Filed Mar. 23, 1893.

517,664. Electrical Switch. Ernst Ruebel, St. Louis, Mo., assignor to himself, Sherman B. Pike, and William N. Matthews, same place. Filed Sept. 9, 1893.

517,668. Electric Motor. William J. Still, Toronto, Canada, assignor of one-half to Randolph MacDonald, same place. Filed Mar. 3, 1893. Patented in Canada, July 11, 1893 No. 43 566.

517,669. Electric Motor. William J. Still, Toronto, Canada. Filed Mar. 3, 1893. Patented in Canada, July 12, 1893, No. 43,578.

517,692. Conduit Electric Railway. Herbert A. Goreham, Decatur, Ill. Filed Aug. 14, 1893.

517,714. Governor for Electric Motors. John F. Winter, Baltimore, Md., assignor of one-half to James Frank Morrison, same place. Filed Sept. 21, 1893.

517,743. Electrically-Operated Railway-Switch. William S. Gavey, Brooklyn, N. Y. Filed Apr. 1, 1893.

517,749 Underground-Conduit Railway. Wilton F. Jenkins, Richmond, Va. Filed Aug. 8, 1893.

517,762. Telephone. Stewart D. McKelvey, Canton, Ohio, assignor of one-third to Joseph A. Linville, same place. Filed Feb. 20, 1893.

517,763. Magneto-Telephone. Stewart D. McKelvey. Canton, Ohio, assignor of one-third to Joseph A. Linville, same place. Filed Sept. 13, 1893.

517,764. Magneto-Telephone. Stewart D. McKelvey, Canton, Ohio. Filed Dec. 6, 1893.

517,770. Rheostat. Alton J. Shaw, Muskegon, Mich. Filed Oct. 12, 1893.

517,773. Electric Switch. Charles F. Speed, Edward W. Barker and Charles P. Frank, Duluth, Minn. Filed Dec. 1, 1893.

517,778. Electric Stop-Motion Drawing-Frame. Edmund Tweedale, Samuel Tweedale, and Joseph Smalley, Castleton, England. Filed Nov. 14, 1893.

517,804 Conduit Electric Railway. Wilton F. Jenkins, Richmond, Va. Filed Aug. 10, 1892. Renewed July 26, 1893.

517,812. System for Controlling Electric Lights. William F. Bradner, Denver, Colo., assignor, by direct and mesne assignments, to the Electric Specialty Company, same place. Filed May 12, 1893.

PATENTS EXPIRED APRIL 3, 1894

189,098. Electro Magnetic Boiler-Feed Regulators. R. A. Hayes, Elgin, Ill. [Filed Jan. 22, 1887.]

189,116. Dynamo-Electric Machines. D. F. J. Lontin, Paris, France. [Filed Mar. 1, 1876.]

189,184. Automatic Telegraphy. James W. Brown, Port Huron, Mich. [Filed May 21, 1875.]

189 262. Insulated Wire. H. Redding, Boston, Mass., assignor of one-half his right to J. Redding, same place. [Filed Jan. 27, 1877.]

189 272. Dial-Telegraphy. R. J. Sheehy, Boston, Mass. [Filed Jan. 23, 1877.]

189,276. Multiple Telegraphs. G. Smith, Astoria, N. Y., assignor of one-half his right to G. B. Prescott, New York, N. Y. [Filed Feb. 10, 1877.]

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CONTENTS.

CABLE TELEGRAPHY.

In August, 1858, the first Atlantic telegraph cable was laid, and in June, 1894, the twelfth link will be added to the electric chain that joins the old world with the new. In 1858 the work was tentative and crude, but now cable manufacture and laying has become a science, and every detail in connection therewith can be calculated beforehand to a nicety. The twelfth cable, of which we speak, is the one now being laid by the steamer "Faraday" for the Commercial Cable Company. This is the third laid down by this enterprising company and, as submarine cables are expensive to make and lay, it is safe to presume that the company's business is such as to warrant the undertaking. The business communities on both sides of the Atlantic have much to thank the Commercial Cable Company for. It entered the field in 1884 for the purpose of cheapening, quickening and improving communication between America and Europe, and it has kept its promises. When it began business on December 24, 1884, it reduced the existing rates 20 per cent. A war of rates followed which resulted in all the companies establishing the uniform rate of 25 cents a word. This was a reduction of 50 per cent. on the old rate. The company has kept up with the times and adopted modern appliances for the quickening of the service, and the speed of signaling through the cable has been increased through improvements in apparatus from time to time until now, when signals will be transmitted through the new cable at the rate of 30 words per minute. The new cable will be a most superb specimen of cable manufacture, and not the least interesting feature about it is the fact that American copper enters into its make-up. This is the first instance, as far as we can learn, where American material has been used in the manufacture of an Atlantic or deep-sea cable. The company is composed of Americans, and to that fact may be ascribed its progressive spirit and enterprise.

VICTORY FOR MR. HUNT.

The Court of Appeals has affirmed the judgment of the court below in the case of the W. J. Johnston Co., Ltd., against W. T. Hunt and the Electrical Age Publishing Co. This is a complete victory for the defendants. The W. J. Johnston Company sought to restrain W. T. Hunt from working for the Electrical Age Publishing Co., and the Electrical Age Publishing Co. from employing W. T. Hunt, on the ground that Mr. Hunt had violated an agreement with the plaintiff. The W. J. Johnston Company failed in its purpose in every court, and in the Supreme Court, Special Term, Judge Truax dismissed the plaintiff's complaint with costs. The case was then appealed, with the result that the Court of Appeals, on April 10, affirmed the opinion of the court below, all the judges concurring.

AN EXPENSIVE BUSINESS.

Some excellent advice is given by Mr. Sydney F. Walker in a reprinted article on another page of this issue, under the head of "The Expense of Running Electrical Engineering Businesses." Mr. Walker points out the principal causes for the usually heavy expenses of carrying on an electrical engineering business—that is, a manufacturing engineer. Many of them are avoidable and many unavoidable. Those that are unavoidable are due to the exigencies of a developing business, and while such development is costly, the experience thus gained is solidifying and building up a permanent foundation for the future. The article is full of suggestions and is worthy of careful consideration.

At the annual meeting of the Metrological Society, which will be held in Washington, D. C., on Friday, April 20, Prof. T. C. Mendenhall will report on the International Electrical Congress at Chicago last year.

BALL & WOOD VERTICAL COMPOUND ENGINE.

On March 31 last, as noted in the Electrical Age of April 7, the Ball & Wood Company, of New York, exhibited at its works at Elizabethport, N. J., the new vertical compound engine built by the company for the Chicago Edison Company.

FIG. I—FRONT VIEW OF BALL & WOOD VERTICAL COMPOUND 600 H.P. ENGINE.

Engineers are divided in their preferences between two types of stationary engines—the slow speed and the high speed. The Corliss engine represents the highest development of the former, and is the standard type for economical steam consumption. The high speed engine, however, offers some advantages over the slow speed that in many cases outweigh those of the latter. In electric generating plants floor space is an important factor in the calculations, and this, in connection with the necessity of higher rotative speeds, has led to great improvements in engine designing. There has been a recognized place for an engine that would combine the efficiency of the Corliss engine with high speed, small floor space and better regulation. This necessity has arisen in electrical work through the practice of connecting the dynamos directly onto the engine shaft, which practice requires higher rotative speed than given by the Corliss engine and greater uniformity of operation.

Increase of speed of rotation permits the use of shorter stroke, and for this reason the vertical form of engine has come into favor; it offers fewer disadvantages than when long strokes are used.

The vertical compound engine referred to above has been designed by the Ball & Wood Company to meet these requirements, and it is believed by the company

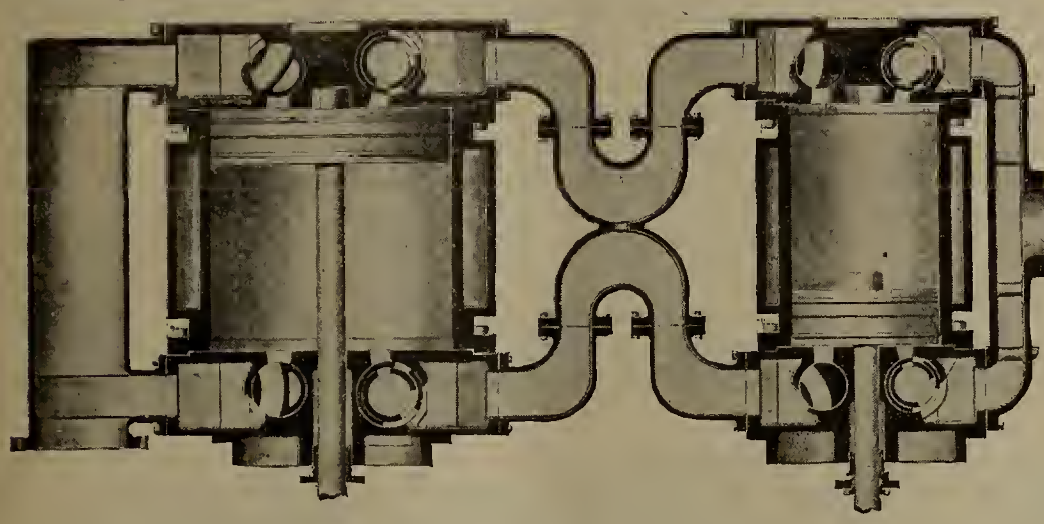


FIG. 3—SECTIONAL VIEW OF CYLINDERS AND VALVES.

that this new type will receive the hearty approval of engineers.

This engine has several novel and meritorious features, the claims made for it by the manufacturers being unexcelled economy, which is obtained by minimum clearance spaces and correct distribution of steam; moderately high rotative speed; fine regulation; small floor space and special adaptation to driving direct-connected dynamos. The cut-off valve gives a rapid cut-off and wide opening of ports at all points from zero to three-quarter stroke. And in order to obtain the best steam distribution and the smallest possible clearance a modified form of the Corliss wrist-plate motion and valve has been adopted in this engine, the valves being placed in the cylinder head. The world's record for economy was given to an engine constructed with such an arrangement of valves.

The automatic cut-off is obtained by an independently operated cut-off valve, placed inside the steam valves and actuated by a specially designed governor. This arrangement places no restriction on rotative speed. In the design of this engine it has been the aim of the builders to find a medium unobjectionable to the slow speed advocates.

The governing mechanism of the engine is of special interest, and the regulation is obtained by transmitting the necessary motion to the cut-off valves through a special wrist-plate device in which a compound motion is obtained. These valves, at all points of cut-off, operate relatively to the main valves, just as though the latter were standing still, thus preventing wire drawing of steam at any point of the cut-off.

The location of the valves in the cylinder head gives the shortest possible ports. The peculiar motion of the valve cut-off utilizes the ports to the fullest possible extent, and the cut-off motion at every point from zero to the three-quarter stroke is a rapid one, because of the higher rotative speed of the engine.

This engine is of 600 H. P., with non-condensing cylinder, 19 inches by 31 inches by 24 inches, and has an initial steam pressure of 125 pounds. The speed of

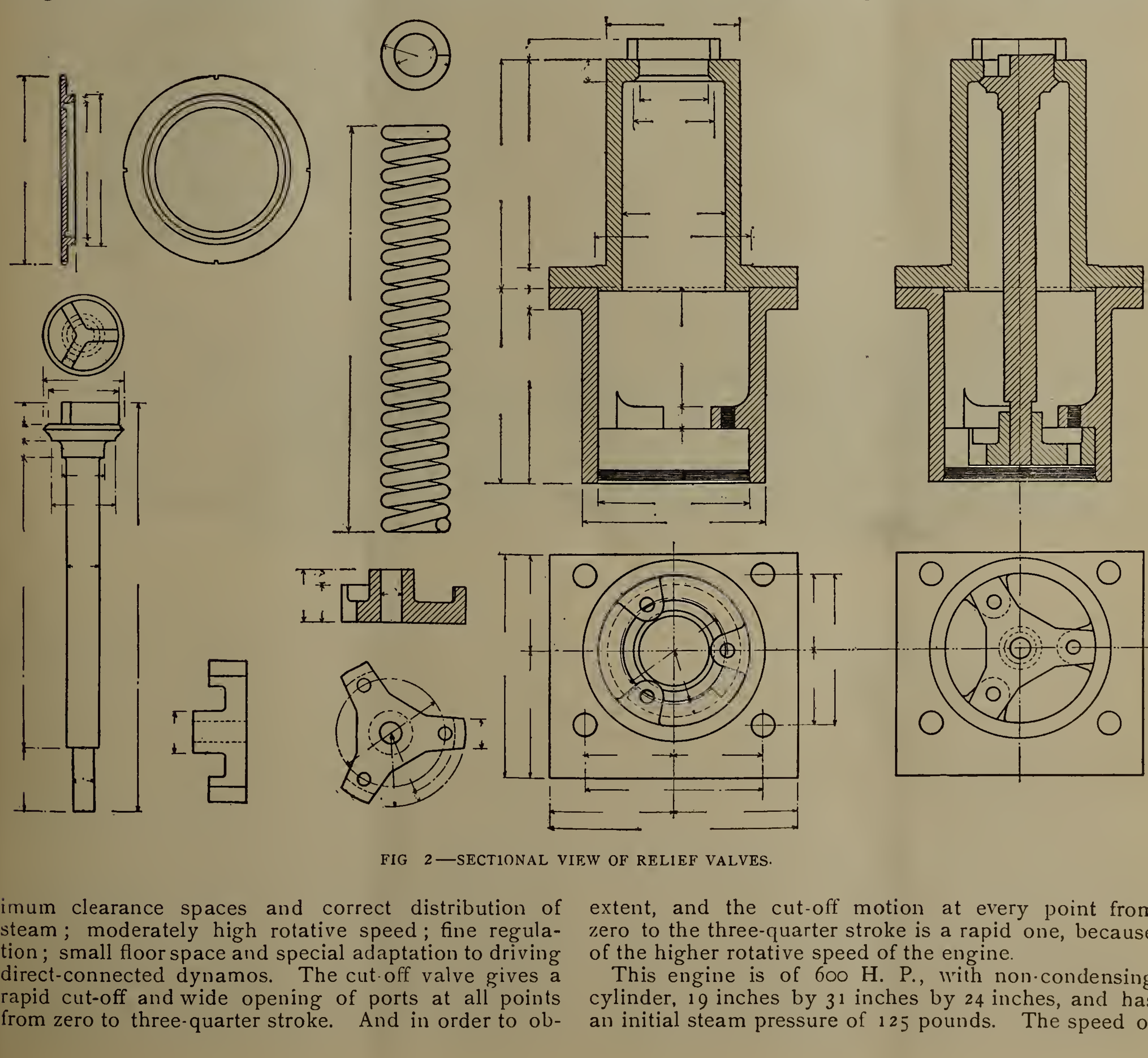


FIG 2—SECTIONAL VIEW OF RELIEF VALVES.

the engine is 150 revolutions per minute. Fig. 1 gives an illustration of the front view of this engine. Fig. 2. is a sectional view of the relief valves, and Fig. 3 a sectional view of cylinders and valves.

NEW ATLANTIC CABLE.

The Commercial Cable Co. has begun the work of laying its third cable across the Atlantic, between the old and new worlds The eastern terminus of the new cable will be at Waterville, Ireland, and the western end will be landed at Canso, Nova Scotia.

On April 11 the steamer "Faraday" left London with about 500 miles of the first section of the new cable aboard for Waterville, Ireland. Starting from this point she will lay about 100 miles of shore cable and then buoy it. She will then proceed to Fox Bay, Canso, N. S., and lay from that point, eastward, about 400 miles of shore cable. The steamer will then return to London for the balance of the cable, which will be the deep-sea section, with which she is expected to sail about the 1st of June. The connection of the shore ends with the deep-sea cable will then be accomplished and it is expected that the completed cable will be in working order by July 1.

In the construction of this cable, the amount of materials used is as follows : 1,100,000 pounds of copper, 800,000 pounds of gutta-percha, 9,500,000 pounds of steel wire, 1,300,000 pounds of jute yarn, 1,800,000 pounds of compound.

The weight of the copper conductor is 500 pounds per knot, and it is said to be the largest core ever laid in the Atlantic or any other water of the world up to the present time. A large portion of the copper used in the construction of this cable was supplied by the well-known firm of J. A. Roebling Sons Co., Trenton, N. J. The contract called for the copper to be 98 per cent. conductivity. The portion supplied by Roebling & Sons had an average conductivity of 98 $\frac{8}{10}$ per cent , $\frac{8}{10}$ of one per cent. higher than the contract requirement. During the manufacture of the cable every inch of the core was tested with an alternating current of 5,000 volts. The dielectric of the cable is gutta-percha, and weighs 320 lbs. per knot. The sections off the coasts of Nova Scotia and Newfoundland, will be of specially heavy types, in order to withstand the fouling of anchors, to which cables are subject in the fishing grounds about these localities.

The guaranteed speed of signaling through the new cable is 33$\frac{1}{3}$ per cent greater than that on the present Commercial Company's cables. The new speed will be about thirty words a minute.

COMMERCIAL CABLE CO.'S STATION AT CANSO, NOVA SCOTIA.

The total length on the new cable will be 2,200 nautical miles, and during its manufacture and laying the Commercial Company was represented by Mr. John Gott, who has been connected more or less with Atlantic cable work since 1865. The contractors of the cable are the well known firm of Siemens Bros. & Co., Ltd., London, of which concern Mr. Alexander Siemens is managing director in England.

The Commercial Cable Co. will own 10,000 miles of submarine cable, when this new one is completed. The history of this company has been one of enterprise and progress. It stands today as the leading Atlantic cable co., and, through its enterprise, it has brought cable telegraphy up to the highest state of perfection. The introduction of the automatic system of cable telegraphy across the Atlantic has attracted the attention of the cable world.

At the World's Fair in Chicago last year, the Commercial Cable Co. had a very unique and attractive exhibit, and the company received the only two awards given for superior apparatus and method of transmission.

AGAINST MUNICIPAL CONTROL.

The special committee appointed by the Philadelphia select councils to investigate the physical condition of the city's gas works has made a report that is of especial interest to electric light companies and the advocates of municipal control of electric light stations. The report is decidedly unfavorable to municipal control of gas works. The committee found the city plants in a wretched condition and very inefficient. It would require $1,878,000 to put the plants in good working condition. They recommend that the city should purchase from private makers all the gas it sells and uses, and that it sell or lease its works. Under the latter head the report says:

"In an ideal government, where changes of administration are infrequent, and where successful methods

STATION BUILDINGS OF COMMERCIAL CABLE COMPANY AT WATERVILLE, IRELAND.

once adopted can be continued and improved upon, State control of all these things affecting citizens generally will no doubt accomplish the greatest good to the greatest number; but in a government like ours, where changes come with quick succession, where new men and new methods speedily supplant the old, and none remain long enough to define a policy or introduce needed reforms, the application for a long period of time of business reforms, the application for a long period of time of business methods for the conduct of a permanent business enterprise is almost impossible. * * * For years and years we have been going in the same old groove. One head of a department comes in, looks over the works, detects their faults, makes recommendations for reforms and improvements, and before anything is done he is succeeded by another, who does the same thing. The system of book-keeping employed does not show the details of actual operation and condition of the works as to interest upon plant, wear and tear, etc., and no man can tell, except by estimate, the exact status of our gas account; but that it is unfavorable to the city is evidenced by the fact that after fifty years of what is supposed to be profitable management we find ourselves with antiquated works, requiring an expenditure of nearly $3,000,000 to make them presentable, and with half our gas franchise of manufacture in the hands of private parties without a dollar of actual outlay for procuring it."

REPORT ON ELECTRICAL INDUSTRIES.

We have received from the Census Bureau, Washington, a copy of the Census Office Report on Electrical Industries in the State of New York for the year 1890. This report was prepared by Mr. Allen R. Foote, special agent for the collection of statistics pertaining to the generation and application of electricity. The report does not include commercial telegraph and telephone companies, and is based on returns made by corporations, firms and persons engaged in electrical industries as they existed in the State during the year ended May 31, 1890. In the four years since the period covered by this report a great many changes have taken place in the electrical industries, therefore the report does not represent the condition of the industries at the present time. It, however, will serve as a mile-stone, and a basis for comparisons. The report is introduced with an historical sketch of the various electrical industries, for the purpose of showing how young these are. This section of the report in itself is valuable, giving as it does the dates of the beginnings of the vast industries existing at the present day, which make the electric current the basis of their business.

The report treats of the electrical industries under the following general heads: Isolated Electric Lighting and

Power Plants; Steamboat Electric Lighting Plants; Central Electric Lighting and Power Stations; Electric Street Railways; Electric Welding; Electric Smelting; Uses of Electricity in Medicine and Surgery; District-Messenger Electrical Call Service; Municipal Police Patrol Telegraph Service and Municipal Fire-Alarm Telegraph Service.

BATTERY "FAKES."

BY C. M. W.

A few years ago the primary battery era of our national life was ushered in. It was at a time when the public mind was profoundly moved by the marvelous developments in electrical invention and application and electricity had conquered the nation. Everything was electricity this and electricity that, and the mere mention of the word "electricity" seemed to possess the wonderful power of absorbing men's brains as well as their money. Unscrupulous men took advantage of this state of feeling, and imposed upon the public in many Eastern cities. Primary batteries were evolved by the dozen, that would light a whole house as brilliantly as the blazing sun, at a trifling cost. How brilliant things did look to the lucky investor, under the blaze of the great rival of sunlight! Crœsus's wealth was nothing compared with the affluence that the owners of primary battery stock supposed was theirs.

My attention was recently called to a so-called "volt distributor," used by the inventor of a certain primary battery, which, when used in connection with this particular battery, would light something like 10,000 incandescent lamps for something like 10 cents an hour. This "volt distributor" idea is by no means a new one, although the means of accomplishing the same result may not be the same in all cases.

Some years ago, when the primary battery wave was at its height, it cast up on shore a gentleman with a battery of this class that was a wonder in its way. It had the peculiar and inherent power of varying its voltage in accordance with the needs of any particular requirement. A few cells of the battery were placed on exhibition and peopled flocked from every direction to witness the wonderful performance of these storehouses of concentrated essence of wealth. Capitalists came up to see the battery and the inventor charmed them with it.

"Gentlemen," said he, in stentorian tones, "I will show you what a wonderful range of action this battery has. See how it lights this three-power candle-lamp," (connecting a 3 C. P. incandescent lamp to the battery terminals.) "Now I will take a 16 candle-power lamp (connecting the same); see how brilliantly it burns!"

"But this is not all," continued the inventor, in a dramatic manner. "This little battery will operate this motor (connecting motor, which fairly whizzes); yea, it will do more; it will give you arc lights as readily as it lighted the tiny three candle-power lamp. Observe for yourselves!"

Here he took in each hand a carbon pencil connected with the battery wires, and, bending his body backwards and turning his face sidewise, so the rays of the arc would not blind him, he brought the points together. A brilliant arc light was the result. What visions of wealth that exhibition conjured up in the minds of the fortunate ones, who had been let in on the ground floor, may never be told. Their dream, alas! was like all dreams in that it was evanescent.

One of the spectators suspected that there was a trick tied to the thing somewhere, so he quietly organized an investigating committee of one to discover the secret of this battery's wonderful power.

Curious people are not always rewarded for their trouble, but this committee of one was. After the crowd of enthusiastic capitalists and the inventor had dispersed, presumably to divide territory and stock, this investigator discovered, in an adjoining room, a rheostat, wires from which led (out of sight of course) into the room where the battery stood. This clue led to the final revelation of the secret, which was that the electric light mains from the building were connected with the battery through the rheostat, and that the inventor's confederate operated the rheostat while the inventor himself did the rest. The partition between the two rooms was sufficiently thin to hear through, and when the inventor exclaimed that he would produce a three candle-power light, an arc light, or run a motor, his confederate would regulate the current at the rheostat to suit each particular requirement.

There was a good deal of nibbling at this bait, but just how many fish were caught I am unable to say. The wonderful volt-regulating battery, however, received its death-blow by this exposure.

Another fraud that was practiced on the gullible public was exposed in a rather humorous way. The "primary battery" in this case was of marvelous power. A few cells were placed upon a table and several incandescent lamps were arranged about the room. The problem was to light all the lamps from the small battery. A switch was turned, and lo and behold! every lamp blazed forth in glorious light.

There was among the guests invited to witness this great exhibition a well-known electrician who has a strong propensity for getting at the bottom of things. He suspected that there was some crooked work, so he quietly looked around. Unseen, he felt around for concealed wires and his trouble was rewarded by the discovery of such a wire underneath the projecting edge of the table. While the inventor was in the midst of his oratory the lamps suddenly went out. He made a hasty examination of all the visible wires and connections, but found no apparent cause for the behavior of the lamps, and just at a time, too, when he was on the point of selling large blocks of stock. "It is very strange," he muttered, turning to his audience with a truly puzzled expression of countenance. Then the inquisitive guest, with the most childlike innocence (feigned, of course) exclaimed: "I was feeling around the table and I found a wire concealed under the edge. I cut it with my knife and the lights went out immediately, but that could not have been the cause!"

This broke the spell. The cat jumped out of the bag and all was over, as far as that particular primary battery was concerned. The wire that was cut fed the lamps directly from the mains in the building, the battery really having an easy time of it.

The storage battery for a time was extensively used as the basis for the practice of wool-pulling, and if some of the advocates of particular batteries were to be believed, the millenium had really made its appearance with the storage battery. The storage battery formed a good vehicle for the disposition of stock, and the proverbial hot cakes were sluggish in their movements in comparison with the alacrity with which storage battery rights were gobbled up.

A certain boomer had a small storage battery that beat them all. It was a "dry" storage battery, and although it was a pigmy in size it was a giant in power. In due time a flock of capitalists appeared to witness a practical test of this "dry storage battery." It was lighting lamps without limit and apparently had an inexhaustible supply of current, when an unlooked-for circumstance supervened which sent a polar chill down the inventor's spinal column and opened the eyes of the spectators. The lamps went out suddenly, and while an investigation was in progress to ascertain the cause, the door was opened and in the opening appeared the head of the Irish janitor, who startled the party, especially the inventor, with a piece of information that was not on the programme.

"Mr. Smith," said the Irishman, "the engineer wants ye to shtop fooling wid thim lamps. This is the thirrud toime ye've blowin the fuse out."

An electrician present among the party took in the situation at once and explained to the prospective investors the meaning of this abrupt admonition. The inventor had in reality connected his lamps directly with the mains of the building plant, and the "dry storage battery" was only a dummy, as far as the current was concerned. The overloading of the circuit caused the blowing of the fuse, the frequency of which occurrence the engineer protested against.

COMING DEVELOPMENTS IN ELECTRICITY.*

BY GEORGE D. SHEPARDSON.

Part I.

Under the head of electrical generators, we may notice a number of points. The great problem is to obtain electrical energy more cheaply, or to secure it from sources not at present utilized. The most economic method in use at present is to convert mechanical into electrical energy by means of a dynamo machine. These machines have an efficiency varying from about ninety per cent in generators of ten horse, up to ninety-seven per cent. in very large generators. (Efficiency of smaller machines is lower, but in these cheapness is more important than efficiency). We cannot expect, therefore, any great advance in the operating efficiency of generators. In what might be called financial efficiency, there is possibility of improvement, in that dynamo electric machines may be designed along entirely different lines from those followed at present, with marked decrease of cost. With the dynamos made at present, there is room for improvement in a number of particulars, such as the use of a better grade of iron, slower speed, more durable insulation than cotton. A substantial welcome will be given to the inventor who devises a method of covering wire with something better than cotton or silk, something that will not char under the action of heat. Most of the insulating materials in use at the present time are composed partly or entirely of carbonaceous matter, which becomes a fair conductor when subjected to prolonged or intense heat. Non-carbonaceous insulators, as a rule, are too brittle for use on wires which must be handled or bent, as in winding armature or field coils.

There is also room for improvement in the economy of prime movers used for driving dynamos. Steam engines and boilers cannot be given an efficiency much higher than twelve per cent., a figure which is already reached by some large plants. The main source of this inefficiency is the narrow range of temperature through which the steam can work. Since the final temperature cannot well be as low as that of the atmosphere, the only way to increase efficiency is to raise the initial temperature. The limit of efficiency in the steam engine seems to have been about reached on account of the difficulty of effective lubrication at high temperatures, and the disproportionate increase of pressure corresponding to any given increase of temperature after passing the limits of modern practice.

The efficiency of gas engines is somewhat better. This might be raised, theoretically, to something like fifty per cent. The difficulty of l ibricating at high temperatures and making the engines strong enough to withstand the enormous pressure due to the exploding gas, are some of the limiting factors. It is getting to be understood by engineers, that the same amount of coal will deliver more mechanical power when changed into gas and used in a gas engine than when burned under boilers and used with steam engines.

There is room for development in the utilization of irregular or spasmodic sources of power, such as the wind, waves and tide. This problem is complicated by the necessity for some method of storage. Water reservoirs are generally too expensive. The same thing might be said of storage batteries used in connection with dynamos. The principal difficulty in the way of using dynamos and storage batteries is the low efficiency of dynamos when operated under the varying conditions of wind power, and the difficulty of regulating them so that they charge and not discharge the batteries. Considerable attention is being paid to both of these problems, and we may reasonably expect further knowledge. There is room for development in the use of current motors or water motors which may be placed directly in a stream or river without the expense of constructing a dam.

Some primary batteries, under good conditions, have an efficiency of nearly 90 per cent. But zinc costs more than coal, and even if carbon be substituted for zinc, the other chemicals required cost more than the oxygen of the air. The total cost per horse power per hour is about two cents for the steam engine and fifty cents for primary batteries. Hence the steam engine is by far the cheaper method for obtaining power, notwithstanding its low efficiency.

The ease with which the latent energy of fuel is liberated in the form of heat, the interconvertibility of heat and electricity and the efficiency with which electricity may be changed into any other desired form of energy, all point to the direct conversion of thermal into electrical energy as an efficient and cheap method of rendering available the energy stored in fuel. The efficiency of the conversion of electrical into thermal energy is practically unity, although electric cooking utensils and other heaters seem to have a practical efficiency of not over 50 per cent. On the other hand, thermo-electric currents are very easily obtained from almost any combination of metals or other conductors. It is not surprising, therefore, that inventors seek in this direction to make an economic solution of the problem. Investigations have been carried along a number of different lines.

Much was expected, at one time, from the development of "pyro-magnetic" generators. These are based upon the fact that, at the temperature of red heat, iron is a better conductor for magnetism than any other temperature, while, at white heat, it loses this property entirely. This magnetic change may be used to induce electric currents. If a mass of iron subjected to magnetizing force be alternately heated and cooled between red heat and white heat, electric currents would be induced in a coil of wire surrounding the iron. Generators based upon this principle have been invented by Berliner, Tesla. Edison and Menges, and probably others. Some years ago the writer worked out a theory for the maximum efficiency and found it to be 000 000 0005 on one hypothesis and 0.16 on another, the latter being probably the more correct. Edison thought he obtained an efficiency of about 0.015 from one of his machines.

The thermopile has been looked upon by many as a very promising source for electrical energy. But the highest theoretical efficiency for any combination of elements yet tried is 0.12, while the highest actually obtained and published is .0054. The efficiency of the thermopile is limited by the fact that any substance which conducts electricity also conducts heat, and much of the heat is lost between the two sets of junctions.

* *Denison Quarterly*, January, 1894.

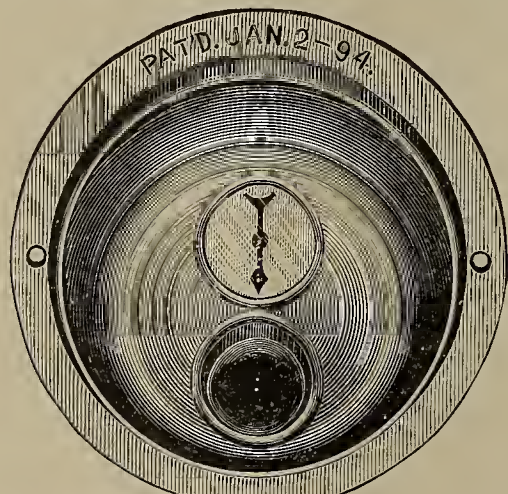
The thermopile might be compared with a galvanic cell whose electrodes are in contact, external force being almost nullified by electrical action. By substituting an electrolyte for one of the metals of a thermopile, the efficiency is greatly increased. In some cases hot gases have been introduced into circuit with advantage, the line of distinction between gaseous thermopiles and gas batteries cannot be drawn sharply.

Gases become fair conductors at high temperatures, a fact which many have sought to utilize. Gas batteries have given some promising results. In some of these a high temperature is obtained by the external application of heat, while others work at ordinary temperatures. Batteries of the latter class have been improved until an efficiency of 50 per cent. is claimed in the oxidation of hydrogen or hydro-carbon gases at ordinary temperatures. This seems to be the most promising line for further investigation.

A NEW PUSH BUTTON.

The accompanying illustration shows an improvement in the manufacture of push buttons, which will certainly find extensive use.

In using an ordinary push button, there is no means of indicating or knowing whether the circuit is complete or not. Frequently a wire breaks or a connection becomes loose and the bell fails to ring, and the one who sends the signal usually has no means of knowing this fact, until an investigation is started. In many cases it is very essential that the bell should ring at the proper moment; its failure to do so might entail loss.



PUSH BUTTON WITH MAGNETIC NEEDLE.

The push button herewith described has a small magnetic needle. Being affected by an electric current, it serves to indicate whether the circuit is complete or not and whether the distant bell is ringing. If the circuit is complete, when the push button is closed the needle will indicate the fact by its movements. If the bell at the other end of the circuit is vibrating, then its movements will be indicated on the needle by the tremulous vibrations of the same, thus indicating that the bell is working all right and that the signal has been received.

This push button is manufactured in the same general style as the ordinary push buttons, excepting with the addition of the needle. It was invented and patented by Dr. C. D. Hunking of New York city, and is for sale by Messrs. Stanley & Patterson, 34 Frankfort street, New York city. These push buttons are made in burnished bronze metal or in any of the ordinary materials used for this purpose, and their cost is a little more than that of the ordinary style.

CATHODIC RAYS IN GASES.

The rays exciting phosphorescence, proceeding from the cathode of a Giessler tube, permeate thin leaves of metal as Hertz has shown. If it were practicable to find a metallic leaflet of such a thickness, that with perceptible permeability it still closes air-tight, and is capable of bearing the pressure of the atmosphere on one side only, it would be sufficient to close an opening in the side of a discharge tube with such a plate, in order to allow those rays a passage into the air.

This line of thought has been carried into experimental effect by Dr. Philipp Lenard, of Bonn, who, in a paper read before the Royal Prussian Academy of Science, at Berlin, on January 12th, 1893, describes the method and details of his investigation. He succeeded in demonstrating that the cathodic rays, when once produced, propagate themselves into space filled with air: thus their observation is greatly facilitated, and it becomes possible to select and to vary the conditions of observation, independently of those of their origin.

The metallic leaf selected for experiment was of aluminium, 0.003 mm. in thickness. This was found to be permeable for cathodic rays, but quite impermeable to air and light. The cathode was an aluminium disc, 12 mm in diameter, and the anode had a very large surface. The arrangement of the apparatus was such that the space for observation was kept perfectly free from light and from the electric action of the discharge.

The observations made are given at considerable length, but the more important of them may be briefly described as follows:

Cathodic Rays in the Open Air.

1. The rays render the air faintly luminous with bluish light, and there is a strong odor of ozone.

2. Substances capable of phosphorescence glow when held in the rays; the intensity of the glow depends upon the distance at which they are situated from the source of the rays. The phenomena cease if a magnet be applied to the discharge tube so as to repel the rays.

3. A quartz plate interposed causes the extinction of the light. Gold, copper, aluminium foil, silk, paper, and soap-bubbles scarcely weaken it. The permeability depends upon the thickness of the stratum employed.

4. The air is a dull medium for cathodic rays; these spread in a diffused manner, not rectilinearly.

Cathodic Rays in a Vacuum.

1. The more complete the vacuum the greater the distances at which the phenomena of phosphorescence become visible; the rays become brighter and more sharply defined. Conceding that the imperceptible traces of matter left in extreme vacua exercise no perceptible effect, it follows that the cathodic rays are processes in the ether.

Cathodic Rays in Various Gases.

1. The gases are turbid media for the cathodic rays, and the turbidity varies according to the nature of the gas. Greater permeability is connected with greater clearness. Experiments with coal gas, hydrogen, oxygen, and carbonic acid gas demonstrate this fully. The behavior even of the elementary gases is that of a non-homogeneous medium, each molecule appearing to exercise the function of a distinct obstacle. Arguing from the observations made, and from the theory that the number of molecules upon which the cathode rays impinge in equal volumes of different gases is always the same, Dr. Lenard concludes that hydrogen molecules "obscure" the ether to a less degree than the molecules of oxygen, and that these again obscure it to a less extent than do the molecules of carbonic acid gas.—London *Electrical Review.*

THE EXPENSE OF RUNNING ELECTRICAL ENGINEERING BUSINESSES.

BY SYDNEY F. WALKER.

The following article from the *Electrical Engineer*, of London, is so appropriate to existing conditions in this country, that we reproduce it for the benefit of our readers. It may prove to be a leaven and ultimately work much good for the electrical trade:

Probably few electrical engineers, except those who have been in business for a number of years, appreciate how very heavily all electrical engineering work is handicapped by the dead expenses involved in carrying on the work. The remark is true of all engineering businesses, but particularly of electrical engineering. Even the rapid advances of which all electrical engineers are so proud, add considerably to the cost of working. Some new improvement is made, and not only patterns and drawings, but perhaps a lot of finished work becomes dead stock, of the value of old metal. When, too, as is constantly happening, one firm works out an improvement in some part of their apparatus, every other firm making the same class of apparatus must follow suit, no matter at what cost, or be left out in the cold when orders are given out.

It must be borne in mind too, by those who think electrical engineering businesses so many veritable Eldorados, returning enormous profits upon small outlay, that the proprietors of an electrical engineering business have to make good, not only their own slips, but those of all their employees, and often those of the employees of other firms. To be successful, you must follow your work, see it kept right, no matter what it costs or into whose hands it goes. If you do not, any breakdown is attributed, not to the apparatus being improperly looked after, but to the apparatus itself being improperly made. And unfortunately, too, electrical engineers are very much like women, in that they are rarely able to see any good in each other's work. Few electrical engineers, if called in to repair the work of another firm, can resist the temptation to condemn the rival firm's work. And so all these little things cost money, and a good deal of it. And besides all these, as every electrical engineer of experience knows, every now and then something turns up, some new development of the laws of the science that had not occurred to anyone before, that often appears at first sight to be contrary to those laws, but which always lead to one result—additional expense, more or less heavy, for the manufacturer or contractor.

And the above are in addition to the regular expenses of all properly conducted businesses. Keeping accounts so that you may know what you are owed, and what you owe, and what your expenses really are, is an important and often a very heavy item in proportion to the business done. Even the correspondence of electrical engineers in business is heavier and more costly than that of other businesses. The thing is new, and buyers often require to be very sure of their ground. Misunderstandings are more likely to arise over work that is quite new to one of the parties concerned than where both are familiar with the principal details And this necessitates the treasuring up of every letter that one has written or received for years after.

Securing orders is also, if one may judge by what one sees in other lines of business, a far more expensive matter in electrical engineering than elsewhere. Electrical engineers themselves are, perhaps, to blame for a large part of this. No sooner is it known that an order is in the market than the representatives of several firms rush for it, each bent on belittling all his rivals. Tenders, too, are a constant source of expense, and the writer believes affect electrical engineers more severely than other business. People do not scruple, apparently, on the plea of asking for a tender, to put several firms to heavy expense often without the slightest intention of employing any of them ; sometimes even merely with a view to obtaining information.

All of these things, and many others, cost money, and unfortunately, the sum of them, when added up, bears a very heavy proportion to the amount of business done. With limited companies the proportion is usually even higher.

The writer's object in penning this article is to endeavor to deter those who are engaged in electrical engineering businesses from the stupid practice of cutting prices. If your business is to continue, and if your are to make a moderate profit out of your business, you must have a certain average rate of profit on your transactions, such that the sum it furnishes in the year will cover your expenses and leave you your modest profit. If you attempt to cut below this figure, whatever it may be, you will lose money and your business. If you attempt to cut your coat to your cloth, or, in other words, to make a profit by inferior work or materials, you will lose your business as soon as the results of your work have had time to show themselves. If you simply take the loss, carrying out the work as it should be done, you will lose your capital.

If anyone will look round at the firms that are now in existence that were in existence 10 or 20 years ago, he will find two characteristics invariably present. The work of these firms has been invariably good, and their prices have been high in comparison with those of other firms since deceased. These firms—those that are still standing—have marched well abreast of the times. Research and practical work have always gone together, and the research has been paid for, as it should be, out of the profits made on the practical work—that is to say, by the purchaser, for whose benefit the research was undertaken.

Young engineers, too, often fancy that they have a heaven-born genius for conducting business. No special knowledge is supposed to be required, no training, for what is perhaps the most difficult work that one can put one's hand to. Often the youngster thinks he will make up for the want of experience, both in business and in engineering, by the exercise of the very worst quality that a business man could be cursed with—that quality of sharpness, of over-reaching, that so many mistake for the necessary business quality of shrewdness—forethought. There is no necessity for any young electrical engineer who knows his work to go into business for himself. They are plenty of openings for properly trained engineers. An electrical engineer has only to master his work, as far as it is known, to strike a line for himself, and to go on working away as hard as head and body will let him, continuously, and he will be bound to succeed in the end. This success, too, will come at a time when he will most appreciate it, when nature begins to warn him that the pace must not be so rapid, and in consequence of his success it need not be so rapid. If he goes into business and does not succeed—and few can—he will find himself thrown out of the race, and that many whose abilities were not equal to his have passed him ; just as the hare found when he raced with the tortoise. We are apt not to look upon the tortoise as an animal to be admired, nor as one whose ways we should emulate, yet the way of the tortoise in the fable is the way to success in electrical engineering. Strike a bee line, as the American would say, and keep on pegging away.

The resistance of hard drawn copper wire is equal to the resistance of soft drawn copper wire multiplied by 1.0226.

IMPROVED BATTERY MOTOR.

The accompanying illustrations, Fig. 1, shows a No. 1 Premier Motor, made by M. R. Rodrigues, 17 and 19 Whipple Street, Brooklyn. Something new in the motor line is possessed by this machine. It is the new reversing switch. By simply swinging the switch lever to the right or the left, the current going through the armature is reversed, the polarity of the field magnets, however, remaining unchanged always.

The reversing switch can be attached to any of the Premier motors, at small cost.

This size of motor is used in operating the small electric railroad made by Mr. Rodrigues, which, geared at 7 to 1, will carry a load of 8 pounds, or draw 21 with a current of 1 ampere at 6 volts.

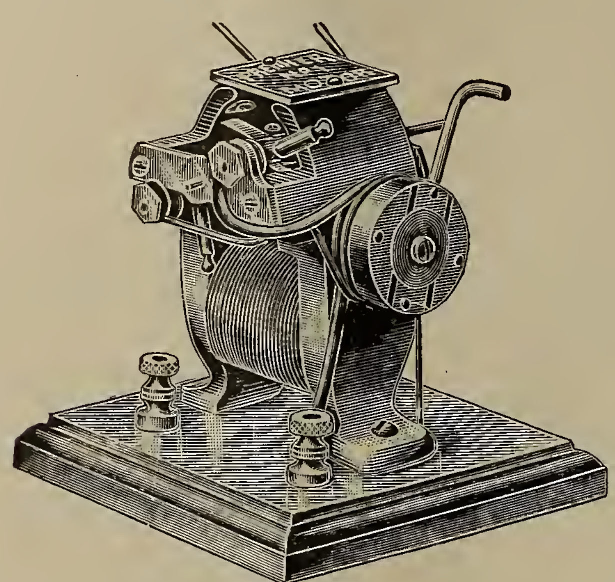


FIG. 1.

By raising this new model Premier motor, it will operate a ten inch fan with the same current required for the No. 3 motor. Five cells of improved Premier DeMott bluestone battery will run it at a good speed.

Fig. 2 is an illustration of a cell of the DeMott bluestone battery. This battery has been greatly improved, and by a process of treatment the deposit of copper upon the porous cup is entirely prevented. Another point in its favor is the absence of heavy sediment in the porous cups, which is so common in batteries of this type. It is claimed to be the ideal battery for charging storage batteries and for motor work. It has long life and is economical in operation and maintenance. The cells are made in two sizes; viz.: type A, 5x7 inches; type B, 6x8 inches.

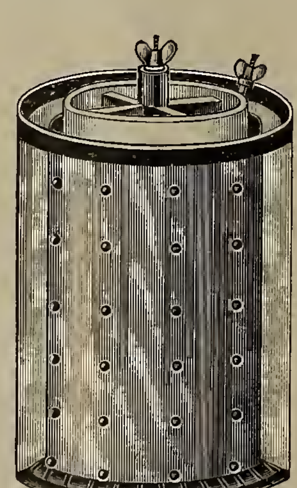


FIG. 2.

An English bacon factory is using an electric brand for the purpose of branding pigs. It is much easier to handle than the old-fashioned heavy iron brand.

THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

The annual meeting of the American Institute of Electrical Engineers for the election of officers and transaction of other business will be held in Philadelphia on Tuesday, May 15, next. On the following day the general meeting will be held for the reading and discussion of papers.

JAMES I. AYER TO SETTLE IN NEW YORK.

Mr. James I. Ayer, General Manager of the Municipal Lighting and Power Company, of St. Louis, and President of the firm of James I. Ayer & Co., electrical engineers, of the same city, has received the appointment of General Manager of the Royal Arc Electric Company of 143 Liberty Street, New York City. Mr. Ayer will hereafter make New York his home, and the Royal Arc Electric Company is to be congratulated in having selected such a capable gentleman to manage its affairs. None is better known in the electrical fraternity at large than Mr Ayer, and the trade in New York will give him a hearty welcome. New York is the proper place for men of his calibre, and we hope to see the Royal Arc Company prosper abundantly under Mr. Ayer's guidance. Mr. Ayer was at one time President of the National Electric Light Association, and has always been one of the association's most active workers.

MAINTENANCE COST OF STREETS INCREASED BY CAR TRACKS.*

BY W. L. DICKENSON.

It is generally acknowledged by men familiar with traffic and its injurious effects upon our streets, that when a car track is laid in any street of ordinary width it quickly increases the cost of maintenance and makes it impossible to keep the road in good condition for travel.

Whatever road material you use, be it granite blocks, asphalt, brick or crushed stone, the poorest costs the most for maintenance. With the introduction of electricity as a motive power, the mileage of street car tracks is increasing rapidly and they will soon have the main arteries of our cities and towns girdled with electric railways. I have selected a few macadamized streets under various conditions of traffic in different parts of the city of Springfield, Mass., of which I can get a perfect record from the books of the highway department, for the purpose of illustration and comparison.

Mr. Dickenson then gives a table which shows that on residential streets with a moderate traffic and driveway of 30 feet from curb to curb, unemcumbered with street car tracks so that the traffic is distributed over the entire surface, it is possible to furnish the travelling public with a good surface of macadamized pavement at an average annual cost of .013 per square yard for maintenance. On the other hand he continues, when you put a track in the centre and confine the traffic to a narrower space each side, the horses and wagons constantly traveling in the same place will, with the immense pressure per square inch brought to bear, grind the pavement into dust and mud. When you place a car track in the centre of a street it occupies a portion that was originally intended, when the pavements were first laid, to carry the bulk of traffic. Under these conditions it is not at all surprising that on a street that receives but a moderate traffic the cost of maintenance with no track in the centre is increased from .013 to .063 with a track in the centre.

*Abstract from Paving and Municipal Engineering, April, 1894.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL AGE,
FIRST FLOOR, WORLD BUILDING,
NEW YORK, APRIL 14, 1894.

Mr. Thomas L. Scovill, formerly with Holmes, Booth & Haydens, is now president of the Mechanical Boiler Cleaner Co., 32 Park Place, New York City. All steam users should investigate the merits of this device.

Holmes, Booth & Haydens, manufacturers of brass tubing, wire, German silver, etc., etc., report a more favorable outlook for business. The goods of this concern are well known among electrical manufacturers for their uniform good quality and reliability. Mr. Geo. V. Onderdonk is in charge of the metal department.

The Herzog Telesame Co., city, has notified the comptroller of this city that it intends to prosecute a claim against the city for $200,000 damages for delay in fulfilling a contract, which, it alleges, was made to supply the police department with the company's signal system.

Mr. W. E. Page, 32 Park Place, New York city, represents the Newton Rubber Works, of Boston, Mass. This company manufactures storage battery cells and all other electrical rubber supplies.

The many friends of Mr. W. T. Hunt, president of the ELECTRICAL AGE Publishing Co., will sympathize with that gentleman in the loss of his father by death, in Brooklyn, on April 11. The deceased was well-known in Brooklyn and built some of the finest houses in the city.

E. V. Baillard has opened an office and factory at 108 Liberty street, New York city, for the manufacture of telephones. Mr. Baillard is a thorough electrician and has had a large practical experience. He will do all kinds of experimental and jobbing work. Mr. Baillard is a member of the American Institute of Electrical Engineers.

The Imperial primary battery, which is the invention of Mr. B. J. Wheelock, 18 E. 18th street, New York city, is one of the best for operating sewing machines, phonographs, dental lathes, etc. It does good service on all small motor work, and is especially adapted for small electric light plants. It is said that four cells of this battery will light four to six 6-candle power lamps used as night lamps for four weeks on one charge, and it will run a sewing machine one hour a day for one year, at a cost of 50 cents a month. It is stated to be the only battery in existence that will do all that is claimed for it. It costs little to recharge and is easily managed.

The severe storm of April 11 did considerable damage to telegraph and telephone lines in this vicinity. The telegraph lines along the Atlantic coast were badly prostrated.

The Peckham Motor Truck and Wheel Co., 1006 Havemeyer Building, has removed to the thirteenth floor of the same building, where it will have larger accommodations.

The Postal Telegraph and Cable Co. moved its operating department into its new building, corner Broadway and Murray street, on Sunday, April 15. The transfer was made with perfect success, and without the slightest friction.

The American Manufacturing and Engineering Co., Central Building, 143 Liberty street, city, is the sole agent for New York and New Jersey, of the Ries and Scott alternating current fan motor. This motor is claimed to be the most efficient, and it is impossible to burn out or injure the armature.

The Fibre Conduit Co., 45 Broadway, city, manufactures an underground conduit for electric cables, which is claimed to be the best in the market. It is light, strong and durable, and is not affected by acids or alkalies, and it is a perfect insulator. All those searching for an underground conduit should investigate the merits of this particular make.

Mr. W. J. Clark of the Cincinnati office of the General Electric Company has returned to New York, and will make his headquarters, after the 1st of May, at 44 Broad Street. He will resume his old position as manager of the railway department.

The attention of our readers is called to the advertisement of J. R. Warner, 140 E. 48th Street, City, manufacturer of the Little Giant Pocket Battery. This battery can be conveniently carried in the pocket, and is a very complete and efficient piece of apparatus. W. T. H.

POSSIBLE CONTRACTS.

The Lancaster & Lititz Electric Railway Company has been organized to build a line seven miles long to connect the towns named.

The citizens of Troy and West Milton, Ohio, are agitating the question of building an electric railway between the two towns.

The Lancaster & New Holland Electric Railway Company will construct a line thirteen miles in length, with terminal points at Lancaster and New Holland. The directors of both companies are: John S. Graybill, S. H. Reynolds, Dr. Henry Yeagley, H. C. Hopkins, John Schaub, and Carl F. Espenshade.

NEW CORPORATIONS.

International Electrical Supply & Manufacturing Company, Detroit, Mich. Capital, $500,000.

Chestertown Power Light & Railway Company, Chestertown, Md.

Chihuahua Electric & Power Company, Chicago; capital stock, $100,000. Incorporators, John D. Hood, George W. Dupee and Eugene H. Dupee.

Lancaster & Lititz Electric Railway Company and the Lancaster & New Holland Electric Railway Company, Lancaster, Pa., have been organized, each with a capital stock of $100,000. Mr. John S. Graybill is president of both corporations.

The Akron Street Railway Company, Akron, Ohio; capital stock, $700,000.

The Port Richmond Electric Company, Port Richmond, N. Y., has been incorporated with a capital of $50,000 by H. L. Horton, F. J. Emmons, C. S. Ingals and others.

The Electric Toy Company, Brooklyn, N. Y. Capital $10,000, and directors, E. S. Boynton, R. P. Cole and T. Posser, Jr.

The Bluestone Electric Light Company, of Coopers, Mercer County, W. Va. Authorized capital, $50,000. Incorporators, John Cooper, B. Moore, J. P. Bowen, Jenkins Jones and Isaac Mann of Bramwell.

The Augusta Telephone & Electric Company of Augusta, Ga., has been chartered by Messrs. Charles Estes, Geo. R. Lombard, D. B. Dyer, H. H Alexander, Bryan Lawrence, W. C. Jones, Bryan Cumming, W. Ed. Platt, N. Kahrs, V. J. Dorr, Frank E. Fleming, W. C. Boykin, D. J. Murphy, Asbury Hull, S. Lesser, E. J. O'Connor, Paul Mustin, J. L Wilson, W. Jackson and N. L. Willet. The capital is $25,000 and the company will open a new telephone exchange in Augusta, after all preliminaries are arranged.

The electric light companies of Covington, Newport and Dayton, Ky., have been consolidated and the new company will be known as the Surburban Electric Company. It has been incorporated with a capital of $250,000, and the officers are, Dr. J. E. Lowes, of Dayton, Ky., president; John R. Coffin, of Covington, vice-president; H. M. Healy, of Cincinnati, secretary and Treasurer. Directors, Dr. J. E. Lowes, H. C. Keafaber, R. M. Nevins, J. C. Reber and J. H. Winters, of Dayton, Ky.; E. J. Hickey and John R. Coffin, of Covington, and H. M. Healey and C. J. Helm, of Newport.

The Central Traction Company of New Jersey has been incorporated with a capital of $150,000. The company is organized to build and operate a system of trolley roads connecting New York and Philadelphia, and running through the principal towns and cities in New Jersey. Incorporators: George G. Crosby of New York; Jeptha H. Baldwin of Orange, and John H. Lingley of Rahway, N. J.

Electrical and Street Railway Patents.

Issued April 10, 1894.

517,831. Electric-Power Appliance. Bion J. Arnold, Chicago, Ill. Filed Aug. 31, 1892.

517,842. Wire-Stretcher. Geo. J. Cline, Goshen, Ind. Filed Jan. 19, 1894.

517,858. Electric Motor. Edwin T. Greenfield, New York, N. Y. Filed Oct. 1, 1891.

517,862. Electrical Foot-Bath. Isaac A. Isaacs, New York, N. Y. Filed Jan. 10, 1894.

517,866. Governor for Electric or other Motors. Nathaniel S. Keith, San Francisco, Cal. Filed July 5, 1893.

517,886. Electric Railways. Henry S. Pruyn, Hoosick Falls, N. Y., assignor to James S. Gibbs, Chicago, Ill. Filed Nov. 1, 1893.

517,894. Fender for Street-Railway Cars. Eldridge J. Smith, Washington, D. C. Filed Dec. 18, 1893.

517,904. Car-Brake. Peter D. Van Vradenburg, Binghamton, N. Y. Filed Sept. 7, 1893.

517.916. Car-Brake. Geo. W. Chandler and John C. Dale, Manhattan, Kans. Filed July 14, 1893.

517,940. Electric-Railway System. Chas. D. Tisdale, Boston, assignor, by direct and mesne assignments, to himself, and John D. Gould, East Boston, and Chas. Healey and James E. Jenkins, Lynn, Mass. Filed Jan. 17, 1893.

517,948. Method of and means for Speed Regulation of Electric Locomotives. Chas. E. Emery, Brooklyn, N. Y. Filed Oct. 14, 1892.

517,957. Electric Switch. Andrew T. MacCoy, Boston, Mass. Filed Apr. 13, 1893.

517,964. Apparatus for Coiling Wire. Hubert Polte, Remscheid-Hasten, Germany. Filed May 24, 1893.

517,997. Mode of Connecting Dynamos to Car-Axles. William Biddle and Patrick Kennedy, Brooklyn, assignors to the American Railway Electric Light Company, New York, N. Y. Filed July 3, 1893.

517,998. Electric Car-Lighting System. William Biddle and Patrick Kennedy, Brooklyn, assignors to the American Railway Electric Light Company, New York, N. Y. Filed Apr. 20, 1893. Renewed Dec. 27, 1893.

518,006. Electric Locomotive. William Lawrence, New York, N. Y., assignor to the Lawrence Electric Company, same place. Filed Jan. 21, 1893.

518,033. Electric Motor. John C. Henry, New York, N. Y. Original application filed Sept. 27, 1889. Divided and this application filed Aug. 19, 1890.

518,037. Electrical Annunciator. Robert L. Hunter, St. Paul, Minn. Filed Feb. 13, 1893.

518,040. Electrolytic Cell. Ernest A. Le Sueur, Ottawa, Canada. Filed Aug. 22, 1893.

518,062. Speed and Power Regulator for Motors. Horace B. Gale, San Francisco, Cal. Filed June 21, 1893.

518,065. Electrolytical Apparatus. Carl Hoepfner, Giessen, Germany, Filed Feb. 8, 1892. Patented in Germany Feb. 22, 1889, No 58,133; in Norway Sept. 1, 1890, No. 1,967; in England Sept. 1, 1890, No. 13,735; in Italy Sept. 30, 1890, XXIV, 28,112, LV, 196; in Spain Nov. 11, 1890, No. 11,205, and in Austria-Hungary, Dec. 12, 1890, No. 39,156 and No. 66,246.

518,071. Trolley-Wire Insulator. Louis McCarthy, Boston, Mass. Filed June 8, 1893.

518,115. Car-Fender. William V. McManus, Baltimore, Md Filed Nov. 8, 1893.

518 126. Car-Fender. Benjamin Tranter, Brooklyn, N. Y., assignor of one-half to William Burton, same place. Filed Dec. 13, 1893.

518,133. Electrical Contact Mechanism. John F. Blake, New Haven, Conn. Filed Jan. 25, 1894.

518,135. Electrolytic Apparatus. Hamilton Y. Castner, London, England. Filed June 8, 1893.

518,142. Telephone-Transmitter. John Goodman and Henry M. Goodman, Louisville, Ky. Filed Aug. 19, 1893.

518 179. Electric Incandescent Lamp. John E. Criggal, Springfield, Mass., assignor to the Davis Electrical Works, same place. Filed Dec. 8, 1893.

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NEW YORK, APRIL 28, 1894.

CONTENTS.

THE JERSEY CITY AND NEWARK ELECTRIC ROAD.

The opening, during the past week, of the electric railroad between Jersey City and Newark, N. J., has attracted considerable attention among electric railroad people. This road is a notable one in several respects. It may be regarded as a fair example of long distance electric railroading, not particularly on account of the distance between the two cities, but rather on account of the conditions of traffic. The distance between Newark and Jersey City is about nine miles, the intermediate country being practically unsettled. The road traverses the Jersey meadows, which lie between the two cities, and, owing to the flatness of the country, an opportunity will be afforded to demonstrate the possibilities of high speed electric railroading. The traffic, too, promises to be heavy, The line practically parallels the Pennsylvania Railroad, and was built with the object of relieving the latter of some of the travel between the two cities. This traffic is very heavy at certain times of the day, and severely taxes the facilities of the steam roads.

THE UNDERGROUND WIRE QUESTION IN BOSTON.

The city council, of Boston, has passed an ordinance requiring the electrical companies to place their wires underground within certain prescribed districts in that city by November 1, next. To do this, it is said, would be a herculean task, and President Little, of the West End road, thinks it is a physical impossibility. The West End Company, we understand, proposes to seek relief from the legislature against the enforcement of the ordinance.

ELECTROLYSIS OF METAL PIPES UNDERGROUND..

It is three years since the first discovery was made that underground cables, gas and water pipes in localities traversed by electric railroads were exposed to a new danger, in being disintegrated by electrolysis. It did not take long to determine the cause of the electrolytic action; it was soon suspected that the railway currents were responsible for the new and subtle danger, which suspicions were positively verified by tests. Since that time the same general cause has produced the same effects in widely scattered sections of the country, and in many cities semi-panics have prevailed among those most interested. Naturally the complaints from gas, water, telegraph and telephone companies have been loud, and yet, notwithstanding every effort on the part of electrical engineers to devise ways and means to obviate the danger completely, they have not yet succeeded. They have, however, by various expedients, succeeded in minimizing and localizing the effects of the return currents, and especially successful have been the efforts put forth in Boston, where the trouble was first noticed. The paper read by Mr. Isaiah H. Farnham, before the American Institute of Electrical Engineers, on April 18 — an abstract of which we print elsewhere in this issue — throws considerable light on this interesting and important subject. Mr. Farnham does not declare an infallible remedy for the trouble; he does, however, inform us of what has been done in Boston and other places, and with what success. These experiences will greatly aid those who are grappling with the same problem, and it is hopeful that we may soon be able to have more certain ground to stand on in regard to our knowledge of this subject. It is a matter of vital importance to all interests concerned, and no other field offers a better inducement at this time for the exercise of the inventive faculties than this one. The conclusions arrived at by Mr. Farnham may safely be accepted as laws governing the subject. They have been amply proved by experiments and tests, and will do good service as stepping-stones in the progress of this all-important problem.

WESTON ALTERNATING AND DIRECT-CURRENT VOLTMETER.

We describe and illustrate an alternating and direct-current voltmeter made by the Weston Electrical Instrument Company, of Newark, N. J., which, though not particularly new to station men, has not yet been fully described in print. It is an instrument that is said to be giving the best of satisfaction, and as it is constructed on scientific principles, its accuracy is guaranteed by the maker.

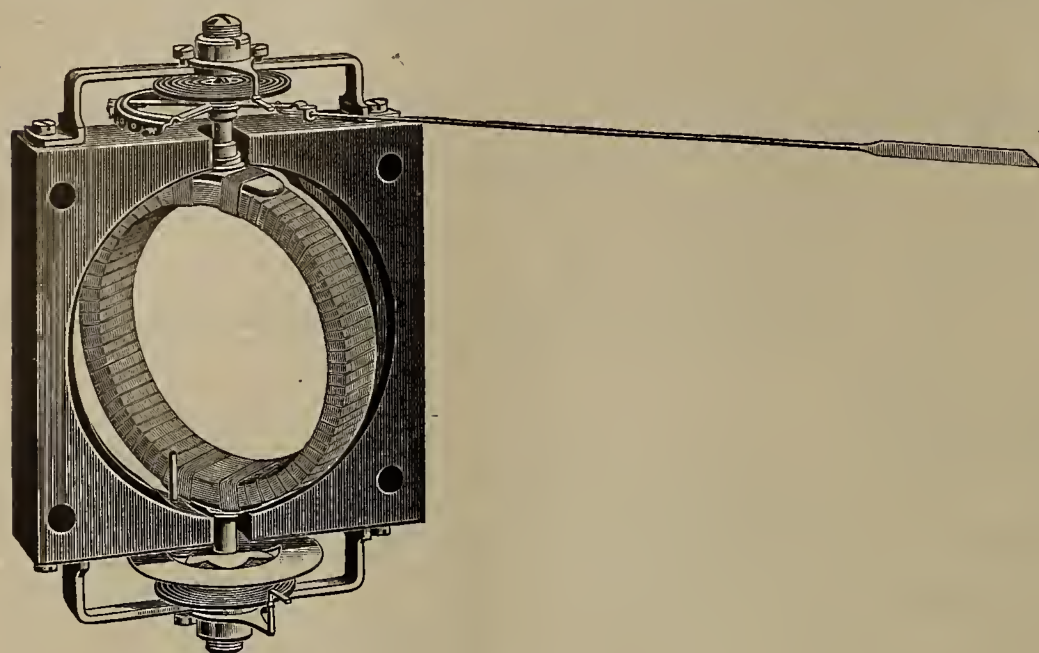


FIG. 1.

FIG. 3.

Instruments for the measurement of direct currents are comparatively easy of construction, but for alternating currents the problem is not so easy of solution; and although there are several instruments of this class available they seem to lack, in some respects, in the fulfilment of every requirement in practice. It is claimed for the Weston instrument, however, that it meets every need in a portable instrument, and the fact that so many of them are in use may be taken as positive evidence that they fulfil every guarantee.

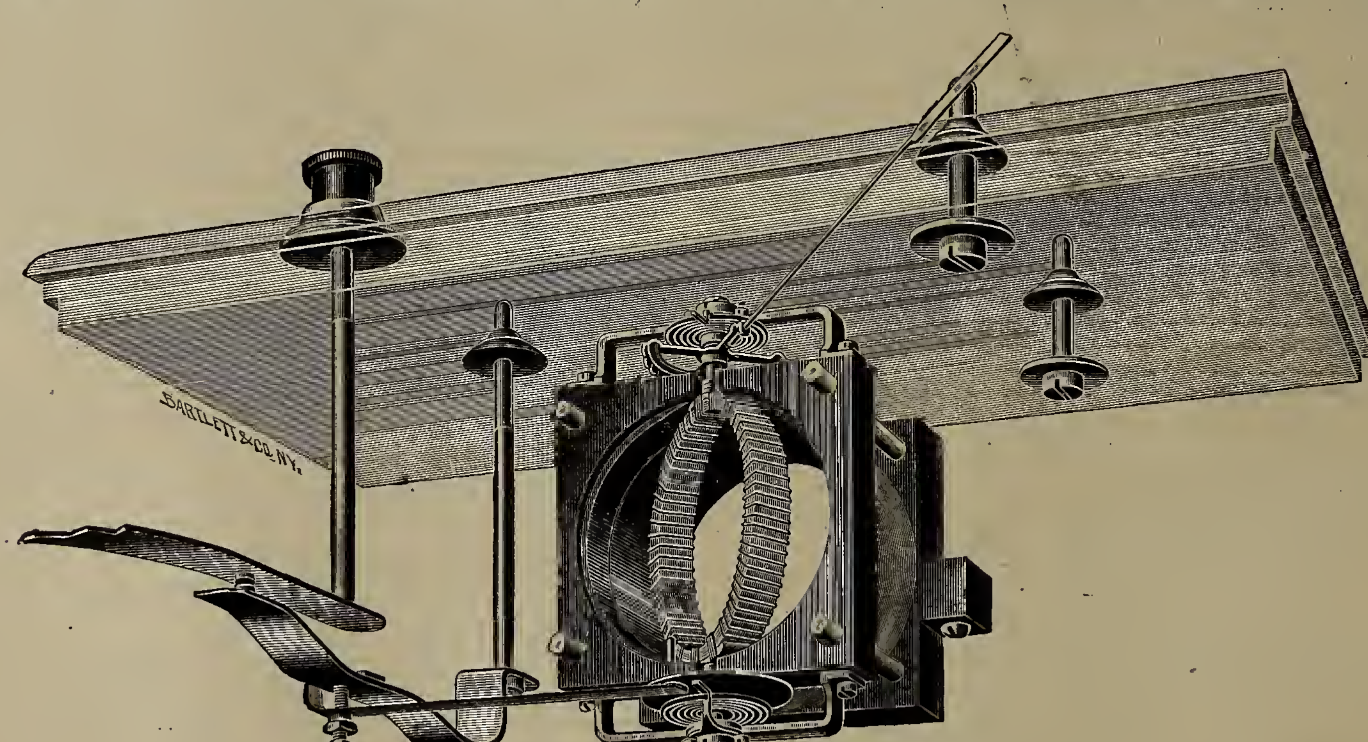


FIG. 2.

If all the requirements of general practical work are to be fulfilled, a direct-reading, dead beat and constant instrument, affected but little by outside influence such as can be readily compensated, becomes necessary, and these requirements it is claimed will be found the most prominent features of the Weston Standard Voltmeter for alternating and direct current.

The principle employed in the Weston Standard Direct-Reading Alternating and Direct Current Voltmeter is the well tested one of the electro-dynamometer, *i. e.*, a system of fixed and movable coils, influencing each other as the coil of the galvanometer would influence a magnet supended within it. If we replace the magnet by a coil of wire, suspended in such a way that the faces of the movable coil form some angle with the faces of the stationary coil, we will find, in sending a current through this system, that the movable coil will be deflected from its original position, this deflection obeying a certain law in relation to the current passing through the system. Moreover, we may change the direction of the current in the outside circuit without changing the direction of the deflection of the movable coil, since both coils will always have the same relative attracting or repelling effect upon each other.

If a current is passing through the movable coil it will tend to assume a definite position in the earth's magnetic field, provided the current flows continuously in the same direction. This is a very evident and important fact, which has to be borne in mind when using instruments of the electro-dynamometer type in direct current work.

This instrument cannot be used below a certain minimum E. M. F; since its sensitiveness is limited, it cannot be used for the measurements of resistances nor for that of very small or very large currents. Its application is limited to that of a voltmeter only, but it has the very great advantage of being applicable for exact measurements of alternating E M. F., and as such it is said to be unrivalled. An instrument of the electro-dynamometer type cannot have a strictly proportional scale, but it can be so proportioned and designed that the scale will be an extremely favorable one within certain working limits.

In the case of the Weston instrument for alternating and direct current the winding is so dimensioned, that errors caused by self-induction are not perceivable.

FIG. 4.

FIG. 5.

No change in the value of the deflection could be observed whether the instrument was used with direct current or with the same alternating potential of 200 periods per second.

The resistance of the instrument is higher than in any other known form of commercial portable voltmeters for alternating currents; it cannot, however, reach the extremely high resistance of the Weston direct current voltmeter. Still it is large enough to allow the instrument to be left in circuit some length of time without being seriously heated; moreover, there is a very ready means of correcting for any changes due to change of temperature by means of a miniature rheostat.

The stationary and movable coil above referred to is fastened under the bridge-piece carrying the three contact plugs and a contact key. Figs. 1 and 2 give a detailed view of the working part of the instrument. The stationary field coils, of which one-half is shown in Fig. 1, is wound in two parts on frames and consists of 1800 turns of No. 6 copper and German silver wire in definite proportions. Between the two halves of the field coils is another frame carrying the movable coil, as shown separately in Fig. 2. This coil consists of 280 turns of No. 6 aluminum wire. No frame is used for this coil, since it has been found sufficiently strong in itself when the turns were well cemented together. The current is taken to and from the coil by two very delicate springs, which also act as the controlling force, as in the magnet type of the Weston standard instruments. The pivots are of hardened steel ground to gauge and highly polished. The whole moving system is balanced in the same manner as a watch balance, by a number of small screws inserted in the rim of a brass sector, which also carries the aluminum pointer. On the lower end of the movable coil, just above the lower spring, is a metal disc which is a part of the mechanical "damping" device explained more fully later on.

The winding of the stationary and movable coil is connected in series with an external non-inductive resistance of German silver. It is partly due to this resistance that errors of self-induction are reduced to a minimum.

The object of having part of the field wound with german silver wire is to decrease errors due to changes of temperature, which would often be more serious than the error of self-induction. Since the accuracy of the instrument is about 1-5 of one per cent., this error comes well within the limits of accuracy obtainable, and may be neglected.

Two styles of the portable form of these instruments are made, single scale and double scale. The single scale instruments are provided with two contact plugs and a contact key on the wooden cover inside the case; the double scale instruments (Fig. 3) have three contact plugs and a contact key.

To secure quick reading and to prevent injury to the pivots of the instrument, by reason of violent shocks to the moving system caused by suddenly closing the current, the instrument is provided with a friction brake, which is shown in Fig. 2.

It will be observed that this friction brake is always on when the contact key is not fully depressed, and the index and other moving parts are locked in position by it, and can only be set free by full pressure on the contact key. The index therefore cannot return to zero unless the circuit be first broken and the contact key fully depressed, and kept depressed, until the index comes to rest. By proper use of the contact key, complete control of the moving parts of the instrument is obtained, and their movements can be checked perfectly and the index brought to rest quickly and gently, as if the instrument was dead beat.

When the instrument is to be used for measuring potential differences on direct current circuits, some further precautions must be taken to secure accurate results. With direct currents the instrument is somewhat sensitive to the disturbing influences of external magnetic fields, and even the earth's magnetic field exerts a perceptive influence upon its indications. It becomes necessary, therefore, to take care to avoid errors from these causes when making measurements on direct current circuits. This is easily done by placing the instrument in a fixed position and making a reading with the current flowing first in one direction, then reversing the direction of the current through the instrument, and taking another reading. The *mean* of the two readings will be the true potential difference. The direction of the current through the instrument can be easily reversed by simply transposing the terminals of the flexible conductors at the contact plugs.

The actual error in these instruments is very small; it closely approaches six-hundredths of one per cent. for one degree Fahrenheit for single scale, 120-volt instruments ; is still lower for higher range instruments and somewhat higher for lower ones.

Fig. 4 shows an illustration of an Inspector's Pattern Voltmeter. This instrument is of the same class as the one above described, and is intended for inspector's use in testing anywhere along a line. It is provided with four Lamp Adapters, for the Edison, Westinghouse, Thomson-Houston and Weston systems, and according to the system used on the circuit to be tested the particular Adapter is employed.

An illustration of an Adapter is shown in Fig. 5. As will be seen a flexible cord is provided at one end with a contact plug to be inserted in the Lamp Adapter and at the other with contact pins for connection with the voltmeter. Connection with a lamp circuit on any system is effected by simply placing in the lamp-socket the proper Adapter, then connecting the voltmeter therewith by means of the flexible cord.

A space is provided at the right hand of the box containing the instrument for the accommodation of the adapters and coils, as shown in Fig. 4. They are thus neatly and compactly laid away when not in use.

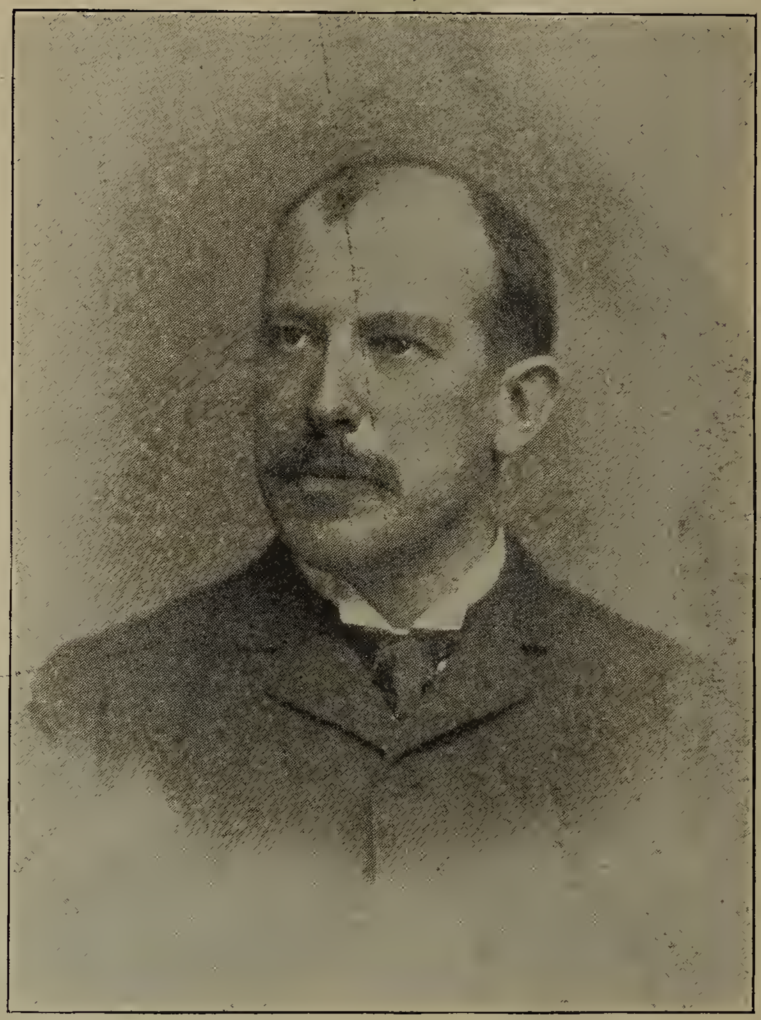
In the Inspectors' instrument corrections for the different ranges are made in precisely the same way as in the regular double scale voltmeters.

This style of Inspectors' instrument is especially recommended for the use of electric light inspectors The instrument can be connected without loss of time to any part of a circuit where lamps are burning.

PERSONAL.

Wm. B. Vansize.

Mr. Wm. B. Vansize, the subject of this sketch, is well known among electrical people in and about New York as an attorney-at-law, solicitor of patents and expert in patent cases. He was born in Utica, N. Y., April 8, 1853. He received an academic education in his native city, and in 1868 became a messenger in the service of the Western Union Telegraph Company in Utica. During his six months' stay in this position he applied himself assiduously night and day to learn the art of telegraphy. At the end of that period he branched out as a telegraph operator, taking a night position in the telegraph office at Oneida, N. Y. He remained in this place but a short time, going into the service of the New York & Oswego Midland Railroad, now the New York, Ontario & Western. He worked at several stations on this road at various times, and in various capacities, besides operating. He was station agent, ticket agent, baggage "smasher" and brakeman all combined, and he showed fidelity and business aptitude in all these duties. He left the road in 1869, and, seeking a wider field for the development of his abilities, he located in Syracuse under Superintendent A. L. Dick, of the N. Y. C. R. R. telegraph. During his stay of a few months



WM. B. VANSIZE.

in Syracuse his enterprise and desire to push ahead brought him ill-fortune in the shape of three dismissals from the service at various times and two reinstatements. He improved rapidly in his skill as an operator, and his transmission was so rapid that Superintendent Dick was compelled to request him to be easier on the rules, thus infringed, as well as on the receivers. What caused his final suspension was certain communications alleged to have been sent by him to the old telegraph paper, *Telegrapher*, which was then edited by J. N. Ashley. These communications reflected upon the business ability of Superintendent Dick. Mr Vansize denied the authorship of the articles, but Mr. Dick insisted that he was responsible for them and finally discharged the alleged writer of the objectionable communications. Mr. Vansize then returned to his home in Utica, and took a position as a telegraph operator in the Western Union office, at the same time prosecuting the study of short-hand. In May, 1870, he accepted a position in Troy, N. Y., for the Atlantic & Pacific Telegraph Company, and in June of the same year he went to Albany for the same company, remaining there until 1877. While in Albany he had become a proficient short-hand reporter and was at one session an official reporter in the Canadian Parliament at Ottawa and also a reporter in the New York State legislature. During these periods he held his position in Albany by employing a substitute. During his stay there he became chief operator and circuit manager between New York and Syracuse, which was an important position, since all dispatches at that time had to be relayed at the Albany office. He had under him, at Albany, twenty men, one of whom was Mr. George H. Usher, now manager of the Postal Telegraph-Cable Company's office in New York city.

Mr. Vansize became very proficient in the use of the galvanometer while he was at Albany, and did excellent service in locating troubles on the telegraph lines. When the Atlantic and Pacific Company was absorbed by the Western Union Telegraph Company, he accepted a position as operator, reserving sufficient spare time, however, to attend the Albany Law School. In May, 1879, he graduated with the degree of Bachelor of Laws from the Union University, of which the Albany Law School is a department. He was at once admitted to the bar as attorney and counselor at law and came to New York City, where all of his subsequent successes have been achieved. In June, 1879, he took a position as night operator in the Western Union Telegraph service at 195 Broadway, continuing his study and practice of law during the day. In October, 1879, he gave up this position to accept one in the attorney's office of the Telegraph Company, being recommended for this position by ex-governor E. D. Morgan, Ellis H. Roberts, then ex-assistant treasurer of the U. S., at the Sub-Treasury, New York, Thomas L. James, ex-Postmaster General, as well as others prominent in business circles with whom he had formed acquaintance. In his new position he had charge of the department of taxes, rights of way, licenses, etc., as affected by the laws of the different states and territories, which he collated in a single volume. In 1881 he was transferred to the executive offices of the Atlantic & Pacific Telegraph Company, having charge of the department of claims and other legal work. Early in 1882 he returned to the attorney's office of the Western Union Telegraph Company, and devoted himself to patent law and patent expert work, remaining there until the spring of 1884, when he went with the American Bell Telephone Company in Boston, as solicitor of patents and patent expert. While here he pursued, under a special tutor, courses in mathematics, physics and mechanics. In 1886 he left the Bell Company, together with Theodore N. Vail, O. E. Madden and Charles R. Truex, who had purchased a controlling interest in the Electrical Accumulator Company, which owned the Faure, Swan. Sellon-Volckmar and various other patents on secondary batteries, between which company and the Brush Company extensive litigation was impending. This litigation was begun in the spring of 1887, and was but recently terminated. Mr. Vansize had charge of the supervision of this litigation, and was, besides, the principal expert for the Faure interests. He succeeded in establishing the claims for novelty and patentability of the Faure and Swan inventions, and the fact that Faure was the first inventor, *de facto*, of the improved form of secondary battery. The United States Courts, however, rejected Faure's testimony, because he was a foreign inventor, and awarded the broad claims to Charles F. Brush of Cleveland, who thereby became *de jure*, the first inventor. The litigation involved a dozen or more separate suits and actions, and was the most stubbornly and thoroughly contested patent litigation ever prosecuted in the electrical art, with, perhaps, the exception of the Edison lamp cases, and the telephone cases.

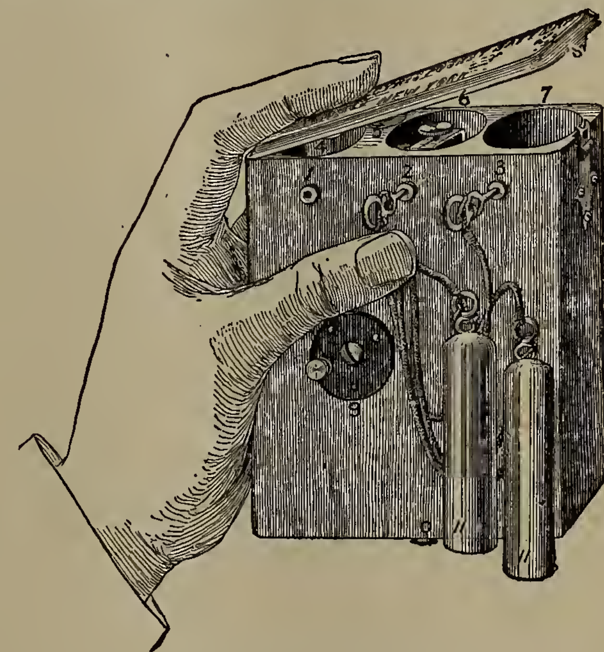
In 1890 Mr. Vansize entered the service of the General Electric Co., 44 Broad street, as a solicitor of patents and patent expert, the company having the right to his services, excepting the prior rights of the Accumulator Co. His attention was almost exclusively given to the subject of the electric railway and its details. He has been engaged in all the General Electric Company's litigation in this particular branch of its business, comprising a dozen or more suits, and is still so employed. In the spring of 1894 Mr. Vansize rearranged his professional relations with the General Electric Co., so as to enable him to establish an independent *clientele* in all matters excepting electric railways He is now engaged in the general practice of his profession, and has established offices at 44 Broad street, New York city, where electricians and inventors generally are availing themselves of his wide experience and well known legal and technical skill.

Mr. Vansize is an active member of the American Institute of Electrical Engineers, and has been proposed by the council as a candidate for election to the Board of Managers for the ensuing year. For the past eight years he has been chairman of the Board of Examiners of the Institute.

POCKET MEDICAL BATTERY.

The value of electricity as a remedial agent and an ameliorative is unquestioned. All of the leading physicians have medical outfits, and electricity now occupies as important a place in the *materia medica* as do the various drugs.

There has been a demand for a small medical battery outfit, and to meet this necessity the Little Giant Pocket



POCKET MEDICAL BATTERY.

Battery, illustrated herewith, has been designed by J. R. Warner, 411 and 413 East 107th St., New York City.

This little apparatus can be conveniently carried in the pocket, and is always handy for use. It is simple, yet complete, and not easily deranged. The metal parts are nickel plated, and the current given out is of three grades—weak, medium and strong. The cell is made of hard rubber, the mechanism being accessible by lifting the lid. The switch is located on the side of the cell, and the coil is adjustable, the central top opening providing access to the same for the regulation of current.

The apparatus is remarkably compact and efficient, and it is not a toy in any sense; it is a serviceable and reliable device. The battery is easily charged. Mr. Warner is the manufacturer of this handy battery.

There are at the present time about 700,000 incandescent electric lamps used in London, and about 425,000 in England, outside of London.

DESTRUCTIVE EFFECT OF ELECTRICAL CURRENTS ON SUBTERRANEAN METAL PIPES.

BY ISAIAH H. FARNHAM.

Early in the summer of 1891 some lead-covered telephone cable removed from wooden ducts in Boston showed some very marked yet local spots of corrosion. The cause of the corrosion was generally attributed to acetic acid contained in the wooden conduit, which had, years before, caused corrosion on a few cables in certain sections of the city. In the case just mentioned the corrosion was so severe, and located in spots only, that it led me to attribute the cause to electrolytic action from the railway currents, and a letter was written to my company to that effect.

A few months later, the lead covering of a cable (No. 208) resting upon the ground, in manhole chamber No. 76, located at the corner of Berkeley and Newbury streets, was found eaten entirely through at the point of contact with the earth. I then felt certain the cable had been destroyed by the action of the current. With Mr. W. I. Towne, my assistant, I proceeded to prove the theory.

Mr. Farnham then described in detail the experiments and tests made with the view to verifying the suspected cause, and, if possible, to find and apply a remedy.

During the experiments Mr. Fred. S. Pearson, then engineer of the West End Street Railway Co., made two suggestions which have proved exceedingly helpful in overcoming the difficulties. The first suggestion was that if the railway current should be reversed, so that the positive pole would be connected with the trolley, the danger of electrolysis would be confined to a more limited area, near the power houses, where the difficulty could be more easily dealt with.

The other suggestion was to run out large copper conductors from the negative side of the dynamo and extending them through the dangerous districts, connecting them at frequent intervals to the cables liable to be affected by electrolytic action.

After referring in a general way to corrosion of water and gas pipes by electrical currents in various cities, and the attempts to eliminate the effects of the same, Mr. Farnham considers the proposition:

"How small a difference of potential between pipe and earth will cause electrolytic action?" In reply to this, it may be stated that some of the worst cases of corrosion in Boston have occurred where the difference was but one and one-half volts. Mr. A. T. Wells, of Chicago, in describing to me an examination of some of the first cases in Cincinnati, states that the "difference of potential between the cables and the rail, was never more than one-half, and usually less than one-quarter volt." Such a difference between cable and rail would mean a much less difference between cable and earth, where electrolysis takes place. Mr. John C. Lee, of Boston, has experimentally caused the corrosion on lead and iron by a difference of potential of $\frac{1}{100}$ volt.

These facts certainly indicate that but a very small pressure is necessary to produce the action and should dispel the numerous statements that well bonded rails or a large amount of rail return wires will alone overcome the trouble. In some cities, where electrolysis is in progress today, the return copper nearly equals that of the trolley and feed wire system. We cannot force the current to take one path exclusively when others are open to it.

The facts given above, with others similar, though not enumerated, lead me to these conclusions:

1st. All single trolley railways employing the rails as a portion of the circuit, cause electrolytic action and consequent corrosion of pipes in their immediate vicinity, unless special provision is made to prevent it.

2nd. A fraction of a volt difference of potential between pipes and the damp earth surrounding them, is sufficient to induce the action.

3rd. Bonding of rails, or providing a metallic return conductor equal in sectional area and conductivity to the outgoing wires, is insufficient to wholly prevent damage to pipes.

4th. Insulating pipes sufficiently to prevent the trouble is impracticable.

5th. Breaking the metallic continuity of pipes at sufficiently frequent intervals, is impracticable.

6th. It is advisable to connect the positive pole of the dynamo to the trolley lines.

7th. A large conductor extended from the grounded side of the dynamo, entirely through the danger territory and connected at every few hundred feet to such pipes as are in danger, will usually ensure their protection.

8th. It is better to use a separate conductor for each set of pipes to be protected.

9th. Connection only at the power station, to water or gas pipes, will not ensure their safety.

10th. Connection between the pipes and rail, or rail return wires, outside of the danger district, should be carefully avoided.

11th. Frequent voltage measurements between pipes and earth should be obtained, and such changes in return conductors made as the measurements indicate.

* Abstract of paper read before Eighty-sixth Meeting of the American Institute of Electrical Engineers, New York, April 18, and at Chicago April 25, 1894.

THE PENNSYLVANIA TRACTION CO.

What is said to be an authorized statement of the plans of the Pennsylvania Traction Co., which was organized last year with headquarters at Lancaster, Pa., has been given to the public.

The company proposes to construct a four-track trolley road between Harrisburg and Philadelphia, a distance of about 100 miles, and it is proposed to have at least the greater portion of the road in operation in about a year. Starting from Harrisburg the line will run through Steelton, Middletown and Mount Joy, to Lancaster, there to connect with the lines of the Lancaster Traction Company.

From Lancaster the line will run to Coatesville, passing through the numerous small places between those two thriving towns. From Coatesville the route will be direct to Westchester and then to Philadelphia.

Branches will be constructed from Coatesville to Downingtown, and along the line of the Pennsylvania railroad near Philadelphia to the more important places, such as Frazer, Wayne, Bryn Mawr and Ardmore. The branches will be constructed with double track.

The two inner tracks of the main line will be for through or high speed traffic, and the other two for local traffic from town to town. The through cars will make only one or two stops between Harrisburg and Philadelphia, probably at Lancaster and Coatesville, but the local cars will probably stop in the country districts, at stations placed closely together at convenient points. In the towns they will stop on signal, as is usual.

This road will be built from one end to the other on private rights of way, and all grade crossings will be avoided. The rights of way are 70 feet wide, and will be fenced from one end to the other.

It is stated that the right of way has been secured the entire length of the line.

The roadbed will be of the very best constructed, stone ballasted throughout, and a 70-pound rail will be used. The road will be practically level, there being no grade exceeding four per cent. The track will be standard gauge throughout, and the block signal system will be used over the entire line to insure safety. The route will be as straight as it is possible to make it.

Connections will be made with one of the traction systems in Philadelphia, so that passengers can readily reach any part of the city. There will probably also be a terminal station.

From Lancaster, where connection will be made with what was the Lancaster Traction Company's system, now owned by the Pennsylvania Traction Company, branch lines are to be built immediately to Lititz, Manheim, Terra Hill, Adamstown, New Holland and Ephrata. There will then be a system of 125 miles of electric railways in Lancaster county alone.

The cars to be run on this road will be of the Pullman palace car pattern, vestibuled, and the high speed cars will be provided with smoking apartment and baggage room, and will be 68 feet in length. They will be handsome in design and finish. The cars for the local traffic will be somewhat similar in design, but somewhat smaller, being 20 feet in length. The speed they purpose to make is from 40 to 50 miles an hour, as the traffic demands. From Coatesville to Philadelphia the company expects to run at least 150 long and short cars. All the cars will be run singly.

The high speed cars will probably be equipped with four 40-horse power motors each, one on each axle, two four-wheel trucks being used for each car. The smaller cars will be equipped with two 40-horse power motors each. The smaller cars will also make high speed.

The question of power has been seriously considered, and the Pennsylvania Traction Company is now in consultation with the Westinghouse Electric and Manufacturing Company in reference to the adoption of one of two systems, that of the long distance transmission or of having several power houses, the former, however, being the most possible and most positive. In case of long distance transmission, the same system will be used as is used by the Niagara Falls Company, the power being concentrated at one power house, situated possibly at Coatesville, a central point, and the power transmitted by the alternating current to sub-stations in both directions.

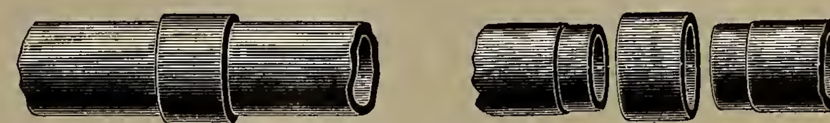
With the alternating current system the current will be supplied from two-phase generators situated at Coatesville, and, with the use of step-up transformers, the power will be carried to sub-stations from twelve to fifteen miles apart. With step-down transformers the current is passed through what is known as revolving transformers, which convert the alternating into direct current, at 500 volts, which is universally used for trolley service.

The direct current will be fed to the trolley wires in both directions from the sub-stations, each station feeding from twelve to fifteen miles of the road. The long distance transmission by the alternating current will be done by metallic circuits. These will run from the central station to each sub-station, the wires being carried on poles along the company's line. The direct current feeding the trolley wires will have a ground return, as is generally used. The overhead construction will be of the best character.

The president of the Pennsylvania Traction Company is ex-U. S. Senator John J. Patterson, of South Carolina, who is now a resident of Lancaster, Pa. Mr. John Hertzler is secretary and treasurer of the company.

FIBRE CONDUIT.

The Fibre conduit manufactured by the Fibre Conduit Co., 257 Broadway, New York, is rapidly making a name for itself through its merits. It possesses all of the essential properties necessary in an electrical conduit, and is giving much satisfaction in use. It is light in weight, durable, strong, and is said to be a perfect insulator. It weighs less than one-third the weight of iron pipe of the same dimensions. It is practically imperishable; is non-absorbent; is not affected by alkalies or acids, and is not affected by changes in temperature.



FIBRE CONDUIT JOINTS.

As to its insulation it is good for any voltage. A conduit seven-sixteenths of an inch thick has been tested on a 20,000-volt alternating current without any perceptible effect.

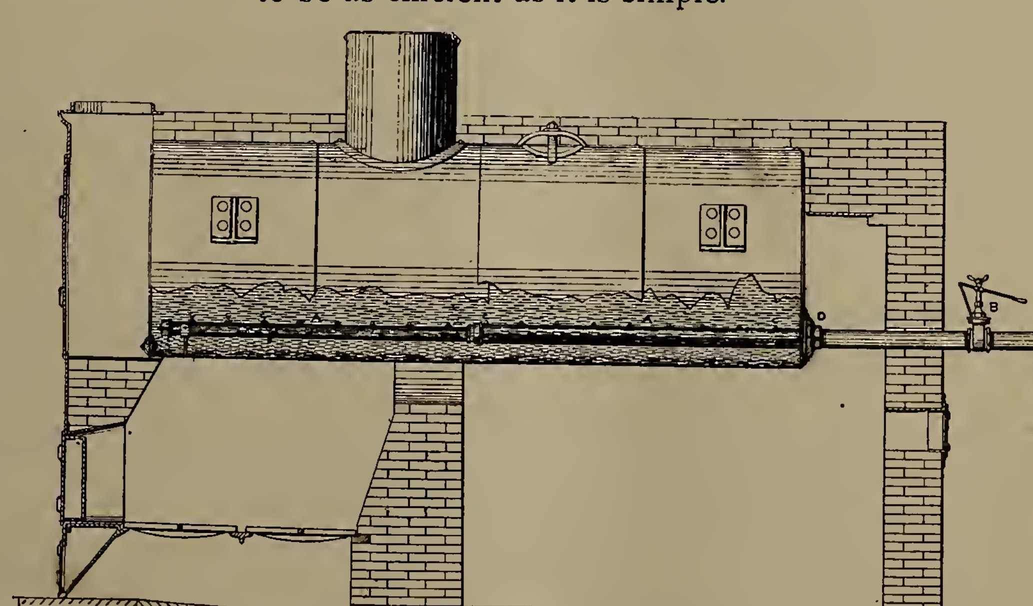
A valuable property of this material is its freedom from condensation. It will stand a temperature of 200° F. without detriment, and is easily worked mechanically. The joints are tight and strong and said to be superior to those of any other electrical conduit.

The company unhesitatingly commends it to the earnest consideration of engineers, contractors and dealers. It is made in standard sizes in 5-foot lengths.

The material of the conduits is wood fibre treated with an insulating and preserving compound, producing a hard, tough and solid substance.

MECHANICAL BOILER CLEANER.

The accompanying illustration shows a device which is of interest to steam users. It is an apparatus for keeping the interior of boilers clean by preventing the deposit of mud or sediment of any sort, and preventing the formation of scale. This mechanical boiler is said to be as efficient as it is simple.



APPLICATION OF MECHANICAL BOILER CLEANER.

The cleaner consists of lengths of wrought iron pipe, *AA*, three inches and two and a half inches in diameter, with holes drilled all around the pipe in a line; these holes form the line of a screw thread of a very long threaded screw. In these holes, which are about eight inches apart, are inserted metal nipples C, with an opening of three-sixteenths to one-quarter of an inch in diameter; the opening at the top of the nipple is smaller than its outlet, consequently cannot clog; anything getting into the nipple must go through. The pipe is furnished with a quick opening valve, B, connecting blow-off pipe with the sewer. As soon as the valve is opened the steam and water rush toward this pipe ig the bottom of the boiler from all directions at oncei downward, upward and from the sides, thereby causing a violent motion all through the whole body of the water. This action prevents the impurities in the water from combining and settling in any part of the boiler by keeping them afloat. If this cleaner is put into boilers coated with old scale, the violent motion, it is claimed, will gradually loosen it and deposit it in the bottom of the boiler when it can be easily removed; the boiler being clean of scale, there will be no necessity for opening the boiler no matter how long it is used or what the quality of the water may be. It is claimed that this operation does not cause any loss of steam during its action. The only thing that escapes through the opening in the pipe to the sewer is the contents of the pipe.

This device, which is manufactured by the Mechanical Boiler Cleaner Company, 32 Park Place, New York City, is said to be giving the best of satisfaction in practice, and from a thoughtful consideration of the apparatus, it appears to be constructed on sound principles, and well calculated to perform the work for which it was designed.

NEW YORK NOTES.

Office of the Electrical Age,
World Building, New York,
April 21, 1894.

Hugh J. McMahon, 22 & 24 Frankfort street, New York city, is a practical plain and ornamental japanner, and makes a specialty of electrical work. He does his work in the very best manner, and can always be relied upon. His japanning is very durable.

The C. & P. Manufacturing Co., 635 Kent avenue, Brooklyn, N. Y., manufacturer of the well known C. & P. dynamos and motors, is meeting with its share of business. Mr. Wm. D. Perry is manager of the company. Besides making dynamos and motors, the company also manufactures arc lamps for arc and incandescent circuits, direct current transformers, electro-plating dynamos, etc. The dynamos regulate automatically and instantaneously under all changes of loads, and are made in the best manner, with the best of materials.

Mr. David Chalmers, the ever smiling "Dave," has been appointed manager of the New York branch of the Holtzer-Cabot Co., of Boston, which will be opened at 114 Liberty street, on May 1 next. Mr. Chalmers will carry a full line of the various goods made by this concern, also a complete line of general electrical supplies. The Holtzer-Cabot Co. has selected a good man as its representative in New York, and Mr. Chalmers represents a good house.

The American Electrical Publishing Co., publishers of the *Electrical Reporter*, 136 Liberty street, city, has taken largei quarters at 173 Broadway, cor. Cortlandt street. It is estimated that the semi-annual directory of the *Electrical Reporter*, which will be issued July 1, will cover 313 pages.

C. A. Schieren & Co , the well known belt makers, 47 Ferry street, New York city, are filling a large order for perforated electric belts for the Richmond Light, Heat and Power Co., of Richmond, Ind. The firm reports a lively business on general orders.

The Edison Electric Illuminating Co., Brooklyn, N. Y., has placed an order with William Tod & Co., of Youngstown, Ohio, for two 1,200-H. P. engines.

Mr. Charles Blizard, the well-known storage battery man, has recently been appointed representative and general sales agent of the Electric Storage Battery Co., of Philadelphia, at 45 Broadway, city.

The Climax boiler is having remarkable success among steam users. The wonderful record made by these boilers at the World's Fair has done much to increase their reputation, and the Clonbrock Steam Boiler Works, Brooklyn, has a list of testimonials from prominent individuals and concerns using these boilers which speak unequivocally in their favor. In a letter from Mr. Thomas A. Edison that gentlemen says, "I have a Climax boiler, and it is giving great satisfaction. Taking everything in consideration it is, in my opinion, practically and theoretically, the best boiler so far invented." Steam users in general should look into the merits of this boiler, if they have not already done so.

Chas. A. Schieren & Co., 47 Ferry street, city, makers of the celebrated perforated electric belts, come in for a good share of the honors connected with the successful opening of the Jersey City and Newark electric road. The railroad company is using, in its power stations, three 27-inch double belts and two 16-inch double belts made by Chas. A. Schieren & Co. This firm's belts are met with everywhere, and the satisfaction they give in actual use is uniformly excellent.

E. B. Willcox, Fulton Foundry and Machine Works, 21 Furman street, Brooklyn, has reorganized the foundry department of the works, and work is now being carried in all departments. The foundry business is now conducted on a new basis, which will benefit the producer and buyer. These works manufacture fine machinery, iron castings, and make tools and patterns—in fact, a general machinist business is carried on.

W. T. H.

CINCINNATI NOTES.

A permanent injunction has been granted restraining the Cleveland Company, which was lately awarded the privilege of building a street railway over what is known as route 25, from Fountain Square to Price's Hill. There has been a hard fight over this franchise, there being quite a number of bidders for it, among them the Consolidated Street Railway Company of Cincinnati, the latter company placing the most unsatisfactory bid received. The Cleveland Company's bid was not the lowest, but was accepted as the "lowest responsible bid." The ground for the restraining order is that the city erred in not granting the franchise to the lowest bidder. This is the first blood for the home company, which has a practical monopoly. The case will be appealed.

The equipment of the Eighth Street (Price Hill) route, lately transformed into an electric railway, is of the latest design, and has the handsomest and most commodious cars ever seen in Cincinnati. The apparent desire of outside capital to invest in Queen City railways has spurred the Consolidated into renewed activity. There are but two or three horse car routes now in operation.

Subscribers Win the Fight.—The Wisconsin Telephone Co., Milwaukee, Wis., which proposed to charge its customers two cents for each call in excess of 250 a quarter, or 1,000 a year, has decided to rescind the order and charge on the old basis.

OPENING OF THE JERSEY CITY AND NEWARK TROLLEY ROAD.

At 10 A. M., Saturday, April 21, the Consolidated Traction Co., of New Jersey, formally opened its trolley line between Newark and Jersey City, N. J. At that hour the first car, gaily decorated with bunting, left the Jersey City ferry for Newark. It contained President E. F. C. Young, of the Consolidated Traction Co., General Manager David Young, Superintendent Sayre, and some officials of the Pennsylvania Railroad.

At 10:15 three cars started from the Pennsylvania R. R. station in Newark for Jersey City, containing the Mayors of the two cities and invited guests. The cars arrived at the Pennsylvania station in Jersey City at 10:50, making the nine-mile trip in 35 minutes, including a five-minute stop on account of an open drawbridge.

The road is double tracked and stone ballasted. Heavy stringers are set on the outside of the rails to prevent wagons and other vehicles getting on the tracks and interfering with the progress of the trolley cars.

The road crosses the Passaic and Hackensack rivers on draw bridges which will be operated by electric motors.

Current is generated by Westinghouse machines driven by Allis-Corliss engines, and the motor equipment on the cars is on the Westinghouse system. The cars were built by the J. G. Brill Co., Philadelphia, and each affords seating capacity for 26 passengers. The overhead line equipment was furnished by J. H. Bunnell & Co., of 76 Cortlandt street, New York.

The route of the new line is from High street in the city of Newark, over the tracks of the Newark Passenger Railway Co., the Newark Plank Road Co. and the Jersey City and Bergen Railroad Co., to the Jersey City ferry of the Pennsylvania Railroad.

Until further notice regular trips will be run every ten minutes each day, including Sundays, from 5:30 in the morning until 8 o'clock in the evening, and every fifteen minutes from 8 o'clock in the evening until 1:15 A. M., the first car starting from High street, Newark, and the last car from the Jersey City Ferry.

The fare is ten cents each way, including ferry tickets to and from New York. Tickets will be sold with ferry coupons attached for a ride in either direction.

No transfers will be given to or from this line.

NEW LAMP FACTORY.

The New York and Ohio Company of Warren, O., will erect an incandescent lamp factory in Minneapolis, Minn. Mr. W. D. Packard, president of the company, has perfected arrangements and states that the plant will be in operation about the middle of May. The factory at the start will have a capacity of 1,000 lights per day, and this output will be increased as the trade demands it. This will be the first factory of the kind ever established in the Northwest, and the business community of Minneapolis are jubilant over this accession to the city's industries.

UNDERGROUND WIRES IN BOSTON.

The city council of Boston has passed an ordinance requiring that all over-head electric wires shall go underground on or before the 15th of November next. The West End Street Railway Co. has been notified to remove all its feed and return wires of the over-head trolley system in the crowded parts of the city, and place them underground.

The Western Union Telegraph Co., and the Boston Electric Light Co., and the New England Telephone and Telegraph Co., have also been ordered to place their wires underground in certain parts of the city.

President Little, of the West End Co., says that the order of the Common Council is nullified by the impossibility of carrying out the provisions. To place the company's wires underground would involve a considerable engineering feat requiring much time. It is estimated that in order to comply with the ordinance the West End Co. would have to build 50 miles of conduits at an expenditure of $2,000,000.

A PROGRESSIVE INSTITUTION OF LEARNING.

Sibley College, the mechanical and electrical engineering department of Cornell University, has the reputation of being one of the most practical technical schools in the world. One feature of its course is the visitation of leading manufacturing concerns each year by large parties of students. These visits are made during the Easter recess, when some half dozen tours East and West are planned and conducted by professors of the college. As reduced rates are always granted by the railways and hotels, the trips are comparatively inexpensive and attract a very considerable portion of the students, especially those of the graduating class and other older students. The Sibley excursion parties have become a familiar thing to the manufacturers and electricians of the eastern cities. This year the first section, the mechanical engineers in charge of Prof. Barr, went first to Buffalo and Niagara Falls, where they inspected the plants of the Buffalo Street Railway Co. and Electric Light and Power Co. and the Cataract Construction Co. and the Niagara Falls Paper Co. They also visited the Lake Engineering Works, the city water works, and the Carey Safe Co.'s works. The rest of the vacation was spent inspecting large manufacturing plants in Lockport, Rochester, Syracuse, Auburn, and New York. Another party of students, composed of electrical engineers, went to Buffalo with the first section and then on to Schenectady, where one whole day was spent at the works of the several electric companies. The remainder of the vacation was spent in New York city and vicinity; among the places visited being the Western Union Telegraph building, the works of the Crocker-Wheeler Electric Co., at Ampere, N. J., the Pearl street station of the Edison Illuminating Co., at Brooklyn, the buildings of the Metropolitan Telegraph and Telephone Co., the Weston Electrical Instrument Co., at Newark, etc.

Harrison Telephone.—The Harrison International Telephone Co., 44 & 46 Wall street, New York city, and Chamber of Commerce Building, Chicago, Ill., has issued a neat catalogue illustrating and describing the Harrison Telephone, the introduction of which, throughout the West, has been rapid. This company leases the Harrison International Telephone to corporations or individuals at reasonable rates. The company does not sell telephones outright under any circumstances, for the reason that parties buying instruments outright have to stand all costs for repairs and loss in case of accident. The Harrison Telephone is electric, and the patents cover an exchange system, magneto bells, lightning arresters, switchboards and other devices.

The Maryland legislature has reported unfavorably a bill to allow the city of Baltimore to build an electric light plant.

NEW CORPORATIONS.

The Eatonton Electric Light Co., Eatonton, Ga., is being organized to establish an electric light plant.

The Tampa & Manatee Telephone & Telegraph Co., Tampa, Fla., has been organized with F. A. Salamonson as president; H. I. Knight, vice-president, and S. A. Padgett, secretary and treasurer.

The L. Guthmann Co., incorporated by Louis Guthmann and others, Chicago, Ill. Capital stock, $1,000,000. Will manufacture telephones, torpedoes, etc.

The Augusta Telephone and Electric Co., Augusta, Ga., has applied for a charter. Capital stock, $100,000. Incorporators : Chas. Estes and others.

General Power and Quick Transit Co., South Bend, Ind. Capital stock, $100,000.

St. Louis Electric Brake Co., East St. Louis, Ill. Capital stock, $2,000,000.

The Kansas City Cable Railway of Kansas City, Mo., the Independence Railway Co. and the Kansas City and Independence Rapid Transit Railway Co. have been consolidated under the name of the Kansas City Cable Railway Co., with a capital stock of $4,300,000. Directors: L. C. Kurthoff, Webster Withers, Geo. W. Clawson, and R. W. Hocker, of Kansas City, and Frank C. Warnell, of Westport.

The South New Mexico Telephone Co. has been organized at Las Cruces, New Mexico. Capital stock, $30,000.

The Wisconsin Electric Dynamo Co., of Milwaukee, Wis., has been incorporated with a capital stock of $50,000. Incorporators : G. Pedoll, J. M. Brandmueller and John B. Zaun.

The Utah-Nevada Company, Council Bluffs, Iowa. Capital stock, $5,000 contract for railways, tramways, telephone and telegraph lines, etc.

The Dean Electric Manufacturing and Supply Company, Des Moines, Iowa. Capital stock, $50,000.

The Western Electric Beer Pump Company, Chicago, Ill. Capital stock, $10,000. Address R. H. Rudolph, 801 South Rockwell St., Chicago, Ill.

The Ohio Royal Arc Company, Elizabeth, N. J., incorporated for the purpose of manufacturing apparatus for producing electric light. Capital stock, $3,000,000.

The Citizens' Electric Light & Power Company, Hudson, N. Y. Capital stock, $10,000.

The Sachs Electric Company, New York, N. Y. Capital stock, $20,000.

The Pasadena and Los Angeles Electric Railway Company, Los Angeles, Cal., has been incorporated by P. M. Green and others. Capital stock, $500,000.

The Waterloo Light & Power Company, Waterloo, N. Y. Capital stock, $50,000. Francis Bacon is interested.

The St. Joseph & Lake Shore Electric Railway Company, St. Joseph, Mich. Capital stock, $75,000.

The Stevens Industrial Steam Electric Company, Spirit Lake, Iowa. Capital stock, $10,000. B. F. Stevens is interested.

The National Heat & Power Construction Company, Philadelphia, Pa., incorporated by L. G. McConley and others. Capital stock, $150,000.

The International Electrical Supply & Manufacturing Company, Detroit, Mich. Capital stock, $500,000.

The Bangor Electric Light, Heat & Power Company, Bangor, Pa. Capital stock, $30,000.

The Electric Telegraph Company of Westchester, N. Y., has been organized with a capital of $10,000 to build a telegraph line from Westchester to New York City and Brooklyn. Directors, John T. McDougall, J. T. Broderick, A. W. Keppler and others.

POSSIBLE CONTRACTS.

The Bay Street Railroad, Jacksonville, Fla., will erect a power plant. Mr. Geo. W. Haines is superintendent.

I. H. Wannamaker and others of Orangeburg, S. C., will establish a telephone exchange in that place.

Adam Baum, of Mount Sterling, Ky., has received permission to establish a telephone exchange in that place, and Percival Moore and others will do the same in Lexington, Ky.

The authorities of Mount Sterling, Ky., intend to erect an electric light plant.

A telephone exchange is to be established in Cordele, Ga., by F. J. Moore.

Sandersville, Ga., wishes estimates for an electric light plant. Address the Mayor.

The Mount Mansfield Electric Railroad Company of Waterbury, Vt., has not yet been contracted for. Equipments for the same are wanted. Address Mr. M. H. McIntosh.

An electric light plant, to cost $15,000, is to be established in Waverly, Ohio.

The Troy Blanket Company, Troy, New Hampshire, wishes estimates for an electric motor.

The town of Evart, Mich., has voted to establish an electric light plant, and will want a 75 or 100 H. P. engine, arc and incandescent dynamo.

Negotiations are now pending for the construction of an electric road from Pemaquid to Damariscotta, Me., a distance of thirteen miles.

The Holly Springs Electric Light and Lee Manufacturing Company, Holly Springs, Miss., is being organized by J. G. Leach and others.

The Lexington Electric Light and Power Co., Lexington, N. C., has been organized with J. D. Neal as president; C. M. Thompson, vice-president; J. M. Riley, secretary. A complete plant for arc and incandescent lighting will be erected.

The plant of the City Electric Power Company, Sacramento, Cal., was destroyed by fire on the morning of April 18. The loss is placed at $400,000.

Tenille, Ga., wishes electric lighting and estimates for the same. The Mayor should be addressed.

An electric light and electric railroad power station is projected in Lancaster, Mass. For further information address H. T. Gibbs.

The Seneca & Waterloo Electric Railroad Company, Waterloo, N. Y., will build an electric road.

Estimates for dynamos from 200 to 300 incandescent lamps' capacity, with all necessary fixtures, is desired by E. E. Leake, Colliersville, Tenn.

The People's Street Railway Company, Holyoke, Mass., will build a nine and one-half miles electric railway.

The Central Electric Light & Railroad Company, New Britain, Conn., intends to build four miles of electric road.

The Queen & Crescent Railroad is going to put in a plant in its yards in Lexington, Ky.

The Boston Ferule Company, South Boston, Mass., intends to put an electric light plant in its new factory now being erected. Mr. S. P. Wormwood is president.

The Lockhaven Electric Railroad Company at Lockhaven, Pa., has been granted a charter. The capital stock is $100,000. Messrs. J. H. Frederick, T. H. Harmon and the president, Mr. L. M. Patterson, have been appointed a committee to see to the construction of the road.

The Washington and Arlington Electric Railroad, Washington, D. C., was sold at auction on April 13, for $2,500. Two miles of the road had been constructed when the company failed. The road was bought by the Woodbridge and Turner Engineering Co., of New York, and Chas. H. Henchman, of Philadelphia. The road is constructed on the Wheless underground system. It is the intention of the purchasers to put the road in first-class condition and place it in running order. The plan is also to extend the road into Georgetown.

Hon. J. W. Hinckley, of Poughkeepsie, is interested in an electric street railway company, recently organized to build an electric road connecting Poughkeepsie with New Hamburgh and Wappingers Falls.

The citizens of Lansingburg, New York, are again agitating the question of lighting that town by electricity.

The Nassau Electric Railroad Co., Brooklyn, N. Y., has purchased a site at the foot of 39th street, for a new power house.

Mr. Frisbee will put in an electric light plant in his mills in Stuyvesant Falls, N. Y.

The citizens of Holly Springs, Miss., are anxious to have an electric light plant in that place. The plant necessary will be from 700 to 1,000 lights. The machinery has not yet been contracted for.

The contract for the erection of a new electric light plant at Pestone, Ill., is now open for bids. The plant will include an automatic engine of 80-H. P., a boiler of 100-H. P., two dynamos, and all the necessary apparatus for electric lighting.

The Citizens' Gas Light Co., of Wakefield, Mass., which also operates an electric light station, will transfer its plant to Wakefield, and build a new one at Reading. The contract for the material has not yet been awarded.

Proposals are invited for an electric light plant in the City Hall at St. Paul, Minn.

A new 50-light dynamo is wanted by the Borough Electric Light Co., Chambersburg, Pa. Mr. Knight is superintendent.

The Metropolitan Street Railway Co., of Washington, D. C., is in the market for an underground electrical equipment.

J. Vernon Campbell and others, Washington, D. C., are organizing a new company to establish an electric light plant.

An electric light plant will be put in the new Lange building, at the Southwest corner of Main and 14th streets, Wheeling, Va.

The Monterey & Staunton Telephone Company, Monterey, Va., J. C. Matheny, president, will construct a telephone line, 40 to 50 miles long, with five or six phones.

The New York State Electrical Company, Canisteo, N. Y., has purchased the plant of the Malleable Iron Company, at Youngstown, O., and will there manufacture electrical supplies.

FINANCIAL.

A receiver has been appointed for the New Albany Street Railway Company, New Albany, Ind.

The Hammond, Whiting & East Chicago Street Railway Company, Hammond, Ind., has mortgaged its plant for $100,000.

The chattel mortgage for $350,000 on the property of the Detroit Electric Light & Power Company, Detroit, Mich., has, it is reported, been renewed.

It is reported that a judgment for $46,000 has been entered against the Buffalo, North Main Street & Tonawanda Electric Railroad Company, Buffalo, N. Y.

It is reported that the United States Electric Lighting Company, of New York City, has renewed its chattel mortgage for $750,000.

TRADE NOTES.

The Gerson Electrical Company, 4303 Walnut street, Philadelphia, Pa., dealers in main line and warehouse telephones, sells these instruments outright. The company makes telephones in various styles, for hanging on the wall, and on standards for desks and tables. They are made of the best materials and in the best manner and are thoroughly tested before shipment.

Mr. H. T. Paiste, the well-known dealer in electrical supplies, has moved his business from Philadelphia to 171 So. Canal st., Chicago, Ill.

Electrical and Street Railway Patents.

Issued April 17, 1894.

518,221. Electric-Motor Car. Harold P. Brown, New York, N. Y. Filed Dec. 21, 1891.

518,231. Electric-Switch. Axel Ekström, Lynn, Mass., assignor to the Thomson-Houston Electric Co., of Connecticut. Filed Dec. 24, 1890.

518,232. Regulator for Dynamo-Electric Machines. Wm. H. Elkins, Cambridge, Mass., assignor to the General Electric Co., of New York. Filed Jan. 3, 1893.

518,236. Rheostat. Jonathan P. B. Fiske, Lynn; assignor to the General Electric Co., Boston, Mass. Filed Feb. 25, 1893.

518,245. Damping Device for Electrical Measuring-Instruments. Frank Holden, Lynn, assignor to the General Electric Co., Boston, Mass. Filed Mar. 3, 1893.

518,263. Telephonic Apparatus. Chas. Milde, Paris, France. Filed Oct. 31, 1893.

518,265. Electric Measuring-Instrument for Multiphase Systems. Edgar W. Mix, Lynn, Mass., assignor to the Thomson-Houston Electric Co., of Connecticut. Filed Mar. 21, 1892.

518,290. Armature for Dynamo-Electric Machines. Elihu Thomson, Swampscott, Mass., assignor to the

Thomson-Houston Electric Company, of Connecticut. Filed Jan. 19, 1892.

518,291. Mode of Cooling Electric Motors. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company, of New York. Filed Nov. 30, 1892.

518,293. Electric Railway System. Charles D. Tisdale, Boston, Mass., assignor, by direct and mesne assignments, of five-sixths to John D. Gould, New York, N. Y., and Charles Healey and James E. Jenkins, Lynn, Mass. Filed Apr. 26, 1893.

518,297. Electric Stop-Motion. John Weir, Fall River, Mass., assignor of one-half to James Monaghan, same place. Filed Oct. 4, 1893.

518,310. Universal-Phase Alternate-Current Motor. Thomas Duncan, Fort Wayne, Ind. Filed May 22, 1893.

518,311. Electric Meter. Thomas Duncan, Fort Wayne, Ind. Filed Aug. 2, 1893.

518,313. Railway-Truck. Ernst Egger and Ferdinand A. Wessel, New York, N. Y., assignors of one-fourth to Aaron Naumburg, same place. Filed May 17, 1893.

518,331. Telephone-Exchange System. John I. Sabin and William Hampton, San Francisco, Cal. Filed Jan. 19, 1894.

518,332. Telephone System. John I. Sabin and William Hampton, San Francisco, Cal. Filed Nov. 14, 1893.

518,333. Telephone-Exchange System. John I. Sabin and William Hampton, San Francisco, Cal. Filed Mar. 3, 1893.

518,334. Telephone-Exchange System. John I. Sabin and William Hampton, San Francisco, Cal. Filed Apr. 13, 1893.

518,337. Electric-Tower Clock. Charles D. Warner, Ansonia, Conn. Filed Apr. 6, 1893.

518,345. Controller for Electric-Motors. William Cooper, Minneapolis, Minn. Filed Aug. 28, 1893.

518,349. Regulator for Dynamo-Electric Machines. Charles L. F. Muller, Milwaukee, Wis; Charles B. Carstens, same place, administrator of said Muller, deceased, assignor to the Wisconsin Electric Light and Power Company, of Wisconsin. Filed May 13, 1889.

518,357. Automatic Trolley-Wire Finder. Theodore Straus, Baltimore, Md. Filed Jan. 26, 1894.

518,359. Electric-Current Regulator. Addison G. Waterhouse, Hartford, Conn., assignor to the Waterhouse Electric Company, of Connecticut. Filed Nov. 26, 1892.

518,360. Method of Regulating Electric Currents. Addison G. Waterhouse, Hartford, Conn., assignor to the Waterhouse Electric Company, of Connecticut. Filed April 13, 1892. Renewed Mar. 15, 1894.

518,365. Rheostat. Alva C. Dinkey, Allegheny County, Pa. Filed Dec. 1, 1893.

518,392. Telephone-Transmitter from Secondary Batteries. John J. Carty, New York, N. Y., assignor to the Western Electric Company, Chicago, Ill. Filed April 14, 1891. Renewed Nov. 7, 1893.

518,401. Car-Brake. Frank E. Gilling, Toledo, Ohio, assignor of two-thirds to Francis M. Oliver and Frederick J. Shovar, same place. Filed Aug. 18, 1893.

518 404. Electric Starting-Switch. Frederick V. Henshaw, Brooklyn, N. Y. Filed June 2, 1893.

518,414. Bond for Electric Railways. Julius Meyer, New York, N. Y. Filed Jan. 18, 1894.

518,444. Dynamo-Electric Machine. Henry E. Dikeman, Berkeley, Cal. Filed Feb. 13, 1894.

518,463. Coin-Controlled Electric Machine. Robert J. Merker, Cleveland, O. Filed October 10, 1892.

518,471. Electric Switch. Joseph B. Smith, Manchester, N. H. Filed Oct. 10, 1893.

518,481. Electrical Contact Mechanism. John F. Blake, New Haven, Conn. Filed Feb. 23, 1894.

518,511. Electric Railway-Signal. Benjamin F. Rex, St. Louis, Mo. Filed Mar. 4, 1892.

518,525. Automatic Electric Signaling Device for Crossings. Edward A. Hermann, St. Louis, Mo. Filed Sept. 25, 1893.

518,534. Electric-Current Recorder. John W. Th. Olan, New York, N. Y. Filed July 7, 1892.

518,540. Electric-Railway Conduit. Paul P. Banholzer, Philadelphia, Pa. Filed Nov. 16, 1893.

518,542. Thermo-Electric Generator. Harry B. Cox, Hartford, Conn. Filed Apr. 28, 1892. Renewed Feb. 2, 1893. Again renewed Oct. 6, 1893.

518,561. Electric Motor. Harold P. Brown, New York, N. Y., assignor to the Edison General Electric Co., Same place. Filed Jan. 26, 1893.

518,562. Armature for Electric Motors. Harold P. Brown, New York, N. Y., assignor to the Edison General Electric Co., same place. Filed Feb. 6, 1893.

EXPIRED.

189,584. Armatures for Electro-Magnets. Henry Stroh, Edwardsville, Ill. [Filed Sept. 14, 1876.]

189,714. Electro-Magnetic Engines. M. Egger, Mariaschein, Austria. [Filed Dec. 20, 1876.]

189,717. District-Telegraph Signal Boxes. S. D. Field, San Francisco, Cal. [Filed Jan. 2, 1877.]

189,779. Galvanic Batteries. Myron W. Parrish, Jackson, Mich. [Filed Jan. 11, 1877.]

REISSUE.

7,621. Printing Telegraphs. F. L. Pope, Elizabeth, and T. A. Edison, Menlo Park, N. J., assignors, by mesne assignments, to the Gold and Stock Telegraph Co. Patent No. 102,320, dated Apr. 26, 1870. [Filed Mar. 21, 1877.]

ELECTRICAL AGE

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NEW YORK, MAY 5, 1894.

CONTENTS.

THE CHICAGO AND ST. LOUIS ELECTRIC ROAD.

It is reported that the Chicago and St. Louis Electric Railroad is about to do something. The report is that it proposes to build and equip a branch of the main line, between Chicago and Alpine Heights, a distance of twenty miles, to demonstrate to the public that the system has the merit claimed for it. So much has been said about the Chicago and St. Louis Electric Road, and so little accomplished, that the public has lost all confidence in the sincerity of its promoters, and it will require a mighty effort to win back that lost confidence. The company, if it means business, should build the road without saying anything more about it, and when it is finished, let the public know and see what has been done. Any amount of talk now will not help the cause the least bit.

COST OF THE ENGLISH TELEGRAPH SERVICE.

A recent statement of the English Treasury shows that the telegraph service in that country costs the people more than they get in return. The receipts for the year 1893 amounted to over $12,000,000 (£2,526,312), while the expenses were about $825,000 (£166,682) more than the income. Since the government took charge of the telegraphs the total expenses have exceeded the total receipts by about $2,500,000. After all this effort and expense it is questionable whether the British service, under government control, is any more efficient than the American under private control.

THE A. I. E. E. ANNUAL MEETING.

The annual election of officers of the American Institute of Electrical Engineers will take place in Philadelphia May 15. Philadelphia is an excellent place to go to when a quiet time is desired, but in this instance the electrical fraternity of that place are determined to make things exceedingly pleasant for the visitors, even if they may have to violate the rules of law and order. Prof. Houston is the council candidate for president. That gentleman is eminently qualified to fill the position, but he has enjoyed the honor for one year, and should now step aside in some one else's favor.

WHEN WAS THE FIRST MESSAGE SENT?

An interesting question has recently arisen in respect to the date on which the first telegraphic message was sent in this country. The statement was made that the fiftieth anniversary of that historical event would occur on May 24 of this year. The Postal Telegraph-Cable Company proposes to commemorate the celebrated incident by the formal opening of its handsome new building on Broadway, corner of Murray street, on the same date this year. But there is some doubt as to the exact date of the original event; equally good authorities differ on that point. Some give May 24 and others May 27, 1844, as the date. There is no doubt that the message was transmitted from Washington to Baltimore on one of these two dates, but which one is a question yet to be definitely settled, if it can be at this late period. As far as our investigation into the matter has proceeded, we are inclined to believe that May 24 was the date. We base our opinion on the fact that one of the authorities giving it as May 24 compiled his story from the private papers of Prof. Morse, and it is reasonable to suppose that the facts coming from the original source would be correct. But how can we reconcile this date with that given by other good authorities? We would like to hear from those of our readers or any one else who have any personal knowledge or documentary evidence bearing on the subject. The point at issue, while not vital in any sense of the word, should be settled for the sake of historical accuracy.

AMERICAN ELECTRIC HEATERS FOR STREET CARS.

The heating of street cars has always been a perplexing problem to street railway managers, but with the advent of electric power the difficulty seemed at last to have been settled, at least as far as electric cars were concerned. There was the electric current. "Why not use the same current that propelled the cars to heat them as well?" was the very natural suggestion. That was easily enough done if the factor of economy was disregarded. Street railway managers, however, are very careful in their calculations as to the cost of operating their roads, and they soon found out that the cars could not be heated by electricity except at a large cost.

This important fact led inventors to apply themselves to the problem of economically heating electric cars by electricity. Manifestly the improvements had to be made in the apparatus designed to transform electric current into heat, and in this direction many advances have been made.

One of the most successful systems of electric heating yet devised is that of the Central Heating Company of New York City. This company is the sole owner and manufacturer under the patents covering The American Electric Heating System in the States of New York, New Jersey, Pennsylvania, Delaware, Maryland, West Virginia, Kentucky, Ohio, Michigan and the District of Columbia.

Any progressive railway management need not be told of the advantages of electric heating, for they are obvious. There is no dirt, smoke, ashes, nor odor, the avoidance of which is in itself a great consideration. Other equally important features of electric heating are economy of space, safety, and ease of control and regulation, and in the system under consideration, economy can be added as a further feature of prime importance. This one advantage is really the most important one of all, and the first that receives the attention of the manager.

The Central Electric Heating Company's system has been thoroughly tested in actual use in various types of heaters, with uniformly satisfactory results. The heaters are so constructed that ample radiating surface is afforded to prevent overheating and fusion of the conducting material, and, owing to their simplicity of construction, they are readily repaired. In order that they may not burn out they are made to carry, with perfect safety, a muchlarger current than that required in actual use.

The small space required by these heaters is a meritorious feature of the system. Each heater is only 26 inches long, 2 inches wide and 10½ inches high. The outer casing is made of cast iron, and weighs about 25 lbs.

The heaters may be fastened to the floor under the front edge of the car seat or to the panel, as preferred.

The heater shown in the illustration (Fig. 1) is known as Style A, and is intended to be fastened in the manner first referred to. The heater designed to be fastened to the panel is known as Style B.

Four to six heaters, according to the climate and the size of the car, will furnish the required amount of heat.

The heat can be regulated by a switch, to meet varying conditions of the weather. No attention is required beyond the turning of the switch.

FIG. 1—AMERICAN HEATER, STYLE A.

The radiating surfaces are sufficiently large to effectively heat the car without danger of burning the garment or the person.

Fig. 2 gives a diagram showing the wiring of a car equipped with six heaters. The heaters are connected in multiple-series.

Fig. 3 gives a view of the interior of a car fitted up with American heaters of the style A. It will be seen that these devices are entirely out of the way, and it is evident that the heat is generated near the floor.

Passengers like to have their lower extremities warmed first, as such application of heat induces warmth throughout the body more quickly than if the heat is distributed in the reverse manner.

Very elaborate and complete tests have been made on the various roads using these heaters, showing very satisfactory results. These tests were made last February on several of the lines of the Atlantic Avenue Railway Company of Brooklyn, the Steinway Railway Co., Long Island City, L. I., and the Coney Island and Brooklyn Railway, Brooklyn. To give an idea of the heating power of these heaters reference to one particular test will be of interest. On February 24 last a test was made on Car No. 64 of the Greenwood line of the Atlantic Avenue Railway. During the tests the temperature outside averaged 7–12° F. above, while the average of the readings of a thermometer placed in a position in the centre of the car was a little more than 38°. This car was equipped with four style B heaters, taking an average of 23 25 watts, the average e. m. f. being 436 volts, and the average amperage 5⅓. The wind was blowing at a velocity of 28 miles an hour while the tests were being made.

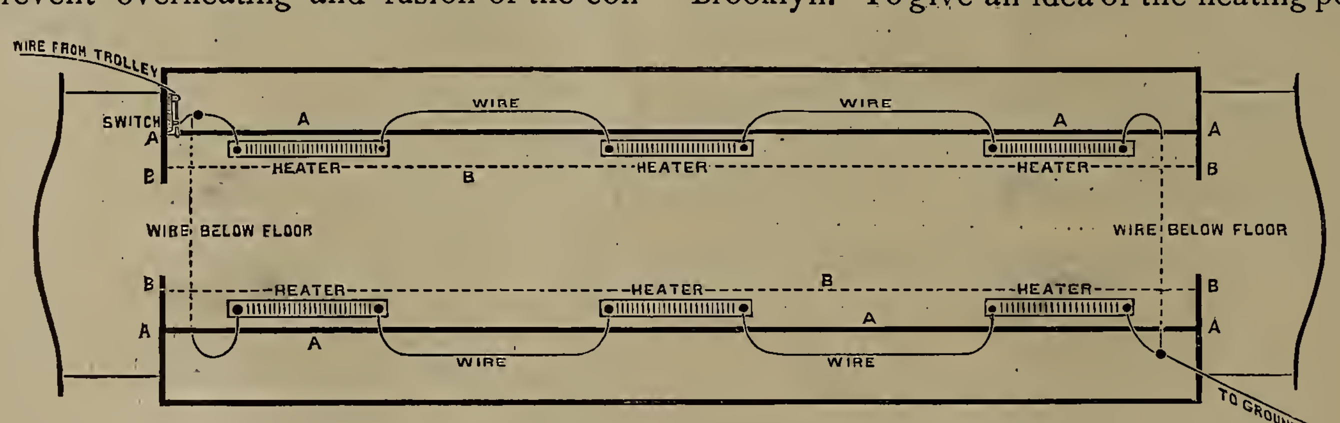


FIG. 2—DIAGRAM OF WIRING.

The Central Electric Heating Co. also manufactures heating apparatus of every description adapted for industrial and domestic purposes.

PETROLEUM BRICKS FOR FUEL.

As a matter of general interest to those concerned in steam generating plants we give below the method of Maestracci of manufacturing petroleum bricks for fuel. This information was communicated to the State Department by C. W. Chancellor, U. S. Consul at Havre, France :

Mix one litre of petroleum, 150 grams triturated soap, 10 per cent. of rosin, and 333 grams of caustic soda. Heat this mixture, being careful to stir it well meantime, until solidification commences—say about forty minutes. If the mixture should tend to boil over, pour in a few more drops of the soda and continue to stir until solidification has sufficiently progressed; then pour the semi-fluid material into molds to form the bricks, and place these in a hot room or drying-place for ten or fifteen minutes; then remove them and let them cool. In a few hours they can be used as fuel.

To the three elements, which constitute the mixture, Mr. Maestracci recommends the addition of 20 per cent. of sawdust and 20 per cent. of clay or sand, which makes the bricks more solid and less expensive. Trials of these bricks as fuel have been made at Marseilles on several tugs, and it has been found that, weight for weight, they develop three times as much heat as the ordinary coal brick, and leave no ashes.

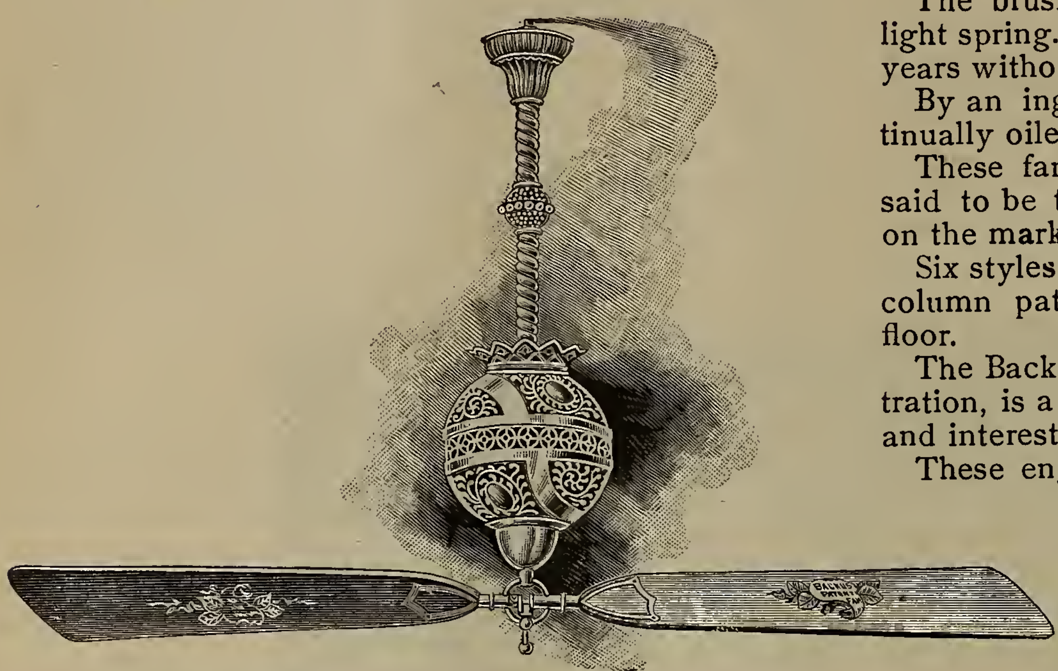
It is expected, with some slight changes in the furnaces, to arrive at still more perfect results, not only in the increased heat, but in the entire suppression of smoke, and on the most economical basis, one kilogram of the solidified material being equal to 4 kilograms of coal. These experiments seem to be very interesting, and it is quite easy to understand that there is a double advantage in using such fuel on steamers, as they economize in both space and cost.

FIG. 3.—INTERIOR VIEW OF CAR EQUIPPED WITH AMERICAN ELECTRIC HEATERS.

Largest Dynamo.—What is said to be the largest dynamo ever built is now being constructed at the Lynn works of the General Electric Company, Lynn, Mass. It is being made for the Philadelphia Traction Company, and when completed will weigh 32,000 pounds. The castings of this dynamo are of extraordinary dimensions and were difficult to make. When the rough work is completed the machine will be shipped to Schenectady, N. Y., to be finished.

BACKUS ELECTRIC FANS AND GAS ENGINES.

As the warm season approaches, the question as to how we shall keep cool is the one that is likely to occupy our minds. There are several methods of keeping cool, but none is more practicable and convenient than with the electric fan.



BACKUS ELECTRIC FAN.

There are a large number of fan motors on the market, but none better than the one made by the Backus Manufacturing Co., 174–182 Pennsylvania ave., Newark, N. J., of which an illustration is given herewith.

The illustration (fig. 1) shows a Backus Electric Ceiling Fan, which, it will be seen, is very neat in design and compact. It is noiseless in operation, and free from all objectional features.

The carbon brushes are automatic, and the motor requires no oiling after once starting. This motor has been simplified and improved for the season of 1894, and the blades are adjustable. It is said that they have the largest blades and greatest sweep of any electric fan ever built.

The brushes are of imported carbon, and fed by a light spring. It is claimed that one set will last for two years without attention or readjustment.

By an ingenious device the bearings are kept continually oiled, without any possibility of dripping.

These fans take $1\frac{2}{10}$ amperes at 110 volts, and are said to be the most economical to operate of any fan on the market.

Six styles of ceiling fans are made, and eight of the column pattern, which is designed to stand on the floor.

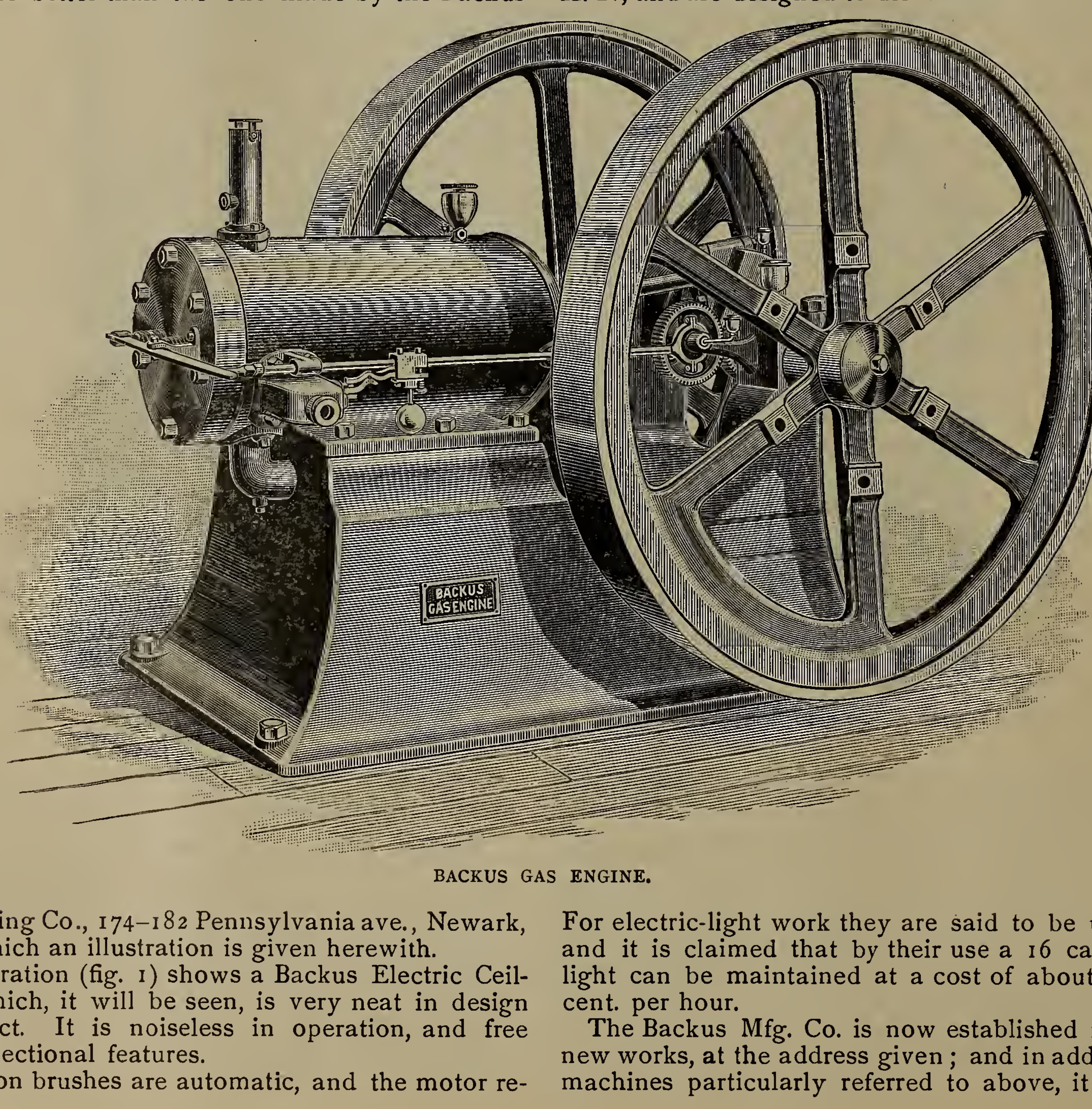
The Backus Gas Engine, of which Fig. 2 is an illustration, is a machine that has several features of merit and interest to those who fancy gas engines.

These engines are said to be very efficient, and are simple and compact in construction and economical in operation.

It is claimed that a 15 horse-power gas engine can be operated at a cost of from $1. to $1.25 per day. There are no igniters or slide valves, and the speed can be changed while the engine is running.

All sizes of engines, up to 5 H. P., are built upright, in order to economize space; sizes over 5 H. P. are built on the horizontal pattern, in order to secure strength and stability.

These engines are made in sizes ranging from 1 to 35 H. P., and are designed to drive all kinds of machinery.



BACKUS GAS ENGINE.

For electric-light work they are said to be unequalled, and it is claimed that by their use a 16 candle-power light can be maintained at a cost of about one-fourth cent. per hour.

The Backus Mfg. Co. is now established in its large new works, at the address given; and in addition to the machines particularly referred to above, it makes the celebrated Backus Water Motor and Patent Exhaust Ventilating Fans, both of which devices are in very extensive use all over the country.

ELECTRICAL OSCILLATIONS.*

BY NEWTON HARRISON, E. E.

The law of inertia is universal. All matter, of whatever shape or form, kind or condition, is subject to its effects. The most impalpable gas known can be proven to possess this permanent quality. Force—which must be expended in order to illustrate inertia in bodies—is a direct outcome of motion ; and motion, force and energy are three almost identical properties which matter in general possesses.

The vast storehouse of nature contains the same amount of energy today as it did long ages ago; as it did before the earth had been moulded by the Creator's hand, or the encircling systems of planets evolved by cosmic forces from their nebulous states.

Energy was a latent power in the universe before it helped create the world around us. Our minds refuse to comprehend the destruction of either matter or energy. A condition of equilibrium throughout space might be conceivable ; we could imagine space filled with the atomic constituents of extinct worlds ; there would be no light, no motion, no sound, chaos reigning everywhere, yet the inexhaustible fund of energy and matter would remain—the one unthinkable without the other.

Helmholtz advanced the principle just enunciated. It is not a theory but a truth that is being perpetually illustrated on earth, in the heavens, anywhere and everywhere.

Matter set in motion tends to keep in motion ; it is due to the gradual absorption of energy that it comes to rest. This energy passes away to surrounding objects and affects them according to their susceptibility at the time. It is said that a thought—the mere passing fancy in one's mind—moves the entire universe, because thought itself is the result of molecular movements in the brain, which in ever increasing spheres moves the matter of space forever.

If matter, then, be subject to the influence of inertia or a reactive force, the sudden inrush of an electric current through a conductor would immediately upon its subsidence bring into existence a current of opposite direction.

A Leyden jar can never be discharged without this phenomenon occurring. Wollaston pointed out the existence of both gases at both electrodes when discharged through a liquid. Joseph Henry, in 1842, was the first to consider the discharge of a condenser as of an oscillatory nature. Helmholtz, in 1847, remarked "We assume that the discharge of a jar is not a simple motion of the electricity in one direction but a backward and forward motion between the coatings, in oscillations which become continually smaller until the entire *vis-viva* is destroyed by the sum of the resistances." Sir Wm. Thomson, in 1853, wrote an article on "Transient Electric Currents," in which he calls self-induction, "electro-dynamic capacity." He explored the subject mathematically and found an expression for the complete periodic time of one oscillation, the frequency of the oscillations or number in one second, and the resistance which would render a circuit non-oscillatory or dead beat.

Feddersen experimented by placing a revolving mirror in front of the two brass balls of a Leyden jar battery. The discharge was through a high resistance and was examined by means of a telescope. A band of light only was seen which gradually reduced itself into a series of separate strips of light when the resistance was reduced to the right point.

Feddersen found that the critical resistance, as stated by Fleming, at which the discharge just becomes oscillatory, varies inversely as the square root of the capacity of the battery. This was proven by Sir Wm. Thomson, mathematically, previous to this by purely theoretical considerations.

Maxwell, in his theoretical treatment of the subject, actually demanded an oscillatory discharge. This was an expected condition on account of the nature of the medium considered.

The ether, wavering and undulating under the influence of impressed forces, must obey the same laws as those which govern the grosser and more palpable matter of the earth.

These oscillations depend upon the mass and initial energy exerted. They are determined by the resistance of the circuit to a large extent. All electric systems are determined by their C. L. R. K. or dielectric constant, and, in the case of a discharge from a condenser, the form of discharge can be predicted by knowing these quantities.

(*To be continued.*)

*Lecture delivered before the Franklin Electrical Society, New York, March 24, 1894.

MEETING.—The Northwestern Electrical Association will hold its annual meeting in St. Paul, Minn., on July 18, 19, 20 and 21. It is stated that an effort is being made in Chicago to organize a Western electric light association as an independent society to work in connection with the Northwestern Electrical Association.

FROM THE SOUTH.—The Southern Electrical Manufacturing and Supply Co., Ltd., New Orleans, La., manufacturer and dealer in electrical supplies, contractor for arc and incandescent light and power plants, etc., has just issued a little pamphlet giving a list of the establishments operating plants installed by this company, also several testimonials from various users, which speak in the highest terms of the company's work. This company is one of the most enterprising in the South. The officers are : E. L. Bemiss, president ; Alfred Raymond, superintendent; W. A. Willard, secretary and treasurer.

LEGAL.—The South Milwaukee Light and Power Company, which has been in the hands of a receiver, has again resumed its own management.

STREET RAILWAY NEWS.

ELECTRIC RAILROADS IN BALTIMORE.

The *Manufacturers' Record*, of Baltimore, in its issue of April 27, contains an interesting article on the activity in electric railroad construction in and about that city.

During the last two or three years about $15,000,000 have been invested in the construction of electric and cable lines, and about eighty miles of additional road are now under construction or will be built this summer.

The following is a list of the new roads proposed or under construction in and around Baltimore.

The Baltimore, Middle River and Sparrow's Point Company intends building an electric road from a point in the eastern suburbs to Sparrow's Point, passing near several hotels and fishing shores. The length of the line is estimated at fifteen miles. George R. Willis and F. W. Trimble, of Baltimore, and several Philadelphia people, it is understood, are interested.

The Canton, Sparrow's Point & North Point Railway Co. intend building an electric road from or near the terminus of the Central Railway in the city to North Point, at the mouth of the Patapsco river. The distance is ten miles. Prest. F. W. Wood, of the Maryland Steel Co., and T. Wallis Blackistone, of Baltimore, are among the members of this company.

The Baltimore, East Baltimore & North Point Company holds a franchise which was renewed March 17 to build an electric line between the points named. It is learned that about five miles only will be built this spring, from the city limits to a resort called Keller's Pavilion. O. Hammond, of Baltimore, is associated with this enterprise.

The City & Suburban Railway Co. is about to extend its Highlandtown branch to Point Breeze, a distance of two miles. Work will be completed by June 1. Nelson Perin is president.

The City Passenger Railway Co., Oden Bowie, president, will also extend its Canton division one mile, to Tenth street, to be operated by electric motors.

The City & Suburban Railway Co. will also rebuild its Catonsville division, seven miles in length, for electric motors.

The Edmondson Avenue, Catonsville & Ellicott's Mills Company, which is a part of the company recently formed to construct an electric road from Baltimore to Washington, it is understood, contemplates building nine miles of its road west of Baltimore during the summer. George Yakel and Alexander Brown, of Baltimore, are interested.

The Baltimore Traction Co., T. Edward Hambleton, president, has obtained permission to connect its Fremont and Ridgely street lines and extend them to the south-western city limits, with a possible terminus at Westport.

Work has commenced on the Walbrook, Gwynnoak & Powhatan, an electric road four miles long, extending from the terminus of the Walbrook division of the Lake Roland elevated railway system to Powhatan. The road is to be completed by June 1. F. H. Calloway is secretary of the company. Smith & Schwarz, of Baltimore, are also interested.

The Baltimore Traction Co. is completing an extension of one mile to its Arlington division.

The Pikesville, Reisterstown & Emory Grove Company has been formed to build from the terminus of the Pikesville branch of the Baltimore Traction system to Reisterstown, Glyndon and Emory Grove campgrounds. The distance is ten miles. Geo. R. Webb and John L. Cowan, of Baltimore, are prime movers in the project.

The City Passenger Railway Co. is about to extend its Hall's Springs division to Lauraville, five miles.

All of these projects are backed by responsible prrties, who are actually preparing to complete them. They embrace, all told, about eighty miles of electric road.

In addition, two companies have been formed to build electric roads from Baltimore to Washington, the routes being thirty-eight and forty-two miles long.

THE AMERICAN STREET RAILWAY ASSOCIATION.

ATLANTA CONVENTION.

We have received from Mr. W. J. Richardson, Secretary of the American Street Railway Association, the following list of the subjects and special committees appointed to report thereon, at the thirteenth annual meeting of the American Street Railway Association, to be held in the city of Atlanta, Ga., October 17-19, 1894.

"Can the T-Rail be Satisfactorily Used in Paved Streets?" Joel Hurt, President Atlanta Construction Street Railway Co., Altanta, Ga.; S. Hendrie, Manager Wyandotte and Detroit River Railway Co., Detroit, Mich.; H. J. Crowley, Engineer Atlanta Construction Street Railway, Atlanta, Ga.

"City and Suburban Electric Railways." Elwin C. Foster, Supt. Lynn and Boston R. R., Boston, Mass.

"Mail, Express and Freight Service on Street Railway Cars." Richard McCulloch, Electrical Engineer Citizens' Railway, St. Louis, Mo.

"The Best Method of Treating Accidents and Complaints." John B. Parsons, General Manager, West Chicago Street R. R. Co., Chicago, Ill.

"Street Car Wheels and Axles." D. S. Cook, Electrical Engineer Trenton Passenger Railway Co., Trenton, N. J.

"Transfer and Commutation." Rodney Curtis, President Denver Tramway Co., Denver, Col.

"The T-Rail Construction of the Terre Haute Street Railway Co." M. F. Burke, Supt. Terre Haute Street Railway Co., Terre Haute, Ind.

"A Standard Form for Accounts for Street Railways." H. I. Bettis, Cons. Engineer Atlanta Construction Street Railway Co., Atlanta, Ga.

DETROIT STREET RAILWAYS.—It is reported that Thomas Nevins & Son, Orange, N. J., have purchased the entire street railway system of Detroit, Michigan, paying therefore $4,000,000 in bonds, and $4,000,000 in stock. It is reported that the Nevins's will organize a company with a capital of $10,000,000 to develop the railway system of Detroit and equip it with the trolley system, as well as to extend it.

NEW CAR WORKS.—The Barney & Smith Car Company, Dayton, O., is now building electric, horse and cable cars. This company was recently established.

The threatened strike among the employes of the Milwaukee Street Railway Co. has been averted by the decision of the company not to cut the wages. The old wages scale was signed.

It is reported that the franchise of the United Electric Railway, of Nashville, Tenn., has been sold to Nathaniel Baxter, jr., for $138,500, Mr. Baxter representing bondholders.

DECISION IN THE INTERIOR CONDUIT CASE.

On April 21 Judge Coxe, in the United States Circuit Court for the Southern District of New York, rendered a decision on the final hearing in Equity in the case of the Interior Conduit & Insulation Company, vs. the Eureka Electric Company.

This was an infringement action based upon letters-patent No. 401,498, granted to E. H. Johnson and E. T. Greenfield, April 16, 1889, for "Improvements in Wiring Structures for Electric Lighting." The object of the patentees was to provide buildings with wires for electric lighting which could be readily removed and replaced by other wires. A second object was to furnish protection from fire. The improvement in controversy consisted in placing a pair of wires into a pipe of insulating material, a safety catch being interpolated in the circuit.

The defenses were, lack of novelty and invention, non-infringement, defective title and the absence of an oath from the amended specification. In the specification as originally filed the patentees claimed the invention without reference to the material of which the pipes were constructed.

They also assert that instead of one tube with two wires, two tubes containing one wire each may be used without departing from the spirit of invention.

The application was rejected upon several references, the examiner holding that the applicants had merely adopted the well-known underground system for use in buildings, and that it was not new to run electric wires through pipes under the plaster of buildings. The applicants thereafter amended, the principal change being the limitation of the claims to pipes made of insulating material. The application was again rejected on the Martin patent No. 286,940, which shows paper tubes for conveying electric wires, the examiner observing that "the mere fact that the pipes are of insulating material is not patentable." He also pointed out that safety catches were old.

The specification was again amended and thereafter the patent issued.

The judge then refers to several old devices and combinations in considering the question as to whether there was any invention involved in placing "the old twin wires in the old insulating tube," and interpolating a safety catch in each circuit, and concludes that these references prove that the patent "rests upon an exceedingly vague and shadowy foundation."

"I have examined the patent with care," says Judge Coxe, "to discover what new idea it has contributed to the art, and am compelled to think that the art of electric lighting would have lost nothing tangible if the statements of the patent had never been made public. I cannot resist the conclusion that many of the marvellous attributes ascribed to the patent are after-thoughts, which find their origin largely in ardent and ingenious expert imagination. It may be doubted whether the patentees themselves were conscious, when they put the old wires in the old pipes, that they had made a discovery which cured all the defects of the past and was to lay a heavy tribute upon all electrical wiring in the future. What they did do seems most simple to the ordinary layman. Both were accomplished electricians. Mr. Greenfield had large experience in wiring buildings. In 1883 he had wired the Mills building, by drawing insulating wires through zinc tubes. Mr. Johnson had a cottage at Greenwich, which he wished to have wired. He consulted Mr. Greenfield on the subject and the latter describes what occurred at the supreme moment when the invention had its birth. 'Mr. Johnson asked me if I couldn't wire that cottage in a way so that the wires could be got at and repaired, if necessary, without tearing up any of the building, and I told him, yes; I thought that I could put in a system of tubing which could be used for race-ways, if properly constructed, making a continuons channel, and he said, "'Greenfield, go ahead and do it, which I did.'" Most assuredly he did it. What else could he do? He had done substantially the same thing before in the Mills building, and he utilized his knowledge to suit the changed condition precisely as any other skilled electrician would have done after he was told what was wanted. The attempt to magnify this apparently simple exploit into an invention of surpassing excellence, can be accomplished only by the substitution of theories based upon the imagination for facts based upon the evidence.

"If a construction broad enough to cover the defendant's structures is placed upon the claims, they must be held invalid. If limited to a complete system of pipes extending continuously through the building "from supply to consumption," as shown in fig. 1 of the patent, the claims may be upheld. But the defendant does not employ such a system, and in no event is the third claim infringed, for the reason that the defendant does not use a pair of wires twisted together.

"It follows that the bill must be dismissed."

The Interior Conduit and Insulation Co. has decided to appeal.

WANTED.

A PHONOGRAPH GIVES EVIDENCE.

A peculiar use of the phonograph was made in a law suit in London. Some householders sought to obtain an injunction against an electric light company on the ground that the company's station was a nuisance on account of the vibration caused by the machinery. Prof. Silvanus Thompson gave evidence in support of the plaintiff's argument, and in corroboration produced a phonograph on which a record was made of the alleged vibrations and jarring. The phonograph had been placed in various rooms in the houses affected, for the purpose of securing audible evidence of the cause of complaint. The judge stepped down from the bench, held the tubes to his ears and listened. He was evidently impressed with the "testimony" since, on his return to the bench, he made a note of the novel evidence.

FORMAL OPENING OF THE POSTAL TELEGRAPH CO.'S NEW BUILDING.

The Postal Telegraph-Cable Company will formally open its new building to the public on May 24, and hold a reception on the occasion. The building will be thrown open for general inspection. This date has been selected as an appropriate one for this event, because it will be the 50th anniversary of the sending of the first telegraph message in the United States.

Peculiar Sound Effects —Mr. A. A. Knudson, of the Phillips Insulated Wire Co., 39 Cortlandt street, has an interesting article in the *Popular Science Monthly* for May, 1894, on "Peculiar Sound Effects." He refers especially to the difficulty of always locating sounds, and some of the peculiar effects of the same. The article is a valuable contribution to the subject of sound and is well worth careful reading, as it reveals a good many things about that interesting subject that a majority of people do not know, but are worth knowing.

Patent Law in Denmark.—A new Patent Law for Denmark will go into operation about June 15, next. The principal features are the same as the laws of Germany, Norway and Sweden, viz.: Protection from date of filing application; duration of patent, 15 years; importation of patented articles prohibited; examination as to novelty prior to the grant; opposition to grant by interested party permitted.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, April 28, 1894.

Mr. Charles W. Holtzer, of the Holtzer-Cabot Co., Boston, is in the city, supervising the work in connection with the opening of the company's New York supply house, at 114 Liberty street. Mr. David Chalmers, as has already been noted, will represent the company in New York.

Mr. Frank MacGovern, representing Rossiter, McGovern & Company, electrical contractors, has moved his office from 39 Cortlandt St., to 141 Liberty St. Mr. MacGovern is handling all makes of fan moters, and makes a specialty of ventilating by electric power.

Mr. A. B. Laurence, New York manager of the Shultz Belting Co., of St. Louis, Mo., has opened his new office and salesroom at 113 Liberty street. The new quarters afford greater capacity and facilities for the carrying on of the rapidly increasing business, and the ocation is more central. Mr. Laurence is now right in the midst of the electrical and machine trade, where he can be in closer touch with those desiring belts. Mr. Laurence is a perfect image of Henry Irving, the actor, and his fine, clear cut features command respect and attention wherever he goes. He sells the belts "just the same."

Mr. Louis Hannemann has been appointed receiver for the Fifth Avenue Railway Co., on the application of Geo. H. Davidson, who obtained a judgment for $2,020, which the sheriff has returned unsatisfied. The company was organized several years ago with a capital stock of $2,000,000, for the purpose of building a railroad on Fifth avenue.

Chas. A. Schieren & Co., 47 Ferry street, the makers of the well-known perforated electric belts, of which so many are used in electric light and power stations throughout the country, are now offering to the trade their leather dressing composition. The substance is sold in tin cans and is recommended for use on belts to keep them pliable, so that they will adhere closer to the pulleys and not slip. This "electric stuffing," as the composition is called, closes the pores of the leather and prevents the belt from further stretching; it also preserves the leather.

The Electrical Manufacturing Co., of America, Havemeyer Building, New York, has extensive factories in the southern part of New Jersey, where the company is now preparing dies and tools for the manufacture of something really novel in the electrical line. It is a nickel-in-the-slot automatic banjo. Electro-mechanical fingers will execute a perfect tune upon the strings, in an artistic manner, too. The company has a contract to construct several hundred of these machines. The right to introduce this device in several of the states and territories can be had. It is stated that this apparatus has been a very profitable one to the Electrical Manufacturing Co. Mr. Fackenthal is manager.

Mr. Henry Hine, of the Stanley Electric Co., Pittsfield, Mass., is in town this week.

The National Water Tube Boiler Co., of New Brunswick, N. J., has moved its New York office from 20 Cortlandt street to 74 Cortlandt street. Mr. Arthur Loretz, Jr., is the New York manager.

Mr. W. K. Freeman, 136 Liberty street, has secured a contract from the Gold Bluff Mining Company of California to install an electric plant for generating current to supply power for hoists, mining machinery, and other uses in mining operations at the Gold Bluff Company's mine. The plant will consist of two Freeman 200-kilowatt generator, motors for the hoists, and pumps for the mines. The generators will be driven by water-power.

The Electric Steam Generating and Power Co. has opened offices in this city, and has an experimental plant in operation. This company proposes to generate electricity and furnish it for all purposes, especially for heating and the generation of steam. The company claims its system has 85 per cent. efficiency. It has in connection with the system an automatic valve so arranged that, when the steam rises to a certain pressure, it automatically cuts out the electric current, and also cuts it in when the pressure falls to a given point.

W. T. H.

NEW CORPORATIONS.

The Interstate Construction Company, Des Moines, Iowa; capital stock, $500,000. The object of the company is to construct and operate railroad and telegraph lines. Incorporators, J. Boardman Cann, of Boston, Geo. W. Malcolm, of New York, G. G. Fancher, of Chariton, and E. I. Rosenfeld.

The San Diego, Pacific Beach and La Jolla Railway Co., San Diego, Cal.; capital stock, $25,000.

The Hamilton-Elliott Telephone Company, Coffeyville, Kan. Incorporators, D. F. Elliott and others. Capital stock, $6,000.

The Wellsborough Electric Co., Wellsborough, Pa.; capital stock, $7,000.

The Mount Minsi Electric Railway Company, Stroudsburg, Pa.; capital stock, $125,000.

The Bessemer Light, Heat and Power Company, Braddock, Pa.; capital stock, $10,000.

The Bluestone Electric Light Company, Coopers, W. Va.; capital stock, $50,000.

Fox River Electric Railway Company, Green Bay, Wis.

Milwaukee Steam Heating and Electric Construction Company, Milwaukee, Wis.

The Citizens' Telephone Company, Cumberland, Mo. I. D. Rohrer, president. Capital stock, $40,000.

The Shelbyville Water and Electric Light Company, Shelbyville, Ky. Louis Channing is president. Capital stock, $40,000. An electric light plant will be established.

The Pennsylvania Telephone Co, Sonman, Pa. Officers, Dr. George R. Glass, president; William Allison, vice-president; J. J. McDonnell, treasurer; F. H. Young, general manager and secretary.

The Hillsboro Investment and Electric Company, Austin, Tex.; capital stock, $50,000. Incorporators, A. T. Rose, H. T. Ivy, E. G. Shields and others.

The Urbana and Champaign Street Railway, and the Champaign Rapid Transit Company, Champaign, Ill., have been consolidated under the name of the Urbana and Champaign Street Railway Company. The capital stock of the new corporation is $50,000.

The Glencoe Electric Company, Chicago, Ill.; capital stock, $3,000. Incorporators, John I. Flanning, Sylvan Newhall and J. J. Flanders.

The Milford Telephone Company, Milford, N. H.; capital stock, $1,000.

The National Gas, Electric Light and Heating Company, of the District of Columbia; capital stock, $2,000,000. Incorporators, J. Wesley Bovee, George W. Harvey, John F. Chamberlain, John W. Childers, Davies Murdoch, S. Sterrett McKim, Charles C. Lancaster, George B. Cowlam and William F. Mason McCarty.

The Telephone Exchange Company, of Seneca, Kan., has been incorporated by John A. Gilchrist and others; capital stock, $25,000.

The Special Fire Alarm Electrical Signal Company, New York, has been incorporated by Frederick Pearce and others; capital stock, $50,000.

The Tipton Electric Light Company, Tipton, Iowa, has been incorporated by W. N. Freichler and others; capital stock, $12.000.

The Gregory Reed Company, Chicago, Ill., incorporated by Jacob H. Gregory, Wm. S. Reed and others, to contract for building electric light and water-works plants; capital stock, $60,000.

The Jerseyville Telephone Company, Jerseyville, Ill., incorporated by John G. Swartz and others; capital stock, $5,000.

(*Continued on page* 214.)

CONCERNING A CHANGE OF POLICY IN THE ADMINISTRATION OF THE PATENT OFFICE.*

BY T. J. W. OLAN.

Abstract.

In its principle, the patent law is an acknowledgment from the side of the state of the inventor's title to his invention, and in consideration of a certain fee it grants him for a certain period the exclusive right to use for his own exclusive benefit, if he deems proper, the fruit of his genius.

* * *

If the people desire to see the affairs of the Patent Office so administered as to benefit the public in other respects than as a mere source of revenue from patent fees, instead of the benefit of the inventor, in acknowledgment of whose right and for the benefit of whom the patent law was created, such desire, as abolishing the principle of said law, must be checked in such a way that it will not reappear; and it must be checked now, since from a timid and sophistic argument from the side of the patent officials it seems to have entered into the public's mind in earnest and to such an extent as to claim acknowledgment from the inventors themselves. Even the patent officials—if they are so misconstruing the law, and whilst exercising their official duties are aiming to benefit the public at the expense of the inventor, for the benefit of whom the law exists—must be checked, and checked in such a way as to be able no longer to defy the law and violate or obviate its purpose.

* * *

Now, since it is evident from the very principle of the patent law, as I have tried to point out, that said law exists for the benefit of the inventor and not for that of the public, the law must be altered so as not to allow that principle to be subject to any assaults, either from the public or still less from the patent officials who have charge of the administration of said law. It must be altered so that it will become impossible for those officials without serious consequences for themselves to place obstruction in the inventor's way under his endeavors to secure his right. The law must be made so clear and concise as to allow neither "liberality" nor "illiberality" from the officials, which will at once do away with all arbitrary treatment of the inventor. The law must be altered so as to become logically consequent to its different paragraphs or sections, so as not to give room for any interpretation leading to confusion. The law must finally be put in accord with general principles of justice and right, and in general be made so clear, consequent and concise in its form that the inventor will know that he has to deal with the law itself and not with the different individualities of various officials.

The provisions in reference to appeals should therefore be altered, not only on account of the misuses to which they clearly may lead, but also in order to accord with principles of justice and right.

I think we are able here to make the following conclusions:

First. The patent law should make provisions for necessary qualifications of all the patent officials, so as to provide guarantees for their necessary ability to fulfil the duties conferred upon them, so far as possible without error or mistakes.

Second. The examiners of patents should be well paid, so as to enable them to direct their entire attention to their duties, as they should be of adequate number for carrying on the business of their office without overwork or strain, and the work required from them should be so limited as to enable them to follow the progress in the art, and to make themselves more and more fit for their duties.

Third. The patent officials should be made independent of political influences, whereby able men who have either already entered in service or who may in the future be appointed could be retained in office.

Fourth. For evidently misconstruing the provisions of the law for making arbitrary decisions in defiance of said law, the officials should be removed from office.

Fifth. An official record should be kept with reference to decisions of each separate examiner, subsequently reversed upon appeal; and no examiner should be allowed to retain office after having had a limited number of his decisions reversed. The inventor should be reimbursed by the losing examiner for all expenditures for appeal fees, in cases ultimately decided in his favor.

Sixth. No authority in the Patent Office should have any adjudging power in appeal cases, if he is not by scientific merit and skill in the arts fully qualified for such duty in the strictest sense and spirit of the law.

That the last and highest authority in patent appeal cases should be a jury composed of men of scientific ability and skill in appertaining matters as we have already concluded.

When the patent law has been so altered as to contain provisions embodying the changes here above suggested, and deduced as necessary conclusions from the discussions of the matter, then I think the law will become harmonious and consonant with reference to its fundamental command, principle and aim.

*Communicated in discussion of Mr. Mauro's paper before the American Institute of Electrical Engineers.

MAGNETIC CLUB SPRING MEETING.

A largely attended meeting of the Magnetic Club of New York was held at Jaeger's restaurant, corner of Madison avenue and 59th street, on the night of April 24. Over 100 persons sat down to the elegant dinner, which was thoroughly enjoyed by all. Dinner through, the rest of the night was given over to other entertainment, in the shape of vocal and instrumental music, speech-making, recitations, etc., all of which were in keeping with the festive occasion.

There were many prominent telegraph and electrical people present, among them being Wm. H. Baker, vice-president, J. H. Emerick, superintendent, Geo. H. Usher, assistant superintendent, F. W. Jones, electrician, Charles P. Bruch, assistant secretary, and other officials of the Postal Telegraph-Cable Co; Charles Selden, G. L. Lang and E. A. Smith, superintendents of telegraph respectively, of the Baltimore and Ohio R. R., the New York and New England R. R. and the Fitchburg R. R., and W. J. Dealy, Superintendent Western Union Telegraph Co. Messrs. Selden, Lang and Smith were unanimously elected members of the club.

Mr. Selden was the guest of the evening, and made a few remarks, in response to a call from President E. C. Cockey, which were full of good feeling and humor.

Equally entertaining remarks were made by General Fowler, of the Postal Telegraph Co., W. J. Dealy, Wm. H. Baker, G. L. Lang and others.

The Magnetic Club is enjoying immense popularity among the electrical fraternity in this city, and the fact that the membership is limited by its constitution, it is a rare privilege to be a member. President Cockey is one of the most genial men in New York, and under his guidance the club has prospered and dined well. The motto of the club is, "Are You Happy?" For an answer to this question, a glance at the members when they engage in the effort to absorb the good things laid before them at these periodical gatherings is sufficient.

(*Continued from page* 212.)

The Wisconsin Electric Dynamo Company, Milwaukee, Wis., has been incorporated by G. Bodall and othsrs ; capital stock, $50,000.

The Springer Water & Electric Light Co., Springer, New Mex., incorporated by Peter B. Talle. Capital stock, $30,000.

The Citizens' Electric Light and Power Co., Hudson, N. Y., incorporated by S. D. Lake. Capital stock, $10,000.

The Heat, Light and Power Co., Fishkill Landing, N. Y., incorporated by W. D. Haven. Capital stock, $10,000.

The Chicago and Morgan Park Electric Street Railway Co., Chicago, Ill., incorporated by F. Dean. Capital stock, $500,000.

The Hillsborough Investment and Electric Co., Hillsborough, Texas. Capital stock, $50,000. Incorporators, A. T. Rose, H. T. Ivy, E. G. Shields, and others.

There is talk of organizing an electric railroad company to build a line from Opelika to Auburn, Ala. The capital is to be $60,000.

The Allegheny and Butler Railway Co. (capital, $300,000), has been incorporated and will run a road from Glenshaw to Butler, Pa , a distance of 25 miles. A charter has also been granted the Etna and Glenshaw Street Railway Co. to build and operate a road from Etna to Glenshaw, a distance of five miles. Capital stock, $50,000. Directors of both companies are : Chas. K. Hill, W. B. Rhodes, Frederick Gwinner, Jr., and Edward W. Gwinner, of Pittsburg.

Taylor Belding Electric Co., Chicago. Capital stock, $10,000. Incorporators, Chas. H. Taylor, Warren S. Belding and David Fales.

The Inter-Urban Rapid Transit Co., of Pittsburg, Pa , has been chartered at Trenton, N. J. Capital stock, $100,000. Incorporators, Geo. M. Ludlow, Chicago ; Louis E. Holden, Beloit, Wis.; Chas. C. Burton, Pittsburg; Elliott Rogers, Pittsburg; John C. Des Grages, Pittsburg ; and Frank S. Katzenbach, of Trenton, N. J.

Suburban Co., Cincinnati, Ohio. Capital stock, $250,000. Mr. Arch Stewart, president ; H. M. Healey, secretary and treasurer. Directors, H. Buchanan, Jr., J. R. Coppin, E. J. Hickey, Judge C. J. Helm, F. C. Kemp, T. J. Cooney.

POSSIBLE CONTRACTS.

The Virginia Electric and Railway Company, Richmond, Va., has asked for permission to construct a viaduct.

L. P. Harper, of Suffolk, Va., is interested in a movement to organize a new telephone company.

The Mayor of Kingston, N. C., is desirous to obtain figures and particulars regarding the cost of establishing an electric light plant in that place.

E. J. Mack, city clerk of Albion, Neb., can give information regarding the project of establishing an electric light plant in that place.

Dr. R. F. Quigley is interested in a company which proposes to build an electric railway from Wellington to Vermillion, O. The right of way is now being secured.

The Young Men's Christian Association, of Davenport, Iowa, is erecting a new building which will need an electric lighting apparatus.

The York Street Railroad Company, York, Pa., is asking for bids for the extension of its lines.

It is proposed to put an electric light plant in the new school-house now being erected in Oneonta, N. Y.

A company has been organized to build the Frederick and Middletown electric road, Frederick, Md. Mr. D. R. Kefavauver is secretary.

The Lancaster Ice, Light and Water Co., Lancaster, Ky., is going to construct an electric light plant.

An electric light plant will probably be erected by the city of Columbia, S. C. For further particulars, the Mayor should be addressed.

Greenville, N. C., proposes to establish an electric light plant of its own. Address the Mayor.

An electric light plant is to be established in Trappe, Md. The Mayor of that place can give further particulars.

The Consolidated Electric Light Company of Portland, Me., is about to enlarge its power plant.

The Street Railroad Company of Bangor, Me., proposes to extend its lines to connect with Mt. Hope.

The Kansas legislature has appropriated $72,000 for an electrical annex to the State University. Bids are now desired

Kervanna, Ind., proposes to have an electric light plant of its own. Address the city clerk.

Wapakoneta, O., is talking of putting in an electric light plant, and a similar sentiment exists in Valparaiso, Ind.

Bids are wanted for a plant of 100 arc and 1,000 incandescent lights in Mt. Sterling, Ky. Mr. Adam Baum is mayor.

The Helena Gas Company, of Helena, Ark., is about to establish an electric light plant.

An electric plant is wanted for the new orphan school in Philadelphia.

The Anacostia Railroad Company, of Anacostia, D. C., is going to extend its lines and needs equipment. For further particulars address President Griswold.

The Laurel Electric Light Company, Laurel, Md., is in the market for dynamos and other electrical apparatus.

Hughes, Chisolm & Co., Charleston, S. C., proposes to establish an electric light plant, and will receive figures on the same.

An electric light plant is to be installed in the new morgue on Wood street, Philadelphia, and a dynamo and gas engine are required. Chief Eisenhoven, of the Bureau of City Property, will give further information.

Charlotte, N. Y., has decided to erect an electric light plant.

An electric light company is being organized in Palatka, Fla.

The electric street railway company of Leavenworth, Kas., is making arrangements to build a power house of its own.

Mr. H. V. Van Sickle, of Toledo, Ohio, is interested in a movement to build an electric railway between Centerburg and Delaware, Ohio.

The Athol and Orange Street Railway Co. has been organized to build a street railway in Athol, Mass., and proposals are invited for material. Mr. L. B. Caswell, of Athol, will furnish specifications.

It has been decided to at once begin the work of building an electric road between Rockford and Dickson, Ill. Address J. S. Ticknor, president; or H. Andrews, secretary, Rockford, Ill.

The Portland Electrical Works, Portland, Me., has been organized to manufacture and deal in electrical apparatus and supplies. Capital $50,000. The officers are, president, Nathan A. Redlon, of Portland; treasurer, Chas. O. Files, of Portland.

The subject of an electric street railway in Lyons, N. Y., is again being agitated. Mr. O. F. Thomas, of that place, is interested in the scheme.

The Lanier Printing Company, Winston, N. C., wants an electric motor.

The subject of erecting an electric light plant in Cuthbert, Ga., is under consideration.

The Nansemond Telephone Company, Suffolk, Va., wants equipment for its telephone line.

The stockholders of the Springfield Railway Co., Springfield, Mass., have voted to extend a line through Longmeadow and another through Chicopee Falls to Willimansett.

TRADE NOTES.

The Chesley Electric Co., of Hoboken, N. J., has fully settled in its new factory on Ferry street. Mr. Chesley is an electrician of high reputation, and has given special attention to electrical repairing work for the past seven or eight years. The company has a drying oven, for the purpose of drying out armatures, in which Mr. Chesley takes considerable pride. He has in his factory a complete testing outfit for testing armatures, and will not allow an armature to go out of the place until it measures up to the standard of insulation. A large number of central station and railway companies have had their armatures attended to by Mr. Chesley and are thoroughly satisfied with his work. Many isolated plants send their dynamos here for repairs. Mr. Chesley has a large line of dynamos and motors that have been used but a short time, including one large Edison dynamo, a large Elektron multipolar dynamo, Sprague, Barriett and other machines, all of which are as good as new.

The National Electric Co. has been established at 469 Main street, Springfield, Mass., with F. M. Clark as manager and J. M. Edwards as electrical engineer. Both gentlemen have had large experience.

The Vulcanized Fibre Co., 14 Dey street, New York, and Wilmington, Del., has just issued a neat catalogue and price list of its well-known vulcanized fibre goods. Vulcanized fibre has been on the market now for over 20 years, and is recognized as a staple article of commerce in all portions of the civilized world, being largely used for railway, electrical and general mechanical purposes. It is an excellent insulator in all dry positions, and is largely used as a substitute for hard rubber by most of the principal electric light companies and manufacturers of electrical instruments in the United States and Europe. It is very tough and strong and can be forced into all sorts of positions without breaking. It is also easily tapped, drilled and screw threaded. It comes in three colors, red, gray and black, and is susceptible of a fine polish and beautiful finish. It is made in sheets or tubes.

Van Wagoner & Linn, 74 Cortlandt street, New York city, electrical contractors, are establishing a good reputation for their work. They give estimates for electric light, wiring, electric gas lighting, burglar alarms, electrical annunciators, and all kinds of electrical and speaking tube work. They give prompt attention to repairs. The members of the firm are D. Van Wagoner and S. J. Linn.

William Schimper & Co., 322–326 Ferry street, Hoboken, N. J., are making a specialty of stamped metal goods. They manufacture fine silver plated novelties. Those desiring stamped metal work would do well to consult this firm.

Stucky & Heck Electrical Manufacturing Company, 23 and 25 N. J. R. R. Avenue, Newark, N. J., repairs and reconstructs lighting dynamos, power generators and motors, and overhauls and rewinds armatures of every system. Special attention is given to street car motors. The members of the firm have had sixteen years' experience in the construction of electrical machinery.

The Electric Car Supply Manufacturing Company, 84–88 Mechanic st., Newark, N. J., makes a specialty of bearings and boxes for electric motor cars. The composition used stands the enormous amount of wear and tear that motor bearings and boxes are subjected to, with remarkable success. The boxes are lined with the company's special lubricating metal which, it is said, wears longer, produces less friction, requires less attention and less grease than any other in use. The company overhauls old bearings and boxes of any system. The motor bearings and boxes thus made over can be used for years with satisfaction.

B. W. Payne & Son, the well known engine makers, 41 Dey St., New York City, are installing one 90 H. P. and one 85 H. P. Payne engines in the New York Post Graduate Hospital. They are direct connected to General Electric Company's dynamos. They are also installing one 90 and one 45 H. P. Payne engines in the Hotel Empire, 63d St., New York. Other engines being installed by the firm are two of 60 H. P. for the Board of Charities and Correction at Central Islip, L. I., for electric lighting, and they are putting in a small engine to light the the East River Gas Company's tunnel under the East River.

Electrical and Street Railway Patents.

Issued April 24, 1894.

518,604. Electrical Calculating System. Herman Hollerith, Washington, D. C. Filed Dec. 9, 1892. Renewed Sept. 22, 1893.

518,613. Protector for Electric or Other Bells. Leon R. Lecellier, Villedieu, France. Filed July 31, 1893. Patented in France, Apr. 7, 1891, No. 212,612.

518,642. Car-Wheel Fender. Sylvester A. Breen, Alexandria, Va. Filed Nov. 23, 1893.

518,654. Electric Arc Lamp. Rudolph Segerdahl, Chicago, Ill. Filed Sept. 29, 1893.

518,667. Electric Lock. James Eldon, Lock Haven, Pa. Filed Oct. 31, 1892.

518,673. Electrical Device for Towing Vehicles. Thomas P. Milligan, South Orange, N. J. Filed June 3, 1893.

518,693. Controlling Switch for Electric Railways. Philip Lange, Newark, N. J., and Benjamin G. Lamme, Pittsburgh, Pa., assignors to the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa. Filed Feb. 25, 1893.

518,695. Conduit Electric Railway. Charles A. Maynard, Springfield, Mass. Filed Feb. 9, 1894.

518,713. Support for Electric Lights. William H. Connell, Wilmington, Del. Filed Mar. 28, 1893.

518,719. Electric Arc Lamp. Carl Hoffmann, Berlin, Germany, assignor to Siemens & Halske, same place. Filed Sept. 28, 1893.

518,738. Apparatus for Neutralizing the Effects of Self-Induction in Alternating-Current Circuits. John F. Kelly and Cummings C. Chesney, Pittsfield, Mass., assignors to the Stanley Laboratory Company, same place. Filed Nov. 18, 1893.

518,739. Means for Reducing the Apparent Energy Supplied to Alternating-Current Magnets. John F. Kelly, Pittsfield, Mass., assignor to the Stanley Laboratory Company, same place. Filed Nov. 18, 1893.

518,740. Alternating-Current Dynamo. John F. Kelly, Pittsfield, Mass., assignor to the Stanley Laboratory Company, same place. Filed Dec. 22, 1893.

518,742. Telephony. William C. Lockwood, New York, N. Y., assignor of one-fourth to John H. Flagg, same place. Filed June 27, 1892.

518,756. Armature for Dynamo-Electric Machines or Electric Motors. Thomas H. Hicks, Detroit, Mich. Filed Jan. 9, 1893.

518,768. Dynamo-Electric Machine or Motor. Andrew L. Riker, New York, N. Y. Filed Jan. 29, 1894.

518,781. Electric Operating Mechanism for Vehicles. Louis E. Freedley, Boston, Mass. Filed Dec. 29, 1893.

518,782. Distribution System for Electric Railways. James E. Goodhand, Baltimore, Md. Filed Jan. 20, 1894.

518,788. Electrical-Instrument Table. Jacob F. Mehren, Chicago, Ill., assignor to John P. Barrett, same place. Filed Feb. 7, 1893.

518,792. Duplex Arc Lamp. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Dec. 10, 1890. Renewed Oct. 16, 1891.

518,796. Safety Car-Fender. August W. Stiefel, Baltimore, Md. Filed Jan. 31, 1894.

518,800. Electric Switch. Ernst Woltmann, Chicago, Ill. Filed July 11, 1893.

518,813. Electric Switch. Warren S. Hill, Hyde Park, Mass. Filed Oct. 31, 1893.

518,877. Electric Releasing Device for Doors. Samuel H. Curwen, Salem, Mass. Filed July 12, 1893.

518,885. Tabulating System. Herman Hollerith, Washington, D. C. Filed Aug. 1, 1893.

518,886. Tabulating System. Herman Hollerith, Washington, D. C. Filed Nov. 17, 1893.

518,904. Car-Fender. Charles F. Thomas, Buckeystown, Md. Filed Dec. 28, 1893.

518,906. Automatic Device for Removing Resistance in Starting Electric Motors and Replacing Same. George H. Whittingham, Baltimore, Md., assignor to the Automatic Switch Company of Baltimore City, of Maryland. Filed Apr. 4, 1893.

518,907. Cleat for Supporting Conducting Wires for Electric Circuits. Horace B. Wyman, Slingerlands, assignor of one-half to Albert C. Goodwin, Albany, N. Y. Filed Dec. 20, 1893.

518,913. Commutator-Brush. George W. Brown, Deering, Me. Filed Nov. 15, 1893.

518 916. Telephone Transmitter. Herbert Cottrell, Newark, N. J. Filed Mar. 15, 1894.

518,926. Fender for Street-Cars. Henry F. Rooney, Randolph, Mass. Filed Sept. 12, 1893.

EXPIRED.

189,998. Electric Clocks. C. F. Brush, Cleveland, Ohio, assignor of one-half his right to the Telegraph Supply Company, same place. [Filed Aug. 28, 1876.]

189,993. Indicators for Electric Burglar-Alarms. A. Bradford, Amsterdam, N. Y. [Filed Jan. 20, 1877.]

Underground.—The Common Council of Syracuse, N. Y., will order all the telegraph, telephone, electric light, and fire alarm wires within certain limits in that city placed underground.

ELECTRICAL AGE

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NEW YORK, MAY 12, 1894.

CONTENTS.

THE PHILADELPHIA MEETING.

The programme of the general meeting of the American Institute of Electrical Engineers, to be held in Philadelphia next week, is an excellent one and well arranged. There should be a large attendance at this meeting, and in addition to the intellectual feast other good things to satisfy the physical nature will be provided at the low price of two dollars and a half per plate. Planked shad is one of the institutions of Gloucester, N. J., and, according to the programme, the members are invited to visit that institution, which invitation, no doubt, they will accept. Ample entertainment for the ladies who accompany members has been provided, and a good time all round may be expected.

AFTER THE $50,000 PRIZE.

Governor Flower, of New York, last week signed a bill passed by the legislature authorizing the State Railroad Commission to act as judges of inventions submitted in competition for the prize of $50,000 offered some months ago by the Metropolitan Traction Company, of New York, for the best method of street car propulsion by electricity, without the use of the overhead trolley. The bill also authorizes the commission to award the prize. It is stated that over 500 drawings of inventions have already been submitted, coming from all parts of the civilized world. The conditions of the offer of the prize require that the service wires shall be underground, and the system otherwise efficient, the object being mainly to adapt electric propulsion to the needs of large city street traffic, but without the overhead trolley equipment. We have lately seen several models of meritorious inventions, having the trolley wires under the surface, any one of which would seem to meet the conditions of the offer. It will therefore be a delicate duty to compare the merits of various good systems and award the prize. In this connection the system described and illustrated in this issue will be read with interest. It is not our purpose here to praise this particular system, but merely to call attention to the article describing it. The description, as furnished us, is too general to enable us to pass judgment on its merits. All we know is that the tests are said to have proved highly satisfactory, and that the system seems to answer every requirement of city street traffic. We hope the best system will get the prize.

THE BUCKEYE ELECTRIC CO. AGAIN WINS.

As we go to press we learn that Judge Ricks has rendered a decision favorable to the Buckeye Electric Company, of Cleveland, Ohio, in a second suit brought for an injunction by the General Electric Company. The details of the case had not reached us at the time of going to press.

ELECTRIC LIGHT SUIT.

The Edison Electric Light Company has brought a suit in the United States Circuit Court against the Westinghouse Electric and Manufacturing Company for alleged violation of patents granted in 1882 for the distribution and translation of electricity. The Edison Company claims royalties for the electric lights used at the World's Fair in violation of its patent rights. The Westinghouse Company has filed an answer in which it is set up that Edison had no right to the patent sued on, on the ground that the principle applied is old and well known, and was not his invention.

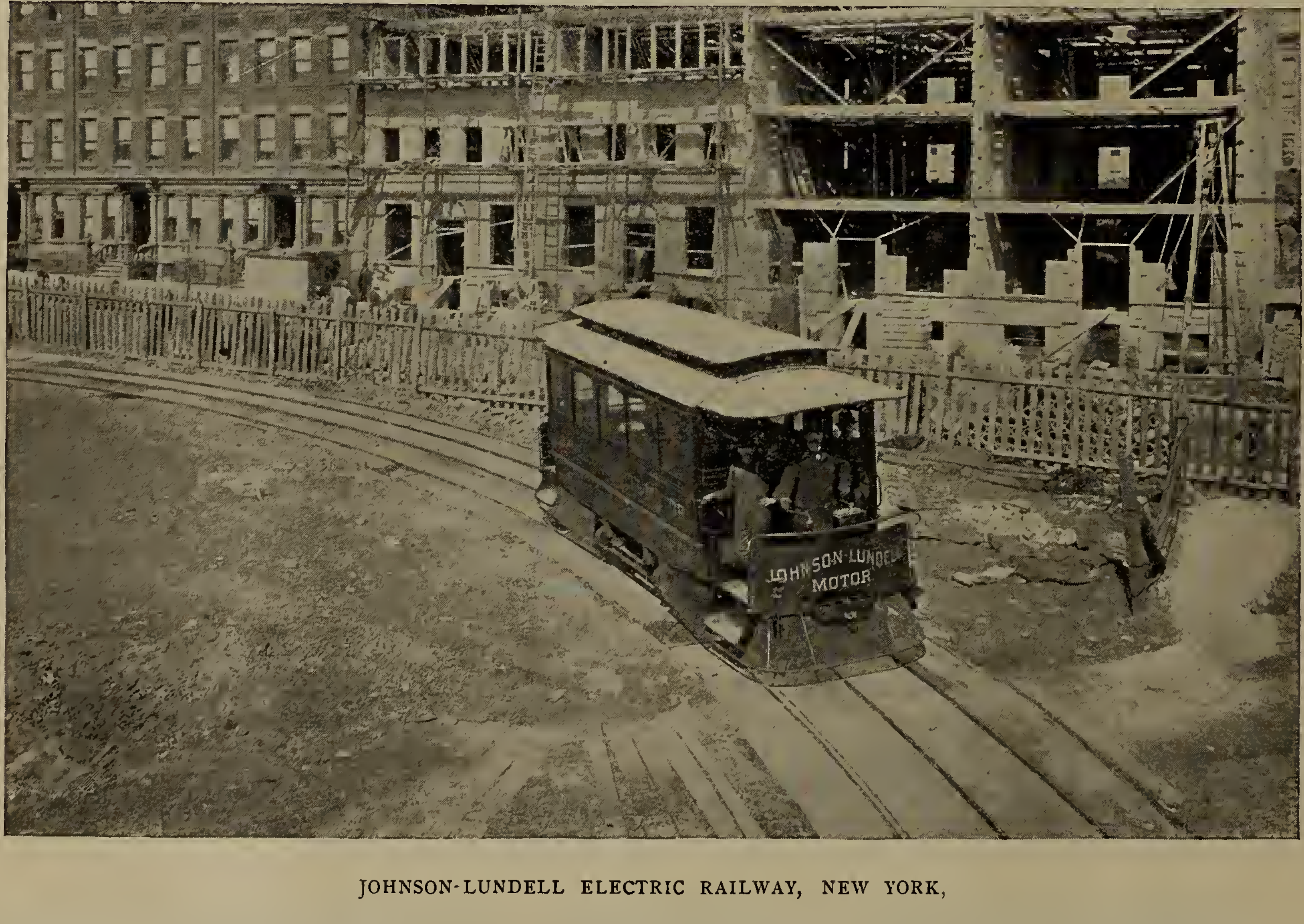
THE JOHNSON-LUNDELL ELECTRIC RAILWAY SYSTEM.

From time to time the newspaper press, technical and daily, has printed brief references to the Johnson-Lundell electric railway system, but beyond the indefinite hints thus given out, nothing authentic about the system has been obtainable until now.

We are now able to give to our readers an account of this system, which has attracted so much attention recently, and which has been thoroughly tested and brought to practical perfection on an experimental road in New York City.

The track runs around a whole city block, with stiffish grades and with difficult curves of necessarily short radius. The power-house is at the foot of the hill and at the centre of that section of the track or circuit. The generating plant comprises a vertical engine driving directly a pair of Lundell dynamos. the unit being such that it could be enlarged on exactly the same proportions up to any size for any road. Its capacity here is far beyond the need, but serves admirably to illustrate the manner in which the generating part of the Johnson-Lundell system is provided for. By means of the Interior Conduit telescopic iron tube, current is carried to the track at the proper points of feeding, and is distributed without any loss due to leakage or conduction, owing to the high insulation of the ducts. The track itself is of ordinary construction as to the rails. Between the rails it is asphalted or paved—examples of both are shown—and paralleling the rails lies a conducting bar or strip of metal embedded in the asphalt. This bar is level with the surface, and is divided up into sections with insulating blocks of stone or other material between them. Just outside the single track, or midway between the double tracks, are plain boxes with iron covers flush with the street surface. In these boxes are substantial electro-magnetic devices which deliver current to each section as the car comes along, and then lie quiet until the succeeding car rolls up. These switch-boxes are water-tight, and may be compared to automatic switchmen. Each box governs its particular sections of track. The car carries a pick-up rubbing brush which leads the current into the motor and which takes the place, or fulfils the function of the trolley pole-wheel. In fact, if a man were to stand on his head, and if paving stones were made of glass, he would see underneath a literal counterpart or reproduction of the trolley system, so far as the track itself goes. There is one great difference, however, which the eye does not reveal. The trolley system is alive throughout. This is not alive anywhere except at the point over which the car is passing. Moreover, owing to the fre-

AFTER A SNOW STORM.

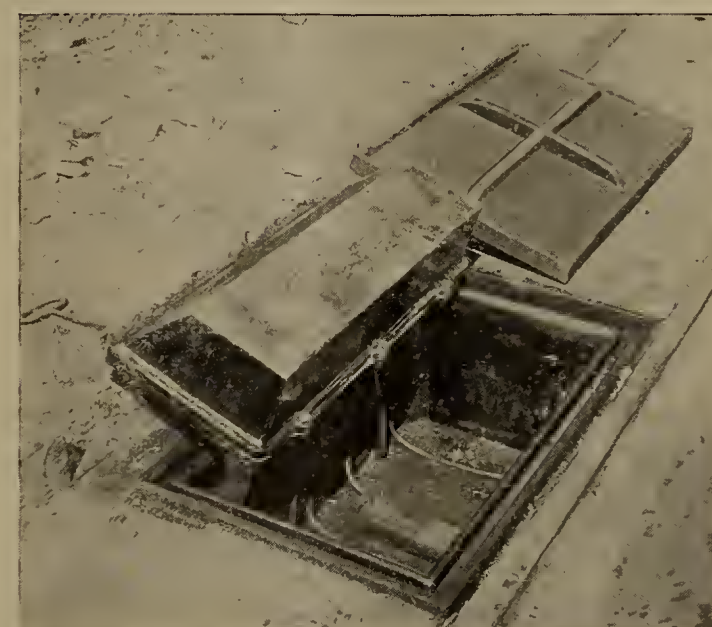


JOHNSON-LUNDELL ELECTRIC RAILWAY, NEW YORK, quent rupture of trolley wires, one is apt to get a shock from casual contact with any part of the trolley circuit. Here, the difference of potential between the two sides of the circuit between which the car moves is practically

SWITCHBOX, WITH COVER REMOVED.

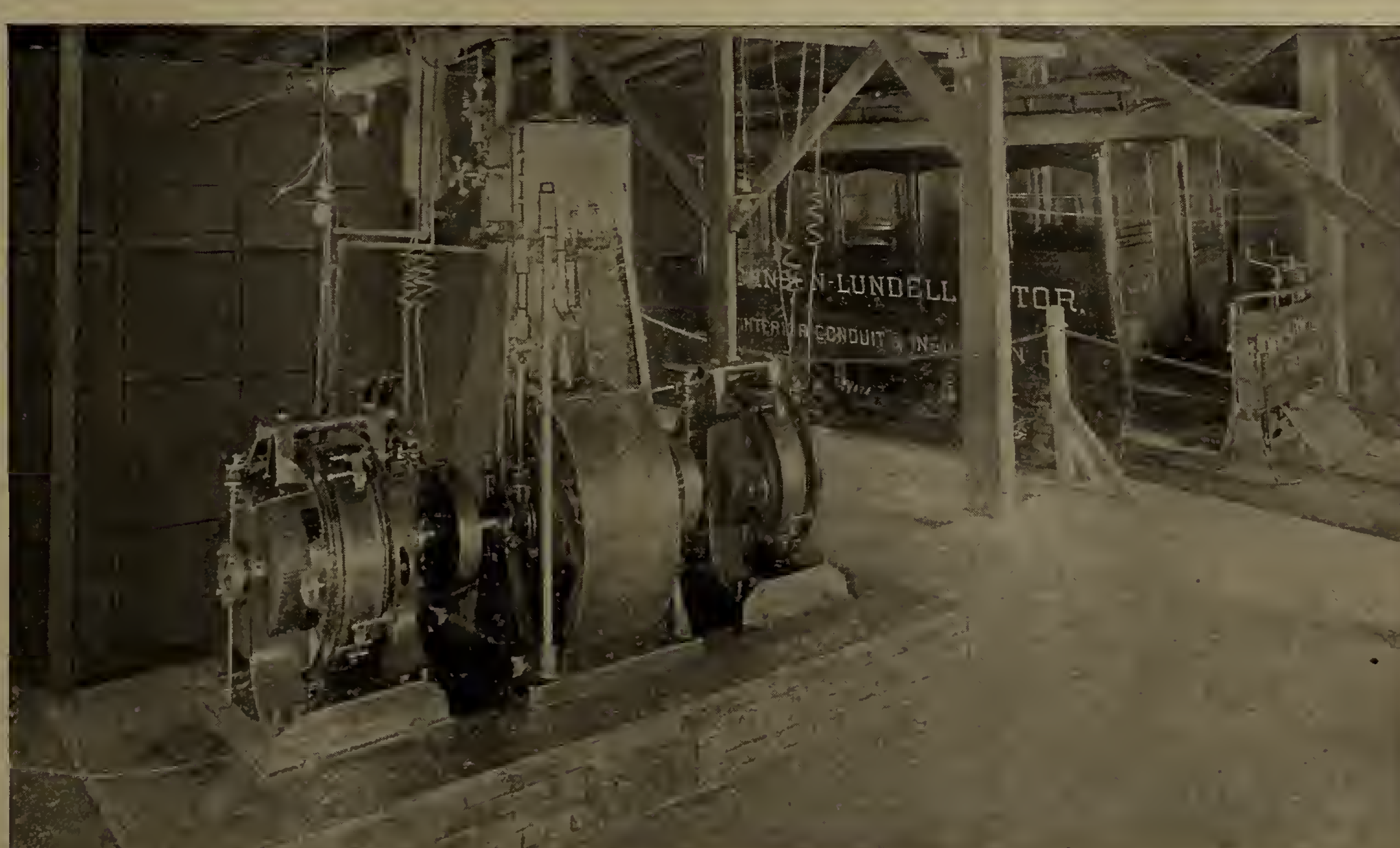
and actually *nil;* hence there is no danger to horse or passer-by.

The car has but one motor, a feature toward which all the first-class electrical inventors have been directing their energies for years. This motor is central under the car and drives on each axle by means of bevel gear, and with sprocket wheels and link chain in flexible connection with same. Its suspension is flexible, the bevels are boxed, the sprocket wheels and links mesh noiselessly; and by the intervention of a bipartite screw coil in close relation to the armature shaft, the motor, though capable of instantaneous arrest or sudden starting, never moves off or stops with a jerk. It sustains no jar, no sudden rush of current, no heavy short circuiting, no swift reversing and consequent break-down. The spring coils are a perfect buffer between it and any danger. The motor is, moreover, iron cased and protected against dirt, stones, moisture, etc.



SWITCHBOX IN POSITION FOR INSPECTION.

Underneath the car is a steel brush which gathers up the current and passes it up into the motor, the return being as usual through the rails, which are obviously harmless, as the conducting strip between them is only alive when a car is right over it. But the car is not dependent merely upon the supply of live current.



GENERATING PLANT.

Under the seats are frames holding a very simple, elementary form of lead storage battery, enough to furnish the voltage at which the motor runs—300 volts—and though with very few plates in each sell, giving considerable capacity. This is at once a combination of great value. The batteries are always in place; they need no change, practically no attention, but at a moment's notice they furnish current and can carry the car through many emergencies. The batteries play one or two parts in the internal economy of the car—"picking up the circuit" for a second when it starts; lighting the car; but their great beauty is that they render the car at once self-contained and dispense with the usual costly, complicated and troublesome wiring at crossings, switches, steam-railway tracks, etc. If the car has not sufficient headway to run over a crossing, the battery will do that, just as it will keep the car going should it be deprived of central station current, or even put on a line that is without electricity.

The advantages claimed for this system are :

1. Absolute and immediate control of the car.
2. Moderate first cost.
3. Low rate of depreciation.
4. Independence of weather conditions.

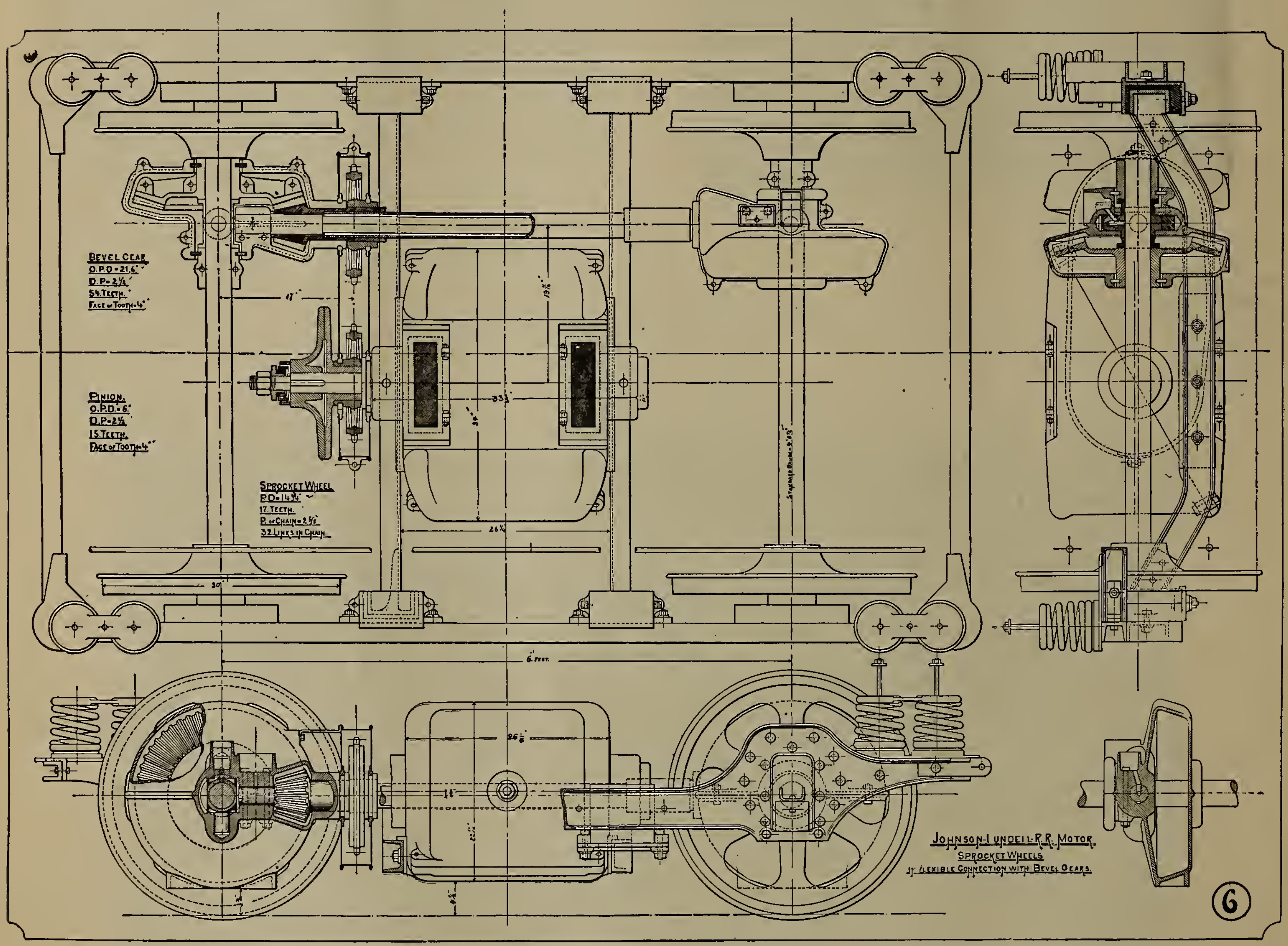


DIAGRAM OF DETAILS OF TRUCK.

5. Moderate cost of operation.
6. Independence of each car.
7. Freedom from noise.
8. Ease of adaptation and extension.

These features will be considered serially in brief :

As to the control of the car :

What is needed is that the motor shall first stop, and then reverse its direction of rotation while the car may be travelling onward. To do this there must be an interval of free elasticity, however brief, so that while there is a sequence of effect it is so gradual that nobody could tell when the moment of reversal began and nobody would know that the car had smoothly followed suit until it had come to a halt or gone backward. All this is done in the Johnson-Lundell system, not by any auxiliary apparatus but by the motor itself, so that all the motorman has to do is to pay attention to the one handle of the switch stand in front of him on the platform.

In the matter of first cost it is claimed that the Johnson-Lundell system compares more than favorably with anything that has gone before. To install it well involves a liberal expenditure, but the outlay is small compared to that for the cable system, and on practically equal terms with that of a well-built trolley road. There is no deep excavation, there are no poles to set, no overhead wires to maintain, no trolley poles and wheels to renew. The conducting strip along the track does not scrape away in any perceptible degree, and the steel brush will perhaps wear to a stub after a great many months' use. The magnet boxes have nothing to wear out except strong little contact jaws, and the iron tubes are a solid protection to the feeders. On the cars the gears are liable only to the usual wear, and to less than that, as the elastic connection prevents any grinding or stripping action. The battery is under the most favorable conditions that could well be conceived. In the work of the past, what has ruined the batteries has been the sudden, heavy drains on them, incessantly repeated during the run Here they get no strain, and little work, but when their opportunity presents itself, they are always fresh and ready. Besides, the use of but a few plates in the batteries on these cars greatly simplifies the conditions of their care. Another feature is that each car has its single set of batteries and does not have two or three other relay sets lying around a large central power-house to be charged, occupying time and space and attention. What charging these batteries get is given them out on the road while the car is at work.

Low rate of depreciation. The line renewal, in the Johnson-Lundell system becomes as insignificant as it does in underground conduits generally, where today the *rental* and not the *renewal* is the only item that is thought of. As for the motors, they are no longer subject to rapid depreciation, having between them and the evils they have been liable to a method of resilient gearing that cushions them against any abrupt action or onslaught, and whose presence at once absolves from the readjustment of mechanical parts, the use of levers, the renewal of brake shoes, etc. Although it is claimed, without fear of successful contradiction, that the Johnson-Lundell system has reduced depreciation in the track and rolling stock of a street railway service to its lowest terms.

That the system is independent of weather conditions is emphasized by the fact that it was tested during the winter of 1893–94, which was wet, with rapid fluctations, yet the Johnson-Lundell car ran through it all very satisfactorily, and apparently the better when the days were wettest.

As regards cost of operation. The Johnson-Lundell storage battery system does not need the attention of an expert, hence a great item of labor is saved. Another economy is of course in the absence of well-manned construction and repair gangs patrolling the lines, fixing up breaks in the overhead circuit, etc. A further economy arises from the fact that each car has but one motor. In the Johnson-Lundell car, the motor does not start up from dead rest with all its load to be lifted at once. Owing to its peculiar mounting and gearing it does not grapple with the task like an untrained young car horse, almost killing itself in a few wild efforts to get right away, but like the disciplined veteran coming up to the full effort required, by easy, imperceptible degrees. The result is that the motor starts the car with but a normal supply of current, and hence both the horse-power of the motor is less and the weight of the motor is less; while the current as well as the generating plant in the power house are less. It follows again that the attendance necessary in the power house is greatly minimized and economized.

As a matter of fact, the special winding of the motor under this car gives it all the flexibility of two motors, as its coils when thrown into series and into parallel by means of a new form of series parallel-controller accomplish all that has been aimed at in that device through its various modifications; although it is only now that the drawbacks are avoided of having to consider and deal with two mechanisms. The advantages of both the series and the parallel groupings are here, without the certainty as to one motor possibly working against the other or of an unbalanced condition steadily wasteful of energy. It is obviously also more economical to vary the conditions of speed and current in one motor than in two. The statement has been made that the introduction of the series parallel controller on the old style two-motor cars has resulted in an increase of 15 per cent. in efficiency, and with corresponding reduction of current consumed. The gain in this system can be inferred when the same ends are reached not with two single motors of 25-h. p. each, but with one motor of but 35-h. p.

It is obvious that by giving every car a reserve of power, it becomes at once an independent unit, and with all that the phrase signifies in gain of safety, flexibility, freedom from blockade, readiness of redistribution of cars along the line, ability to meet an emergency —everything that the car dependent solely on central station current lacks.

Except for the presence of the little central strip between the ordinary street car rails, nobody would ever know that an electric system had been introduced. Evidently such a system is not only easy of adoption or adaptation but one that can readily be extended. The Johnson-Lundell car is never cut off from motive power and best shows its advantages when the emergency is greatest. For this reason it is claimed that there is nothing to compare with it in meeting the varying requirements of urban and rural or suburban conditions at one and the same time.

ELECTROLYSIS OF UNDERGROUND PIPES.

At the 10th annual meeting of the Ohio Gas Light Association, which was held in Columbus, Ohio, on March 21 and 22 last, the question "What is the best method of preventing wrought iron service-pipes from being destroyed by the single trolley system of electric railroads," was asked and discussed.

A member from Dayton, Ohio, exhibited a sample of gas service-pipe taken from the streets of that place, and showing the effects of electrolysis.

Mr. Faben thought that the best method to overcome the trouble would be to "double the trolley."

Mr. Kelly, Superintendent of the Columbus Street Railway Company, made some remarks on the subject. He said the best way to avoid the difficulty was to weld the rail continuously.

"That will undoubtedly prevent it," said he. "That experiment was tried last year in Cambridge, Mass., and they are so pleased with the prospect of obviating this difficulty that many miles of rail will be welded in St. Louis this year. I cannot agree with Mr. Faben about adopting the double trolley instead of the single trolley system, because that introduces complications we do not care to encounter. The difficulties we have met thus far are in trying to use the old horse car rails, which are loose on their chairs and have loose splice-bars, so that the bonds are frequently broken. This necessarily produces a high resistance, and as the current always takes the easiest path, it necessarily follows gas and water-pipes. I think the matter is being very carefully considered by the street railway people. They are highly interested in it, and within a few years we will be able to give you relief; but that does not afford present relief, where the current returns to the station by the easiest route through your pipes."

In answer to a question as to whether the earth between the rails and the pipes would be sufficient to insulate the current, provided the rails had ample carrying capacity, Mr. Kelly said:

"Let me mention an occurrence of last year, which was an expensive matter to us. Our feed wires were broken down and as far as possible we had to do without them. We ran our overhead or positive feed wire and cut off these feeders and attached them to the car wheels. We presume the current would distribute itself through the earth and return to the station, because we were also grounded at the station. It seems, however, that the great majority of that current was passing through a 2-inch water-pipe that enters the station. In that water-pipe was a lead gasket, and the pipe was melted off. I was not in the city at that time, but my assistant was a good deal puzzled about it. The station was running all right, but the cars could not move. After a while they found there was a gap of not over 1-16th of an inch; there was not enough current returning through the ground to move the cars, but as soon as they ran a temporary feed line the cars began to move. The great proportion of the current was returned through these feed lines and not through the earth."

The President—Mr. Kelly, why is it that some gas companies and water departments, in some towns having an electric trolley system, suffer in this respect and others do not? Why are we exempt here from this difficulty?

Mr. Kelly—Well, I think that is due somewhat to the character of the soil. I know that is particularly the case in New England, where the earth is often saturated with salt water. There electrolysis takes place rapidly, and attacks gas and water-pipes much faster than here. I think we have a very good return here to the station. We have four very good feed wires attached to the tracks at Spring and High streets, so we do not depend upon the ground.

Mr. Gwynn—A paper read before the National Electric Light Association in Washington brought that question up, and it was attributed, to a great extent, to the heavy traffic on a great many roads. In a city where they have a light traffic they have less of it than where they have a heavy traffic.

Mr. Kelly—We are peculiarly situated as regards that. Our power station is about half a mile west of any of our tracks, and all the lines of the city converge on High street, so that the entire carrying capacity of all lines run through the wires of the High street line, so that all the current on our system being used at any time comes on the wires on High street and returns to the station through these feed lines, together with what goes through the earth, and not through the mains. I have not heard of any current being carried through the mains in this system.

THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

ELEVENTH ANNUAL MEETING, PHILADELPHIA.

The eleventh annual and general meeting of the above named association will take place in Philadelphia on May 15, 16, 17 and 18. The following is the preliminary programme.

The Annual Meeting of the Institute will be held at the house of the Engineers' Club, 1122 Girard Street, Philadelphia, at 10 A. M., Tuesday, May 15. Mayor Stuart, of Philadelphia, will deliver an address of welcome to the Institute. At this meeting the yearly reports will be submitted, officers elected, and other business transacted, including action on a resolution favoring legalization of the units adopted at the Chicago Electrical Congress.

The opening session of the General Meeting for the reading and discussion of Papers and Reports will begin at 2 P. M., Tuesday, May 15, at 1122 Girard Street.

1. "*A Review of the Progress of the American Institute of Electrical Engineers.*"

An address by the President, Prof. Edwin J. Houston, of Philadelphia.

2. "*On Light Distribution and the Use of Lamps,*" by Prof. Wm A. Anthony, of Vineland, N. J.

3. "*Discriminating Lightning Arresters and Recent Progress in Means for Protection against Lightning,*" by Alexander J. Wurts, of Pittsburgh. Experimental demonstrations will be shown through the courtesy of the Philadelphia Traction Co.

A reception will be given in the evening by the Engineers and Manufacturers of Philadelphia, under the auspices of the "Engineers' Club" and the "Electrical Section of the Franklin Institute."

A theatre party for the ladies will also be organized in the evening.

WEDNESDAY, MAY 16.

Morning Session, 10 o'clock.

4. "*Central Station Economy,*" by Mr. C. Reginald Van Trump, of Wilmington, Del.

5. "*Unipolar Dynamos for Electric Light and Power,*" by Prof. Francis B. Crocker, and Mr. C. Howard Parmly of New York City.

6. "*Relative Advantages of Toothed and Smooth Core Armatures,*" by Mr. Alton D. Adams, of Worcester, Mass.

INTERMISSION.

Afternoon Session, 2 o'clock.

7. "*Test for Closed Coil Arc Dynamo,*" by Prof. R. B. Owens, of Lincoln, Neb.

8. "*Alternating Currents and Fuse Wires,*" by Prof. Dugald C. Jackson and Mr. R. J. Ochsner, of Madison, Wis.

9. "*Some Storage Battery Phenomena,*" by Mr. W. W. Griscom, of Haverford, Pa.

In the evening the Annual Dinner will be served at the Hotel Metropole, the price of which has been fixed at $2.50 per plate. This will be a purely social gathering Friends may be invited.

THURSDAY, MAY 17.

Morning Session, 10 o'clock.

10. "*The Waste of Zinc in Open Circuit Batteries when Standing Idle,*" by Mr. Henry A. Lardner, of Madison, Wis.

11. "*Standardizing Electrical Measuring Instruments: (a.) by the Potentiometer Method; (b.) an Improved Direct Reading Potentiometer,*" by Mr. Elmer G. Willyoung, of Philadelphia.

Thursday afternoon will be devoted to an inspection of Cramp's Shipyard followed by an excursion down the river to Gloucester, where a shad dinner will be served.

While the members are visiting the shipyard Thursday afternoon, the Manufacturers' Club will entertain the ladies at the club-house, followed by a "tally-ho excursion" to points of interest in and about the city.

FRIDAY, MAY 18.

Morning Session, 10 o'clock.

12. "*Resonance Analysis of Alternating and Polyphase Currents,*" by Prof. M. I. Pupin, of New York City.

13. "*Some Facts about Polyphase Motors,*" by Dr. Louis Bell, of Boston.

14. "*The Law of Hysteresis (Part 3.) and the Calculation of Ferric Inductances.*" by Mr. Charles Proteus Steinmetz, of Schenectady, N. Y.

15. "*Experiments with Two-Phase Motors,*" by Dr. Louis Duncan, of Baltimore.

ADJOURNMENT.

In addition to the facilities kindly offered by the Engineers' Club, invitations have been extended to members of the Institute, to avail themselves of the privileges of the Franklin Institute and the Schuylkill Navy Athletic Club.

Members and ladies are invited to visit various places, including the new Power Station of the Philadelphia Traction Co., the Edison Electric Light Station, factory of Chloride Accumulator Co., plant of Germantown Electric Light Co. (with large storage battery plant), etc., etc.

Hotel arrangements may be made by addressing Mr. C. W. Pike, Chairman Sub-Committee on Hotels, care of Queen & Co.

FINANCIAL.—The Western Telephone Construction Company, Chicago, Ill., will increase its capital stock from $100,000 to $300,000, and will also increase its board of directors from four to seven.

ELECTRICAL OSCILLATIONS.*

BY NEWTON HARRISON, E. E.

(*Continued from page* 209.)

It is here that I will dilate somewhat upon the power of prediction contained in a mathematical expression. Let a condenser be discharged through a circuit of large resistance. The strength of the instantaneous current in the resistance coil can be measured, also the time. The discharge, if graphically represented, would show an unidirectional and continuous discharge.

Let this same condenser discharge, however, occur through a very small resistance, we then have a discharge that is both periodic and alternate, with the maxima gradually diminishing in geometric progression.

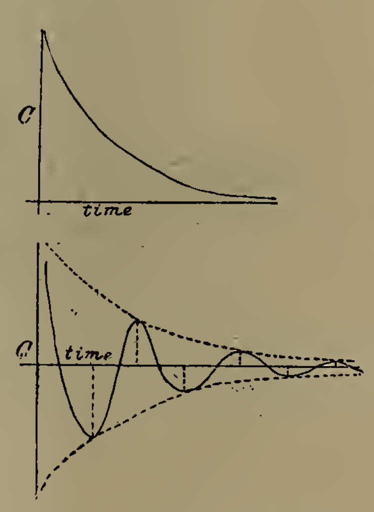
These experiments have been performed and can easily be repeated. How, then, can we predict a discharge of this nature, continuous in one case and oscillatory in the other, by mere mathematics? If we examine the resulting equation which a proper treatment of the above problem would produce, an expression is deduced which in plain language contains two answers.

If in one of these answers the resistance is considered as large, we obtain an equation of exponential form. And a curve drawn according to the equation would have exactly the form of one deduced by the experiment previously spoken of, namely, the discharge of a condenser through a large resistance. On the other

Two solutions:

$R < \sqrt{\frac{4\,L}{C}}$, greater

$R > \sqrt{\frac{4\,L}{C}}$, less



hand, if we place R of small value in the remaining answer, an equation containing trigonometric quantities is evolved. This equation is a symbolic statement and contains the data wherewith we may construct a curve perfectly similar to the one obtained by experiment. Its trigonometric values, or sine and cosine terms, indicate a periodically changing discharge, decreasing by a series of oscillations in which the charge in the condenser is first positive and then negative, but at the same time continually decreasing—in other words, a diminishing oscillatory discharge.

$$q = e^{at}\,(P \cos \beta t + P^1 \sin \beta t)$$

where P and P^1 are constants.

General result:

$$\frac{d^2\,q}{d\,t^2} + \frac{R}{L}\,\frac{d\,q}{d\,t} + \frac{1}{L\,C}\,q = 0$$

This, then, is the manner in which the mathematical treatment of a problem will enable us to predict results and verify them by actual experiments.

We can also, by this last treatment, obtain a method by which we can calculate the time

$$T = \frac{2\,\pi}{\sqrt{\frac{1}{L\,C} - \frac{R^2}{4\,L^2}}}$$

of a complete oscillation or the value the resistance must have to make the discharge oscillatory or non-oscillatory; likewise the number of oscillations or frequency per second can be obtained with perfect accuracy.

The above predictions have been confirmed by various authorities in an experimental manner. Feddersen, Paalzow, Helmholtz and Rood have applied the Wheatstone mirror to their investigations. This is a mirror shaped like a triangular prism, supported on horizontal axes and revolved at a high rate of speed. The spark is observed in its different stages on the rapidly moving faces of the mirror through a telescope.

Paalzow sent a discharge through a vacuum tube and resistance coil before a revolving mirror. Feddersen let the discharge occur in air, and with a high resistance noticed only a band of light at right angles to the discharge, with the results, as previously stated, of obtaining strips of light with a decreased resistance.

Paalzow noted a bluish light at both poles of his tube when the resistance was small. With increased resistance the light remained at only one pole.

A magnet brought near the tube in the first case caused the bluish light to split up into two lines of light; showing the flow of currents in opposite directions.

When the magnet was used with increased resistance the blue light at one pole was unaffected; hence the flow was continuous or undirectional. The deductions drawn from this experiment are obvious. An oscillatory and alternate discharge will occur with a low resistance and a gradually decreasing discharge of one direction observed with a high resistance.

Lord Ra'eigh compared a pendulum swinging in treacle to a Leyden jar discharge. Dr. Lodge created another mechanical analogue to the Leyden jar, as follows:

He considered a loaded spring compressed in a resisting medium and unaffected by gravity. The elasticity is comparable to the capacity of the condenser and its displacement to the charge. The load or inertia corresponds to the self-induction of the circuit and the viscosity of the fluid or medium to the resistance. If this mechanical illustration be symbolically considered we can obtain all the condenser equations as though the two were identical.

To make such a spring dead beat the requisite relations must exist between the strength of the spring, the mass of its load, and the fluid or viscosity resistance of the medium.

Mouton found with a commutated primary circuit and a secondary circuit whose potential difference occurred one-four-millionth of a second after rupture of the primary. The first semi-oscillation had a duration of 110 millionths of a second and those succeeding about 77 millionths.

I have now produced enough facts to prove conclusively the existence of these waves of electricity and the almost inconceivable rapidity with which they surge back and forth in a conductor. Let us now see what part the condenser plays in an induction coil. Fizeau first indicated its use as a means of raising the E. M. F. of an induction coil.

It is a common fact that the condenser has enabled us to produce, in Rhumkorf coils, electromotive forces of enormous values. All the phenomena of a tremendous lightning discharge can be effected and the potential difference across the secondary appears to be doubled by the intervention of a condenser in the break circuit of the primary. (*To be continued.*)

The Electric Traction Co., of Philadelphia, has decided to increase its capital stock from $2,500,000 to $8,750,000 for the purpose of equipping its lines with electricity, and making other necessary improvements.

THE KINSMAN DESK LIGHT.

The Kinsman Desk Light, which was described and illustrated in a recent issue of the Electrical Age, has been so well received that the manufacturing company is enjoying a large trade in the same. The device referred to was designed for roll-top desks, and its use was, therefore, to a certain extent limited. In order to meet the demand for shades of this style for other than desk purposes, two new designs have been produced. These are portable standards for flat desks, tables, etc., and are illustrated herewith.

Fig. 1 shows the Kinsman light shade, which is of neat design and finished handsomely in nickel, and Fig. 2 shows the same light on a standard of plainer

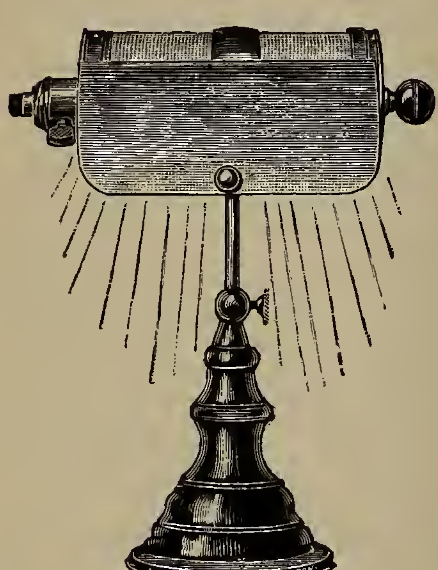


FIG. 1.

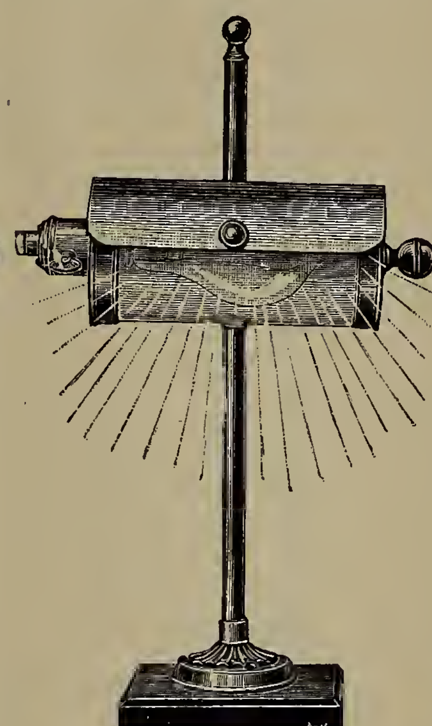


FIG. 2.

design, but in every way as convenient as that shown in Fig. 1. In either case the light can be elevated or lowered as desired.

In Fig. 1 the eye shade is down, which throws the rays of light directly underneath, and in Fig. 2 the eye shade is rolled up, allowing the rays to diverge horizontally or perpendicularly.

The glass cylinders of these lights are revolvable, two-thirds of the glass being ground and one-third clear, the object being to modify the light on the work.

These standard desk lights are fitted with any style of sockets as required, and made by McLeod, Ward & Co., 91 Liberty st., New York city.

Facts vs. Fancies.—Our western contemporary, the *Western Electrician*, has issued a little pamphlet entitled "Facts vs. Fancies," the object of which is to emphasize the fact that it is the most prominent electrical paper in the West. The pamphlet is gotten up in very neat form, and reflects very creditably on our contemporary's enterprise. A curious fact is revealed in a map showing the territory in which our contemporary circulates. This territory is indicated by heavy shading, and, strange to say, the location of the city of Chicago is shown as a blank space amid the surrounding darkness. This would imply that the paper does not circulate at home, but must go into other territory to find honor. How is that, brother Kreidler?

PERSONAL.

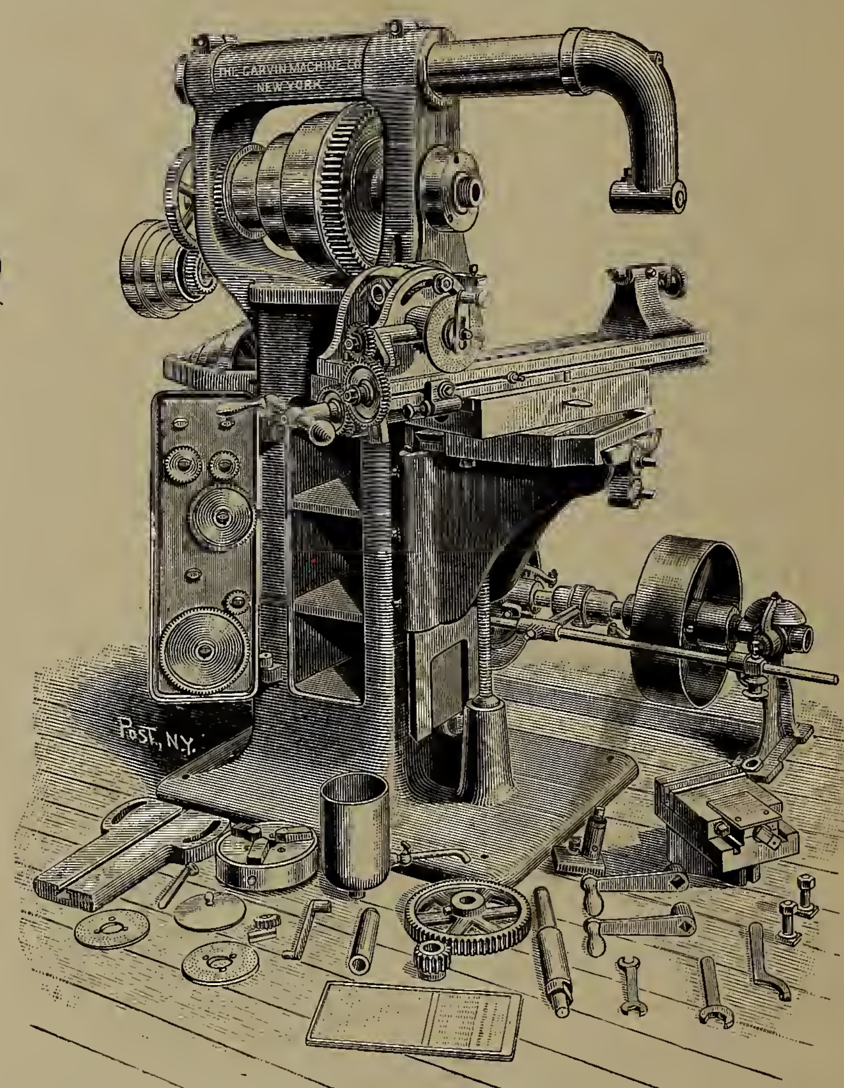
Mr. Albert W. Gilbert, Hartford, Conn., has been appointed city electrician by the Board of Street Commissioners of that city. Mr. Gilbert is an experienced electrician and a man of decided ability.

UNIVERSAL MILLING MACHINE.

Manufacturers of electrical apparatus, and machinists in general, will be interested in a description of the No. 2 Universal Milling Machine, made by the Garvin Machine Co., Laight and Canal Streets, New York City.

The accompanying illustration shows the machine complete and in considerable detail. The machine is designed for heavier work than the No. 1 machine made by the same company, and for this reason is constructed in a stronger manner.

The overhanging arm is clamped over both bearings, and can be readily removed. The outer end of the arm is provided with a cylindrical bearing for the arbor. The spindle is of steel, with front bearing tapered. Both



UNIVERSAL MILLING MACHINE.

journals are accurately fitted, and run in bronze boxes, and are provided with self-oiling devices and means for taking up wear. The front end is threaded for a universal chuck, which is interchangeable with the spiral head, and the rear end carries the feed cone.

The table is wide and long, and has lateral and vertical adjustments to thousandths of an inch. It can be swiveled 45° either way from a straight position on the graduated base.

The feed mechanism is attached to the swivelling block, is self-adjusting and allows the table to operate by power with perfect freedom at any angle, up to 45° either way. It trips automatically at any point, with the table running either way.

The feed gears are so arranged as to give 12 changes, and means are provided for easily reversing the feed. The gearing is designed to cut a large number of spirals of even pitch, and the manner of adjusting is very convenient. The spiral head can be set at any angle in line with the main spindle.

The principal dimensions of the Universal Milling Machine are in length, 34 inches; length of automatic feed, 21 inches; vertical range, 23 inches; swing of centres, 10¼ inches; distance between centres, 20 inches; weight, about 1,950 lbs.

STREET RAILWAY NEWS.

IMPORTANT ELECTRIC RAILWAY DECISION.

Judge Townsend of the United States Circuit Court in New Haven, Conn., on May 3, rendered a decision in the case of the Electric Railway Company of the United States against the Jamaica and Brooklyn Railroad Company. It is in favor of the General Electric Company. The decision is on a final hearing on a bill in equity, alleging infringement of letters-patent granted to Stephen D. Field, July 16, 1889, for improvements in electric railways and assigned to the complainant.

The evidence of infringement, as stated in the decision, applies to the combination of a stationary dynamo-electric generator driven by a suitable motor and circuit of motors, composed in part of an insulated or detached section of the line of rails of the railway track and the electro-magnetic motor mounted on a wheeled vehicle and used for propelling the s me, and included in a circuit of conductors; also a current-controlling device placed upon such vehicles. The defence was a denial of infringement, anticipation by prior patents, publication, and prior inventions.

Judge Townsend states that the complaint admits that every element in the invention existed in art before the combination was made, and he finds that there was a question in the Patent Office in 1879 as to whether patents could be granted to Field, because of a prior patent, known as the Clark, which embodied the same principle.

The suit is said to have been the most important that has yet been tried in any court, as it involves the entire electric railroad systems of the country, and the patent is on the first principle. The plaintiffs, who represent the Field interest, have been non-suited, and Judge Townsend has ordered a decree dismissing the bill. While the defendants are nominally the Brooklyn company, the case was defended by the General Electric Company. Had the decision been in favor of plaintiff it is said they would have controlled the entire electric railroad interests of the United States.

THE PHILADELPHIA AND NEW YORK ELECTRIC RAILWAY.

The organization of the "Central Jersey Traction Company," which was briefly referred to in a recent issue of THE ELECTRICAL AGE, has been completed, with headquarters at No. 2 Wall street, New York City. This company proposes to build an electric railroad between New York and Philadelphia, which project is said to be the largest and most important electric railway yet planned. At the same time it is a most practicable and feasible scheme. It will be a double track road.

The following facts of interest regarding this gigantic undertaking are supplied in the May number of our contemporary, *Transportation*.

The officers and directors elected are Hon. Frank A. Magowan of Trenton, president; ex-Sheriff E. W. Hine of Newark, vice-president; J. H. Baldwin of Newark, secretary; James H. Darrah of Trenton, treasurer; George G. Crosby of New York, J. H. Tingley of Rahway, and Joseph H. Reall of Bloomfield, N. J., directors. A charter will at once be secured in Pennsylvania for the line between Trenton and Philadelphia, via Bristol, Holmesburg and Frankford, probably connecting with the proposed electric railway at the latter point, well within the city limits, to Ninth and Market streets. This line will connect the Consolidated Traction Company's roads in Jersey City and Newark with the Philadelphia Traction Company's lines in Philadelphia, both of these roads being controlled by the same interests.

The plan is not only to construct a through line of electric railway to connect the principal points in the State of New Jersey with each other, and with New York and Philadelphia, but to consolidate the local lines in different places into one system. These lines embrace about seventy miles of paying roads, outside of Jersey City and Newark.

The company just organized has the right to increase the capital stock to $10,000,000. This sum, it is figured, will build the entire system of roads laid out, embracing some 150 miles of line, and secure the local roads referred to, while it is shown that ten per cent. will be earned on the capitalization from the beginning.

The line of road commences at Paterson, New Jersey, where connections will be made with the electric street railway system of that city. After leaving Paterson the road will pass through Upper Montclair, Montclair, Bloomfield, Orange, East Orange, West Orange, South Orange, Maplewood, Wyoming, Springfield, Westfield, Millburn, Fanwood and Netherwood, to a connection with the present electric railway system in the City of Plainfield; thence through Plainfield to Dunellen and Bound Brook; crossing the track of the New Jersey Central Railroad at Finderne, the road will continue past Hillsboro Station, on the Lehigh Valley Railroad, and Weston Station, on the Philadelphia & Reading Railroad, and through Millstone, Rocky Hill, Kingston, Princeton, Lawrenceville and Trenton. Branches of the line will run from Bound Brook to New Brunswick, Somerville and Raritan, from Bloomfield to Caldwell and Irvington, and to Morristown via Chatham and Madison. At Irvington connections will be made with the existing lines of the Consolidated Traction Company, making a direct route to Newark and Jersey City from North New Jersey. From Westfield the road will be built to the City of Rahway, connecting there with the electric railway now being constructed through Woodbridge to Lebanon and Boynton's Beach, with a spur from Woodbridge to Perth Amboy. Another branch will be built from the present system in Rahway to Elizabeth, connecting there with the Consolidated Company's system; also a branch from Bound Brook to the City of New Brunswick, connecting there with the present street-passenger railway.

From Trenton the company will build to Philadelphia, passing through Morrisville, Tullytown, Bristol, Cornwall, Torresdale, Tacony, Holmesburg, Frankford, and connecting there with existing lines to Philadelphia city proper. It will also connect at Trenton with a line to be built on the east side of the Delaware to Camden, running almost parallel with the tracks of the Amboy Division, Pennsylvania Railroad, passing through and connecting the towns of Bordentown, Edgewater Park, Beverly, Riverton, Palmyra, and into Camden by existing lines, with probable branches to Merchantville, Moorestown and Mount Holly.

The main line and branches as projected comprise in all over 150 miles of electric railway. It is the p rpose to build the road in sections, so that portions may be placed in operation as speedily as possible.

This system of electric roads will connect with the principal steam roads of the State, and afford facilities for travelling from one station to another on the road it crosses.

The road will be laid with seventy and ninety-pound steel rails and equipped with thirty-four feet double motor cars of thirty horse-power each. The speed will be eight to ten miles per hour in cities and towns, and twenty-five to thirty in the country. The cars will be run from fifteen minutes to one hour headway, according to the amount of traffic, and when the business demands it, five minutes headway. Five electric power plants, with 1,000 horse-power each, will be located at Trenton, Rocky Hill, Bound Brook, Westfield and Orange, and at points on the branch lines, as necessity may require.

Engineers' reports, based on careful examination, show that the road can be built and equipped in first-class manner at a reasonable cost, and that the immediate traffic will pay the interest on its bonds and a dividend upon its capital stock. There are sections that will tax the equipment to carry the traffic, and that will earn enough to pay interest and dividends on double the number of miles contemplated.

The road will cross over or under all through steam roads except two, thus obviating expensive and dangerous crossings.

THE NEW YORK—WASHINGTON ELECTRIC ROAD.

Fresh interest has been awakened in this project through the consideration of the subject by a Congressional Committee, for the purpose of guiding them in their consideration of the petition for a charter.

Referring to the subject the *Manufacturers' Record* of Baltimore, says:

"Recent deals seem to indicate a change in the original plans for the boulevard and electric railroad between Baltimore and Washington. The Widener-Elkins syndicate, of Philadelphia, which is promoting the enterprise, secured a charter for the line from the Maryland legislature in 1892. This charter, however, did not give sufficient latitude to the company. An unsuccessful attempt was made at the 1894 session of the legislature to so amend the charter as to strike out objectionable and restrictive clauses, giving the company a freer scope. However, at this session a charter was granted to the Baltimore & Columbia Railroad Co. to build a railroad from Washington and Baltimore to the Pennsylvania State line. Stephen Gambrill, one of the corporators named in the original charter given the Widener-Elkins syndicate, is mentioned as one of the charter members of this corporation. This charter is very elastic in its provisions, permitting the building of either an electric or steam road, with a wide section of territory opened to its ramifications. It now appears that the Widener-Elkins people have secured this charter and will build a line between Baltimore and Washington under its privileges. Some interesting speculation is prompted by such a happening. It is intimated that the company will drop the boulevard feature, and it is suggested that it could also, if desired, avail itself of the privilege to build a steam road instead of an electric road, making three steam roads between the Monumental City and the nation's capital. The authority to build to the Pennsylvania State line, it is ventured, may mean the Maryland link in the great electric railway project between New York and Philadelphia, or, tersely stated, an electrical railroad from Washington to New York."

Fire—The power house of the Royal Electric Light Co., Montreal, was burned on the night of May 1. While the fire was at its height, an immense fly-wheel in the station burst, one piece weighing nearly a ton going through the roof and falling into the crowded street. No one was hurt, however. The station, pattern house and a number of small buildings were destroyed. The loss, which is $100,000, is covered by insurance.

THE GREENFIELD AUTOMATIC FASTENER.

In every business the filing of documents, bills and other commercial papers and records is a matter of the utmost importance. Various devices have been brought out for the purpose, but one of the simplest and most satisfactory of the kind is the Greenfield Automatic Fastener, which is described and illustrated herewith.

This machine is very simply constructed and rapid in its work, and it is claimed by the manufacturers that it is superior to all other similar devices now on the market. It is said to be the only automatic portable machine capable of performing this work, and is many times more rapid than others in its operation.

In one operation the wire is unrolled from the spool, placed in position, measured and cut the required length, formed into a staple, driven through the leaves of paper to be fastened, and neatly and securely clinched. It has been thoroughly tested and its merits proved satisfactorily.

GREENFIELD AUTOMATIC FASTENER.

One great advantage of this machine is that it is always ready for use, thus saving much time looking for pins, punching holes in paper, etc. It is such a valuable and convenient little instrument that it is rapidly coming into favor among business men, and is even taking the place of the old pin.

This fastener is the invention of Mr. E. T. Greenfield, of the Interior Conduit and Insulation Company of New York city, and is manufactured and sold by the Greenfield Automatic Fastener Company, 42 and 44 Broad street, of which company Mr. Edward W. Bender is selling agent.

These fasteners are meeting with large favor among the electrical trade, Mr. Bender having received orders for 1,000 of them from the American Electrical Supply Company of Buffalo, N. Y., and an order for 1,500 from Pettengill, Andrews Company, Boston, Mass. The machine is so efficient and cheap that it sells on sight.

The Rose Polytechnic Institute, an advertisement of which appears in this issue of the Electrical Age, is one of our leading engineering colleges, and is especially fortunate in its thoroughly modern equipment and plan of instruction. It lays a 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 laboratories and exceptionally complete outfit, especially in electricity.

POSSIBLE CONTRACTS.

A company has been organized to construct an electric railway between Washington and Manassas, Va.

The Alton Electric Street Railway Company, Alton, Ill., is about to construct ten miles of road, to be operated by electricity.

The City Suburban Traction Company, Dearborn, Mich., has been granted a franchise to construct and operate an electric railroad.

A company has been formed in Towanda, Pa., to build an electric railroad between Towanda and Wellsborough.

A company is being formed in Phillipsburg, Pa., to build an electric railway through that place to Bellefonte and other towns.

W. T. McCoy and W. M. McKnight, of Short Creek, Ala., propose to establish an electric light plant in that place.

The Gettysburg Electric Railroad Company, Gettysburg, Pa., will extend its lines to Emmitsburg and thence south to Frederick.

The Marlboro Electric Street Railway Company, Marlboro, Mass., has voted to increase its capital stock to pay for extending the line to Hudson.

The project of building an electric road from Westerly to Watch Hill, R. I., is again being agitated. Messrs. Shaw of Watch Hill are interested.

A company is to be incorporated to build an electric road from Cleveland to Lorain. The incorporators are James Parmalee, W. H. Lawrence, and F. Wayland Brown, of Cleveland, and C. A. Sturtevant of Lorain.

An electric light plant is to be added to the ice plant of King Brothers, Rogers, Ark.

It is probable that an electric light plant will be erected in Athens, Ga., costing about, $15,000.

The Brush Electric Light & Power Company, of Savannah, Ga., proposes to increase its plant at a cost of $50,000.

It is reported that an electric light plant will be erected in Gaithersburg, Md.

The Cumberland Bell Telephone Company, Louisville, Ky., intends to extend its line to Nashville.

The Biloxi Electric Light Company, Biloxi, Miss., it is stated, intends to erect a telephone exchange.

An electric power plant is to be installed in the Howard flour mills, Belair, Md. The company operating the mills is the Henry Record Manufacturing Company.

An electric light plant is to be established in Crisfield, Md.

The construction of an electric light plant in Forsyth, Ga., is under consideration. R. G. Anderson, city clerk, can give further information.

Contracts are soon to be let for the construction of the Pikeville, Reistertown & Emory Grove Electric Railroad, Baltimore, Md.; also a power house for the same. The road is to be 10½ miles long.

The Raleigh Street Railway Company, Raleigh, N. C., has been sold to John H. McAden, who proposes to put the road in order and to operate an electric light plant in connection therewith.

The street-car line in Jacksonville, Fla., is to be changed from mule to electric power. George S. Haines is superintendent of the road.

An electric street railway company has been given a contract by Ness Bros., Harrison, O., to build a double line of electric railway from Cincinnati to Harrison.

The Springfield street lighting committee, Springfield, Ill., will receive bids for a municipal electric arc light plant of 300 lights and 2,000 candle-power capacity. For terms, plans and specifications address chairman street lighting committee, or city electrician, E. R. Sayler, Springfield, Ill.

NEW CORPORATIONS.

Electrolytic Reduction Company, San Francisco, Cal.; capital stock, $1,000,000.

Burton Electric Heating and Forging Company, Berwick, Me.; capital stock, $1,000,000.

Butte Lighting Company, Butte, Montana.; capital Stock, $1,000,000, for the purpose of manufacturing gas and electricity.

Dallas and Oak Cliff Electric Railway Company, Dallas, Tex.; capital stock, $200,000.

The Hillsboro Investment and Electric Company, Hillsboro, Tex.; capital stock, $50,000, for manufacturing gas, supplying electric motive power, etc.

The Washington Gas and Electric Company, Washington C. H., Ohio; capital stock, $100,000.

Lock Haven Electric Railway Company, Lock Haven, Pa.; capital stock, $100,000.

The Interstate Construction Company, Des Moines, Iowa; incorporated by E I. Rosenfeld and others, to construct and operate railway and telegraph lines; capital stock, $500,000.

The Imperial Electric Lamp Company, New York, N. Y., has been incorporated by John F. Wood and others; capital stock, $250,000.

Electro-Metallic Brick Company, Chicago, Ill.; incorporated by James E. Robinson and others; capital stock, $300,000.

The Victor Light, Water and Motor Company, Denver, Col., has been incorporated by J. E. Downey and others; capital stock, $100,000.

The National Telephone Construction Company, Milwaukee, Wis., has been organized with a capital stock of $150.000. Incorporators are John Z. Westwelt, Orson E. Hubbard and Frank H. Brice.

A company will be organized at Raleigh, N. C., to erect a telephone line from Raleigh to Burham and Henderson.

An electric light company has been organized at Water Valley, Miss. The plant will cost $10,000.

The Opelika and Auburn Electric Railway Company, Opelika, Ala., is being organized by C. I. Daughtry and others; road to run from Opelika to Auburn. Capital stock, $40,000.

West Shore Telephone Company, Newburgh, N. Y., to construct a line between Newburgh, Saugerties and other towns. Capital stock $3,500, and directors Wm. S. Ramsley, J. H. Crook, Wm. V. Snow and others.

The San Gabriel Power Company, Los Ange'es, Cal Capital stock $500,000 Directors: A. Haas, William C. Kerchoff, H. W. O'Melveny and M. C. Eshman of Los Angeles and M. Dodsworth of Azusa.

The Rose Electric Company of St. Louis, Mo. Capital stock, $40,000. Incorporators: Phillip L., A. E. and Matilda Rose.

The Electric Conduit Company, Ltd., of Sturgeon Bay, Wis., by Adolph Hammack and others. Capital stock, $1,000.

The International Telegraph and Telephone Company, New York, N. Y., by August L. McCrea and others. Capital stock, $5,000.

The Hillsboro Investment and Electric Company, Hillsboro, Tex., by A. T. Rose and others for the purpose of supplying light, heat and electric motive power. Capital stock, $50,000.

The Chestertown Electric Company, Chestertown, Md., has been organized.

The Dallas & Oak Cliff Electric Railway Company, Dallas, Tex., by Edward Greer and John W. Simpson of Dallas, Tex.

Baker City Electric Light Company, Baker City, Ore.

The Brookland Telephone Company, Brookland, D. C., has been organized. Dr. J. Henry Brooks, president; Dr. Hiram J. Penrod, treasurer; Thomas C. Johnson, secretary. The stockholders are: J. H. Brooks, C. McGee, T. C. Johnson and others.

NON-ARCING LIGHTNING ARRESTERS.

Mr. Alexander Jay Wurts, of the Westinghouse Electric and Mfg. Co., on Friday evening, May 4, read a paper on "Non-Arcing Lightning Arresters, with Special Reference to the Protection of Street Railway Circuits," in Prof. Chandler's Lecture-Room, at the School of Mines, Colunbia College, New York. Mr. Wurts made some experiments with new forms of apparatus.

FINANCIAL.

The General Electric Company has, according to the Boston papers, issued a circular to the trade, in which it is stated that the company has reduced the prices on all classes of apparatus, and made special reductions in the prices on supplies. The circular further says that the company sold since January 1, last, over 1,000 railway motors; over 13,000 H. P. in power generators; over 11,300 H. P. in lighting machinery, and about 1,000,000 incandescent lamps. This represents a gross manufacturing business during that period of $1,000,000, or at the rate of $5,000,000 per annum, outside of repairs, etc. It is stated that it has been practically decided to scale the common stock of the General Electric Company one-half.

The Southern Massachusetts Telephone Company will increase its capital stock to $100,000.

The Gibbs Electric Company, of Milwaukee, Wis., has increased its capital stock to $30,000 and has put the business under the control of three directors.

UNDERGROUND TRACTION IN NEW YORK.

It is reported that the Metropolitan Traction Company, New York, intends to equip the Lenox Avenue line with an underground trolley system. This fact has been admitted by the railroad authorities, but more information than that is not obtainable as yet.

Legal.—Argument will take place in Philadelphia in the case of the Consolidated Electric Storage Co., vs. the Electric Storage Battery Co. The Consolidated Electric Storage Co. is suing to restrain the Electric Storage Battery Co. from making and selling batteries which are alleged to infringe the plaintiff's patents.

A SMALL OFFICE.

What is said to be probably the smallest office in the city is that occupied by Bloomer Brothers, electrical contractors, Havemeyer Building, New York city. The office is on the ground floor and is four feet wide by eight feet long. In the arrangement of the office there is not an inch of waste space. Mr. Bushnell, of the firm, says it illustrates the art of compactness and the value of space on Manhattan Island. Although the office is small, it is so conveniently arranged that the firm transacts its large business with great facility.

NEW YORK NOTES.

Office of the Electrical Age,
World Building, New York,
May 5, 1894.

Mr. J. L. Chapin, formerly of 34 Clinton Place, has taken handsome quarters at 289 Fourth avenue, city, where he has in stock motors, dynamos, and a full line of electrical supplies. Mr. Chapin carries on the general wiring repair business.

Mr. P. H. Alexander, one of the best known men in the electrical trade, is now connected with the Electric Selector and Signal Co., 45 Broadway. He is doing some active work on the light and power controller of that company.

The General Electric Co., through Mr. W. J. Clark, manager of the railway department, closed orders for 450 railway motors during the week ending May 7.

The General Electric Launch Co., 44 Broad street, has just taken out of Mr. Astor's electric yacht 164 cells of storage battery, which have been used on this vessel for a year and are in perfect order today. The boat made two trips to Newport and back, and at one time carried 65 people. Mr. Plante, of the Tampa Bay Hotel, Tampa Bay, Fla., has a number of electric yachts in service and is so well pleased with them that he is going to purchase six more. Lord Aberdeen, of London, has lately bought one of the electric launches made by the General Electric Launch Co.

Mr. Charlie Huntley, of Buffalo, was found by our representative wandering around the vicinity of Church and Cortlandt streets, one day last week, all alone. This section is becoming very dangerous for out-of-town electricians, as it is a popular resort of agents.

The Fibre Conduit Company of this city has moved into its handsome new offices in the Home Life Insurance Building on Broadway. Elegant quarters have been fitted up there, and they are more central.

The Electric Storage Battery Company, of which Mr. Blizard is the New York manager, has moved into handsome new offices at 45 Broadway.

Our old friend Mr. W. D. Boyd is handling the Royal brand of lubricating oils and is making his headquarters at 239 Water street, New York.

Mr. F. A. Sheffler, of the Stirling Boiler Co., has moved his office to 136 Liberty street. Mr. Sheffler is a competent engineer, and his professional opinions are much sought after.

The C. & C. Electric Motor Co. has secured through its Chicago office a contract for an electric light plant for the new criminal court building in Chicago.

Mr. A. L. Bogart, manufacturing electrician, 22 Union Square, New York city, has completed a large number of Ruhmkorff coils of the latest improved patterns. They give from one to twelve inch sparks and are guaranteed to be the very best that can be made for experimental work, schools, colleges, etc.

Mr. F. D. Russell, an old time engineer, and at one time editor of the *Street Railway Journal*, has charge of the shops of the Rochester Car Wheel Works, 33rd street and 1st avenue, where every facility is provided for repairing old axles and wheels. The company does its own carting and calls for and delivers wheels and axles in New York city, Jersey City and Brooklyn. They have an improved automatic machine for grinding out flat spots on wheels, also a special machine for straightening axles that are bent. The company has a reputation for its promptness in attention to orders and keeps in stock wheels of all standard sizes and axles to meet every requirement. The company's wheels are all made with a patented chill, which gives the face of the wheel, for a considerable depth, a hardness and temper that cannot be surpassed. W. T. H.

TRADE NOTES.

Chas. A. Schieren & Co., 47 Ferry street, New York city, have just taken an order from the Brooklyn City Railroad Company, Brooklyn, N. Y., for an extra belt, which will be 91 feet long and 60 inches wide.

The Weston Engine Company, of Painted Post, N. Y., has just issued a neat illustrated catalogue of its celebrated automatic engines. These engines are noted for their efficiency and other meritorious features, and are largely used in electric light and electric power work.

J. Bradford Sargent, of Boston, Mass., of "Stirling" Water-Tube Boiler fame, has moved its office from 620 Atlantic avenue to 8 Oliver street, Over 150,000 H. P. "Stirling" boilers are in use.

Bloomer Bros. & Company, Electrical Contractors, Room V, Havemeyer Building, N. Y., are installing a 2,000 light plant in the Empire Hotel, 63rd street and 9th avenue. There are two Wenstrom slow-speed belt-driven dynamos driven by a Payne engine. The firm is just finishing the installing of 3,500 lights in the insane asylum at Norristown, Pa. This plant includes Waddell-Entz dynamos coupled direct to Ideal engines. The plant in the Broadway Hotel, installed by this firm, is just being started. It has 1,000 lights' capacity. This company owns the patents on a portable device for cutting beams for the insertion of interior conduit tubes and gas pipes. Architects are specifying the Bloomer beam-scoring method, as it saves the strength of wooden beams.

Mr. Frederick Pearce, 77 & 79 John street, New York city, the well known manufacturer of electrical instruments and appliances, and dealer in general electrical goods, has just issued pocket edition number 10, of his catalogue and price list of electrical annunciators, bells, batteries, and general electrical household furnishings. It is fully illustrated and well gotten up.

BUSINESS NOTICE.

The Consolidated Electric Storage Co. has published two new circulars, Nos. 9 & 10—devoted, the first to "Isolated Lighting" and the second to prices, weights, &c., of batteries. They may be secured of the company at Edison Building, New York, or Drexel Building, Philadelphia.

WANTED.

Weston voltmeter, double scale, with range of 150 volts; also a Weston ammeter for 100 amperes. Address E. V. Baillard, 106 Liberty street, New York city.

Electrical and Street Railway Patents.

Issued May 1, 1894.

518,939. Electric Conductor for Underground Conduits. Daniel E. Conner, Covington, Ky., assignor of one-half to James William Gallup, Cleveland, Ohio. Filed Jan. 23, 1893.

518,944. Dynamo-Electric Machine. George Forbes, Niagara Falls, N. Y. Filed Aug. 17, 1893.

518,945. Dynamo-Electric Machine. George Forbes, Niagara Falls, N. Y. Filed Aug. 17, 1893.

518,946. Construction of Solenoids or Coils of Wire Used in Electric Machinery. George Forbes, Niagara Falls, N. Y. Filed Aug. 17, 1893.

518,952. Trolley for Electric Railways. George W. Hooper, Rochester, N. Y., assignor, by direct and mesne assignments, to James S. Baker, same place. Filed June 1, 1893.

518,959. Telephone. Eugenij V. Kolbassieff, Cronstadt, Russia. Filed Sept. 21, 1893.

518,971. Electric Time-Alarm. Henry P. Sommer, Chicago, Ill. Filed May 1, 1893.

518,972. Switch-Actuator for Street-Cars. Fletcher Sparling, Boston, Mass. Filed June 17, 1893.

519,043. Electric Heater. Samuel B. Jenkins, Boston, Mass., assignor to the American Electric Heating Company, same place. Filed March 31, 1893. Renewed Feb. 20, 1894.

519,045. Electric-Arc Lamp. Joseph B. McKeown, Cleveland, Ohio. Filed Feb. 23, 1894.

519,076. System of Electrical Distribution. Elihu Thomson, Lynn, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Aug. 5, 1889.

519,077. Storage-Battery System. Jakob Trumpy, Hagen, Germany. Filed Nov. 22, 1893. Patented in Germany, May 15, 1892, No. 68,017.

519,097. Field-Magnet for Electric Machines. Albert Schmid, Allegheny, assignor, by mesne assignments, to the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa. Filed Dec. 7, 1889.

519,098. Self-Exciting Constant-Potential Electric Generator. Albert Schmid, Allegheny, and Benjamin G. Lamme, Pittsburgh, assignors, by mesne assignments, to the Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa. Filed Feb. 20, 1890.

519,099. Incandescent Electric Lamp. Frank S. Smith, Pittsburgh, Pa. Filed Nov. 29, 1892.

519,115. Electric-Railway Conductor Support. John C. Henry, Westfield, N. J. Original application Filed Sept. 27, 1889. Divided and this application filed Feb. 10, 1893

519,116. Electric Motor. Frank E. Herdman, Indianapolis, Ind. Filed July 19, 1892.

519,117. Electric Elevator. Frank E. Herdman, Indianapolis, Ind. Filed Oct. 20, 1892.

519,120. Regulator for Electric Motors. Frank E. Herdman, Indianapolis, Ind. Filed Apr. 16, 1892. Renewed Jan. 11, 1894.

519,121. Controlling Device for Electric Motors. Frank E. Herdman, Indianapolis, Ind. Filed July 19, 1892. Renewed Jan. 11, 1894.

519,122. Controlling Device for Electric Motors. Frank E. Herdman, Indianapolis, Ind. Filed July 19, 1892. Renewed Jan. 11, 1894.

519,123. Controlling Device for Electric Motors. Frank E. Herdman, Indianapolis, Ind. Filed Oct. 20, 1892. Renewed Jan. 11, 1894.

519,124. Electric-Motor-Controlling Apparatus. Frank E. Herdman, Indianapolis, Ind. Filed Oct. 20, 1892. Renewed Jan. 11, 1894.

519,213. Automatic Electric Fire Alarm and Signal. Louis A. Werner and Clement J. Werner, Boston, Mass. Filed Feb. 7, 1894.

519,272. Electric Motor. Elias E. Ries and Gordon J. Scott, Baltimore, Md. Filed July 27, 1893

519,280. Electric Generator. Wm. Baxter, Jr., Baltimore, Md. Filed May 12, 1891. Renewed Oct. 16, 1893.

519,281. Electric Motor or Generator. Wm. Baxter, Jr., Baltimore, Md. Filed May 12, 1891. Renewed Oct. 18, 1893.

519,283. Electric-Arc Lamp. John C. Fyfe, Chicago, Ill., assignor of one-half to James Hayes, same place. Filed Dec. 29, 1893

519,289. Wheel Guard or Fender for Cars. James F. Morton, Baltimore, Md., assignor, by direct and mesne assignments, of one-half to Wm. H. Anderson and Nicholas S. Hill, Jr., same place. Filed Nov. 23, 1893.

519,291. Electric Railway. Wm. B. Purvis, Philadelphia, Pa., assignor of one-half to Halsey J. Tibbals, same place. Filed Apr. 14, 1893.

EXPIRED.

190,127. Electric Stop-Motions for Drawing-Frames &c. John Bullough, Accrington, England. [Filed Mar. 23, 1877.]

190,198. Electric Station-Indicators for Railways. J. I. Conklin, Jr., New York, assignor to himself and C. A. Dresser, Brooklyn, N. Y. [Filed June 2, 1876.]

190,206. Electro-Magnetic Motors. W. W. Gary, Huntingdon, Pa. [Filed Oct. 3, 1876.]

190,259. Car-Lamp Houses. John Stephenson, New York, N. Y. [Filed Jan. 5, 1877.]

ELECTRICAL AGE

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BROOKLYN HEADQUARTERS:—G. H. Wise Electrical Company, 199 Fifth Ave., ELECTRICAL AGE on sale and advertisements taken at regular rates.

Electrical books of all kinds can be procured at this office. Libraries can be furnished with a complete set of electrical works at a liberal discount from catalogue prices.

Copy for advertisements or changes therein should be in our hands before the Saturday preceding publication day.

NEW YORK, MAY 19, 1894.

CONTENTS.

THE BROOKLYN TABERNACLE FIRE.

As was expected, the cause of the fire which destroyed the Brooklyn Tabernacle last Sunday is said to have been "electricity," and it is really amusing to note the ingenuity displayed in weaving the web of evidence around the electric wire theory. A "spark" from an electric wire is said to have done the mischief, although the sexton says the point where the fire started was ten feet away from the nearest wire. One person in the congregation saw "an electric spark between two of the organ pipes the moment the organist pulled out a stop," but this person cannot now be found, when his affidavit is required. In weighing the evidence given by the sober-minded ones who witnessed the disaster and those who lost their heads, but not enough to render them blind of the "electric spark," the electric theory seems to have no tangible foothold.

WHERE THE TROUBLE IS.

The trouble with the business of the country today is not the inaction of Congress on the tariff bill, but the unsettled question as to which one of two of our contemporaries has the larger circulation. So long as this momentous question remains in a chaotic condition, so long will the business interests of America remain "in the soup." There are only two classes of citizens that derive any benefit from this disturbed state of affairs, namely, the printers and the "affidavit editors." In the meantime the readers of the journals in question are growing weary in waiting for some real news.

THE CANAL MONOPOLY FRUSTRATED.

The plans of the Cataract General Electric Company, respecting the matter of supplying electric power for the propulsion of boats on the Erie Canal, have received a serious set-back. On the 14th inst. the Governor vetoed the bill introduced in the last legislature, having for its object the repeal of the law giving the State Superintendent of Public Works authority to allow corporations to operate electrical conductors along the lines of the state canals for the propulsion of canal boats. This repeal measure was introduced before any permit had been granted, but before its passage a contract was made with the Cataract General Electric Company, which action, in view of the pendency of the repeal bill, evoked considerable unfavorable criticism. The Governor in his veto briefly reviews the history of the case, presenting the main facts in a concise and consecutive manner. He thinks it would be unwise to bind the state to one contract, as would be the result if the repeal bill were allowed to become law. The Superintendent of Public Works should, in his opinion, be free to enter into other contracts with other companies in case of the failure of the Cataract Company to comply with the provisions of the contract. In other words he wants the principle of unrestricted competition to apply in this matter, so that in case one company should fail to live up to contract requirements, it shall give way to another that will. Governor Flower's action cannot fail to meet with the approbation of all right-minded people. A monopoly in so great an undertaking as is involved in this bill, would be positively unfair to other interests that are just as capable of carrying out the provisions of the bill as is the company that has apparently received the most favor, and we are glad to note the fact that the Governor has interposed his veto power in this case. He has set his foot down on the threatened monopoly, and the electrical interests of the entire country will commend him for the stand he has taken.

THE CONSOLIDATED TRACTION COMPANY.

Reference was made in the Electrical Age of April 28 last to the opening of the electric railway between Newark and Jersey City, N. J. The system has been working well since and the cars are well patronized.

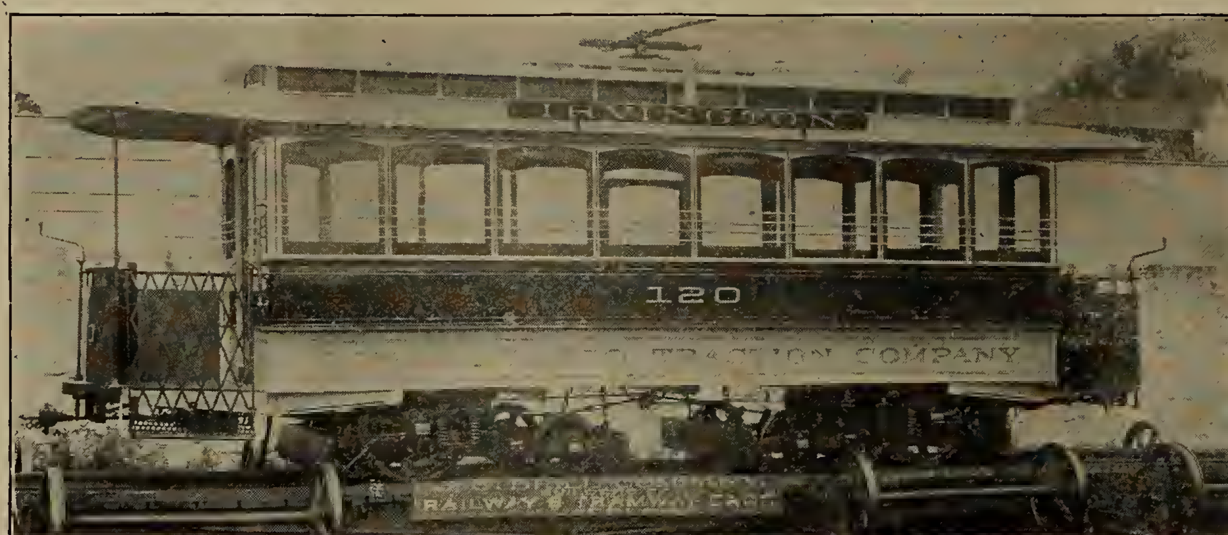
The Consolidated Traction Company, which controls this line, embraces in its system the lines in Newark, Jersey City and Elizabeth. The entire system represents 200 miles of track, 160 miles of which are now in operation, the remaining 40 being under construction.

The company is using 9-inch girder rails as its standard. Fifty miles of this rail have been laid in Jersey City and over 100 miles in Newark and Elizabeth. The rails are made by the Pennsylvania Steel Company. The line across the Jersey meadows is laid with heavy T-rails, on cross-ties, and is stone ballasted.

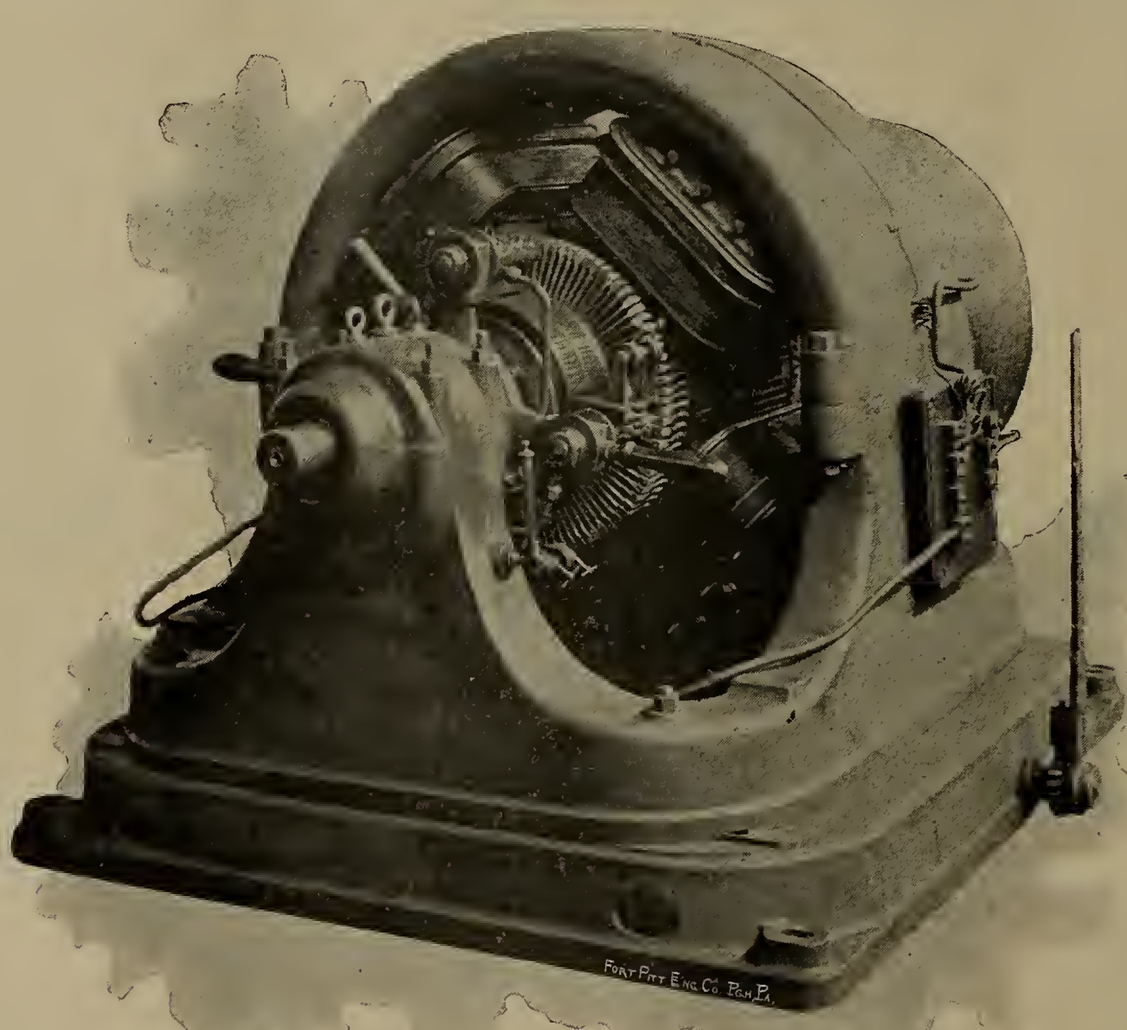
The company has its main power house in Jersey City, on Grand street, and a small one in Newark. A very large plant is soon to be constructed in Newark, which will have a total capacity of between 5,000 and 6,000 horse-power.

The steam plant in the Jersey City station consists of six Ball & Wood horizontal engines, each of 250 H. P. and driving a Westinghouse multipolar generator of equal power. The generators are direct belted to the engines. The power house is a substantial brick building and equipped with everything modern. The capacity of the present Newark station is 1,800 H. P.

The Consolidated Traction Company recently bought a 750-H. P. Reynolds-Allis-Corliss engine, which was exhibited at the World's Fair, and two others of the



BRILL CAR ON CONSOLIDATED TRACTION COMPANY'S LINE.

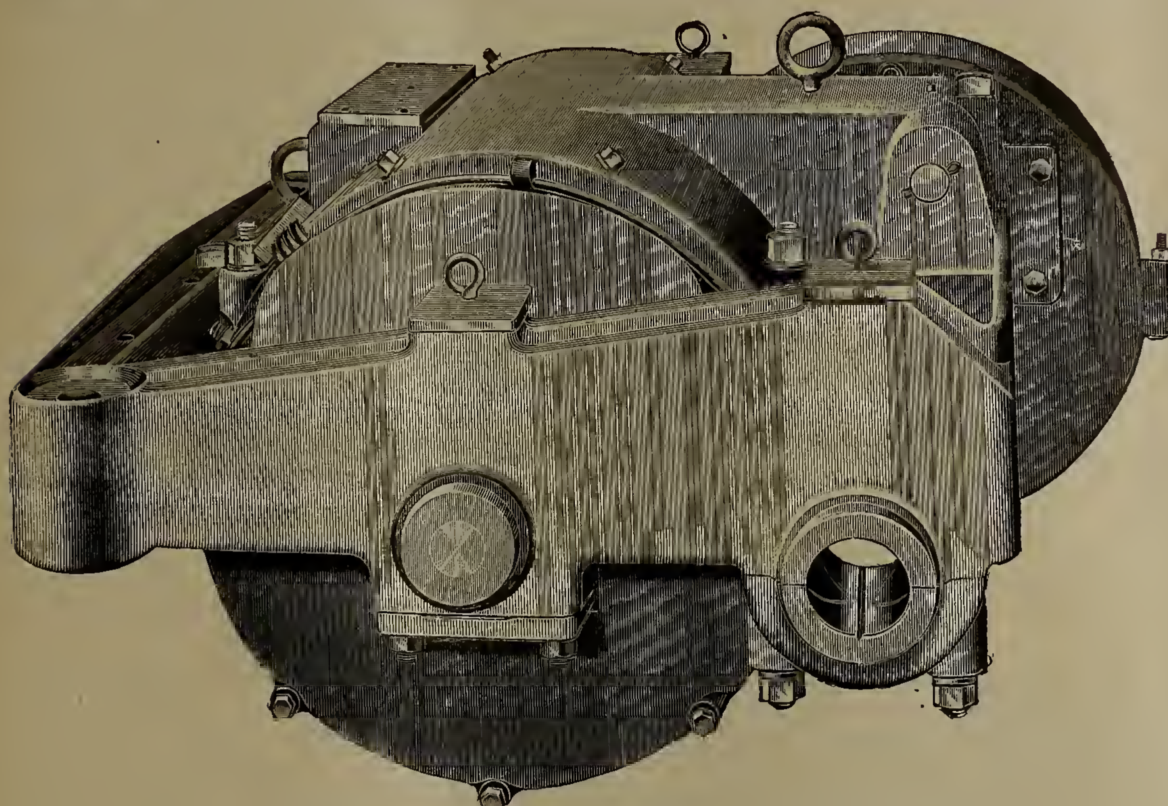


WESTINGHOUSE MULTIPOLAR GENERATOR.

same type of 500 H. P. each. These will be installed to meet the increasing demand for more power.

In the Jersey City station there are five Manning and two Babcock & Wilcox boilers.

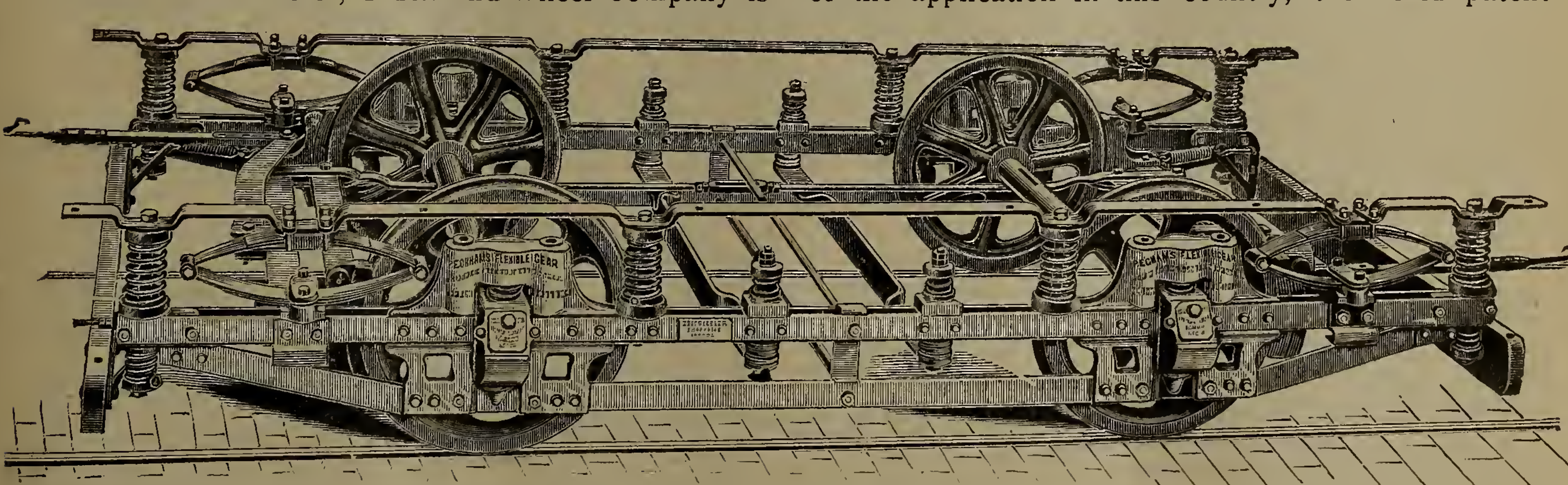
The overhead track construction work was done by various concerns, the company itself performing the greater part of it. The trolley wire and feeders are of the best copper, 98 per cent. conductivity, and were in the main supplied by the John A. Roebling's Sons Co., of Trenton, N. J.



WESTINGHOUSE MOTOR.

The company at the present time operates nearly 300 cars, 100 of which are used in Jersey City and 165 in Newark. Contracts have just been let for 100 more cars, 50 from Stephenson and 50 from the Laclede Car Works, St. Louis. In the present equipment there are over 125 Brill cars, equipped in the main with Brill Eureka Maximum Traction trucks.

The Peckham Motor, Truck and Wheel Company is also largely represented in the matter of trucks, there being over 100 of them now in use on the lines. These trucks are of the well known 6 A, Cantilever Extension type, which is designed expressly for and guaranteed to prevent oscillation of 18 feet closed, or 28 feet open electric cars. The length of the frames is 14 feet; length of spring base, 12 feet 8 inches; length of wheel base, 6 feet 6 inches. The top frames are solid forged, and the truck is constructed throughout with hot rivets. All parts are machine fitted and guaranteed not to break.



PECKHAM 6A CANTILEVER EXTENSION TRUCK.

These trucks are greatly admired for their easy riding, and the absence of oscillation is one of the most pleasant features of a trip on a car equipped with this type of truck. The 6 A truck is provided with self-lubricating, dust-tight journal boxes, and mounted on Peckham No. 6 Ball Bearing Spiral Spring-Cushioned Gears.

Each car of the Consolidated Co , is equipped with two 25 H. P. Westinghouse motors, which run with remarkable smoothness and are practically noiseless.

The officers of the Consolidated Traction Co are: E. F. C. Young, president; Jeremiah O'Rourke, vice-president; M. R. Shanley, director-general; David Young, general manager; R. F. Bower, of Philadelphia, treasurer; and E. N. Hill, Newark, assistant treasurer.

PROPOSED AMENDMENT TO THE PATENT LAW.

The legislative committee of the American Association of Inventors and Manufacturers, Washington, D. C., has prepared and submitted to the committee on patents of the national House of Representatives a draft of a bill for the purpose of amending the existing patent law.

It is proposed to amend Section 4887 of the Revised Statutes, to read as follows:

"No person shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid by reason of its having been patented or caused to be patented in a foreign country within one year prior to the application for a patent on the same invention in this country, but every such patent hereafter granted shall be limited in duration to the term for which any such prior patent had been granted, or if there be more than one foreign patent prior to the filing of the application in this country, then said patent granted thereon shall be limited in duration to the term for which any such prior foreign patent having the shortest term had been granted. No patent now in force, or which shall be hereafter granted, shall be held to be limited in its duration by the terms of a prior foreign patent for the same invention, unless the date from which the term of said foreign patent commences to run was prior to the date of filing of the application for the patent in this country. This section shall not apply to any patents which have heretofore expired by virtue of the Acts in force prior to the passage of this Act. But no patent shall be granted for an invention previously patented, or for which an application for patent has been filed in a foreign country, unless the application shall be made in the United States within one year from the date of such foreign patent. And if more than one patent shall be granted for matter shown or described in a prior foreign patent or application for the same invention, such patent shall issue simultaneously."

Sec. 2. That section forty-eight hundred and ninety-four of the Revised Statutes be, and hereby is, amended by erasing the word "application" and substituting the word "petition" in lieu thereof; also by erasing the words "two years" in each place where they occur and substituting in lieu thereof the words "six months," so that the section as amemded will read:

"Sec. 4894. All applications for patents shall be completed and prepared for examination within six months after the filing of the petition, and in default thereof, or upon failure of the applicant to prosecute the same within six months after any action therein, of which notice shall have been given to the applicant, they shall be regarded as abandoned by the parties thereto, unless it be shown to the satisfaction of the Commissioner of Patents that such delay was unavoidable." This section (two) shall apply only to the applications hereafter filed.

Sec. 3. That all actions shall be brought during the term for which the Letters-Patent shall be granted or extended, or within six years after the expiration thereof.

Sec. 4. That section forty-nine hundred and nineteen of the Revised Statutes be, and hereby is, canceled and repealed and the following substituted therefor and enacted in lieu thereof.

"Sec. 4919. Damages for the infringement of any patent may be recovered in an action at law in the name of the party interested either as patentee, assignee, or grantee. And whenever in such action a verdict is rendered for the plaintiff, except as provided in section eight, the court may enter judgment for any sum not exceeding two hundred and fifty dollars, exclusive of costs, in lieu of damages and profits or the plaintiff shall be entitled to recover the damages caused by the infringement of the defendant, and in addition thereto the total profit of the defendant derived from the unlawful use of the patented invention, and in this case the court may enter judgment on the verdict for any sum above the amount found by the verdict as the damages sustained, according to the circumstances of the case, not exceeding three times the amount of such verdict, together with the costs."

"Sec. 5. That a court of equitable jurisdiction, after personal notice to all parties shown by the records of the Patent Office to be interested, may pass the title to Letters-Patent of the United States, or any interest therein, by decree, without any act on the part of the defendant, whenever, in its opinion, that shall be the proper mode of enforcing the equitable rights of the parties, and a copy of such decree when recorded in the Patent Office shall be legal notice to all parties, and such decree while in force shall be as effectual to transfer said Letters-Patent, or any interest therein, as a conveyance to the same effect executed by such defendant.

"Sec. 6. That the Commissioner of Patents may refund to the payer money paid into the Patent Office by mistake.

"Sec. 7. That the Assistant Commissioner of Patents shall perform such duties pertaining to the office of the Commissioner as may be assigned to him by the Commissioner, and in the absence of the Commissioner he shall be Acting Commissioner.

"Sec. 8. That section forty-nine hundred and twenty-one of the Revised Statutes be, and the same is hereby, amended by adding thereto the following clauses:

"But hereafter, whenever a patent is alleged to be infringed, the patentee or his representative shall seek his remedy by bringing suit in the first instance against the manufacturer or vendor of the article alleged to infringe said patent, provided such manufacturer or vendor can be found within the United States, and shall in no case bring suit against any individual who shall have purchased, in good faith, an article of a regular dealer in the open market for his own use, or who shall innocently use for agricultural or domestic purposes a patented article until the patent has been sustained by a decree of a court of competent jurisdiction; *Provided*, That such individual purchaser shall give to said patentee, or his representative, at his request, the name and residence of the party from whom said article was purchased. and that the manufacturer or vendor can be found within the United States, and when a suit is brought against an innocent purchaser the remedy shall be limited to an injunction, and plaintiff shall pay all costs. *And provided also*, That this exemption from liability of the innocent purchaser shall not apply to any corporation, firm or company, nor to any corporation or party, as to any patented machine or process made or used by them for the manufacture of an article or product for sale. Actions at law or suits in equity for infringements of patent rights may be brought in the district where the infringer has a place of business, whether the defendant or defendants be domiciled therein or in some other district."

The courts of equity of the United States shall have jurisdiction of cases of infringement of patents, after a patent shall have expired, for the purpose of ordering an account and payment to the owner of the patent of such profits as may have been made by the infringer during the lifetime of the patent from the infringement complained of.

Sec. 12. That all Acts and parts of Acts inconsistent with the provisions of this Act be, and the same are hereby, repealed.

COMING DEVELOPMENTS IN ELECTRICITY.

BY GEORGE D SHEPARDSON.

Part II.

Continued from Page 188.

Attempts have been made, with varying success, to substitute carbon for the zinc of a galvanic cell, the carbon being oxidized bp a melted salt or by heated gases.

Another method for obtaining electricity from heat is based upon the increased solvent power of liquids at higher temperatures. The Case heat cell, working between 80° and 168° Fahr., has a theoretical efficiency of about 0.16.

Before leaving the subject of electrical generators, mention should be made of two other natural sources of electrical energy which have long been recognized, but which have not been given any great amount of investigation, and are little utilized. It is well known that objects in the air are at a considerable difference of potential from the earth. Whether this electrification is due to induction, or whether it is due to the air itself being electrified, is a matter of some question. Whatever may be the correct theory, it remains true that electricity may be gathered from the air by a number of different methods. One method is by dropping water through the air. Another is by having a number of sharp points at a considerable distance above the surface of the earth. It is believed that static electricity is a potent factor in the economy of nature, and has more to do with the growth and development of plants than is generally supposed. A large number of experiments have been made with a view to helping nature in the more effective utilization of atmospheric electricity by growing plants. This point will be discussed later.

Some experiments have been made looking towards the utilization of atmospheric electricity for the purpose of obtaining motive power and for doing chemical work. By far the largest part of these experiments have never been published, because unsuccessfnl or because the investigators were hoping to secure valuable patents. Some attempts have been made to operate electro-static motors, modifications of Holtz or Wimshurst machines, by means of atmospheric electricity. The writer has heard claims for successful experiments in reducing aluminium from clay and carrying on other chemical processes by means of a system of lightning-rods connected to the earth through special devices. Some experiments by the writer indicate that the amount of electricity to be obtained from the air by any such means in ordinary weather is extremely small. Over 250 sharp points were raised on a pole, 32 feet above the ground, at the top of a knoll in an open field. These were connected to the ground through a galvanometer capable of measuring .0001 of an ampere, but no measurable current was obtained on a clear day. There is a possibility that some of the energy of thunder-storms may be controlled and adapted to industrial purposes, but there seems to have been no successful attempts published.

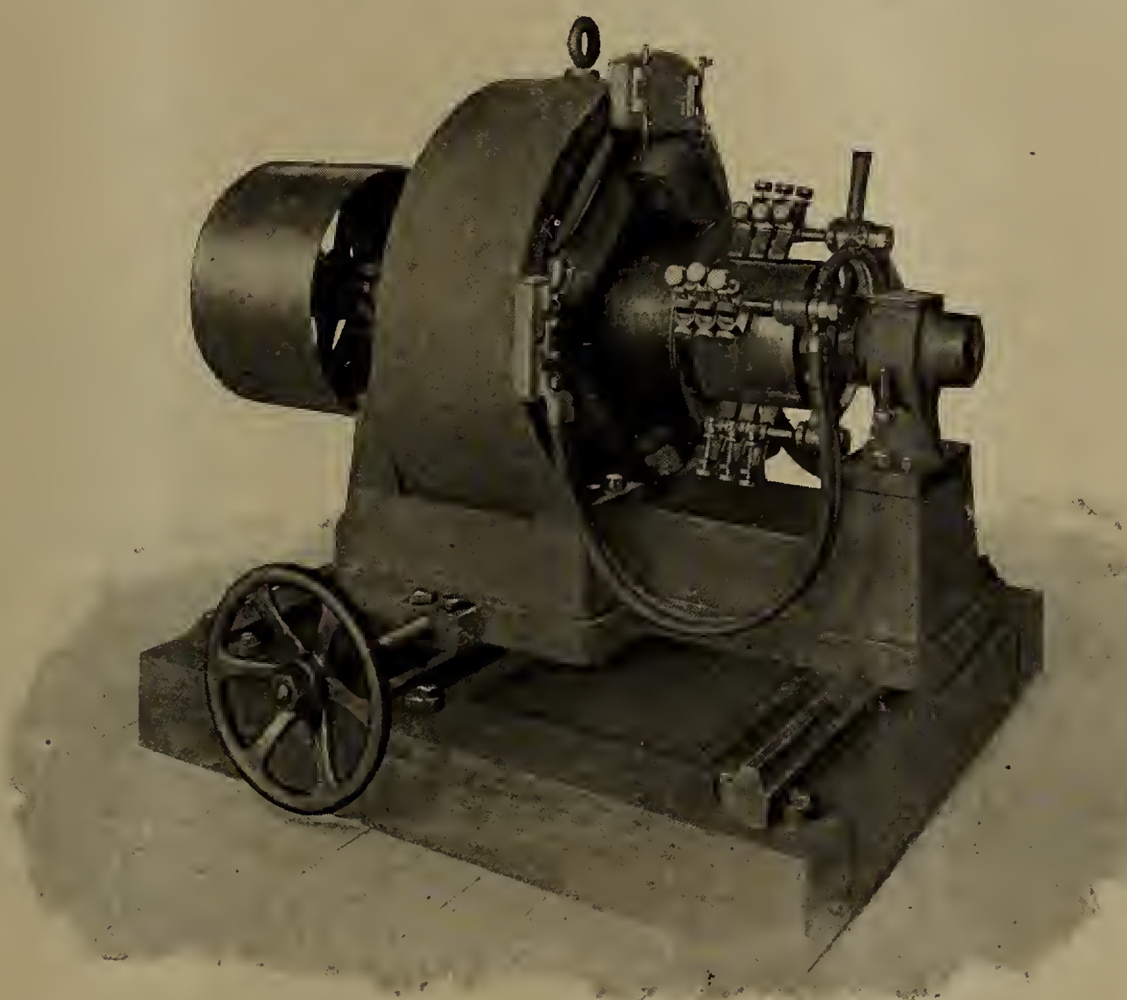
The second source is the earth current. These have been long recognized by operators of the telegraph and telephone. In many cases the telegraph lines have been operated for a long period without the use of any batteries whatever. The real source of these currents is a matter of some uncertainty. There seems to be a close connection between sun spots, auroral displays, "magnetic storms" and earth currents. It is found that circuits running east and west are disturbed the most.

(*To be continued.*)

NEW RIKER MULTIPOLAR DYNAMO.

The dynamo shown in the accompanying illustration has just been placed upon the market by the Riker Electric Motor Co., 45–47 York street, Brooklyn, N. Y.

As ordinarily constructed this machine is designed for an incandescent generator working at the standard pressure of 125 volts. The base is made of cast iron, very heavy and thoroughly braced to prevent the springing of the bearings. The field magnet is built of cast steel with salient poles projecting radially inward. In sizes up to and including 20 K. W. high speed and 6 K. W. low speed the field is cast in one piece, while in larger sizes the field is split to facilitate the handling of the armature. The section of the poles in all machines of this type is square, thus permitting a minimum length of wire to surround a maximum section of iron without the necessity of making separate cores and pole-pieces, as is the case in round core magnets of this general description. The field coils are wound on heavy metallic thimbles or spools, which serve the double purpose of holding the coils securely in place, and, by their action as closed secondaries, absorbing the destructive induction sparks that result from breaking the field circuit.



RIKER MULTIPOLAR DYNAMO.

All these generators are compound wound to maintain practically a constant potential, a slight rise of one per cent. or two per cent. being allowed to compensate for a fall in engine speed.

The armature is of the drum type, the plates being mounted directly upon and keyed fast to the shaft. The plates are clamped between heavy cast iron flanges, which are threaded on the shaft. No bolts pass through the core plates, thus obviating the trouble and expense of extensive insulation in the armature. The wires are laid in milled grooves, and all insulation on the armature between the core and the wire is either micanite cloth or pure mica. The insulating and fireproof qualities of these substances need not be dwelled upon. The coils of these armatures are all cross-connected in parallel grouping, in order that the electrical balance in the armature shall be maintained even when one or two sets of brushes are removed. The commutator is very heavily built, the bars being clamped between steel cones and insulated throughout with mica.

While the machines run without undue heating, they are not built unnecessarily heavy, a good wide working margin being allowed. The armatures under long runs at full load are allowed to rise in temperature about 40° to 50° F. above that of the surrounding atmosphere.

A rating of 500 circular mils. per ampere at full load is allowed in all armatures, while in the shunt and series coils 1,000 circular mils. is the rating. All resistances are kept as low as possible, thus reducing internal waste and maintaining efficiency.

All the fittings and connections of these dynamos have been designed to facilitate installation and at the same to present an artistic appearance.

These machines are thoroughly high grade, both as regards build and performance, and in every particular embody the principles of the best modern practice. From a theoretical point of view they are designed to a nicety, due regard being had for practical considerations. The long experience and continued success of the company and the general good reputation it has enjoyed are sufficient guarantees that its new dynamo is all that is claimed for it.

The company is now prepared to furnish this type machine in from 10 to 100 K. W.

ALL-CHINA CUT-OUT.

A real novelty in cut-outs is the all-china arc cut-out made by Pass & Seymour, of Syracuse, N. Y. Every part of this device is made of china—case, cover and circuit-breaking cam. Hard rubber and other similar substances have been used for the working parts of cut-outs for so long that the use of any other material comes in the nature of a surprise, especially when that material is china. China, ordinarily, is associated in most minds with fragility, but the china that Pass & Seymour

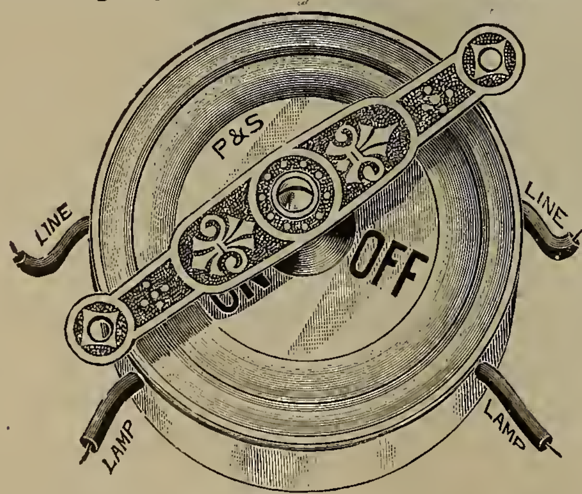


FIG. 1,

make and use for their cut-outs is a "horse of another color." It is tough and very durable, and withstands any amount of rough usage.

The all-china cut-out is free from all danger of grounding in wet weather, on account of the excellent insulating and non-absorptive qualities of the china. This material gives an insulation impossible in cut-outs with metallic cases.

The all-china cut-out is 7 inches in diameter, and is ornamental in design. The handle is nickel-plated.

Fig. 1 shows the cut-out complete, with cover on.

In fig. 2 the cover is removed, showing the lamp circuit cut off. The line circuit is made through contacts F and H and plate D, and also lever A. By turning the handle, the china cam B is turned to right, carrying plates D and C with it, and passing between contact F and lever A, breaking the line circuit and throwing in lamp circuit as shown in fig. 3.

There is absolutely no arcing on plates C or D when line circuit is broken, as D leaves H before B opens circuit, by passing between F and A.

The cam B is moved very quickly by means of the torsion spring on the handle post, and as it passes between A and F, the arc is pushed out, as well as blown out,

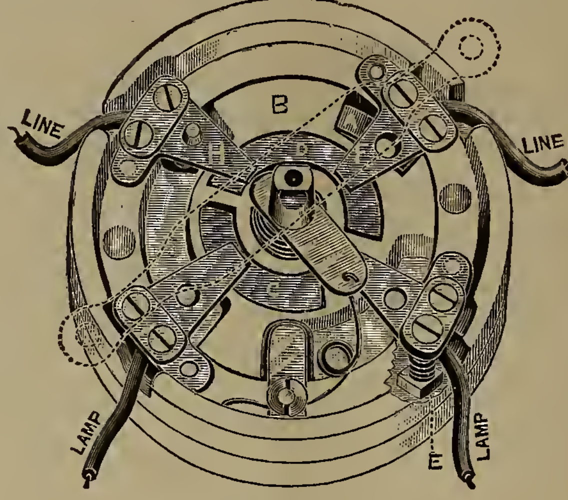


FIG. 2.

by the puff of air produced by the sudden motion of B.

The plates C and D are held against the contacts by three spiral springs under each, and a perfect rubbing contact is made.

The clamps for the line wires have two heavy screws

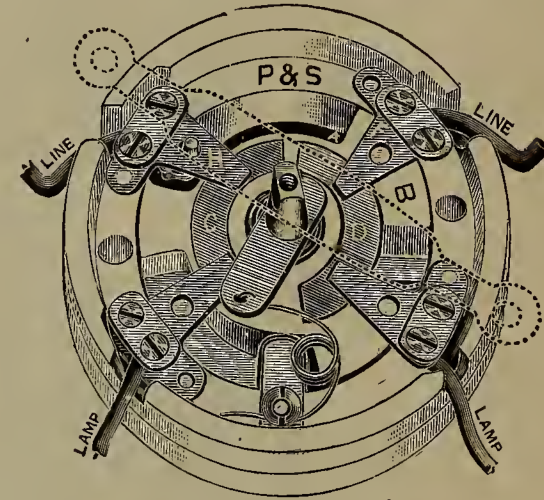


FIG. 3.

in each, and also nut and spiral spring, as shown at E fig. 2, which insures a perfect contact.

These cut-outs are claimed by the makers to be the best as well as the cheapest arc cut-out made.

PERSONAL.

Mr. Fred. W. Cushing and L. O. McPherson, of the Gray Telautograph Co., Chicago, Ill., left for Europe on May 16 in the American line steamer "New York." These gentlemen go abroad in the interests of the Telautograph Co.

Mr. Geo. E. Emmons, general manager of the Lynn works of the General Electric Co., has been appointed general manager of the Schenectady works of the same company. Mr. J. B. Fisk will succeed Mr. Emmons as general manager of the Lynn works.

ELECTRICAL OSCILLATIONS.*

BY NEWTON HARRISON, E. E.

(*Continued from page* 223.)

It can be proven that the magnetizing effect of the secondary current is proportional to the initial strength of the induced current; which initial strength is proportional to the quotient of the mutual by the self-induction of the secondary circuit. Hence if we can by any means increase this ratio we can increase the strength of the secondary or induced current.

A condenser serves this purpose in every respect, even so far as to actually double the E. M. F. of the secondary current. This may be clearly shown in the following manner:

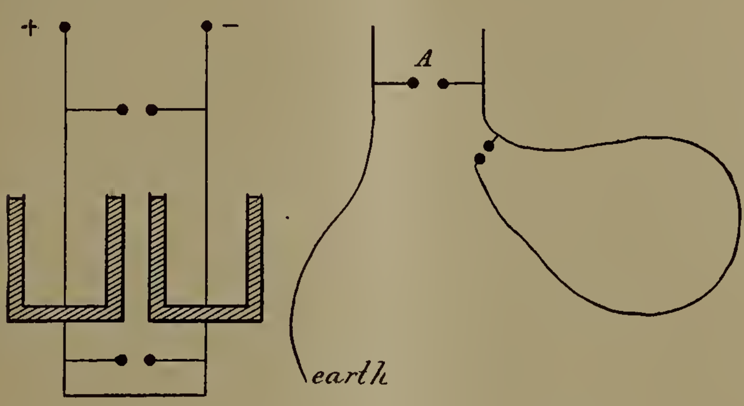


FIG. I. FIG. 2.

If a condenser be inserted across the contact points of a primary circuit, the break of the current still allows the condenser to charge. It then immediately reverses, remaining the same strength as before.

The secondary circuit has had a current induced in it by the stoppage of the primary and an additional E.M.F. is set up, due to the fact that the reversed primary current has neutralized a certain number of lines of force even to the point of replacing them in the opposite direction. Hence the function of condenser has been that of creating electrical oscillations, which with the condenser as their cause, reduces the spark and increases the total change of induction through the second circuit, by following up the diminishing lines of force with lines in a reverse direction of just equal quantity to those withdrawn, thus doubling the potential difference of the secondary terminals.

Therefore as the maximum E. M. F. has been increased, the sparking distance of the secondary is likewise increased and the availability of the coil, as in the case of gas lighters, is greatly assisted. This phenomenon is termed electrical resonance, in which the condenser causes an electric or elastic recoil, as described.

The capacity of a condenser for the complete quenching of the spark must be great enough to take up the full primary current when the contact becomes too great for the spark to jump. Mr. Spottiswoode used the alternating current of a DeMeritens machine and obtained sparks of great length.

If a condenser be discharged through a circuit of exceedingly small resistance, the frequency of the oscillations will rise to millions per second. Leyden jars discharged this way approximate these figures.

Luminous vibrations, the infinitesimal ripplings of the ether, have a frequency of 700 billions per second; hence it is seen that condenser oscillations occupy a position between these and acoustic vibrations.

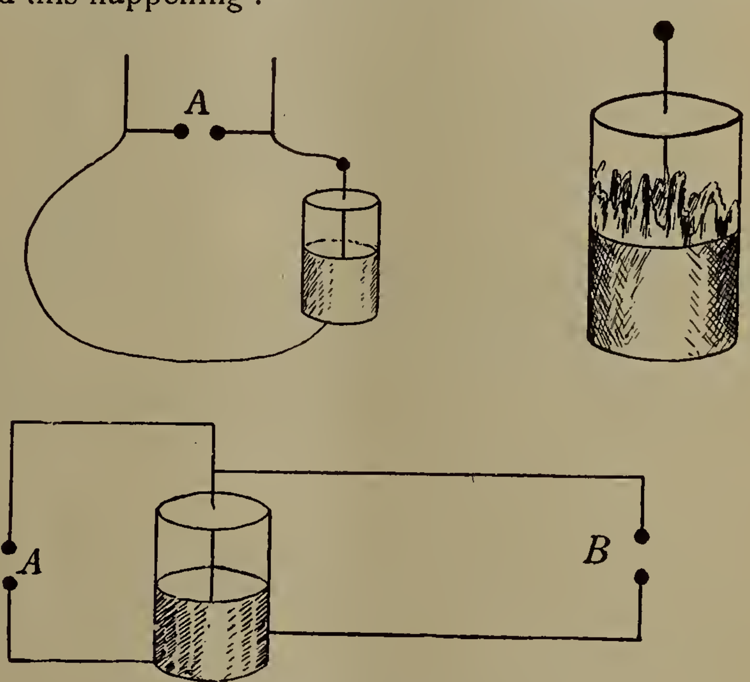
Vibrations of this description which proceed from a wire containing pulsatory disturbances are really emitting light, though not of a kind to affect our eyes. They are like an extremely deep and sonorous tone in music, by which the ear-drum would vibrate so slowly as to leave us unconscious of its existence. Such acoustic disturbances would consist of waves of enormous length, these ether waves being, however, too long to affect the retina.

Waves of light, visible or invisible, travel with a definite velocity. In all ether disturbances $V=3x10^{10}$ cm. per sec., or 186,000 miles per second; therefore, if the frequency is known, the wave length can be found. Dr. Lodge calculates the ether waves of a micro-farad condenser to be equal to 1,200 miles in length at 160 alternations per second, discharging through a coil of 1 henry self-induction. A gallon Leyden jar of .003 micro-farad discharged through about 75 feet of stout wire emits waves 400 yards long with a frequency of about one million per second. If a sphere 2 feet in diameter that has received an electro-static charge be in any way disturbed, ether waves a yard long will be emitted at the rate of 300 millions per second.

Lastly, electric charges on atomic bodies would lash the ether with oscillations of thousands of billions per second, emitting the unseen light of combustion—the ultra violet rays.

There is a very wonderful phenomenon still to be considered. It is called the "Alternative path." Very often the discharge of a Leyden jar is of such a nature that it will prefer to take a path through the air in lieu of a copper conductor short-circuiting its poles.

If a pair of Leyden jars have their inner coating connected to opposite poles of a frictional machine and their outer coatings short-circuited together with knobs so situated that the inner coatings could be discharged across an air space, and the outer coatings similarly arranged (fig. 1) in spite of the short circuiting we will find this happening:



FIGS. 3, 4 AND 5.

When the potential between the inner coating becomes high enough, a discharge occurs between the knobs across the air; the outer coatings, however, will not discharge through the wire between them, but will jump across the knobs as though no wire connected them. Hence they have chosen an air path to a metallic path. The cause of this is due to the fact that upon the discharge of the inner coatings the charges on the outer coatings become free; the potential of one falls and of the other rises. An instantaneous condition of a great difference of potential results. The spark jumps the air space because the sudden electrostatic charge makes the self-induction of the wire connecting the two so great that it is absolutely non-conducting; and the charge meeting an impenetrable medium rebounds and passes through the air. This covers the principle of the modern lightning arrester.

Another experiment to illustrate the surging of an ether wave is to connect the inner coating of a Leyden jar to one knob of a machine; the other knob to the earth. The wire is bent near the knob of the jar so that it almost touches the wire near the knob of the machine (fig. 3.) After turning the machine enough a disruptive discharge takes place between the poles of the machine, and immediately the jar appeared to overflow with electricity.

This is due to the fact that the instant after the discharge the oscillation, rebounding, meets the air gap recently heated, and a comparatively good conductor, but now cold and impassable. The effect is similar to that of the previous experiment. On meeting this barrier a second rebound takes place which causes the charge to leap up over the edge of the tinfoil in tidal waves of ether (fig. 4.)

A small condenser, of a capacity of 2 or 3 centimeters, will, when thus discharging over its edge, have but very small induction. The electrical oscillations in this case are at the rate of a thousand million per second; the wave length being only 20 or 30 centimeters.

If an infinitesimal conductor containing a charge, an atom for instance, were discharged in this way, oscillations of a tremendous frequency would result. Electro-magnetic waves of the length of light waves would be emitted and the eye would see visible light.

The light of the universe bathing the planets in a halo of brightness are but these simple electro-magnetic disturbances propagated through the ether; each atom sending out its minute electric oscillations to brighten our lives and lead us onward to greater and better achievements in this most wonderful science.

THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

ELECTION OF OFFICERS.

The eleventh annual meeting of the American Institute of Electrical Engineers was opened in Philadelphia, on Tuesday, May 15, according to the programme published in our last issue.

Prof. Houston's annual address reviewed the progress made in electrical science since the Centennial exposition, and dwelt on the good exerted by the Institute.

To insure the greatest success in electrical research, Prof. Houston advocated the establishment of a central governing body of the Institute, which should be vested with the power of speaking authoritatively for the major body between the periods of recognized official meetings.

The election of officers for the ensuing year resulted as follows: President, E. J. Houston; vice-presidents, Wm. A. Anthony, Francis B. Crocker, James Hamblet; Managers, A. E. Kennelly, Wm. D. Weaver, Chas. S. Bradley, Wm. B. Vansize; Treasurer, Geo. M. Phelps.

THE CANAL MONOPOLY PROJECT DEFEATED.

On May 14 Governor Flower, at Albany, vetoed the bill passed by the recent legislature, repealing the provision of the law passed last year which gives the State Superintendent of Public Works authority to allow corporations to operate electrical conductors along the lines of the State canals for the propulsion of canal boats. In his veto the Governor says:

"In pursuance of the recommendations of my annual message the Legislature of 1893 passed, practically without opposition, an act authorizing the Superintendent of Public Works to conduct experiments looking to the use of electricity as a motive power on the canals. The second section of that statute conferred upon him, also, the authority to permit any person or corporation to construct and operate electrical conductors along the canals upon such terms and conditions. not inconsistent with the public use of the canals, as he might impose. It is this section of the act, and this authority to grant a permit, which the bill before me would repeal.

"The repeal bill was introduced in the Legislature before any permit had been granted under the act of 1893. Subsequently, however, and before the bill's passage in either House, a permit was granted by the Superintendent of Public Works, and its terms became the subject of inquiry by a legislative investigating committee. Whatever might have been the reason for introducing the repeal bill prior to this time, the effect of passing it after the contract had been made and after its terms had been carefully examined by a legislative committee could only be to create a monopoly. For no legislative act can impair a contract, and the contract which had been entered into by the Superintendent of Public Works with the Cataract General Electric Company would not be annulled by the enactment of this bill. The effect of the passage of this bill, therefore, and its approval would be to confer upon the Cataract General Electric Company a complete monopoly as long as the conditions of the contract were observed, and the Superintendent of Public Works would be without authority to grant any similar permits to other corporations or individuals.

"While this result, brought about by act of the Legislature after a careful inquiry into the terms of the contract, would be a strong endorsement of the advantage to the State of that contract, I cannot but think it unwise thus to bind the State to one contract already made and to prohibit the Superintendent of Public Works from entering into other contracts with other corporations in case the Cataract General Electric Company failed to comply with the conditions imposed upon it, or failed to complete the project of furnishing electric power for canal purposes between Buffalo and Albany within three years, as it is required to do by the contract. While sharing, therefore, the legislative approbation of this contract, as implied by the passage of the bill before me, I think the authority conferred by the act of last year should remain unrepealed.

"The contract alluded to has been so persistently misrepresented in some quarters, and its advantages to the State have been so little understood, that I am glad of this opportunity to call public attention to its principal features. I do this the more confidently because of the official interest which I have taken in the adaptation of electricity as a motive power on the canals, and because this particular contract was drawn under my supervision, after consultation with men best equipped with the knowledge and experience required for the task.

"Assuming the feasibility of using electricity as a power in propelling canal boats, and its superiority over steam, horse and mule power, the question presented is whether the State itself shall establish and operate the necessary electric plant or whether this shall be left to private enterprise. Clearly the only advantage of the State's incurring this enormous expense is to be able to control the rates at which the electric power shall be furnished to boatmen. If the State can control the rates and regulate the construction and use of electrical conductors, it is much better that the establishment and operation of the plant should be left to private enterprises. The utilization of Niagara Falls as a water-power made it possible for one corporation to offer the State particularly favorable terms for permission to furnish electricity for the propulsion of canal boats, and the negotiations thus opened have resulted in the contract under discussion. The contract meets the condition above alluded to as the preliminary requisite for intrusting the project to provide the enterprise, namely, that the State should control the rates charged for furnishing electric power and should regulate the construction and use of the conductors."

The Governor then shows that the contract binds the company to furnish power for transportation at such a price as shall be fixed by the Superintendent of Public Works, but which in any event shall not exceed the sum of $20 per electrical horse-power for the season of navigation, or one-fifth the cost of animal power, and permits twice the speed. If at any time the State should desire to own the plant the contract provides for this contingency. Other features of the contract, he says, safe-guard the State's interest and those of the canal boatmen in every possible way. He adds:

"I am convinced that if the terms of the contract are carried out by the company, as I hope they will be, a new era of prosperity will open for the canal. The great need of this waterway today is more rapid and more economical transit, and I believe this is the way to secure it. I cannot imagine why, with an electric motive power to be had on one side of the canal at one-fifth the cost and furnishing twice the speed, a boatman would go to the other side of the canal and depend on mule or horse-power. Of course, every step followed in transportation arouses the opposition of those who are injured by it. The stage driver cursed the locomotive. So the owner of the steam tugs begrudges the introduction of electricity on canals, if it is likely to take away his business. But progress in the Empire State did not stop at the demand of the stage driver, nor will it stop at the demand of the owner of steam canal tugs. The commercial interests of 6,500,000 people will demand some means of increasing the business of our waterways, and if electricity is the most feasible factor for bringing about that result, it will come into use. I am firmly convinced that its introduction as a motive power will double the canal's carrying trade and give new life along its banks. Such increased business will mean more employment of labor, not less, and more prosperity for all parts of the State."

THE BISHOP GUTTA PERCHA COMPANY.

The Bishop Gutta Percha Company, the well-known manufacturer of insulated wires and cables, has moved into its new and handsome offices at 418 East 25th street, New York City. The greater part of the second floor of the new addition to the company's factory building is occupied by the offices and sales rooms. The new section is 25 feet wide by 50 feet deep, and the rear portion of the second floor is set apart for a new testing room, which will contain the latest improved apparatus for the delicate work of testing the wires and cables manufactured by this concern. The raw material will be handled on the first floor, and the shipping will also be done from the same floor. The finished material will be kept on the third floor and the fourth floor will be used for general storage.

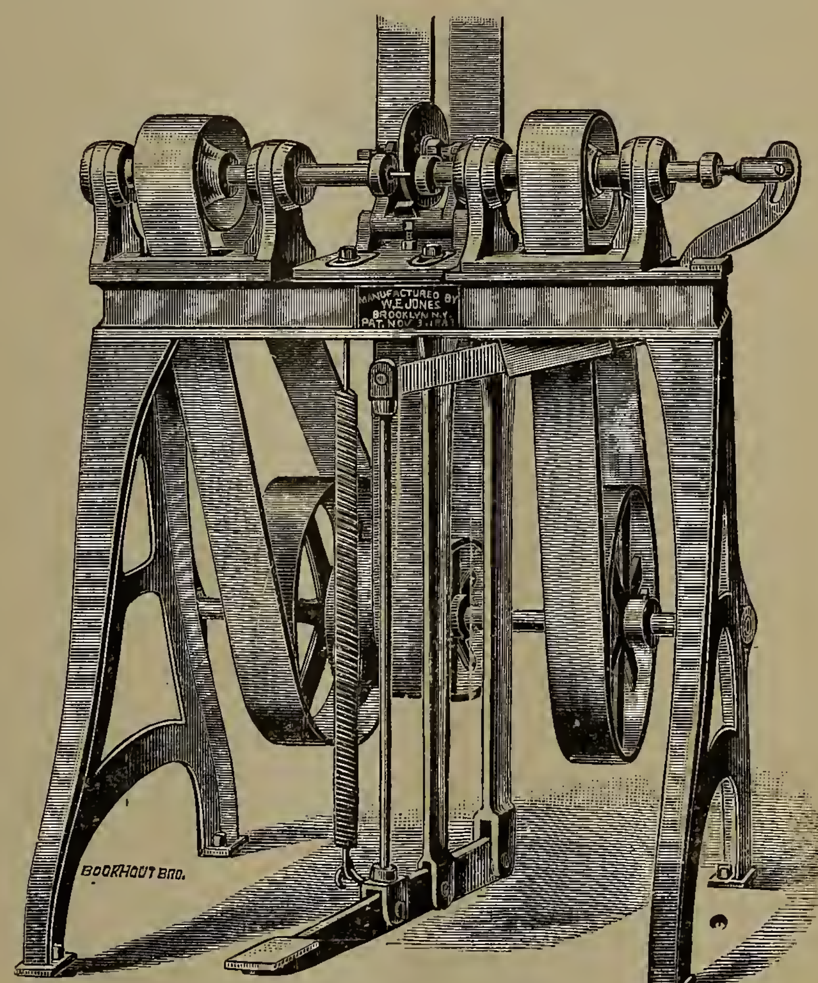
The offices are connected with all parts of the factory by Ness magneto transmitters and receivers, there being ten stations in all. This system enables the office to instantly reach any of the departments of the factory.

The factory throughout is one of the most modern in its equipment, and the company is to be congratulated on its enterprise in keeping in advance of the times. The officers recognize and practice the principle that it pays to have the best of everything.

JONES TRIMMING MACHINE.

The trimming machine shown in the accompanying illustration is designed to trim the edges of metal covers, etc., and for trimming and beading boxes, and other metal articles. Such a machine is very useful in the manufacture of metal goods used in electric lighting and for other electrical purposes, and should be investigated by all who have use for a machine of this character.

It will trim a bead from one to eight inches in diameter and one-quarter of an inch to two inches in depth. One cutting head only is necessary for each size article, thus saving the expense and annoyance of chucks. By depressing the treadle, the revolving disk is brought up to the cutting head, which revolves at the same speed,



JONES TRIMMING MACHINE.

thus clamping the work firmly, while the large cutting wheel is thrown in, doing the trimming by the same movement of the treadle. An experienced boy, with little practice, can trim from 25,000 to 30,000 daily. This machine requires but one adjustment for all diameters—that is, the slide on which the large cutting wheel is carried. It is slotted, so it can be moved to suit the cutter to be used.

The machine is made in a very compact, safe and substantial manner, so as to avoid all danger from belting; also from springing while in operation, it having a steel countershaft 1 1-4 with two 8 in. and two 16 in. pulleys, driving two 4 inch pulleys or steel spindles 1 1-16 inches, running in anti-friction bearings.

Mr. W. E. Jones, 14 and 16 Water St., Brooklyn, N. Y., is the manufacturer of this machine.

How to Make and Use the Telephone is the name of a new book just issued. It is fully illustrated, and will be found very valuable to those who desire to familiarize themselves with the principles and construction of this wonderful instrument. The price of the book is only $1.00. Address the Electrical Age.

BROOKLYN'S NEW ELECTRIC ROADS.

In regard to the Nassau Electric Railroad Company, which is now engaged in the construction of an extensive system of street car lines in Brooklyn, Mr. A. L. Johnson says that one of the aims of the company is to provide long haul facilities and take passengers all over Brooklyn for one fare. As regards the track construction, Mr. Johnson says that it will be novel. A ten-inch girder rail will be used, and not a bolt will be used on the track. The ends of the rail will be welded together by electricity after the pavement has been laid. Every tie rod will also be welded, and it is claimed that there will be none of the thumping and jolting that characterizes bolted tracks. Mr. Johnson stated that this line will be the first in the world to discard the use of copper for the return current, the rails and all metal parts being used instead. The power house is now in process of erection, near the 39th street ferry. It will be a handsome structure and most completely fitted out for the purpose for which it is designed. The Siemens & Halske generators will supply the electric power and will be directly coupled to the engines, which will be of the Corliss slow-speed type. It is claimed that owing to the perfect system of transmission of current, trolley wire half the usual size will be sufficient. The J. G Brill Company, of Philadelphia, and the John Stevenson Company, New York, will build the cars, which will number about one hundred at the time the road is open. Mr. Johnson states that the company expects to have thirty-four miles of the road in working order by the middle of July, and fifty miles by the end of autumn.

ELECTRIC LIGHT AND POWER CONTROLLER.

There is an evident demand for an efficient device to control electric light and power circuits, or individual lights and mechanisms on such circuits, from a central station, and to meet this want the Electric Selector and Signal Company, of 45 Broadway, New York, has recently brought some new apparatus of this class that is worth more than a passing notice.

To give a more comprehensive definition it may be stated that the electric light and power controller is a device to control absolutely the output of current to any individual lamp or motor, or any group of lamps or motors, starting lamps and extinguishing them from the central light and power station, and from the same station regulating the hours the motors are to be operated.

The apparatus of this company consists of three distinct parts: the transmitter, the selector and the switch. The transmitter is the only central station instrument. It consists principally of a disc or a number of discs arranged on an axis, each disc having on its periphery certain elevations or contact points, which, while rotating, make contact with a metallic brush and through it send out current in impulses, which impulses in turn actuate the other devices. The instrument is small, and when designed for ten circuits takes up but 8x8 inches table-space, and is about 6 inches high.

The selector is the instrument on the line which receives the electrical impulses from the transmitter. It consists of a magnet and one disc, the notches in the latter corresponding with the elevations on the periphery of the transmitter disc, which is to actuate it. If the right number of impulses are received from the transmitter, two contact points are closed, and the current flowing through them operates the switch or switches to be thrown by it.

The switch can be made of any pattern or any size, and is a simple magnet-switch operated by the armature of the magnet, which receives its current from the transmitter through the contact points of the selector. More than one switch may be operated by each selector.

The selector and switch are each securely encased in an iron box 8"x6"x4" in size.

The amount of current to operate this controlling device is but nominal, and can be taken from any dynamo at the station. About one-half of an ampere for but seven seconds is sufficient to turn on or off any sub-circuit. The instruments themselves are arranged in series, and a single iron wire of small size—No. 14—is sufficient to carry the current.

The whole output of any machine can be sent over one circuit, and yet each lamp or group of lamps, or each motor or group of motors, be absolutely under the control of the man in charge of the central station, saving many times the cost of this apparatus in switchboard devices, wires, poles, etc.

But the economy is not only in the saving of material but also in the consumption of coal. This is especially true of the motor service. It is a well-known fact that motors are often run more than the number of hours agreed upon with the customer, thus working to the disadvantage of the current-supplier. By the above device, the hours of service having been agreed upon, the motor is started and stopped by the man in charge of the central station, and if it is desired to run it extra hours, it can only be done on application and by paying for such extra service.

The apparatus above described is extremely simple in construction and not easily deranged, therefore it can be relied on in practical operation. The company has greatly simplified its original devices, and now feels justified and secure in backing up the claims made for them.

Mr. P. H. Alexander, formerly senior member of A. B. C. supply house, of New York, is the manager of the light and power department of the Electric Selector and Signal Co. and it is not saying too much to assert that this department of the business is in excellent hands.

ELECTRIC LIGHT ON BRIDGE CARS.

On May 11 a test was made on a train of cars on the New York and Brooklyn Bridge of a new system for lighting railroad cars. The system, which is electric in its nature, is the invention of Lieut. I. N. Lewis, of the Lewis Electric Company, 120 Broadway, New York. It consists essentially of a dynamo driven by the axles of the cars and a storage battery.

The dynamo, which is of a very compact design, charges the storage battery, from which the current is drawn for the lights. It is self-regulating, and wound to give constant voltage at different speeds. Underneath the floor of the car is a battery of 16 chlorine storage cells, which maintain the lights when the car is at rest.

There are 16 incandescent lights to a car, 8 on each side. These are arranged in two circuits, alternate lamps being on the alternate circuits. In this way one circuit may be cut out and the light from the eight remaining lamps will be evenly distributed.

An automatic pole changer is provided, so that when the direction of the motion of the car is changed the polarity of the dynamo will also be reversed. This ensures a continuous charging of the accumulators in one direction.

The test was witnessed by Mayor Schieren of Brooklyn, President J. W. Howell of the Bridge Trustees, Chief Engineer and Superintendent C. C. Martin and others, and all seemed to be favorably impressed with the result. Superintendent Martin spoke very highly of the light and considers the system a great success.

NEW CORPORATIONS.

The Economic Gas Company, Buffalo, N. Y., for manufacturing gas and electricity. Capital stock, $100,000.

The Ladd Elevator Company, Ladd, Bureau Co., Ill., by Thomas Cahill, August Pike and others. Capital stock, $5,000.

The Greene County Electric Company, Roodhouse, Ill., by E. M. Prindle, J. A. Blanrock and others. Capital stock, $30,000.

The Brown Electric and Machinery Company, Little Rock, Ark. J. T. Brown, president; W. G. Brown, vice-president; R. L. Duck, secretary, and T. L Bryan, treasurer. This company is a reorganization of The Arkansas Electrical Supply Company.

Mount Pleasant Street Railway Company, Mount Pleasant, Iowa, with Dr. Geo. E. Smith, president; J. M. Ross, vice-president, and J. C. McCord, secretary and treasurer. The company has not decided as to motive power, but electricity may be adopted.

The Montclair Electric Light Company, Montclair, N. J., by P. Wilcox and others. Capital stock, $50,000.

The Knoxville, Light Heat & Power Company, Knoxville, Pa. Capital stock, $2,000.

Eaton Electric Light, Power & Ice Company, Eaton, Ohio, by H. C. Aydelott and others. Capital stock, $50,000.

The Central Electric Elevated Street Railway Company, Philadelphia, Pa., by W. J. Hamilton and others. Capital stock, $200,000.

The Dobbs Ferry Lighting Company, Greenburgh, N. Y., by G. C. Todd and others. Capital stock, $40,000.

The Huntsville Electric Light and Ice Company, Huntsville, Tex., by T. H. Hall and others. Capital stock, $6,500.

The Fales Electric Light Company, Williamsport, Ind., by L. Swank and others. Capital stock, $6,000.

The Honesdale Electric & Suburban Railway Company, Hazelton, Pa., by A. Markle and others. Capital stock, $100,000.

The Gate City Electric Street Railway Plant, Keokuk, Ia., has been sold for $10,000, which is less than one-fifth of its actual value, to J. C. Hubinger, of Keokuk.

The Mount Pleasant Street Railway Company, Mount Pleasant, Iowa, George E. Smith, president; and J. C. McCord, secretary and treasurer.

Crescent Electric Company, Chicago, Ill., has been incorporated. Capital stock, $10,000. Incorporators, Walter H. Adams, Charles Cohenour and Bernard Elshoff.

The Victor Light, Water and Motor Company, Victor, Col. Capital stock, $1,000,000.

A company is being organized at Batesville, Ark., by Henry Jeffrey, to exploit a new process for generating electricity.

A company is being organized at Ocala, Fla., by H. H. Birdsey, to construct a telephone system.

A company is being organized in Hagerstown, Md., by C. B. Nestor, to establish telephone systems in Hagerstown, Md., Winchester, Va., and other places.

The Bramwell & Pocahontas Electric Light Company, Coopers, W. Va., is to be reorganized under the name of the Bluestone Electric Light Company. Isaac T. Mann, at Bramwell, can give information.

The Monongahela Magnetic Telephone Co., Monongahela City, Pa., by Chas. S. Crall, Oliver Scott and others, for the purpose of constructing and operating a telephone system. Capital stock, $3,000.

The Gilliland Telephone Co., Chicago, Ill., by Andrew F. Crane and others. Capital stock, $1,000,000.

The Chester Traction Co., Chester, Pa., by Eugene Harvey, Geo. Potteiger, and others. Capital stock, $500.000.

Mason Electric Co., Chicago, Ill., to manufacture, buy and sell machinery used for equipping and constructing electric railroads and mining plants. Incorporators, Norman Totten, Frank A. Moore, Manton Haverick. Address T. A. Moore, 4456 Berkeley avenue, Chicago, Ill.

Geo. L. Colgate Company, New York City, N. Y., for manufacturing electrical machinery. Capital stock, $20,000. Incorporators, Geo. L. Colgate, Geo. Van Toast, Jr., I. A. Stevenson, New York City, N. Y.

The Columbus Telephone Manufacturing Company, New York, N. Y., by Edw. S. Wallace and others. Capital stock, $100,000.

The Milwaukee Steam Heating & Electric Construction Company, Milwaukee, Wis., by H. Jane, G. Crooke and G. Huntz. Capital stock, $25,000.

The Mt. Pleasant Street Railway Company, Des Moines, Iowa, by Geo. E. Smith and others.

Imperial Electric Lamp Company, New York City, N. Y., for manufacturing electric lamps and appliances. Capital stock, $250,000. Incorporators: H. F. Rogers, John F. Wood, Huntington, N. Y.; R. I. Murray, Chappaqua, N. Y. Address care of Sammis & Bierck, 6 Wall street, N. Y.

Cutler-Hammer Manufacturing Company, Chicago, Ill. Capital stock, $4,000. Incorporators: H. H. Cutler, E. W. Hammer and R. L. Commons. Address 100 Opera House Building, Chicago, Ill.

The Pacific Stethophone Company, San Francisco, Cal., has been organized with a capital stock of $600-000. Directors: Barclay Henley, W. F. Sawyer, Henry P. Diamond, W. Oscar Ludovici, of San Francisco, and Thomas F. Gibson of Los Angeles.

The Dewey Electric Signal Company was organized in New Jersey, a few days ago, for the purpose of introducing an electric system of signal bells and alarm gongs for use on electric cars. Incorporators, Arthur M. Dodge, J. F. Tams, F. G. Ingersoll, Edward B. Wyman and Geo. B. Hollister.

The Brown Electric & Machine Company has been organized at Little Rock, Ark. Incorporators are: J. T. Brown, president; W. G. Brown, vice-president; R. S. Buck, secretary and treasurer, and F. K. Farsett, superintendent.

POSSIBLE CONTRACTS.

An electric road is proposed from Denton to Queenstown, via Hillsboro, Md.

An electric railroad is proposed in Marion, Ky.

The Freeport Electric Light and Street Railway Co., of Freeport, Ill., has been purchased by an eastern syndicate, and $100,000 will be expended in converting the road into a first-class electric line. Speaker Crisp and several other members of Congress are interested in the enterprise.

The Consumers' Electric Light and Power Co., Houston, Texas, is trying to secure a franchise for the erection of an electric light plant. Among those interested are: J. W. Jones, J. J. Ryan, E. J. Peitzcker and others.

The Gettysburg Electric Railroad Co., Gettysburg, Pa., intends to extend its line to Emmetsburg, Md.

The Jacksonville Street Railway Co., Jacksonville, Fla., intends to introduce the electric system on its road and build extensions.

Mr. B. E. Baker, of New Britain, Conn., is said to be interested in the organization of a stock company with a capital of $100,000, for the manufacture of electrical appliances.

A company has been organized in Milwaukee, Wis., to operate electric launches on the Milwaukee River. The stockholders are: A. Meinecke, Phil. O'Connor, H. O. Franks, D. R. Brigham and William Goltz.

The Flushing and College Point Electric Light and Power Company is endeavoring to secure a franchise to furnish electric light and power in College Point.

The New York and Eastern Telephone Company, Brooklyn, N. Y., has obtained a franchise to construct a telegraph and telephone system.

The Geneva, N. Y., Electric Railway Company, has purchased some property to be used for car shops.

The Street Railway Company of Springfield, Mass , has asked for permission to extend its lines from the junction of Locust street to the Longmeadow line.

The Street Railway Company, Woonsocket, R. I , will extend its lines to the Mendon road.

The street railway lines in Elwood, Ind., are to be extended.

J. B. Lovvarn, Gordon, Ga., has purchased the telephone lines running from Carrollton, Ga., to Graham, Ala., and is reorganizing the company to continue operations.

The Harrodsburg Electric Light and Power Company, Harrodsburg, Ky., is going to erect an ice plant. Riker & Lafon of Harrodsburg, Ky., contemplate the erection of an electric light plant for both arc and incandescent lights.

The City and Suburban Railway Company, Baltimore, Md., has closed contracts for the erection of a new power house. The mechanical equipment for the same will cost $350,000.

Eugene Young and A. B Landers, Princeton, Ky., are organizing a company for the erection of an electric light plant and water-works system.

W. B. Miller of Salisbury, Md., is one of the promoters of a telephone exchange in that place.

The new electric street car line to North Alton, Ill., is to be commenced at once. Mr. A. K. Root, of Alton, Ill., is to be president of the new organization.

The Bluestone Electric Light Company's plant, at Bramwell, W. Va., has been leased to H. P. Mercer for three years.

The Randallstown Granite and Harrisonville Rapid Transit Company, Randallstown, Md., has asked for permission to extend its lines.

It is reported that a new telephone company is to be organized in Pittsburgh, Pa., by Joseph T. Miller, William A. Cooper, Charles A. Rowan, Geo. V. Milligan and Frank Graham.

ELECTRIC SIGNAL AND ALARM BELLS FOR ELECTRIC CARS

The Dewey Electric Signal Company, which has recently organized under the laws of New Jersey, has opened offices at 614 Havemeyer Building, New York city, with F. G. Ingersoll as manager. This company is introducing a signal and alarm system on electric cars, which is said to be very efficient in practical use. The ordinary mechanical signal bells used by the conductor to signal the driver when to start or stop, is displaced by an electric bell which is operated by push-buttons located at convenient points on the inside of the car and under the hood, at each end. This system takes the place of the unsightly bell-strap which has for so many years been an indispensable part of street car equipment. Under the new system nothing of the apparatus is visible inside save the push-buttons.

On the roof of the car is placed the alarm gong. Only one gong on a car is necessary under the Dewey Company's system, and it is rung from either platform by the motor-man pressing his foot on a push-button. The gong will continue to ring until the pressure of the foot is removed. This apparatus will be greatly appreciated by railroad companies, particularly by the drivers themselves, as under the present system it is necessary to keep the foot in continual motion while ringing the bell, which action necessarily diverts some of the motor-man's attention from more important duties.

The current used for operating the gong and signal system is taken from the main line. A very small amount of current is necessary to operate the bells, and the system is so simple that it seems strange that it has not been developed before.

Among the gentlemen connected with the new company are Arthur M. Dodge, J. F. Tams, F. G. Ingersoll, Edward B. Wyman and Geo. B. Hollister, all of whom are well known in the electrical trade.

The Dewey Electric Signal Company has begun business under very favorable auspices and no doubt will do well with its system.

NEW YORK NOTES.

Office of the Electrical Age,
First Floor, World Building,
New York, May 14, 1894.

The Scott Electrical Manufacturing Co., manufacturer of the "Huntington" search light, focussing lamps for photo-engraving, etc., has moved its office and sales rooms from 89 Liberty street to No. 126 same street, where the company has better facilities for handling its increasing business. In addition to the lamps above named, this company makes electro-calcium lamps for theatrical use; also multiple series for low tension and high tension currents, and for 500 volts railroad circuits.

The Elektron Manufacturing Co., of Springfield, Mass., has moved its New York office to 126 Liberty street, where Mr. Baker, the New York agent, will be found with his sleeves rolled up, ready for business at all times.

The New York and Eastern Telephone Company has been granted a franchise by the Brooklyn Board of Aldermen to construct a telephone and telegraph system in that city. The wires will be laid underground, the depth to be determined by the city works commissioner. In return for the franchise, the company is required to pay to the city one per cent. of its gross receipts every six months, beginning with January 1, next. It will provide the city with local telephone service at a rental of $40 per instrument, and the public rentals will be $75 for each telephone. The company also agrees to allow the fire and police departments to string wires in its conduits.

Harry M. Shaw, formerly with Mr. C. E. Chapin, is now vice-president and general sales agent of the Geo. L. Colgate Company, 136 Liberty street, city.

The General Electric Launch Co., of Morris Heights, has just sold two electric launches, equipped with batteries of the Consolidated Electric Storage Co., to A. Meinecke, Jr., of Milwaukee.

The storage battery installation in Eimer & Amend's drug house, at 18th street and 3rd avenue, is giving great satisfaction. The installation was made by the Consolidated Electric Storage Co.

The Storage Battery Supply Company has moved its headquarters from 23d street and 2d avenue, city, to 239 East 27th street.

John V. Gibbons & Bro., 122 Liberty street and 125 Cedar street, city, are selling the M. and M. electric motors and electric sand, and control this district for these goods.

A Hen is on Again."—A new arc lamp for incandescent circuits will shortly appear on the market. There are no carbon holders below the arc and no shadows can form below the light. Keep your eye on us.

H. C. Willis, the old-time electrician, is selling agent for the Washburn and Moen Mfg. Co., 16 Cliff street, manufacturer of bare and insulated wires of all kinds.

Julian Scholl & Co., 136 Liberty Street, New York, are the general agents for the Weston engines, and have met with unprecedented success in the sale of these celebrated machines. An artistic catalogue just issued by the company, shows in testimonials the confidence placed in these engines. Mr. F. W. Hayward, mechanical engineer, formerly with the Ball & Wood Company, has recently been added to the staff of the Julian Scholl & Co. Mr. Hayward's work throughout the country in installing electric light, railway and power plants is abundant evidence of his ability, and his confidence in the Weston engine was the principal reason for his change of base.

L J. Wing & Co., 109 Liberty Street, manufacturers of Wing disc fans and motors, has fitted up a model dynamo room in their store, and has a Billberg dynamo run by a gas engine, which is lighting the store, arc and incandescent lamps being used. Mr. Wing will shortly give an exhibition showing the availability of electricity for general uses.

The George L. Colgate Company, 136 Liberty Street, electrical supplies, etc., has the eastern agency for the McNut incandescent lamp, which is one of the best lamps on the market. It has tested up to 3,000 hours; never blackens and the filament is not broken by concussion or shaking. This makes it a valuable lamp for railway service. The company also handles the Climax Rheostat, Porters' adjuster for incandescent lamps, and arc lamps for incandescent circuits, a large line of testing instruments, volt meters and ammeters, etc. Mr. Shaw, formerly with C. E. Chapin, is associated with Mr. Colgate. Mr. Shaw is a vigorous young man, and can always hold his customer on points. This new firm is selling goods in large quantities, and buyers will do well to give them a chance. They always keep a large stock on hand to show prospective customers.

W. T. H.

FINANCIAL.

The Sioux City Street Railway Co., Sioux City, Iowa, was sold under foreclosure proceedings on May 3, and was bought in by the bondholders, whose judgment amounted to $565,000. A new company will be at once organized.

The plant of the Westinghouse Light, Heat and Electric Light Co., at York, Pa., has been attached to satisfy creditors. The assets of the company ase $50,000 and the liabilities $25,000.

The Macon Gas-Light and Water Co., Macon, Ga., it is reported, has gone into the hands of a temporary receiver. It is stated that the total indebtedness is over $700,000.

The Momence Electric Light Co., Momence, Ill., has increased its capital stock to $10,000.

BUSINESS NOTES.

The Consolidated Electric Storage Co. has a Central Station type of battery, described in its circular No. 8. The battery may be discharged in one hour, or in ten hours. Send for Central Station circular to the company's offices, Edison Building, New York, or Drexel Building, Philadelphia.

Charles A. Schieren & Co., 47 Ferry street, New York city, have received an order for seventy-five feet of 34-inch double perforated electric belting, from the Metropolitan Street Railway Company, San Francisco, Cal. This company has tried various makes of belting and have finally settled on the Electric Perforated.

Electrical and Street Railway Patents.

Issued May 8, 1894.

519,328. Contacting Device for Electric Railways. David F. Graham, Springfield, Ohio, and William P. Allen, Chicago, Ill., assignors of one-third to Oliver S. Kelly, Springfield, Ill. Filed Oct. 25, 1893.

519 334. Carbon-Holder for Arc Lamps. Erwin Lavens, Brooklyn, assignor to Sigmund Bergman, New York, N. Y. Filed Sept. 30, 1893.

519,335. Reactive Coil. Hermann Lemp, Lynn, Mass., assignor to the Thomson Electric Welding Company, of Maine. Filed Nov. 21, 1889.

519,336. Electric Welding-Machine. Hermann Lemp and Carl G. Anderson, Lynn, Mass,, assignors to the Thomson Electric Welding Company, of Maine. Filed May 26, 1891.

519,338. Electric Switch. James F. McElroy, Albany, N. Y., assignor to the Consolidated Car-Heating Company, Wheeling, W. Va. Filed Aug. 2, 1893.

519,346. Apparatus for Telegraphic or Telephonic Transmission. Michael I. Pupin, New York, N. Y. Filed Dec. 14, 1893.

519,347. Transformer for Telegraphic, Telephonic, or other Electrical Systems. Michael I. Pupin, New York, N. Y. Filed Feb. 10, 1894.

519,351. Switch for Overhead Trolley-Tracks. Chas. G. Schmidt, Cincinnati, Ohio. Filed Nov. 7, 1893.

519,376. Alternating-Current Transformer. Charles S. Bradley, Avon, N. Y. Filed Mar. 15, 1892.

519,377. Generating and Utilizing Electric Currents of High Potential. Charles S. Bradley, Avon, N. Y. Filed Nov. 10, 1892.

519,380. Conduit Electric Railway. James F. Cook, Mansfield, Pa. Filed Feb. 5, 1894.

519,402. Life-Guard for Street-Cars. James Campbell, Brooklyn, N. Y. Filed Sept. 21, 1893.

519,446. Trolley-Wire Hanger. Albert B. Crounse and Charles A Rutledge, Passaic, N. J. Filed July 21, 1893.

519,469. Electro-Hydraulic Car-Motor. Charles E. Emery, Brooklyn, N. Y. Filed Mar 27, 1891.

519,472. Fender for Cars. Arthur H. Jelly, Cambridge, Mass. Filed July 11, 1893.

519,482. Electric Accumulator or Secondary Battery. Arthur J. Smith, London, England, assignor of one-half to Henry John Wright, same place. Filed July 20, 1893. Patented in England Aug. 13, 1892, No. 14,658; in France July 10, 1893, No. 231,437; in Belgium July 10, 1893, No. 105,496; in Sweden July 15, 1893, No. 4,938, andin Italy Aug. 3, 1893, LXVIII, 450.

519,497. Electric Fire-Alarm Transmitter. Adolf Dunish, Ravenna, Ohio. Filed Jan. 16, 1894.

519,519. Trolley-wire Crossing. Edward H. Allen, Craner's Hill, N. J. Filed Feb. 2, 1894.

519,561. Overhead-Cable Traction. Walter G. Berg, New York, N. Y. Filed Nov. 11, 1893.

519,597. Electrical Water-Wheel Governor. Earl P. Wetmore, Helena, Mont. Filed Jan. 16, 1894.

519,602. Storage-Battery Plate. Chaimsonovitz P. Elieson, London, England, assignor to himself, and Francisco Alfredo Pellas, Nicaragua, Nicaragua. Filed Oct. 26, 1893. Patented in Germany Feb. 9, 1892, No. 71,132; in Switzerland Nov. 5, 1892, No. 5,655, and in Belgium Nov. 7, 1892, No. 102,011.

519,621. Trolley-Wire Hanger. Chas. F. Strasburg, Lincoln, Neb. Filed Aug. 31, 1893.

519,634. Electrical Temperature-Annunciator. Ernst Kloss, Stettin, Germany. Filed Dec. 22, 1893.

519,648. Safety Car-Fender. Geo. C. Schmidt, Baltimore, Md., assignor of one-half to Abraham Harman, same place. Filed July 25, 1893.

519,674. Electrical Propulsion of Railway-Cars. Jean J. Heilmann, Belfort, France Filed Dec. 18, 1890.

519,686. Method of Operating Electric Motors. John S. Bancroft, Philadelphia, Pa., assignor to the William Sellers & Co., incorporated, same place. Filed Dec. 15, 1892.

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NEW YORK, MAY 26, 1894.

CONTENTS.

THE A. I. E. E. MEETING.

The meeting of the American Institute of Electrical Engineers in Philadelphia last week was, without question, the most successful yet held in point of attendance, interest and character of papers read, and judging from the enthusiasm displayed and the deep interest taken in the proceedings, it is evident that the integrity of the Institute keeps up to high-water mark. The most of the papers were of extremely practical character, and no doubt will be carefully read by every progressive electrician and electrical engineer. The Philadelphia brethren showed an ability of the highest order to provide and entertain, and those who visited Philadelphia on this occasion will long remember the enjoyable time they had.

OUR CONGRATULATIONS TO PROFESSOR HOUSTON.

THE ELECTRICAL AGE congratulates Professor Edwin J. Houston on his selection for the second time to direct the affairs of the American Institute of Electrical Engineers as its president. No one is better qualified to occupy this important place, and none has the welfare of the Institute more at heart than he. While his election probably does not please all sections, the minority should submit to the will of the majority and support the president in every honest endeavor having for its object the upbuilding and the widening of the influence of the Institute.

LIGHTNING ARRESTERS.

Next to the electrical generator or motor there is probably no more important piece of apparatus in an electrical system than the lightning arrester. As all know, many of the lightning arresters on the market are not always reliable, and at times utterly fail in the duty they are designed to perform. It must be said, however, that the inefficiency of such apparatus is not due to any dishonest purpose on the part of the manufacturer, but rather to a lack of knowledge of the actual conditions to be met. Lightning is at the best a decidedly uncertain factor in our calculations, and the result is that we are never sure that our electrical machinery is reliably protected. Investigators and inventors are giving much time and thought to this important subject with the purpose of producing a lightning arrester that will be reliable under all circumstances and conditions, and none has done so much in this direction as Mr. Alexander Jay Wurts, of Pittsburgh, Pa. Mr. Wurts is one of the highest authorities on the subject of lightning and methods for the protection of electrical apparatus from its effects, having given the matter special attention for the past few years. He read a paper on this general subject before the Institute of Electrical Engineers at Philadelphia last week, which shows the progress he is making in this line. An abstract of Mr. Wurts' paper is given on another page in this issue, and is worthy of careful study.

AN OPPORTUNITY.

We publish elsewhere in this issue an advance report furnished us by the State Department at Washington, from the U S. Consul at Messina, Italy, regarding the favorable opportunity for the introduction there of electric light and power. American enterprise should not let this chance slip by without, at least, making an effort to obtain the right. It would be humiliating to European electrical concerns to let an American company come into their own territory and walk away with their business, but American enterprise does not recognize any geographical limit. Americans would like to Americanize the earth, and they will do it to a very large extent because their ideas are progressive.

DISCRIMINATING LIGHTNING ARRESTERS.*

BY ALEXANDER JAY WURTS.

PROTECTION AGAINST LIGHTNING ON CIRCUITS OF ANY POTENTIAL.

A system of protection against lightning discharges has been designed by the writer, which is applicable to circuits of any potential, and although this system has not yet received a practical test, the indications are that it will prove efficient.

The proposition is to connect in series with the circuit, and at frequent intervals, a system of properly constructed choke coils, the expectation being that the energy stored in the circuit in the form of static electricity will, at moments when there is a tendency to a disruptive discharge, dissipate itself into heat through the electrical surgings which will be set up between and among the several choke coils. In Fig. 1 there is represented a power transmission circuit provided with this system of protection against lightning.

The theory upon which these predictions are based

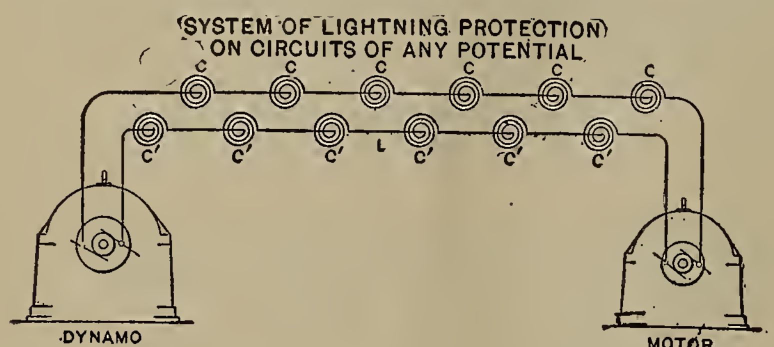


FIG. 1.

is more or less familiar to every electrical student. There exist, however, differences of opinion regarding some of the points involved. Many of my impressions are derived from personal observation, and through these I have been led to believe that, in many cases, electric circuits become statically charged by contact with the neighboring charged atmosphere, that is, by conduction from it. The charge on the line, no doubt, leaks to earth; so does the charge in the atmosphere, but the two are maintained at practically the same potential.

The potential of the atmosphere surrounding the wires of overhead electric light and power circuits is not very high. At the top of Washington monument, Washington, D. C, the difference of potential between the atmosphere and the earth during the thunder storms is about 3,000 volts. If then the potential of an aerial wire is the same as that of the atmosphere intimately surrounding it, the immediate source of danger from the static strain will be inconsiderable. When, however, a lightning discharge occurs from the clouds, this charged condition of the wire becomes unbalanced, the atmosphere has been discharged and its potential has suddenly sunk to zero. The static charge in the wire having lost the support of the previously charged atmosphere now seeks an equilibrium, and in so doing sets up electrical waves which travel to the extremities of the system, or to points of great resistance, and are there reflected to other parts to be again reflected, and so on. At these points of reflection there is an enormous strain, and a consequent tendency to "side flash" so often causing the damage to insulation which we are seeking to avoid. Such electrical disturbances consequent upon a lightning discharge can be observed in wire fences and in tramway rails. In high altitudes even the wet rocks are seen to become luminous, giving off brush discharges at moments of electrical disturbance, and the human body will often feel that peculiar sensation familiar to those who handle influence machines, namely, a sudden and cool draught when an existing condition of electrical strain is broken down.

It is then at these points of reflection that the damage is done, and that we get the impression of a very high potential. An armature insulation is pierced by the discharge, the dynamo current follows, there is a great flash accompanying the short-circuit, several fuses let go and the superintendent is informed that lightning entered the station As a matter of fact, it is probable that the discharge has made a hole in the insulation no larger than the prick of a pin or perhaps that of a pin head, which in most cases is greatly enlarged by the dynamo current.

There are other methods, however, by which circuits probably become charged; namely, by static induction from clouds and by dynamic induction from cloud discharges. It is probable that these also set up electrical surgings in the circuit and that the danger to insulation occurs at points of reflection. I am also inclined to believe that, although a line is seldom, if ever, struck by a direct lightning discharge, it occasionally becomes charged by some of the ramifications which are often seen too accompany a lightning stroke.

Now, if the "electrical surgings" theory be correct, I believe that these dangerous points of reflection can, by means of properly distributed and effective choke coils, be confined to long lines and made to wear themselves out, as it were, between the coils. In this manner frequent points of reflection would be distributed over the system. Primary waves set up during electrical disturbances would be broken into smaller waves, which, surging back and forth between the coils or points of reflection, would finally become dissipated and their energy pass off into heat.

The number of coils which it would be necessary to use for a given length of circuit has not yet been determined, but the writer would suggest placing four to each mile of single wire. For convenient accommodation on the poles these can be arranged alternately on the two legs of the circuit, thus avoiding two coils on any one pole.

Should such a system of protection against lightning be found efficient, its many advantages over the discharge circuit method would be obvious, particularly in a country where good ground connections are costly, and often impossible to construct.

The general form and dimensions of these choke coils is a matter of considerable importance. Dr. Lodge states, I believe, that for disruptive discharges a flat spiral will offer maximum impedance with a given length of wire. To the best of my knowledge, however, Dr. Lodge makes no mention of the number of turns which may be advantageously used. I have found by experiment that the impedance does not continuously increase with the number of turns, but that a critical point is rapidly reached, beyond which additional turns do not add appreciably to the impedance of the coil.

Dr. Lodge has also experimented with such coils in connection with iron cores, and found that the impedance is not appreciably affected by their introduction. I have also experimented in this line, and have naturally surprised myself by obtaining quite different results. It is, however, to be supposed, in view of Dr. Lodge's masterly study of this subject, that my conditions have in some way differed from his. I found that upon the introduction of a small bundle of iron wires into the core of a coil, the impedance to disruptive discharges was reduced nearly 20 per cent. The cause of this was at once made apparent by the beautiful sparks which were seen to appear among the iron wires of the

*Abstract of paper read at the Eleventh General Meeting of the American Institute of Electrical Engineers, Philadelphia, May 15th, 1894.

core upon the passage of each disruptive discharge. These iron wires, of course, form among themselves closed secondaries to the primary coil, and in this manner also very beautifully illustrate the oscillatory character of the discharge

DISCRIMINATING LIGHTNING ARRESTERS.

The Condenser Lightning Arrester.—The discovery and practical application of non-arcing metal to alternating current circuits about two years ago[1], has indicated the possibillity of constructing a discriminating lightning arrester, as it were, for direct current circuits; that is, an arrester which should not require the usual automatic circuit interrupting attachment, but which, by virtue of its material or construction, should allow static electricity to pass and prove an effectual barrier to the dynamo current.

The first step taken in this direction was to carefully analyze the conditions, and the general conclusions arrived at were as follows: A circuit becomes charged in various ways with static electricity tending to earth. These charges are, in a majority of cases, small and of no considerable intensity. The surgings in the system find points of reflection which also become points of greatly increased tension. The earth is the great reservoir (to use common language) for these discharges. This reservoir is, however, unnecessarily large for the accommodation of line discharges. Might not smaller reservoirs be made—little earths insulated from the mother earth? If the circuit were connected directly or through spark gaps to such little earths, these dangerous surgings might be broken up and the line safely discharged without a possibility of the dynamo current following. Each spark gap in each of such discharge circuits would then form a discriminating lightning arrester, but these little earths would be nothing more nor less than one coating of a condenser—the mother earth a common coating to them all. Why not then use condensers connecting one side to line, the other to earth through a spark gap?

(*To be continued.*)

1. Transactions, vol. ix., p. 102, 1892.

THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

THE PHILADELPHIA MEETING.

The eleventh annual-general meeting of the American Institute of Electrical Engineers was held on May 15 16, 17 and 18, in the house of the Engineers' Club, 1122 Girard street, Philadelphia, and was without question the most successful and enjoyable the Institute has had since its organization, 10 years ago.

At 10 A. M., on Tuesday the 15th, President Houston called the meeting to order.

Various reports were then read, after which tellers were appointed to count the votes on the election of officers for the ensuing year. While this work was being attended to Mayor Stuart, of Philadelphia, was introduced and delivered an address of welcome to the members.

It was a pleasure, he said, to have the Institute assemble in Philadelphia, as there was no more useful scientific profession than that in which its members were associated. It was particularly appropriate that the Convention should be held in Philadelphia, where Franklin, the first man to give thought to the science of electricity, lived, and with his far-famed kite first drew from the heavens the electric fluid. The Mayor concluded with the wish that the members would have an enjoyable stay in the city, and invited them to visit the Electrical Bureau at City Hall.

At the conclusion of the Mayor's remarks, President Houston introduced John C. Trautwine, president of the Engineers' Club, who greeted the Institute on behalf of the club of which he is president, and extended them a hearty welcome.

A resolution was then introduced and adopted, favoring the legalization of the standard units adopted at the International Electrical Congress last year, in Chicago, and a memorial setting forth this action will be addressed to Congress.

The secretary's report dwelt, in the main, upon the favorable results of the World's Fair and the Electrical Congress at Chicago last year, as respects the growth and influence of the Institute. As regards the membership it shows that there is a total of 800, classified as follows: 3 honorary; 235 members and 562 associate members.

The treasurer's report shows receipts, including balance on hand at the beginning of the year, $10,454.60; expenditures, $10,047.06, leaving a balance on hand of $407.54.

The Chair announced invitations to visit Girard College, the new power station of the Philadelphia Traction Company, Drexel Institute, Franklin Institute, Historical Society, Schuylkill Navy Club, Germantown Electric Light Company, University of Pennsylvania, the La Roche Electrical Works and Queen & Co.'s show rooms, after which recess was taken until afternoon.

At the afternoon session the result of the election was announced as follows:

President, Professor Edwin J. Houston; Vice-Presidents, W. A. Anthony, Vineland, N. J.; F. B. Crocker, New York; James Hamblett, New York; Treasurer, Geo. M. Phelps, New York; Managers, W. D. Weaver, W. B. Vansize and C. S. Bradley, New York, and A. E. Kennelly, Philadelphia.

President Houston then delivered his annual address, which was listened to attentively. The title of his address was "A Review of the Progress of the American Institute of Electrical Engineers."

Among other things he said "The American Institute of Electrical Engineers is in no sense a local organization. It has in view the interest of no particular section of country, but, on the contrary, is a national body. It represents the electrical profession in all parts of our great land, and welcomes into its membership bright and progressive men in the electrical profession wherever they may be located.

"But while the institute is in no sense a local body, so that no city can properly claim as a right the high privilege of having the annual meeting held in it, yet there is, perhaps, at this time, a special fitness that the annual meeting which witnesses the closing of the first decade of our association should be held in the City of Brotherly Love, where the institute had its birth.

"The International Electrical Exhibition held in 1884 in Philadelphia, under the auspices of the Franklin Institute of the State of Pennsylvania, was called together at an exceedingly favorable moment. Eight years had elapsed since the Centennial Exhibition of 1876 in Philadelphia had sown broadcast the germs of public interest in electricity, and thus laid the foundation for a belief in the bright promises of the electric future. These germs, carried to all parts of the land, were beginning to bear fruit, and a body of earnest and intelligent workers had sprung up on all sides, so that our comparatively limited knowledge of electrical science was markedly increased, although in an extremely irregular and unsystematic manner.

"Between 1876 and 1884, nearly a decade, the work done in the electrical field was necessarily of a pioneer and independent character. The great principles of the science already discovered and announced were but vaguely understood, and needed the practical man to carry them into actual commercial use. To a great extent each investigator trod the path of discovery alone, gropingly penetrating into the regions of the unknown, unaccompanied by his fellow-investigator, and often indeed, unconscious of his existence. Had this early work been properly organized, much of the labor expended in going over ground already trodden might have been saved, but it is by no means clear that this labor was in vain for the weal of the electric future, for truths thus repeatedly wrested from nature and established again and again by independent investigators cannot be too highly prized.

"In our Nineteenth Century activity events move rapidly. In less than a decade from the time of the Centennial Exhibition of 1876, namely, in 1884, the time had come when the advantages of congregation as opposed to segregation were to be demonstrated, when the lonely investigator was to be brought into contact with his brother toiler and taught the advantages of organized work and free exchange of ideas.

"Happily, the International Electrical Exhibition in Philadelphia, of 1884, already alluded to, brought together the workers in electricity both in this country, and, to a certain extent, in other parts of the world, not only during the exhibition itself, but especially during the completion of the buildings and the arrangement of the exhibits. The varied exhibits thus brought together from all sides were a revelation to these hitherto independent workers and showed them, from what had already been accomplished by electrical science, what might reasonably be expected in the near future. The stimulus so excited culminated in the organization of the distinguished body I now have the honor of addressing.

"We are naturally and properly proud of the progress shown by our institute in the first decade of our existence. I ask you now, in all seriousness, how has this progress been assured? Clearly by the establishment of a central, organized body, as distinguished from separate, independent and possibly antagonistic bodies; by the establishment of a central body, which derives its authority from a membership extending over the entire country.

"Is it credible that independent, disconnected and possibly antagonistic societies, located in as many separate cities as there are groups of members sufficient to form separate societes, can hope to accomplish as much good in so short a time as has been accomplished? Would not the disintegration of our institute prove to the electrical engineers of this country little short of a calamity? Might not the establishment of separate organizations result in mutual jealousies and intense sectional feeling, and, consequently, in a tendency to the continuance of errors once contracted?

"Partisanship and intelligent scientific work, in the nature of things, have nothing in common. The true scientific instinct is shown in the desire to know the truth for the truth's sake, and the true electrical engineering instinct is to accomplish the best work in the most economic manner possible. To insure the greatest success I feel sure you will agree with me there must of necessity be a central governing body, viz: The council of the institute deriving its authority from a membership extending all over the country, and vested with the power of speaking authoritatively for the institute between the periods of recognized official meetings."

At the conclusion of President Houston's address, Professor W. A. Anthony, of Vineland, N. J., read a paper on "The Subdivision and Distribution of Artificial Sources of Illumination," an abstract of which will be found elsewhere in this issue.

Prof. Anthony's paper was followed by one by Mr. Alexander Jay Wurts, of Pittsburgh, on "Discriminating Lightning Arresters and Recent Progress in Means for Protection against Lightning." This paper, an abstract of which is printed elsewhere in this issue, was illustrated by experimental demonstrations, through the courtesy of the Philadelphia Traction Company.

Thursday morning's session was occupied by the reading of the following named papers: "Some Storage Battery Phenomena," by W. W. Griscom, of Haverford, Pa., "Unipolar Dynamos for Electric Light and Power," by Prof. F. B. Crocker and C. Howard Parmly, of New York City, and "Alternating Currents and Fuse Wires," by Prof. D. C. Jackson and R J. Ochsner, of Madison, Wis.

At the afternoon session a paper was read by Prof. R. B. Owens, of Lincoln, Neb., entitled, "Test of Closed Coil Arc Dynamo," and was followed by one on the "Relative Advantages of Toothed and Smooth Core Armatures," by Alton D. Adams, of Worcester, Mass.

At Thursday morning's session papers were read on "Standardizing Electrical Measuring Instruments: (a) by the potentiometer method; (b) an Improved-Direct-Reading Potentiometer," by Elmer G. Willyoung, of Philadelphia; "An Optical Phase Indicator and Synchronizer," by Prof. G. S. Moler and D. Frederick Bedell, of Ithaca, N. Y., and "A New Method of Recording any Kind of Variable Current," by Prof. Albert C. Crehore, of Hanover, N. H.

Friday morning's session included the reading of papers as follows: "Resonance Analysis of Alternating and Polyphase Currents," by Prof. M. I. Pupin, of New York City. "Some Facts about Polyphase Motors," by Dr. Louis Bell, of Boston. "The Law of Hysteresis (part 3) and the Calculation of Ferric Inductances," by Mr. Charles Proteus Steinmetz, of Schenectady, N. Y. "Experiments with Two-Phase Motors," by Dr. Louis Duncan, of Baltimore.

The meeting then adjourned.

ENTERTAINMENT.

The local committee of entertainment arranged an excellent programme for the benefit of the members during their stay in the city. On Tuesday evening an informal reception was given by the engineers and manufacturers of Philadelphia, under the auspices of the Engineers' Club and the Electrical Section of the Franklin Institute, at the Manufacturers' Club.

On Wednesday night the annual dinner of the Institute was held at the hotel Metropole, which was largely attended. The dinner was excellent and one of the best yet had at these periodical gatherings. After it was over, speech-making was in order, and it was not until the early hours of the morning that the party broke up.

On the same evening a theatre party was gotten up for the ladies accompanying the members, and they went to the Broad Street Theatre to see John Drew, jr., in "The Butterflies."

On Thursday afternoon about one hundred of the members visited Cramp's ship yards, the steamer leaving the foot of Arch street at twelve o'clock. Every department and shop of the magnificent plant of the Cramp's was inspected, as was also the United States war vessels now being fitted up at the yards. The great magnitude of operations at this place astonished most of the visitors, and all were deeply interested in the operation of the huge machines in the different departments. About 2.30 o'clock the boat returned to the city to take on a few more members who had not started with the original party, and then proceeded down the river to Gloucester, where an elegant planked shad dinner was served. Before dinner a special train on the Gloucester & Woodland Electric Railroad conveyed the party several miles over the line, and on their return a short visit was made to the power-house of the road. By this time the party was yearning profoundly for the shad. The dining-hall was then assailed and the dinner was served in elegant style and greatly enjoyed.

When the sipping of coffee began Mr. T. C. Martin, toast-master arose and made a few appropriate remarks, after which he called on several of the prominent members present, who replied in short speeches of a humorous character, dwelling chiefly on the beauties of the shad and the hospitality of the Philadelphia committee of entertainment.

At half-past seven, with a surfeit of shad, the party boarded the steamer which had brought them hither, and bidding Gloucester a farewell, they were transported, homeward bound, across the moonlit waters of the beautiful Delaware and tortuous Schuylkill. At 9.30 the boat landed at the Chestnut street wharf, and the members of the party scattered to their respective abodes.

On Thursday at noon luncheon was served to the ladies at the Manufacturers' Club, and in the afternoon a local committee of ladies held a reception. A drive on the tally-ho up the Wissahickon to Indian Rock hotel was afterward taken, and a collation served at the hotel.

On Friday afternoon some of the members visited the works of the J. G. Brill Company, the LaRoche Electrical Works and other places of interest, and by Friday evening the city was practically bereft of its visiting electricians.

The local reception committee consisted of the following named gentlemen, who were highly complimented for the excellent manner in which they provided for the welfare of the visitors: Mr. Arthur Falkenau, Chairman; Mr. John L Gill, Jr, Mr. John Birkenbine, Mr. Edward K. Lannis, Mr. Henrik V. Loss, Mr. M. H. Harrington, Mr. Elmer G. Willyoung, Mr. Clayton W. Pike, Mr. Edwin R. Keller, Mr. C. O. C. Billberg, Dr. W. H. Wahl, Mr. George Burnham, Jr., Mr. Frank R. Tobey, Mr. Walter Wood and Mr. James Mapes Dodge.

The following is a complete list of the names of those who were in attendance: W. Lewis, Phila.; H. S. Hering, Phila.; Nelson W. Perry, New York; Carl Hering, Phila.; O. T. Lewis, New York; G. G Grower, Ansonia, Conn.; H. D. Reed, New York; Arthur Hoopes, West Chester, Pa; H. P. Farrington, Phila; E. R. Keller, Phila.; H. M. Davis, New York; E. K. Landis, Phila.; G. B. Price, Phila.; A. E. Weiner, Schenectady, N. Y.; E. A. Scott, Phila.; C. P. Steinmetz, Schenectady, N. Y.; F. W. Tischendoerfer, Schenectady, N. Y.; A. A. Knudson, New York; F. R. Upton, Orange, N. J.; Chas S. Bradley, New York; W. E. Harrington, Camden, N. J.; Fried. Cornell, Frankfort, Germany; Chas. S. Jaeger, Maywood, N. J.; C. Billberg, Phila; E. S. Stuart, Phila.; Wm. A. Anthony, Vineland, N J.; Chas. A. Bragg, Phila.; Ralph W. Pope, New York; W. D. Webster, New York; W. E. Anderson, Virginia; James Hamblet, New York; G. M Phelps, New York; J. C. Trautwine, Jr., Phila.; A E. Childs, Phila.; E. G. Willyoung, Phila.; W. C. L. Eglin, Phila.; W. A. Drysdale, Phila.; H. S. Chase, New York; F. E Swoope, Jr., Phila.; Chas. Hewitt, Phila.; W. J. Johnston, New York; A. E. Kennelly, Phila.; Peter Wright, Phila.; L. Knowles Perot, Phila.; Edwin J. Houston, Phila; R. O. Heinrich, Newark, N. J.; R. B. Owens, Lincoln, Neb.; W. E. Culbertson, Phila.; C. W. Swoope, Phila.; C. P. Wilson, Phila.; J F. Stevens, Phila.; J W. McCrosky, Baltimore; F. McS. Thomas, Baltimore; Geo R. Metcalfe, New York; Jas. G. Biddle, Phila.; Fred'k Bedell, Ithaca, N. Y.; A. J. Rowland, Phila; J. M. Knox, New York; F. H. Hochrath, Phila.; T. Uhlenbent, Jr., Phila.; Chas. W. Black, Cleveland, Ohio; E. E. Keller, Pittsburgh; G. H. Harris, Phila.; J. W. Th. Olan, New York; P. G Gouler, Brooklyn; M. H. Gerry, Jr., St. Paul, Minn.; W. D. Weaver, New York; Leonard Waldo, New York; S. D. Mott, Passaic, N. J.; Alex. Jay Wurts, Pittsburgh; Stephen L Coles, New York; Franklin Sheble, Philadelphia; R. H. Klander, Philadelphia; C. W. Pike, Philadelphia; Craig R. Arnold, Philadelphia; W. W. Griscom, Haverford, Pa.; Robt. McA. Lloyd, New York; Jos. Sachs, New York; Albert Buys, Rutherford, N. J.; F. B. Corey, Brooklyn; H. Ward Leonard, New York; Cary T. Hutchinson, New York; Gano S. Dunn, New York; F. B. Crocker, New York; Thos. R. Taltavall, New York; W. A. Mosscrop, New York; W. R. Hewitt, New York; Thos. Spencer, Philadelphia; F. G. Waterhouse, Hartford, Ct.; Fred'k Reckenzaun, W. Hoboken; Rich. Pfund, New York; Wm. B. Lester, New York; W. P. Dallett, Philadelphia; H. P. White, Philadelphia; W. D. Marks, Philadelphia; W. I. Cheyney, Philadelphia; F. W. Darlington, Philadelphia; F. L. Knight, Philadelphia; S. G. Flagg, Jr., Philadelphia; J L. Hall, Wilmington, Del.; A. Langstaff Johnston, Philadelphia; Chas. F. Scott, Pittsburgh; H. G. Reist, Schenectady, N. Y.; G. M. Brill, Philadelphia; J. P. Jackson, State College, Pa.; Lewis N. Schultz, Philadelphia; T. C. Martin, New York; F. E. Jackson, E. Orange, N. J.; John Hoskin, Philadelphia; I. Paul Gaylord, Philadelphia; W. F. Hanks, New York; A D. Mayers, Philadelphia; F. R. Ford, Philadelphia; J. D. Israel, Philadelphia; J. C. George, Baltimore; A. E. Braddell, Philadelphia; P. R. Moses, New York; Wm. Stanley, Pittsfield, Mass.; Wm. J. Hammer, New York; Chas. E. Emery, New York; Moyan Brooks, Minneapolis, Minn.; E. A. Colby, Newark, N. J.; John Waring, Manchester, Conn.; H. C. Townsend, New York; Luther Steringer, New York; E. W. Bernard, Troy, N. Y.; C. R. Van Trump, Wilmington, Del.; A. L. Register, Philadelphia; T. V. Bolan, Schenectady, N. Y.; F. W. Gladding, Philadelphia; S. Reher, Baltimore; Harold Binney, New York; H. W. Frye, New York; Jos. Wetzler, New York.

ON THE SUBDIVISION AND DISTRIBUTION OF ARTIFICIAL SOURCES OF ILLUMINATION.

BY PROF. WILLIAM A. ANTHONY.

It is a well recognized principle that to illuminate evenly a given area by means of an artificial source, it is necessary that this source should consist of numerous small sources distributed over the area. In carrying out this principle it is usual to divide the area to be lighted into squares, and place a lamp in the centre of each square, as shown in Fig. 1, where each lamp is represented by the sign ×. In order to study the distribution of light by this arrangement of lamps I have computed the illumination at the central point of the figure due to the lamps situated upon the boundaries of each of the squares represented by the dotted lines, the illumination produced by the lamps on the smallest square to be taken as unity. The following table gives the values up to the twelfth square, twice the number represented in Fig. 1, and corresponding, therefore, to an installation in which four times as many lamps are used.

I.	II.	III.	IV.	V.
1	1.000	1.000	4	4
2	.511	1.511	12	16
3	.312	1.823	20	36
4	.223	2 046	28	64
5	.174	2.220	36	100
6	.143	2 363	44	144
7	.121	2 484	52	196
8	.104	2 588	60	256
9	.092	2 680	68	324
10	.083	2.763	76	400
11	.075	2.838	84	484
12	.067	2.905	92	576

* Abstract of a paper read at the eleventh General Meeting of the American Institute of Electrical Engineers, Philadelphia, May 15, 1894.

Column 1 gives the designating number of each square counting outward from the central point. Column 2 gives the illumination at the centre due to the lamps located on each boundary. Column 3 gives the total illumination at the centre due to the lamps included within and upon each boundary. Column 4 gives the number of lamps situated upon each boundary. Column 5 gives the total number of lamps.

It is seen from the table that the twelfth series, which consists of 92 lamps, gives at the centre less than 7 per cent. as much light as the first series of four lamps, and contribute only about two and one-half per cent. to the total illumination at the centre. This arrangement of the lamps does not give an even distribution of light over the entire area, as will be evident from a consideration of the illumination upon the outside boundaries of the space. It is evident that the point B at the corner of Fig. 1 receives one-fourth as much light as it would do if it were the centre of an area four times as large, and lighted by four times as many, or 576 lights. But the illumination at the centre of such an area as seen by the table is 2.905. The illumination at B is, therefore, 2.905 ÷ 4 or .726, while the illumination at A from the sixth line of the table is 2.363. The illumination at B is then less than one-third that at A. At C the illumination is evidently but little more than half that of A. Points located between the centre and outside would be illuminated to an intermediate degree, but after leaving the outer boundary the illumination would rapidly approach that at the centre of the figure. I am considering always points of least illumination in any region, that is, points situated as far as possible from any lamp. It is evident, therefore, that to obtain a uniform distribution of light, the lamps must be concentrated toward the outer boundary of the space instead of being placed at equal distances throughout, as in the figure.

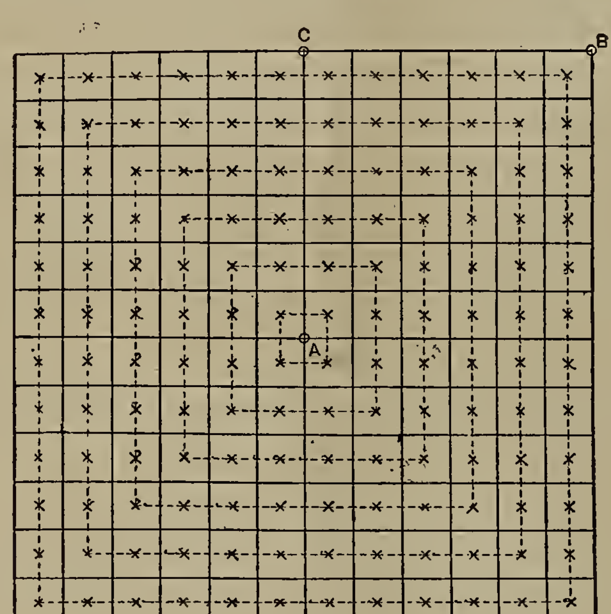


FIG. 1.

But the most interesting question connected with this matter is: what is the effect upon the uniformity of the illumination of grouping the lamps in clusters or using larger lamps at fewer points? It is evident that whatever the candle-power of the lamps or their distances apart in a distribution like that represented in Fig. 1, the *relations* represented in the table will remain unchanged. It is evident also that the illumination at the central point will be proportional to the intensity of the individual sources (if lamps are placed in clusters each cluster is to be considered as a source) and inversely to the square of the distance between the sources.

An inspection of the table will show, that while a given area may be lighted satisfactorily by 16 clusters of four lamps each, an area one-fourth as large, lighted by four clusters at the same distance apart, would not be as well lighted with six lamps to the cluster. It will be seen also that the larger the area, the further apart may lamps of the same candle-power be placed. For example, a room 40 feet square with 16 lamps 10 feet apart, is fully as well lighted as a room 16 feet square with four lamps eight feet apart.

Let us compare arc and incandescent lights on the same basis, that the minimum illumination shall be the same under both systems. First, I must say that the efficiency of arc lights has been greatly overrated. Instead of being ten times, it is rarely three times, and often only one and a half times that of an incandescent lamp.[1] This is for the naked arc. For indoor illumination, ground or opal globes are nearly always used, and these cut off fully half the light. This leaves the efficiency at the most 1.5 times that of the incandescent lamp. The power required for a 16-candle incandescent lamp is 50 watts, and for a full arc lamp 450 watts. The arc lamp must, therefore, replace nine incandescents. Assuming that the lamps are distributed as described in this paper, the table shows that if four arcs take the place of 36 incandescents, their efficiency as compared with the incandescents must be 1.823, and with a relative efficiency of only 1.5, the arc lamps would not light the space as well as the incandescents. If 16 arcs take the place of 144 incandescents, the ratio of the efficiencies required is 1.56, and arcs at 1.5 are still not equal to the incandescents. If 64 arcs take the place of 576 incandescents, the ratio of the efficiencies becomes 1.42, and arcs at 1.5 would be an improvement on the incandescents. It comes then to this, that unless the area to be lighted is so large as to require about 500 incandescent lamps distributed uniformly over it, the use of full arc lamps requiring the same power, will leave some parts of the area less brilliantly lighted.

THE BROTT ELECTRIC ELEVATED BICYCLE RAILWAY CO.

From time to time articles have appeared in the daily and technical papers regarding a projected electric railway between New York and Washington, but until quite recently nothing of a definite character has been given to the public.

On April 2 last, a bill was introduced in the National House of Representatives providing for the incorporation of the "National Rapid Transit Company," which bill was referred to the Committee on the Judiciary. We understand that favorable progress is being made in committee with respect to granting the company the charter it asks for.

The preamble of the bill recites the fact that it is evident that steam locomotion has reached its limit of speed, and that the practice of running passenger and mail trains on the same rails used for the transportation of freight is fraught with danger; that the proposed line will connect Washington with New York, be elevated and operated by electricity, and that a speed of 120 miles an hour or more can be maintained with safety and economy; and, further, that interstate commerce will be facilitated and the general welfare promoted thereby.

Section 6 of the bill provides "That the said road structure and its supports shall be made of iron or steel, of sufficient size and strength to permit the passage of cars on or over the same at a speed of one hundred and twenty miles an hour, and the conduits for the electric current to be so adjusted as to prevent any person from

1. See "Efficiency of Artifical Methods of Illumination." Dr. Nichols: TRANSACTIONS, vol. vi., p. 171.

coming in contact with the electric current having sufficient voltage to endanger life, and that said roadway shall be elevated so that the tracks will be two or more feet above the ground, and shall be provided with one or more side rails at such elevation as will reach above the floor and under the sills of the windows of the cars (made to run on said structure) to prevent derailment, and in all other respects to conform to what is known as the Brott system for rapid transit railways; that when the said road passes through the streets of any incorporated city or village or over any public road or highway, it shall be either elevated sufficient for the passage of vehicles under the same, or placed below the surface of the ground in such manner as not to impede the traffic of said city or village.

Section 13 provides that the capital stock shall be $15,000,000, which may be increased to $25,000,000 by a vote of stockholders. The shares to be $100 each.

Section 15 relates to the schedule of mail and passenger cars, which shall not be less than 100 miles an hour, and also provides that the charge for the transportation of passengers shall not exceed two cents per mile.

The Brott system, on which it is proposed to operate this line, and which is mentioned by name in the bill above referred to, has some novel features, which will be referred to below.

We are informed that tests have thoroughly demonstrated the feasibility and practicability of the system from a mechanical standpoint.

Water power being obtainable on the Potomac within a few miles of Washington, the company proposes to install a generating plant at a convenient point, on the three-phase alternating system, generating current at a comparatively high pressure, and transmitting it either on a substantially built overhead line or in suitable terra cotta or iron ducts insulated in oil, as may hereafter be deemed most advisable, to the Washington terminus of the road. From this point it will form a part of the construction of the rail supports themselves, being carried in a proper manner under the main rails, with suitable distributing and equalizing mains carried under the side rails. A duplicate electrical plant will be installed, in order to insure continuous service all the time. Transformers of the step-down type will be used at frequent intervals, maintaining a positively uniform pressure at all points along the line. The Great Falls plant will supply current to the line from Washington to Philadelphia, another plant being located in the vicinity of Trenton, N. J., to feed the line in both directions to Philadelphia and New York.

Each car will contain four motors of the gearless type directly connected on the axles, two on the front wheel and two on the rear, and while of the multipolar type, will be constructed for high speed.

The motors will make 700 revolutions per minute under full load, and will be directly connected to a steel driving-wheel, built up in a laminated manner of sheets of steel, in order to get the highest degree of tensile strength, and resist the tendency to burst from centrifugal force. The car being built in the lightest possible manner, comparatively narrow, and pointed at both ends to reduce the air resistance to a minimum (when operated singly, the front and rear cars only being pointed when run in trains) will run at a normal speed of 2⅓ miles per minute. The weight of the motors will tend to greatly assist in the balancing of the car, aiding materially the traction, and yet permitting the car to rest freely upon suitable springs.

By means of automatic cut-outs, the line wires supplying current directly to the side collecting wheels, are cut in sections of 2,000 feet each, every other portion of the line which is exposed being dead except that particular half mile on which the car is situated.

Where cars are run in trains all the motors are controlled by one motorman, in the front car, giving him absolute control of the movement of the train to a much wider extent than can be obtained in heavy and cumbersome steam locomotive and cars. One great advantage in the braking of the train is the fact that the entire current passes through the wheels into the rail, forming a momentary electric welding, which current when permitted to flow so as to reverse the direction of the motors, enables the operator to bring his train to a standstill in less than one-third the time required by steam, or air-braking, and thus lessening the danger of accidents. This power of control, combined with the cradle in which the whole train lies, makes an accident of a serious character practically impossible.

VIEW OF BROTT ELECTRIC ELEVATED RAILROAD.

The following is a brief statement of the main features of the Brott system:

The structure rests on a single line of iron posts, having a single supporting rail and side rails just below the car windows.

The cross section of this structure is U or trough shape, through which the cars run with great velocity without the possibility of derailment.

A double electric motor is adjusted to each supporting wheel of the cars, making each a traction wheel, and making it possible to ascend a 10 per cent. grade with ease.

One side rail is charged with electric current, which operates the motors and thence passes through the driving-wheel to the main track, thus completing the circuit.

A train of cars on a steam surface road with a capacity for carrying 150 passengers, will weigh over 200 tons, while a train of same capacity on the Brott elevated structure, will not exceed 30 tons in weight, making a difference of 170 tons of dead weight which has to be carried whether the number of passengers be few or many.

In the Brott system there is a saving in the cost of operating and in cost of repairs; also time of transit and in land for right of way.

The average track elevation is about four feet, with more at road crossings and in cities, thus avoiding dangerous crossings, and the system is free from danger of washouts, snow blockades, etc.

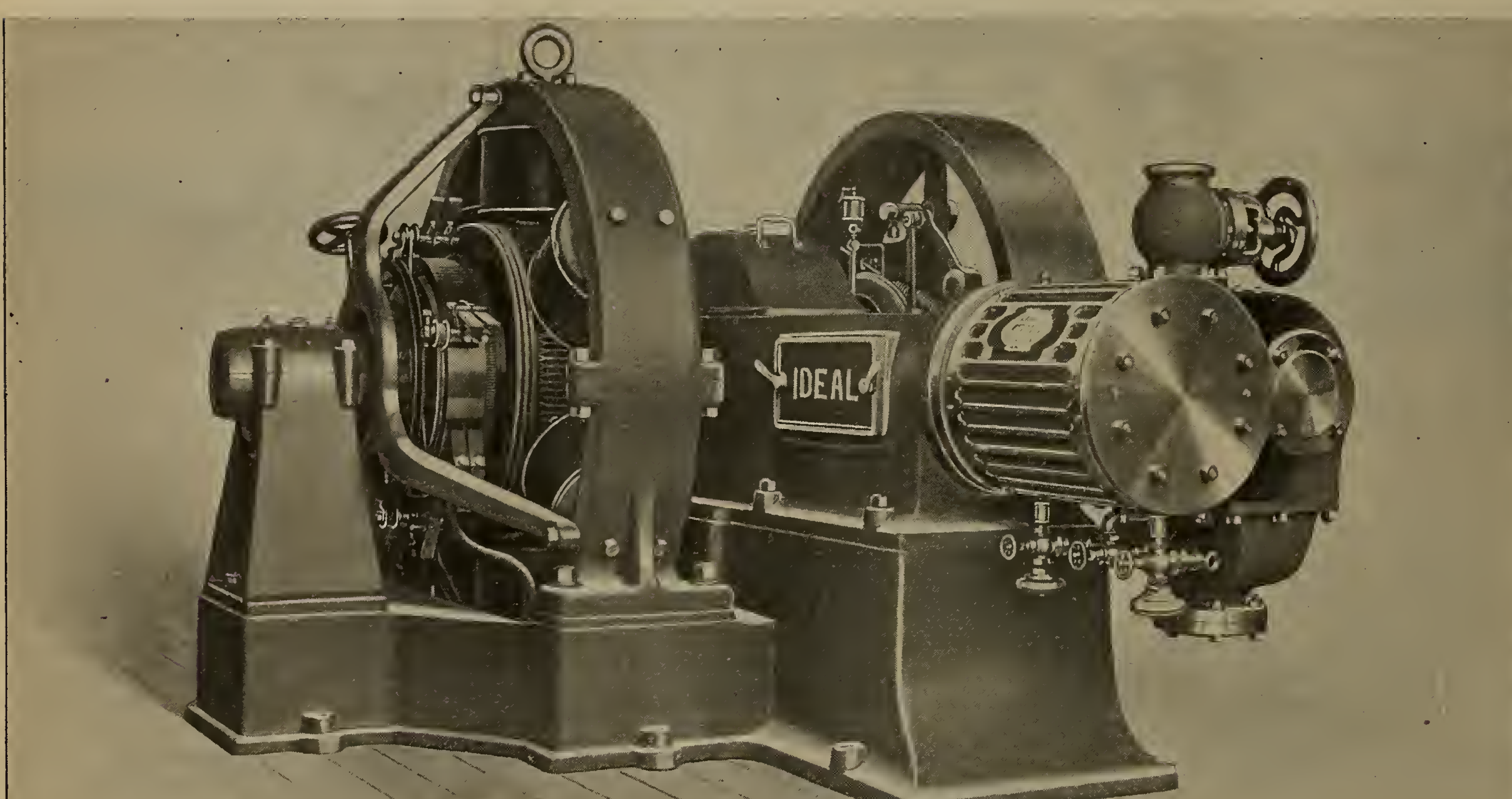
The structure, which is made of iron or low grade steel, is indestructible, the estimated cost of which is about $20,000 per mile.

When a double track is used the two are connected at the side rails in such manner as to add to the stability of the structure.

The offices of the company are at 63 McGill Building, Washington, D. C., and Mr. Geo. F. Brott is president, and Chas. A. McEwen, secretary.

DIRECT CONNECTED STEAM-ELECTRIC COMBINATION.

The accompanying illustration shows a dynamo and engine combination, the two being directly connected. The engine is the "Harrisburg Ideal" self-oiling pattern, cylinder 12" diameter by 12" stroke, manufactured by the Harrisburg Foundry and Machine Works, Harrisburg, Pa., and the dynamo is of the General Electric Co. multipolar type of 50 K.W. capacity, speed 275, 450 amperes, 110 volts.



DIRECT CONNECTED DYNAMO AND ENGINE.

The self-oiling out-board bearing feature in the "Harrisburg Ideal" engine shown in the illustration is designed on a generous model, and has the latest arrangement of movable sleeve with ring oilers, being, except for the increased weight and size, almost the same construction as the standard Edison bi-polar dynamo bearings, which have by years of universally good service proved the merit in them.

A test of the Ideal General-Electric combination made recently in New York city: The engine was started in the usual manner under steam, and when running at the desired speed, 275 revolutions, the brushes of the dynamo were adjusted, and engine and dynamo prepared for undertaking the load. The switchboard was also arranged so that the entire current of power generated would pass through two switches side by side. A five cent nickel was balanced on edge on the outer end of the cylinder head, the engine running at "friction load." The two switches were then thrown in instantly, the ammeter showing 340 amperes; the switches were thrown out in seven seconds, then in and out again, thus throwing upon the engine practically the full load of the dynamo twice within fourteen seconds, during which time the five cent piece remained balanced on the cylinder head, showing the combination to be operating absolutely without any vibration whatever.

There are now between thirty and forty Harrisburg Ideal electric direct connected combinations in successful operation, nearly every one of which was installed by the New York representatives of the Harrisburg Foundry and Machine Works, W. R. Fleming & Co., 203 Broadway, New York, and 620 Atlantic avenue, Boston.

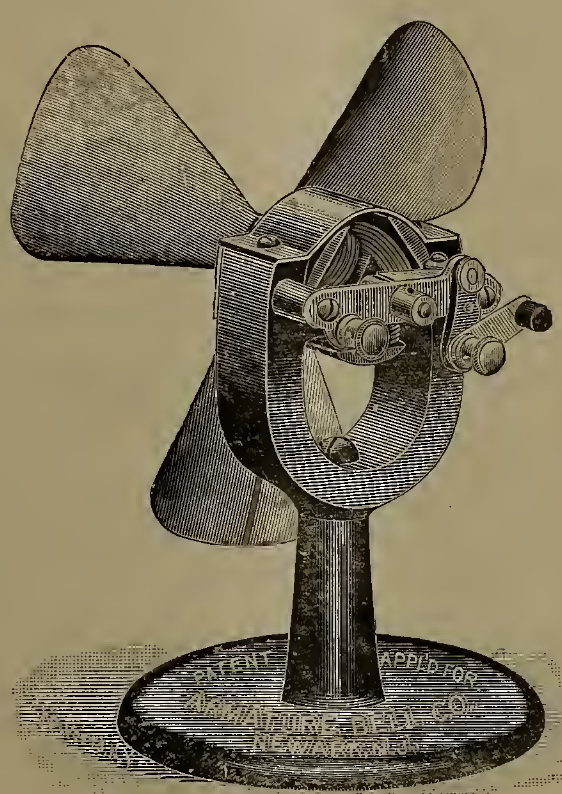
Lecture.—A lecture on "Electricity and the Human Body. Facts, Fallacies and Fancies," was delivered by Mr. H. Newman Lawrence, M.I.E.E., of New York, before the Department of Electricity of the Brooklyn Institute of Arts and Sciences, on the night of May 22. The lecture was well illustrated and enjoyed by those who were present.

Reorganization.—A meeting of the first mortgage bondholders of the Utica Belt Line Street Railroad Company, Utica, N. Y., was held in New York, May 15, for the purpose of agreeing on a plan of reorganization of the road, which is now in the hands of a receiver. It was agreed to raise $50,000 on second mortgages to pay off the indebtedness of the road to Receiver Benton, the same to be placed in the hands of John W. Boyle, to whom the power and authority of the Board of Directors is given, and who is to settle all the indebtedness of the road, except with the Thomson-Houston Company, which is about $400,000.

NEW FAN MOTOR.

As this is the season for the reappearance of standard fan motors and others of more recent design, it is interesting to note the new ideas that are exemplified in some of the newer motors. The one illustrated herewith has just been brought out by Hillhouse & Co., 136 Liberty street, New York City, which is claimed by the manufacturers to be the simplest, cheapest and best fan motor. It operates an eight inch fan and is said to run noiselessly. It is wound for battery current and revolves at a high rate of speed on Edison-Lalande, Premier-DeMott and all wet or dry open circuit batteries. Closed circuit bluestone batteries may be equally as well used for the operation of the motor, the latter requiring only one volt and about seven-tenths of an ampere of current.

The motor stands on a heavy iron frame and is of



NEW FAN MOTOR.

the three-pole type, and a conveniently arranged switch at the rear end of the machine cuts off and on the current as desired. It is compactly made, and no doubt will find a large sale.

HOW THE TROLLEY WORKS.

The electric railroad is a great educator. Two citizens of Brooklyn were talking about the trolley, and one of them not being as well "up" in it as the other, the latter kindly volunteered to let his friend into the mystery. This is the explanation he gave :

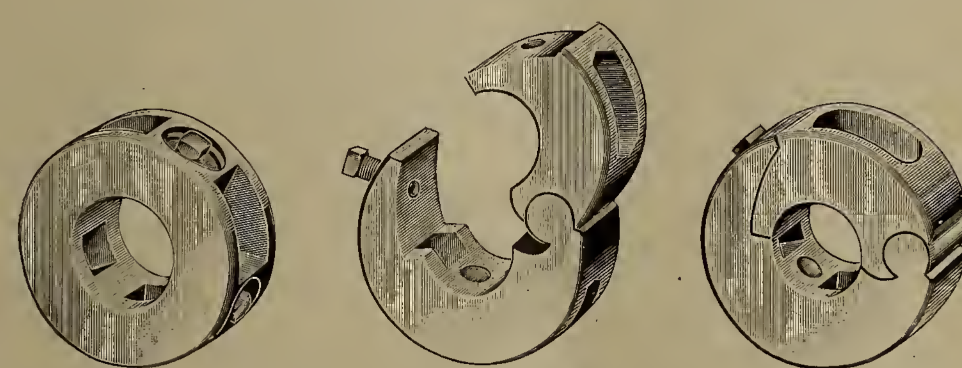
"You see that little copper wheel on top of the pole, that runs along pressing against the wire," said the "electrician." "Well, that's what makes the electricity. That was the invention. The pole from the car-roof with the copper wheel on the end of it is what they call the carbon. Now some fellow discovered that such a wheel on the end of the carbon, running against a steel wire, created the electricity. The faster that copper wheel revolves, the more electricity it makes and the faster the car goes. That's the reason the little copper wheel is made so small. Then the extra power, more than is necessary to keep the car going, you know, is accumulated in those things at each end of the car, and when the driver wants to start her up he just turns his crank and lets out enough electricity to start her ; then the copper wheel on top of the carbon starts generating, and so on it goes. Great invention, sir ; great invention !"

GIANT SAFETY COLLARS.

An improvement which will be appreciated by machinists and operators of steam plants in general, is the Giant Safety Collars, which are illustrated herewith.

Two styles of collars are made, one solid, which is designed to slip on the end of the shaft, and the other split so that it can be applied directly at any point of the shaft, as a clamp would be applied. In order to add as little weight as possible to the shaft, these collars are chambered, but in such a manner as to preserve full bearing surfaces at each end. The safety collars have a hinge joint, and when in place on the shaft, the set screw that holds the two joints of the collar together also screws and holds it in position on the shaft.

In the construction of these collars no bolts are used, and the set screw heads do not project above the surface. There is nothing unsightly about these devices, and in their construction, material sufficient to give the necessary strength is used, at the same time useless waste has been avoided.



SOLID SPLIT OPEN SPLIT CLOSED

The Giant Safety Collars are manufactured by the Gouverneur Machine Company, Gouverneur, New York.

THE LAUFFEN-FRANKFORT TRANSMISSION PLANT.

The report of the testing committee of the late electrical exhibition at Frankfort-on-the-Main, Germany, has been rendered. The portion regarding the transmission of electrical energy from Lauffen to Frankfort is summarized as follows : The transmission was over a distance of 105 miles, alternating current at from 7,500 to 8,500 volts being used for the purpose, and the conductors being bare copper insulated by oil and porcelain insulators. The efficiency of the transmission—that is to say, of the energy delivered by the alternators at Lauffen and that received in the conductors at Frankfort—was 68½ per cent. at the lowest output of the generators, and 75.2 per cent. at the highest performance. Theoretical investigations showed that the influence of capacity in long bare conductors carried in the air for the transmission of alternating currents upon the efficiency of transmission when using a periodicity of between 30 and 50 is so small that it can be regarded in the projection of transmission plants as being quite subordinate. The working with alternating currents at from 7,500 volts to 8,500 volts by the use of oil, porcelain, and air insulated conductors, extending over 60 miles, is as regular and safe as the operation of low-tension alternating currents in short conductors.

PERSONAL.

Mr. Geo. T. Manson, of the Okonite Co., has just returned home after a seven weeks' trip through the South, Mexico and California. He looks as if he enjoyed the trip and if it had ageed with him.

NEW YORK NOTES.

Office of the Electrical Age,
World Building, New York,
May 21, 1894.

Mr. I. H. Moses, 36 South Water street, Cleveland, Ohio, contractor for electric wiring of all kinds, was in town last week buying a large stock of goods. He placed orders for 100,000 feet of interior tubing and 100,000 feet of insulated wire. McCreary electrical specialties also came in for a good order. The tubing and wire go into the Garfield Building, now being finished in Cleveland. Mr. Moses got the contract to install 2,300 lamps in this building, the electrical work of which is under the supervision of Mr. E. P. Roberts, electrical engineer, Brainard Building, Cleveland, Ohio. Mr. Moses has the largest and finest electrical supply house between New York and Chicago. He manufactures telegraph instruments and a general line of electrical goods, making repair work a specialty.

The M. & M. Electric Co., 140 Washington street, city, have just issued a circular describing their new motor fan outfit No. 4. The outfit includes two cells of battery in a polished oak box, with motor and switch, the fan running 20 hours on one charge.

The General Electric Launch Co. has just sold an electric launch to Cornelius Vanderbilt, for use at Newport. It will be equipped with the Consolidated Electric Storage Company's batteries.

Mr. William Marshall, the manufacturer of the celebrated Marshall condensers, has moved his establishment from the University Building to 709 Lexington avenue, near 57th street, city.

Mr. R. J. Sheehy, the well known electrical inventor of this city, has the deepest sympathy of the electrical fraternity in the loss of his estimable wife on the 15th inst. Mrs. Sheehy was greatly esteemed by all who knew her.

Mr. J. G. Dolph, of the Eureka Tempered Copper Company, 126 Liberty street, city, is doing a good business in the sale of this company's well-known tempered copper goods, including commutator sections and arc brushes. The company is doing a nice trade in complete commutators, and is getting some good orders for T-H and Brush arc dynamo tempered copper segments. Mr. Dolph keeps in stock a large supply of goods for immediate delivery, including rough castings of commutator segments of all makes of dynamos and railway motors. He also keeps a generous supply of the Eureka Dry Battery, which is meeting with great success.

Mr. Charles J. Bogue has opened an establishment at 206 Centre street, city, where he will manufacture electrical supplies for electric light and power purposes. He will make a specialty of armature and commutator repair work. Mr. Bogue has been connected with the Thomson-Houston and other large electrical concerns for the past twelve years and is fully qualified to engage in the new enterprise.

Ridsdale & Lewis, 39 and 41 Cortlandt street, city, are agents for the Acton Steam Pump Governor, which gives perfect control over the action of steam pumps. It is entirely automatic and is a most valuable appliance for controlling hydraulic elevator pumps, fire pumps, air compressors, or wherever it is necessary to stop or start a steam pump by the change in pressure of the fluid being pumped. The firm is general dealer in machinery and supplies, both for the export and the domestic trade, and consists of T. W. Ridsdale and T. A. Lewis.

The Central and South American Telegraph Company announce that code messages for all places in Brazil can now be accepted "via Galveston."

Mr. A. O. Tate, private secretary of Mr. T. A. Edison, has been elected vice-president of the Montana Trust Company, Helena, Montana.

Mr. Samuel Insull, general manager of the Chicago Edison Co., is in town. He looks extremely well. His old friends are all glad to see him.

Mr. Henry W. Pope, well-known in the electrical fraternity, is now president of the Mutual Telephone Exchange and Construction Co., of this city.

Diehl & Co., 385 Broadway, City, are busy preparing for the summer rush for fan motors; indeed the rush has already begun. The Diehl electric fans are growing in popularity, owing to their extreme simplicity and handsome design.

W. T. H.

STRIKE.

On Sunday, May 13, the Atlantic Avenue Railroad in Brooklyn, N. Y., was tied up owing to a strike among the motormen and conductors. The trouble grew out of the order of the company, that each man should provide himself with a new summer uniform. The men refused to obey the order, with the result that a portion of the system was tied up for a couple of days. Operations were, however, resumed on Monday night, the company having rescinded the objectionable order.

Wiremen's School.—The Association of Practical Electricians has been organized in Chicago. The object is to establish a school for wire-men and other electrical workers, giving instruction mainly in practical work, not, however, neglecting electrical theory. It is the purpose of the association to secure competent instructors and occasional lectures from well-known electricians. It is to be a sort of school, and at the end of the course graduates will be given a diploma. The instruction will be given at night, because the members and students will, as a rule, be engaged in their regular duties during the daytime.

German Incandescent Lamps.—A conference of incandescent lamp makers has been held in Berlin with the object of raising the price of lamps. It was decided to form a union of European incandescent lamp manufacturers, and to fix the minimum price per lamp at 75 pfennige (about 18 cents) to direct consumers and at 65 pfennige (about 16 cents) to middlemen.

FOREIGN.

A Profitable Plant.—The municipal electric lighting station, which is the only municipal electric plant in Hungary, made a profit of 22,000 florins on its last year's working. In consequence thereof, the price for current has been lowered to 1.8 kreuzers per lamp hour, and large consumers will be given a rebate up to 15 per cent.

The Heilmann Locomotive.—This locomotive was tested on May 9 on the Western of France Railway. The locomotive drew a special train from the St. Lazare Terminus in Paris to the Seine et Oise Station, a distance of 33 miles, performing the journey in 55 minutes. The train was composed of five coaches and a dynamometric brake van, and at certain portions of the line a speed of 65 miles an hour was attained. The locomotive subsequently took the ordinary train, No. 54, back to Paris.

ELECTRIC-LIGHT PROSPECTS IN MESSINA.

Hon. Chas. M. Caughy, U. S. Consul at Messina, writes to the State Department as follows:

The present contract for illuminating this city by gas expires on the 28th of March next, but, owing to a deadlock in the municipal council, the Ministry has appointed a commissary, who will act until the organization of a new body in June, and consequently, no action will be taken until then. The only illuminating plant in Messina is the gas works owned and operated by an English company under a concession from the Crown in 1861, and which has been once renewed.

The light furnished and the prices charged are both causes of great dissatisfaction to the people of Messina. The power is of only 8 candles, and it costs about $1.92 (gold) per 1,000 cubic feet. It appears to me that there is here a great opportunity for any enterprising electric-light company, for in Italy, as well as in the United States, the people are very willing to adopt the latest and best illuminant.

For the installation of a plant for lighting stores and dwellings, and the furnishing of motive power, the prospects are equally favorable. The usual place of abode in Messina, as in the majority of other European cities, is the apartment, or what we know as the "flat." The walls here are never less than two, sometimes three, feet thick, and are built of stone, so that the introduction of gas pipes on any floor, except the first, where the connection is made from the street, is attended with so much labor and expense that very few houses, except those recently built, in which it was carried during construction, are provided with it.

No such obstacles confront the introduction through the smallest of apertures, under window jambs, etc., of the tiny electric wire, which can be carried upon arms projecting from the houses, that privilege being now enjoyed by the telephone company, so that one of the largest factors in construction expense, the buying and planting of poles, is avoided.

As to motive power there is one applicant already in the field willing to adopt it as soon as it is installed, and that is the tramway company which runs its lines from Messina to Faro Point, a distance of 9 miles, and to Barcelona a distance of 30 miles. At present the road is operated by dummy engines.

I realize that the first questions that will arise are, what will be the cost of constructing a plant and what will coal cost? When I say that the average price for unskilled labor is 35 cents, and for skilled 45 cents a day; that the laying of stone, including cost of material, is fifty per cent cheaper than brick; that lumber is no more expensive than in the United States; that land is remarkably cheap and that Cardiff coal costs, delivered on the wharf, $4 per ton, I think the questions are satisfactorily answered.

Before writing this report I made a thorough canvass of the business men of the city, and they, without exception, promised their most earnest coöperation, both with their influence and their purses, to make the installation of an electric plant in Messina a success.

Let me say to those companies who may see fit to enter into competition that they should do so personally, so to speak, by sending a well-equipped representative to look over the ground, and to be on hand to meet any emergency or to answer any question that may arise.

Electrical Execution.—On May 14 Lucius R. Wilson, a condemned murderer, was executed by electricity in the Auburn, N. Y., prison. Death was instantaneous, on the turning on of the 1,680-volt current.

THE WESTINGHOUSE COMPANY'S AFFAIRS.

The annual meeting of the stockholders of the Westinghouse Electric and Manufacturing Co. was held on May 16 at the company's office, in Pittsburgh. Notwithstanding the general paralysis industrial affairs throughout the United States during the nine months of the fiscal year ending March 31, the balance sheet in the annual report discloses net profits amounting to $1,640,-809.11.

The company's assets are placed at $14,722,314.48, and liabilities $9,016,596.50. The total amount received by the company from World's Fair contracts was $487,-704.47. After charging the account with all costs of every nature, it shows the net cost to the company to have been $16,013.03. The report speaks of Niagara Falls power transmission, incandescent stopper lamps, competition and patents, and new works in progress and contemplated, and throughout shows the company's business to be in a most satisfactory condition.

The election of a Board of Directors resulted as follows: Chas. Francis Adams, Lemuel Bannister, August Belmont, N. W. Bumstead, A. M. Byers, Marcellus Hartley, Geo. W. Hebard, Henry R. Hyde, Brayton Ives, Geo. Westinghouse, Jr.

The Board organized and re-elected the present officials.

NEW BOOKS.

How to Make and Use the Telephone. By George H. Cary, 117 pages, with numerous illustrations. Bubier Publishing Co., Lynn, Mass. Price, $1.00.

Since the expiration of the telephone patents great interest has been awakened in the telephone. Prior to that time, the telephone was looked upon by the public as a jealously guarded secret. All this has been changed, however, by the operation of the law. The telephone has become public property and the public has evinced an unquenchable thirst for knowledge about this interesting instrument. To satisfy this desire this little book has been produced, and from the easy and simple style in which it is written, it will undoubtedly meet with popular favor. It will be especially valuable to experimenters and mechanics who wish to construct the apparatus themselves, and to aid such, dimensional diagrams and illustrations of the different parts of a telephone outfit are given. The author of the book is a practical telephonist, and knows exactly how to describe the instrument and give directions for its construction.

A chapter is appended giving directions for making a phonograph, which greatly adds to the value of the work. The book is thoroughly practical, and is suited for everybody who wishes to know all about the telephone.

Electrical Measurements for Amateurs. By Edward Trevert, 117 pages with nearly 50 illustrations. Bubier Publishing Co., Lynn, Mass. Price, $1.00.

This little work is designed as well for the practical electrician as for the amateur. It is written in a clear and concise manner, and no doubt will be found very handy by all engaged in electrical measurements. Chapter I is devoted to definitions of electrical units; Chapter II to the measurement of resistance, and Chapter III to current measurement. It is an up to date work, and every one interested in electricity in any way should possess a copy.

These books, as well as all others on electrical and kindred subjects, are for sale at the office of the Electrical Age Publishing Co., World Building, New York.

NEW CORPORATIONS.

The California Ground Electric Company, San Francisco, Cal. Capital stock, $100,000, by Frank Shay, Geo. W. Schell and others.

The Crescent Electric Company, Chicago, Ill., by Walter H. Adams and others. Capital stock, $10,000.

The Quindaro Park Electric Railway Company, Kansas City, Kan., by J. P. Moore, C. C. Dail and others. Capital stock, $200,000.

The Pittsburgh Automatic Lighting Company, Pittsburgh, Pa., by C. H. Cobell and Lawrence Wolfel. Capital stock, $25,000.

The Automatic Electric Coupler & Train Signal Company, Portland, Ore., capital stock, $100,000. Incorporators: W. E. Wamsey, Geo. W. Simons and others.

Block, Heat & Light Company, Camden, N. J., by Samuel K. Robbins and others. Capital stock, $100,000.

A company has been formed in Hartford, Conn., for the purpose of operating a new telephone system. Capital stock, $50,000. R. L. Andrews and Richard Schuey are the promoters of the scheme.

The Woodstock and Canterbury Telephone Company, Woodstock, N. B., has been incorporated. Capital stock, $3,000.

The Wireless Armature Dynamo & Motor Company, Jersey City, N. J., manufacturing electrical machines and devices. Capital stock, $100,000.

California Ground Electrical Company, San Francisco, Cal. Capital stock, $100,000.

Banning Electric, Chemical, Fire Extinguisher Company, Jersey City, N. J. Capital stock, $100,000.

Peoples' Electric Street Railway Company, Holyoke, Mass. Capital stock, $100,000.

The Central Electric Railway Company, Philadelphia, Pa., and Delaware County. Capital stock, $60,000.

The Harrison International Telephone Construction Company, Jersey City, N. J. Capital stock, $200,000.

The Buttonwood St. and Fairmount Park Street Railway Company, Norristown, Pa. Capital stock, $30,000.

Esmond Electric Traction Company, New York, N. Y. Capital stock, $1,000,000.

Livgro Incandescent Lamp Company, Harrison, N. J. Capital stock, $1,000,000.

The Geneva Construction Company, Trenton, N. J. Capital stock, $25,000.

Portland, Vancouver & Northern Railway Company, Portland, Ore., constructing railroads, telegraph and telephone lines, etc. Capital stock, $3,000,000.

The Fletcher & Fletcher Electric Company, Cleveland, Ohio. Capital stock, $10,000.

The Citizens' North End Street Railway Company, Philadelphia, Pa., by F. Weckerly and others. Capital stock, $36,000.

The Butler Traction Company, Butler, Pa., by Jos. Hartman and others. Capital stock, $75,000.

The Citizens' Clearfield & Cambria Railway Company, Philadelphia, Pa. Capital stock, $6,000. Geo. S. Gandy, 51 N. 6th St., will give information.

Fort Wayne Postal Telegraph Company, Fort Wayne, Ind. Capital stock, $20,000.

Reading Gas & Electric Company, Reading, Mass. Capital stock, $50,000.

Stoneham Gas & Electric Company, Stoneham, Mass. Capital stock, $50,000.

The Chesley Electric Company, Hoboken, N. J. Capital stock, $100,000.

Brown Electric & Machinery Company, Little Rock, Ark. Capital stock, $30,000.

POSSIBLE CONTRACTS.

The Lake City Light, Ice & Power Company, Lake City, Fla., proposes to erect an electric light plant. Wm. R. Bush is the manager.

Meyer & Shawalter, Lancaster, Wis., are seeking a franchise to operate an electric light plant in that place. They will need the necessary equipment when the franchise matter is settled.

The Upper Peninsula Asylum for the Insane, Newberry, Mich., is about to install an electric light plant and is ready to purchase the necessary equipment.

The Home Electric Light & Power Company of Elkhart, Ind., has been given the contract to install 75 electric arc lamps in the streets of that place.

Electric lighting apparatus and a motor will probably be installed in the new County Alms House, Rome, N. Y. Address Architect Jacob Agne.

Bids are to be opened June 1, in Jackson, Tenn., for furnishing the city for five years with electric arc lamps for street illumination. Address S. C. Lancaster, city engineer, for further information. The city government will also grant a franchise for the operation of an incandescent light plant for domestic uses.

An electric light plant is to be installed in the Santa Fé hospital, Topeka, Kan. For further information address J. W. Perkins, architect, 720 Kansas avenue.

The Agricultural Department, Washington, D. C., is inviting proposals until June 6 for the building of 120 miles of telegraph line extending from Titusville to Jupiter, Fla. Complete equipment is desired.

A bill has been introduced in the Ohio Legislature appropriating $100,000 for the installation of an electric light plant at the State Penitentiary, Columbus, Ohio.

A. Ormsby Graydon, city engineer, London, Can., can give information regarding the contract for the electric lighting of that city for a term of years.

A bill is before the Ohio Legislature authorizing the city of Cardington, O., to issue $25,000 in bonds to build an electric road.

The Khedive of Egypt has invited bids for the proposed concession for constructing and operating a system of electric tramways in Cairo and its environs. The bids are to be opened August 1 next. Fred. C. Penfield, United States Agent and Consul General, can give further information.

The U. & M. Electric Street Railway Company, Rahway, N. J., will extend its lines to Sewaren.

A new telephone company is being organized in Parkersburg, W. Va., by J. B. Finley.

A stock company is being organized at Centerville, Minn., to put in an electric light plant.

An electric railroad is to be built from Xenia, Mass., to Springfield, Mass.

The Akron & Cuyahoga Falls Rapid Transit Company, Akron, Ohio, has been incorporated. Capital stock, $300,000. Incorporators are: R. J. Randolph, E. L. Babcock, E. F. Voris, Charles F. Walsh and W. E. Hall.

A company is being organized at Sandy Spring, Md., for the purpose of putting telephones throughout that neighborhood.

A telephone exchange is about to be organized at Le Roy, N. Y., by the business men of that place.

A franchise has been granted to the Scranton syndicate at Cortlandt, N. Y., to operate electric cars on all the principal streets of that place.

The Hardware City Telephone & Electrical Company, New Britain, Conn., has been organized. Capital stock, $500.

An electric light and bell plant are to be installed in the residence at 135 Madison avenue, New York. Mortimer Porter Thain, 150 Broadway, can give information concerning the work.

Robert McAffle, Pittsburgh, Pa., can give information regarding the proposed addition to an electric light plant in that place.

The Opelika & Auburn Electric Railway Company is looking for new equipment. For further particulars, C. I. Daughty should be addressed.

A new electric light plant is to be established in Hamburg, Iowa, by H. P. Smith.

An electric light equipment is to be installed in a large building to be erected in Newport, Vt. For further particulars address H. H. Coswell.

TRADE NOTES.

The Interior Conduit & Insulation Company has just issued a new catalogue in which are described all of the Lundell machines, including fan outfits, etc., for 1894. The catalogue is gotten up in the company's usual artistic style.

The Hayden-Booker Manufacturing Company, 2140 DeKalb st., St. Louis, Mo., has just issued an illustrated catalogue of the various kinds of batteries and battery supplies made by this company. Directions for setting up various types of battery and charging the same are given at the end of the catalogue.

Everyone desiring to furnish his office so as to give satisfaction to himself and friends should have it papered well. Papering can be done cheaply now, and we call attention to "Bargain House" advertisement on another page, where fine papers can be had at low prices.

The Belknap Motor Company, Portland, Me., has just secured an order for one of their new multipolar generators and two 40-H. P. motors from a house that has been using for two years a 20-H. P. motor of the Belknap Company's make. The new multipolar generator referred to has a capacity of 75 kilo-watts. Patents have been granted the Belknap Motor Company on its composite woven-wire and graphite brushes. The company is now on a firm foundation with respect to its right to manufacture and sell these excellent devices.

The Mason Electric Co., Pullman Building, Chicago, Ill., is handling, among the many other lines of goods, the Medbury insulation appliances for over-head construction for electric railways.

An electric railway is to be constructed from Lock Haven, Pa., to Mill Hall. The contract was awarded to the Complete Electric Construction Company, of New Jersey.

The firm of Barnard & Hoopes is the latest addition to electrical trade in Philadelphia. The firm is located at 916 Arch street, and is the selling agent in the vicinity of Philadelphia for various electrical manufacturing companies. A full line of electric and gas fixtures, dynamos and motors will be kept on hand and the firm will make a specialty of supplies for electric and power uses. Both Messrs. Barnard and Hoopes are well known in the trade, the latter having been connected with the Fort Wayne and Edison Companies.

The Westinghouse Electric and Mfg. Co., Pittsburgh, Pa., has secured a contract to supply the Ohio Steel Co., of Youngstown, Ohio, thirteen 25 H-P motors, one of 10 H.-P., and one of 5.

The Columbia Incandescent Lamp Co., of St. Louis, Mo., has opened an office in Chicago, at No 932 Monadnock Building. Mr. J. M. Hill is manager.

We have received an illustration showing the casting of one half of one of the General Electric Company's 450,000 watt alternating dynamos. The casting was made by the Builders' Iron Foundry, Providence, R. I., Ten laminated wrought iron pole-pieces had to be cast in and united with the cast iron. It was a difficult operation, and great care had to be taken.

The old Richmond paper mills property, at East Providence, R. I., have been overhauled and will be occupied by the American Electrical Works, the well known manufacturers of insulated wires and cables for all electrical uses. Three new buildings have been erected on the property, and the total area of the buildings to be used by the American Electrical Works is 113,000 square feet. The location of the plant is in Phillipsburg, three miles from Providence, and is on the New York, New Haven and Hartford railroad, which gives excellent facilities for the shipment of goods.

ALSITE ALUMINUM.

There has been a need for a reliable aluminum solder, and many attempts have been made to produce a successful article, but up to the present time success does not seem to have attended these efforts. Our attention has been called to a solder for aluminum which is claimed to be perfect, and this claim would seem to be well founded, from the fact that many of the leading manufacturers of the country have endorsed it. The name of this substance is Alsite Solder, and a joint made with it can be rolled, hammered or turned on the lathe. Either a butt or lap-joint may be used. It is stated that tubing soldered with Alsite Solder can be drawn. The solder does not deteriorate nor disintegrate and does not contain any poison. The latter fact will be appreciated by those who have to work the solder. The Alsite Aluminum Company, of 106 and 108 Liberty street, New York City, manufacture this valuable substance.

On Wednesday, May 16, a practical demonstration of this method of soldering, also of the company's process of electro-plating aluminum was made before the Franklin Institute in Philadelphia.

BUSINESS NOTICE.

The Consolidated Elfctric Storage Co. has published two new circulars, Nos. 9 & 10—devoted, the first to "Isolated Lighting" and the second to prices, weights, &c., of batteries. They may be secured of the company at Edison Building, New York, or Drexel Building, Philadelphia.

The Consolidated Electric Storage Co. is now making a special type of battery for the General Electric Launch Co. strong, durable, and of good capacity.

Address, Edison Building, New York, or Drexel Building, Philadelphia.

Electrical and Street Railway Patents.

Issued May 15, 1894.

519,715. Hand Regulator or Switch for Motors. Emil E. Keller, Chicago, Ill. Filed July 12, 1893.

519,726. Electric-Arc Lamp. Wilhelm Mathiesen, Leipsic, Germany. Filed May 29, 1893.

519,794. Electric-Railway System. David Mason, Schenectady, N. Y. Filed June 27, 1893.

519,803. Fender for Street-Railway Cars. John B. Bailey, Baltimore, Md. Filed July 3, 1893.

519,824. Car-Truck. Louis Warfield, Detroit, Mich. Filed Aug. 7, 1893.

519,837. Trolley-Wheel. Van Dyke Cruser, Flatbush, N. Y. Filed Feb. 13, 1894.

519,849. Alternating-Current Arc-Lighting System. Thomas Spencer, Philadelphia, Pa. Filed Feb. 12, 1894.

519,858. Constant-Current Dynamo. Wm. H. Elkins, Cambridge, Mass. Filed Feb. 3, 1894.

518,869. Electric Mechanism for Giving Reciprocating Motion. Henry S. McKay, Boston, Mass. Filed Mar. 12, 1892.

519,876. Telephone-Circuit. Chas. E. Scribner, Chicago, Ill., assignor to the Western Electric Co., same place. Filed Sept. 28, 1893.

519,881. Device for Regulating Electricity Generated by means of Wind-Power. Theodore A. Willard, Norwalk, Ohio. Filed Apr. 6, 1893.

519 912. Electric-Arc Lamp. Jesse F. Kester, Buffalo, N. Y., assignor to the F. P. Little Electrical Construction and Supply Co., of New York. Filed Oct. 23, 1893.

519,932. Electric Railway-Signal. Rollin M. Strong and Chas. F. Reed, Omaha, Neb. Filed Sept. 5, 1893.

519,938. Electric Railway-Signal. Frank Beattie, Leete Island, Conn. Filed Apr. 2, 1894.

519,945. Electric Indicator. Wilbur E. Garey, Chicago, Ill. Filed Oct. 13, 1893.

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NEW YORK, JUNE 2, 1894.

CONTENTS.

"UNIPOLAR" DYNAMOS.

The term "unipolar" as applied to certain dynamos is rather confusing, its meaning of course being that a "unipolar" dynamo has but one pole. Such a machine is impossible; but, strange to say, many electricians believe in the possibility of constructing a unipolar dynamo. A so-called unipolar dynamo, the Ball for instance, has one pole-piece for each armature, but it is found that a complete magnetic circuit exists, and must exist, for the reason above noted. The term "unipolar" refers more strictly to the fact that the induction in the armature coils of a so-called unipolar dynamo is "unipolar"—that is, the current so induced flows constantly in *one* direction, without the necessity of commutation. Even this definition is not strictly in accordance with the facts, but is tolerated mainly on account of its having come in to general use—as inapplicable as it is. The efficiency of "unipolar" dynamos has been discussed and discussed, and it is a question in the minds of some electrical engineers, whether such a machine has any great practical value. Prof. F. B. Crocker, and Mr. C. H. Parmly, however, are positive in their opinions concerning the practicability of unipolar dynamos, and state that such machines are much more practical and applicable than is generally supposed. In a paper read before the American Institute of Electrical Engineers at the Philadelphia meeting, these gentlemen gave some interesting facts regarding the theory of such machines, and concluded that unipolar dynamos and motors possess a good many advantages, and important ones. These advantages are set forth in the abstract of the paper referred to, which is printed elsewhere in this issue, and the favorable opinions of these gentlemen, who are abundantly qualified to speak on this subject, will no doubt bring about a reaction in favor of the "unipolar" machine.

THE BELL TELEPHONE BUSINESS.

The statements of the business of the Bell Telephone Company have, up to recent times, been, uniformly on the ascending scale, but this condition of affairs no longer exists. According to the company's last statement there were, on May 20 of this year, 2,646 fewer Bell telephones in use in the United States than on the same date the year previous, and the net output for the month showed a decrease of 2,092 as compared with the same period last year. These figures tell a story more plainly than a page of argument; they show that the Bell Company is not enjoying so extensive a business as of yore. Several good reasons can be given for this condition of things. Some people will say that "the monopoly has been broken" and that the Bell Company can no longer have its own way. This possibly is a partial reason for the change, but it cannot be the only one. Times are hard and a great many people are cutting off the item of expense for telephones. The private and independent telephone business has, as yet, cut no great figure in sharing the Bell Company's general business, and so long as a reasonably good substitute cannot be offered for the Bell service, it is hardly likely that people are going to throw the Bell instruments out just to spite the company. This applies to general telephone service, including the long distance. A great many local wires and circuits have been erected throughout the country, which are equipped with independent telephones; but very few of these existed before the telephone patents expired, so little of this new business can hardly be charged against the Bell Company as a loss. On the whole it appears to us as if the hard times had more to do with the decrease in business than any other cause.

UNIPOLAR DYNAMOS FOR ELECTRIC LIGHT AND POWER.*

BY F. B. CROCKER AND C. H. PARMLY.

The object of the present paper is to call attention to the fact that unipolar dynamos and motors are much more practical and generally applicable than is ordinarily supposed to be the case. The term unipolar dynamo is here used in its ordinary sense to designate a machine in which electric currents are generated by the *continuous cutting* of lines of force. These machines are identical in principle with the original disc machine of Faraday. The term unipolar is by no means satisfactory, but is almost universally used in connection with machines in which the magnetism in the armature is not reversed by the rotation of the latter.

The action of unipolar dynamos is based upon the fact that a conductor moving in a magnetic field so as to cut lines of force will have an E. M. F. set up in it whether the field be uniform in intensity or variable. The error is very commonly made of supposing a *variation* in the number or density of the lines of force is

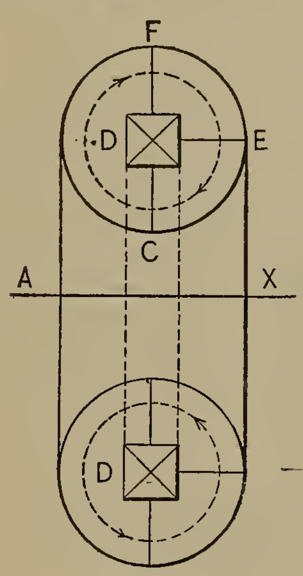


FIG. I.

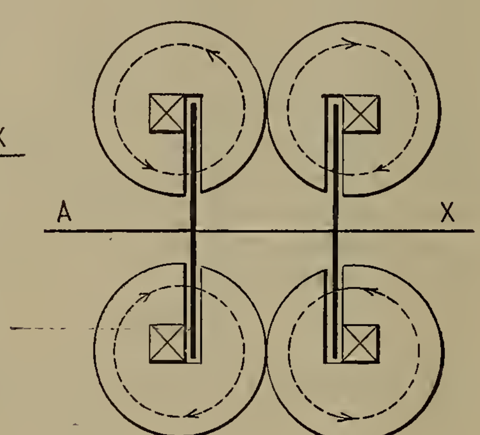


FIG. 2.

necessary in order to produce a current by magneto-electric induction. As a matter of fact, however, an E. M. F. must always be produced if any lines of force whatever are cut. It may happen, and in the case of a *coil* of wire, it usually does happen that lines of force are cut in one direction by one portion of the conductor and in the opposite direction by the other portion, in which case one effect neutralizes the other. The simplest example of this is a closed metallic ring moving in a uniform field perpendicular to the lines of force. In this case one half of the ring generates an E. M. F. in one direction and the other half in the opposite direction, so that no *current* is produced; but the full difference of potential corresponding to the number of lines cut per second will, nevertheless, exist between the two sides of the ring.

In the unipolar dynamo or motor a variation in the lines of force is not only unnecessary but is positively objectionable, since it would cause serious losses from eddy current and hysteresis, whereas if the field is perfectly uniform these losses are practically avoided.

The theory of the magnetic circuit is now well understood, and modern practice in the design of dynamos and motors fully appreciates the advantages which result from making the ratio between the length of the magnetic circuit and its cross-section a minimum. In a unipolar dynamo this reduction of the reluctance of the circuit can be carried farther than in any other class of machines, because the creation of an electromotive force by the continuous cutting of the lines of force enables a form of magnetic circuit to be employed, which in the highest degree combines the advantages of minimum length with maximum cross-section. This type of magnetic circuit is the circular ring; for if we surround a circular coil DD of wire carrying a current with two circular rings of semi-circular cross-section, as shown in Fig. 1, we shall form a closed magnetic circuit of maximum induction for minimum excitation. Cut this circuit along any radius of the circular cross-section and a magnetic field is obtained in which, if an inductor be rotated about AX as an axis, there will result a continuous cutting of the lines of force, which only requires that appropriate collectors be provided to form a closed electrical circuit, in order to produce a current of electricity. The magnetic circuit is indicated by dotted circles with arrow-heads.

There are, however, but two directions in which the magnetic circuit can be cut so as to form a field suitable for practical use. One is along the radius CD, in which case the inductor will rotate in a plane perpendicular to the axis, and the other is along the radius ED, in which case the inductor will move in the convex surface of a cylinder whose axis is the axis of rotation. In the first case the armature of the resulting dynamo will be a disc, and in the second case a cylinder. In both, the way to collect the current would be to provide one set of collectors at the centre of the circular cross-section and the other set at the axis, thus utilizing the shaft as a portion of the electrical circuit. The relative advantages and disadvantages of the two forms depend upon circumstances in each particular instance.

In many cases the single magnetic circuit shown in Fig. 1 is not the best for practical use, because it would be necessary to make the diameter of the ring larger than it would be if two rings were placed side by side as shown in Fig. 2, because in this type of dynamo we must depend wholly upon the total magnetic induction and the speed of rotation to produce the electromotive force, as it does not appear to be practicable to greatly multiply the voltage by multiplying the number of inductors.

Advantages of unipolar dynamos and motors.—The greatest advantage of the unipolar machine is its extreme simplicity. Its armature consists of nothing but a solid cylinder or disc of steel, or other suitable metal firmly mounted upon a shaft. The construction of the field magnet and the rest of the machine is also very simple. The elimination of the commutator, although already mentioned in connection with simplicity, is nevertheless an essential feature of this type of machine and is a great advantage. The almost infinitesimal armature resistance of these machines is decidedly advantageous, not only in increasing efficiency and decreasing heating, but also because it causes the machine to regulate more closely either as a dynamo or as a motor. According to all accepted theories there would be no hysteresis in these machines because both the armature and field are always magnetized in exactly the same direction and to exactly the same intensity.* For similar reasons there would be no Foucault currents, since the E. M. F. generated in any element of the armature would be exactly equal to that generated in any other element and there could be no tendency to produce eddying currents. This perfect uniformity of the magnetic field is secured by the construction which is exactly symmetrical, the air gap being precisely the same at all points.

The question of armature reaction is somewhat doubtful, since some authorities state that it is quite considerable, but in the opinion of the authors it is very

* Abstract of a paper read before the American Institute of Electrical Engineers at Philadelphia, May 16, 1894.

* There might be some molecular friction due to cutting the lines of force, but this would probably be slight.

small, and certainly no greater than in other types of machine. The armature consists of only a single turn, consequently the maximum magnetizing effect of the armature in ampere-turns is numerically equal to its current capacity, and since the ampere-turns on the field would be made considerably greater than this, the armature reaction cannot be great. It is interesting to consider how armature reaction can occur in such a machine. The probability is that it has the effect of curving and slightly lengthening the lines of force so that they do not pass perpendicularly from one pole surface to the other in the air gap and have a spiral path in the iron, since the field current tends to produce lines in plane passing through the axis and the armature current acts at right angles, producing an inclined resultant. There can of course be no change of distribution of magnetism as a result of armature reaction, which is the really objectionable effect that it produces in the present types of machines, and in the unipolar machines there are no back ampere-turns and no magnetic leakage.

In conclusion we may say that unipolar machines are practically indestructible, since they are so simple and so strong that they are not likely to be damaged mechani.ally and it is almost impossible to conceive of one being burnt out or otherwise injured electrically, since the engine would be stalled by the enormous current before the armature could be fused by it. A machine possessing all these important advantages certainly deserves a prominent place in electrical engineering, whereas it now has practically no existence whatever.

DISCRIMINATING LIGHTNING ARRESTERS.*

BY ALEXANDER JAY WURTS.

(*Continued from page* 247.)

One difficulty immediately presented itself. After the condenser had become charged how was it to become discharged? To be successful it must be self-discharging, and not only this, but the discharge must take place in such a manner that no dynamo current should follow. Therefore, to discharge the condenser disruptively was at once out of the question. Experiments in this line led first to the application of a wet string to the terminals of a condenser, the idea being to leak out the charge through an ohmic resistance sufficiently great to prevent an appreciable flow of dynamo current. A two M. F. condenser provided with a wet string leak was treated with violent disruptive discharges from a battery of Leyden jars, and upon immediately applying the tongs to the terminals of the condenser after the crack of the discharge, not the smallest trace of a charge could be detected. When the string was removed or had become dry the charge was retained. Evidently a wet string would not answer as a permanent leak. Various compositions of plumbago with moulding sand, red lead and plaster-of-paris were pressed into a tube and used, but these all proved unsatisfactory, being unreliable. In many instances this composition leak would, before testing with the condenser, have a resistance of 30,000 ohms, and after a single discharge it would be found that this resistance had increased to many hundred thousand ohms. This was, perhaps, due to the flying apart of the plumbago particles under the influence of the discharge, and so breaking the continuity. Finally, a pencil-mark over ground glass was suggested and this was found to work admirably. A medium pencil was rubbed back and forth over a strip of ground glass, making a narrow shining streak having a resistance of from 40,000 to 50,000 ohms. Rubbing with the hands did not seem to appreciably change this resistance. Broad black pencil-marks were made on the ends for better contact, and connection to the terminals of the condenser was obtained through aluminium foil, both glass and foil being protected on the bottom by the wooden case of the condenser, and on top by a small inverted wooden trough. A condenser provided with such a pencil-mark leak, was now connected to a 500-volt direct current circuit and to apparatus, as shown in Fig. 2. A was a 500-volt direct current generator; L one leg of the circuit, which may represent a trolley wire; G the other leg of the circuit, and which may represent the ground return: K the two M. F. condenser with its high resistance leak *l*; C a small spark gap in series with the condenser, and in the discharge circuit; B was a 12-32 inch spark gap over which disruptive discharges would pass

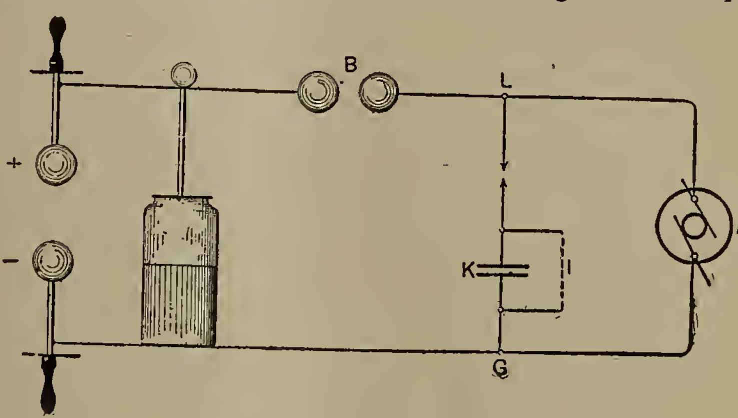


FIG. 2.

from the battery of Leyden jars and in this manner suddenly charge the line L. The most violent disruptive discharges that could be obtained in the laboratory were unable to damage either the generator or the condenser. A small spark gap, a trifle larger than C connected either in series or in shunt to the generator, failed to take any of the discharges, thus demonstrating the ease with which the discharges were received by the condenser. Such tests were continued for half an hour at a time, the discharges following each other in rapid succession, but the condenser was ever ready, being kept constantly discharged by the high resistance leak. Of course, the resistance of the leak was sufficient to prevent the formation of an arc at C. The terminals of the leak were also too far apart to permit the condenser to discharge disruptively. This device ensures all the requirements of a discriminating lightning arrester, and in this form seemed admirably adapted for station and indoor use on 500-volt direct current circuits.

For line or outdoor use the condenser was placed in a suitable cast-iron box, one terminal of the condenser being grounded to it while the other was led out through a specially designed and water-tight bushing. If then this iron box were buried in damp earth, as a ground-plate, so to speak, the outer terminal connected to the lower electrode of a small spark gap placed on a pole, and the upper electrode of the gap connected to the line, the combination would constitute a discriminating line lightning arrester.

Practical tests have been made during the past summer with both station and line condenser lightning arresters, and the results obtained have been most gratifying.

The Non-Arcing Railway Lightning Arrester.—I have, however, designed a lightning arrester which is much smaller, cheaper and, perhaps, in every way more desirable than the condenser arrester. It is also a discriminating lightning arrester.

I had frequently noticed what is probably familiar to many of you, namely, that a disruptive discharge will leap over a non-conducting surface much more readily than through an equal air space. The non-conducting surface seems to form an entering wedge, as it were, through the air, so that this being already partly split or ruptured, the discharge has but to further separate the air from the non-conducting surface instead of boring its own path through it. A pencil-mark over a rough piece of glass or unpolished marble still further reduces the breaking down strain.

But to avail myself of this fact, in the construction of a lightning arrester, was a problem over which I pondered for some time. My design was to bring electrodes located in a discharge surface near enough together to form a lightning arrester spark gap, and at the same time to avoid the passage of dynamo current when the electrodes were connected to the terminals of a 500-volt direct current generator. I reasoned that a dynamo arc to be maintained must be fed by the vapors of its electrodes. To prevent an arc, the formation of such vapors must be suppressed. My first attempt in this direction proved successful. I drew a pencil-mark about two inches long over an unpolished piece of marble, covered this with a second piece similar to the first, and, having previously slipped between the two marbles pieces of aluminium foil as terminals to the pencil-mark, I bound the whole together with twine. These terminals were now connected to the terminals of a five-hundred volt direct current generator, and disruptive discharges caused to pass between the marbles and over the pencil-mark. A one-ampere fuse was connected in the dynamo circuit. No current following these discharges, the terminal foils were brought successively nearer together, testing each time for the passage of dynamo current. When the electrodes had reached a distance of a quarter of an inch from each other the fuse was blown. The terminals were now placed a half-inch apart, and oft-repeated tests failed to establish a short-circuit. The dynamo was now cut out and upon resting my hand on the upper marble, while the discharges were still passing, I noticed a considerable mechanical shock and, when the twine was removed, the upper block was thrown off. In consequence of this it seemed advisable to provide more space for the discharge. A small groove was, therefore, cut in the lower marble from one electrode to the other, and well blackened with a lead-pencil mark. Discharges now failed to produce the above-mentioned mechanical shock, or to throw off the cover. It was, however, noticed that after several discharges had passed, this pencil-mark disappeared, having been dissipated and apparently scattered over the surfaces of the two marbles. To overcome this difficulty a piece of wood was laid into the lower marble between the electrodes, and into this a shallow groove was burned. Various materials were now tested into which one or more discharge grooves might be burned, such as fibre, felt, leather, ivory, boxwood, celluloid and others, but most of these proved unsatisfactory for various rersons. With fibre, the charred surface was quickly worn away; ivory chipped off in small pieces; both leather and felt crumbled away. Lignum vitæ, however, proved to be a most excellent material. In the final form adopted for this arrester both upper and lower blocks were made of this material, thus enabling the discharge grooves to be burned into the lower block itself, and avoiding the necessity of inserting a discharge piece between the metal electrodes.

Another and more simple form of this arrester was also constructed. A hole was bored through a solid block of marble, the centre of which was then filled with a cylindrical block of hard maple having grooves burned in on the sides. Solid brass cylindrical electrodes were then inserted in either end, making a snug fit. But in practice these marbles were in many cases split open by the expansive force of the discharge, thus demonstrating the necessity of the vent which is obtained by clamping two surfaces together, and between which the discharge may pass.

This device, like the condenser arrester, constitutes a strictly discriminating lightning arrester. In regard to its action, I have been asked why a discharge should find an easier passage across a conducting film than through a non-inductive conductor having the same ohmic resistance as the conducting film. My conception of the case is as follows: When a discharge passes through a conductor of more or less ohmic resistance the time of discharge is considerable; there is a great strain from all parts of the charged surfaces during the time of passage, and there will be a tendency to discharge or "side flash" along paths normal to the conductor. The passage of the discharge may be likened to the passage of tangible matter through a dense fluid —there is a gradual yielding of the opposing resistance, but nothing is broken. When, however, a discharge passes over a conducting film as described, there is a sudden breaking down or giving way of the dielectric, and this is aided by the presence of the conducting film. The film, however, does not act in the sense of what is commonly called an electric conductor, but as a wedge, splitting the dielectric preparatory to the passage of the disruptive discharge.

This non-arcing railway lightning arrester is eminently suited for the protection of direct current circuits up to 1,000 volts. On 1,000-volt alternating current circuits from smooth body armatures it also operates satisfactorily, but on similar circuits from toothed body armatures the arresters break down after a few discharges, and a short circuit is established. However, it is not impossible that two or three of these arresters might not be used to good advantage in series on circuits of high potential.

The especial advantages of this arrester may now be summed up, as follows:

1. It offers a direct and non-inductive path to earth.
2. It is absolutely non-arcing and consequently requires no attention after being once properly installed.
3. It has no moving parts and there is nothing about it to get out of order.
4. It is small and, therefore, easily installed under a car.
5. It is cheap and can, therefore, be used in large numbers on the line, on the cars and in the station.
6. Its non-arcing property avoids danger from fire, which property also ensures the non-interruption of the system due to blowing of fuses and constant throwing of the circuit-breakers.
7. Its simplicity and reliability will commend it to every one.

ELECTRIC HEATING FROM THE ENGINEERING POINT OF VIEW.*

BY W. S HADAWAY, JR.

In considering the generation of heat by electricity it has been customary for electrical engineers to regard this product as waste. The question arises whether this form of energy, which is always an adjunct to other forms of electrical action, in a greater or lesser degree, may not be utilized for commercial applications of heat, either in itself, or by using the same source of supply for this purpose directly, when not in use for light or motive power.

In entering upon a discussion of electric heating as the art is today, we have three sources of supply to consider; First: The street railway plants in which the power is figured at a comparatively low rate. Second: The electric lighting plants in which the power is figured

* Abstract of a Paper read before the New York Electrical Society at Columbia College on May 10, 1894.

at a comparatively high rate. Third: Isolated plants in which power is figured at cost and which in most cases is a clear gain on money invested for light and power purposes. In the first case the introduction of electric heating does not affect the time of operation and offers no direct aid in increasing working efficiency. In the second case the introduction of electric heating increases period of output, is utilized most extensively at period of least present load and consequently increases working economy of the plant.

There are three methods by which electricity may be employed for heat purposes.

1. Directly,—the entire heat being supplied by degrading electricity through a resistance.

2. Indirectly,—electricity being employed as an agent in operating a heat engine.

3. In combination,—the heat of resistance raising a combustible to the point of ignition.

Heat generated by the first method is generally applicable to localized heating at high temperatures and in some instances to diffused heating. The second method is applicable to that class of work where large quantities of heat are required at comparatively low temperatures, as in house heating. The third method is used in high temperature furnaces for muffle and crucible work, where a considerable quantity of heat is wanted at a very high temperature. I shall confine myself in this paper to consideration of the first method. Practically little or nothing has appeared in commercial work of the second method, though its importance in the development of water powers, as at Niagara for instance, is well nigh incalculable.

We have already seen that we have three sources of supply of electricity available at present: Street railway power stations, electric light and power stations, and isolated plants, and it is on the circuits of these stations that we must look at the outset for the applications of the first method of heating. On street railway power circuits, the only application available on a large scale, outside of electric welding, is in car heating.

A great deal has been said concerning this method of car heating that is misleading. It has been stated that electric railway companies could get a better income by selling their power at two cents per kilowatt and heating their cars by stoves. A report written for the Street Railway Convention last Fall, urged the adoption of stoves in preference to electric heaters.

In heating public buildings, schools, steam cars and dwellings we have reached the point where an equable diffusion of heat is demanded, as it is safer, more comfortable, and conduces to better general sanitary conditions. This distribution of heat either by steam or hot water or hot air is easily and economically arranged, where the space to be heated is large. But in a street car, where the space to be heated is relatively small, such systems are not feasible.

The very fact that makes the operation of an electric street railway possible, makes it possible to secure an equable diffusion of heat by use of electricity. We find power figured as low as $2.00 per H. P. per month and the figures given at the "cost per car mile" in many instances appear to be figured on a basis as low as this. An expenditure of 100 watts per sq. ft. bronzed or dull black radiating surface will maintain that surface 135 degrees Fahr. above the surrounding air. The area of radiating surface for proper heating will of course vary with the size of the car and latitude. In cars heated the past winter, 27 5 sq. ft. surface were found sufficient to properly warm a well built 20 ft. car.

On a basis of $2.00 per H. P. per month, the cost of operation would be about 27 cents per day. But in practice it was found unnecessary to run more than half the radiating surface provided, a considerable portion of the time, bringing the average operating cost at about 20 cents per day. In other words in this case we secured a proper diffusion of heat by electricity and cost of operation was only 20 cents per day, while it is conceded that a stove will cost 15 cents per day to operate. The difference between the two costs surely does not compensate for foul smelling cars, unevenly heated, and a menace to health as when heated by the slightly cheaper stove.

I therefore claim for the electric car heater the same high grade heating results in small, draughty cars as we secure in carefully arranged heating plants of large dimensions; a large quantity of air moderately heated and consequently good ventilation. These factors warrant the use of electric heaters in preference to stoves even at a very largely increased cost.

The main sources of supply of electricity for industrial and domestic applications are the electric light and power stations and isolated plants. It is in conjunction with the use of the station equipment for lighting and power that electric heating develops maximum station efficiency. I have already alluded to the inefficiencies of these stations as reported recently before the National Electric Light Association. Careful study of the reports of the Massachusetts State Board of Gas and Electric Light Commissioners gives us the practical results of this manner of operation. These reports show that the money invested in electric stations, and particularly the smaller ones, is not properly remunerative.

On an average I find that the electrical H. P. hour costs four times what the mechanical H. P. hour is sold for. Large dynamo efficiencies exceed 90 per cent., showing that this excess charge must be due, conditions being equal, to a variable load line of extreme irregularities. We have as yet insufficient data from industrial and domestic applications of electricity for heating to construct a representative load line, but we know that time of maximum cooking is at time of least lighting and vice versa, and that industrial applications of heating by electricity are a supplementary motor load.

We have seen that electricity generated from coal represents a heat efficiency of about 7 per cent. In practical applications, therefore, we are limited to work where high constant temperatures are a desideratum or where present efficiency of fuel is less than this figure. The most complete published tests regarding efficiency of the common house range of which I am aware were published in *Science* for September 15, 1893. The author gives results of a long series of tests. In summarizing, the total *cooking* efficiency is given at 2.7 per cent. and the total all-day efficiency plus water-heating efficiency as 4.2 per cent. These figures have been closely confirmed by English observers and 4 per cent. may fairly be regarded as a good working value for average range efficiency.

We see that, notwithstanding great inefficiencies in operation, electricity can be delivered at a rate of 7 per cent. efficiency from central stations as against 4 per cent. from coal directly burned in ranges. If we could eliminate the water boiling factor, electricity for cooking would be far cheaper than coal or gas. This difficulty in practice will have to be met by a water heater, heated directly by coal. It is this difficulty in the application of heat of simple resistance for cooking that causes me to look with confidence towards thermo-electric devices in which electricity is derived directly from heat and the diffused or scattered heat utilized in water heating for house warming, baths and cooking. If my data is correct these devices are already made in France with an electrical efficiency exceeding four per cent., which with the water heating device added will bring total heat efficiency to practicable figures.

At the outset cooking by electricity will generally be found more expensive than cooking by coal. But the advantages attendant upon its use compensate for a wide disparity in price. I have been assured by a representative hotel man that if its cost exceeds coal cost four times, hotels will use electricity in cooking on account of cleanliness, facility of regulation, constant temperatures, cooler kitchens and better general work.

The use of the simple heat of resistance for room heating is not generally economical except in a case like car heating where heat transference by electricity satisfies other requisite conditions than can be supplied by heat of fuel directly used. Heating by electrical resistance is essentially heating by friction, and no one would think of setting up a steam-engine or water-wheel with a brake on the fly-wheel to heat a building.

On a large scale the indirect application of electricity is the only feasible way of employing electrical energy in this work. We find in practice, however, a surprisingly large number of places where a simple electric heater is of greatest convenience as auxiliary to other methods of heating. No one can foretell how far this practice will extend as the convenience of electric heaters become better known and the cost of electricity cheapens. Every electrical engineer knows that in practice apparatus of highest efficiency oftentimes meets with poorer success than less efficient apparatus, because more than one requirement has to be fulfilled, and so in direct electric heaters, a heater for occasional use is being found of great value notwithstanding relatively great cost of operation.

In the foregoing I have shown the limitations and possibilities of useful work from heat transference by electricity. We have seen that the field of use is an actual one on questions of efficiency, equable distribution and convenience. The value of high potential heat energy to central station men has been pointed out. Electric heating should be recognized in central station work as an additional outlet for power, and grasped and exploited as such. It was not simply the desire for electric lights that induced so many people to use them; but an aggressive campaign on the part of the station men as a source of revenue. With electric heating apparatus some of the most progressive will have it anyway; but in summer work, its value will be fully shown only by a determined effort to sell current to restaurants, cafes and dwellings. The manufacturer cannot be expected to do this work; but by proper co-operation good results will be reached of value alike to the manufacturer, central station and customer.

CHEAP AND RELIABLE TELEPHONE OUTFIT.

We illustrate below a unique telephone outfit which will probably become very popular.

The illustration is so clear that little description of the apparatus is necessary. Conversations are transmitted and received on one instrument—the receiver—which is similar to the Bell receiver in construction and appearance. The receiver, however, is dissimilar from the Bell in that it is electro-magnetic in principle and not a magneto instrument.

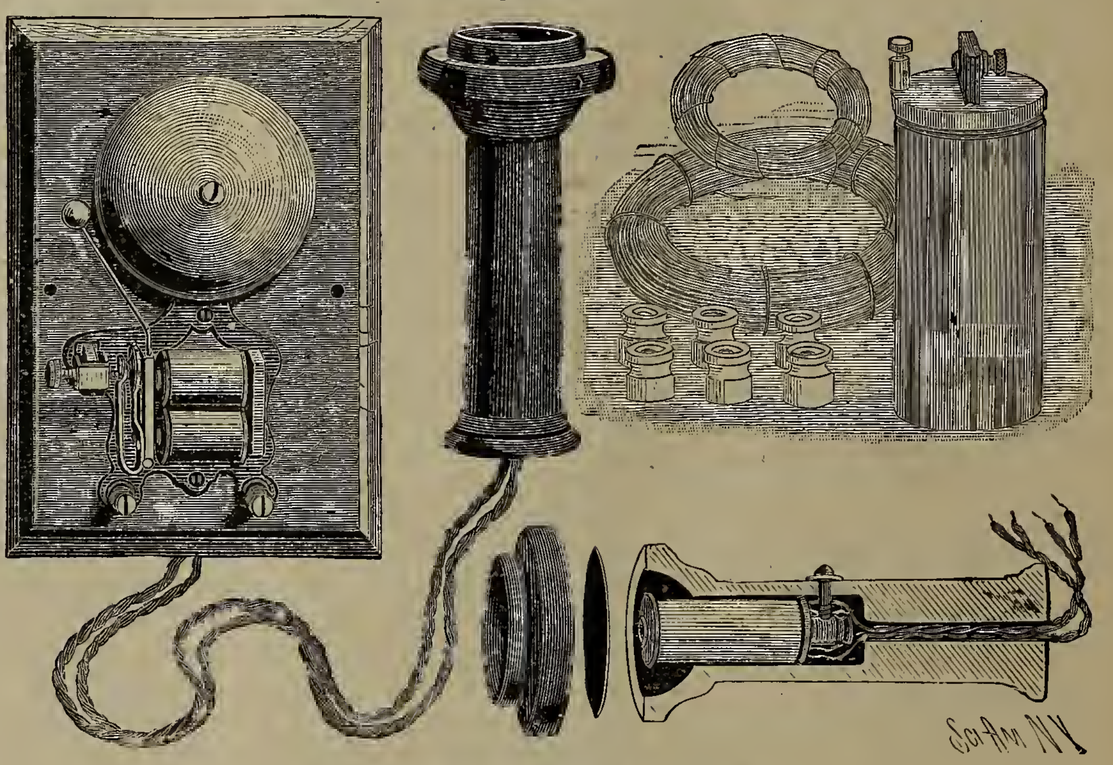
A constant battery current keeps the magnet of the receiver charged, the electrical impulses corresponding to the sound-waves produced by the voice being generated by the vibration of the iron diaphragm in front of the pole of the magnet. This action of the diaphragm varies the current in the usual manner, and this variable current as received at the opposite end of the line reproduces the sounds that originally caused it.

The call-bell was specially gotten up for this outfit. On the board are two push-buttons; one to ring the distant bell, and the other to cut the home bell out of circuit while conversation is being carried on, and at the same time cut the receiver in circuit.

The outfit—receiver and call-bell and accessories—is finished in the best manner and the best of materials are used in construction. The 'phone is a substantial instrument; the call-bell is of the latest improved pattern; the connecting cords are of the best quality, and the dry battery is the best that can be made with a view to long life and strength.

With each outfit come wire and insulators, and it is claimed by the manufacturers of this apparatus (Robt. H. Ingersoll & Bro., 65 Cortlandt street, New York) that the 'phones will work perfectly over 1,500 feet of No. 18 copper or No. 10 iron wire, and by adding an extra cell of battery at each end the capacity of the instrument is increased to half a mile. Longer distances can be operated by increasing the battery power in proportion.

The low price and general serviceability of this outfit will surely win great favor for it.



CONVENIENT TELEPHONE OUTFIT.

AN ELECTRICAL LIBRARY.

Below will be found a list of books which comprise a complete electrical library for the practical man. These books practically cover the entire electrical field. We will send this lot of books on one order, for $10.

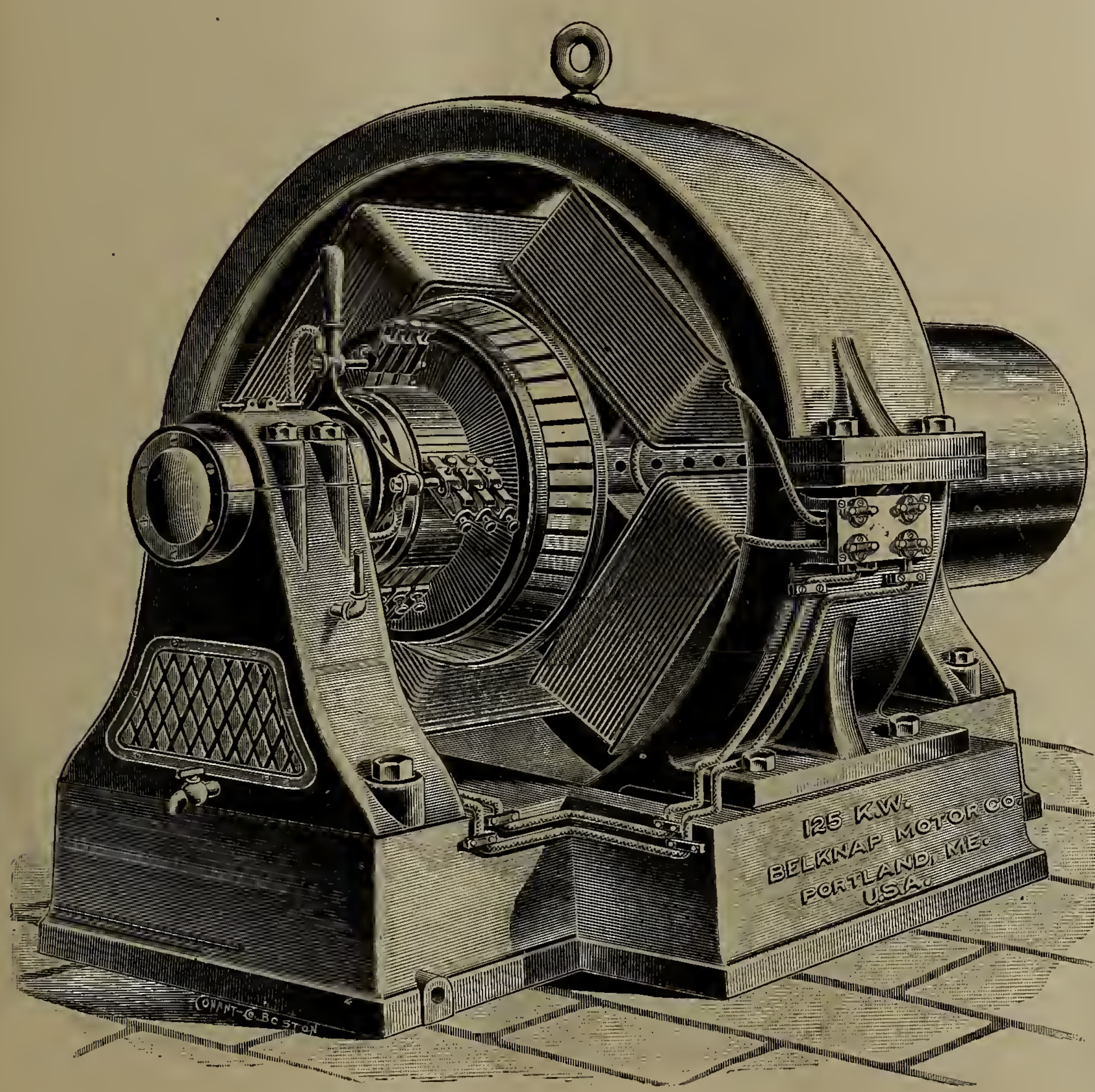
The Electric Railway in Theory and Practice. By O. T. Crosby, and Dr. Louis Bell	$2.50
Standard Electrical Dictionary. By Sloane	3.00
Practical Management of Dynamos and Motors. By Prof. F. B. Crocker and Dr. S. S. Wheeler.	1.00
How to Make and Use the Telephone. By G. H. Cary	1.00
Electric Lighting. By P. Atkinson	1.50
How to Wire Buildings. By A. Noll	1.50
Standard Tables for Electric Wiremen. By Davis	1.00

It is usually supposed that the higher the vacuum in an incandescent lamp bulb the more efficient will be the lamp. Such, however, is not the case. A moderate exhaustion of the air is more beneficial to the lamp.

NEW BELKNAP MULTIPOLAR GENERATOR.

We herewith illustrate the new Belknap Multipolar Generator which the Belknap Motor Co., of Portland, Me., has just put on the market. The frame of the machine is made up of several parts, making it convenient to handle, and the total weight is quite uniformly divided between the several parts, making a very convenient machine to set up in stations which are not provided with apparatus for holding very heavy weights. The bed is planed to fit iron slides and is very rigidly constructed, so as to withstand the strain brought on it by the weight of the field magnet.

The magnet consists of two iron castings, the two together forming a complete circle with four inward projecting cores to receive the field coils. The magnet is bored and fitted with a pole bushing surrounding the armature, which gives the greatest possible effective polar arc and prevents the disagreeable humming sometimes observed with toothed armatures under heavy loads, and also suppresses the tendency to spark by reason of stray lines of force.



NEW BELKNAP MULTIPOLAR GENERATOR.

The armature is of the toothed hollow-drum type. By a system of end connections, crossing of the conductors at the leads of the armature is avoided, which reduces the danger of burn-outs, and every wire is conveniently accessible.

The commutator is massive and the celebrated Belknap Woven Wire and Graphite Brushes are used. The bearings are very large and are self-aligning and self-oiling. The two terminals are located at opposite sides of the machine, to avoid the danger of a short circuit.

The field coils are compound wound and the magnetic circuit of the machine is carefully designed with reference to the reluctance of cast-iron, wrought-iron and air, so as to get the very best attainable effect from the material involved. Such a machine should find a ready market.

The Belknap Motor Co. is one of the concerns that is crowded with orders and, notwithstanding the hard times, is building a large addition to its factory preparatory to going into the manufacture of large railway generators and motors.

ELECTRICITY APPLIED TO ST. ETIENNE INDUSTRIES.

In a report to the State Department, Charles W. Whiley, Jr., U. S. Consul at St. Etienne, France, gives an interesting account of the introduction of electric power in that district to drive the silk-weaving looms, and for other manufacturing purposes.

Of the 18,000 looms in St. Etienne, the greater number are owned by the individual weavers and worked by hand in their own homes. While it is apparent that the recent inventions for the transmission of power by electricity will shortly effect an alteration in the methods, it is not thought that it will change, to any great extent at least, the location of the work.

Until very recently the ribbon-weaver, laboring in his own home, could see no room for improvement in the mechanical execution of his work. From time immemorial the long bar had been worked by hand. Brought up to it from childhood, and inheriting the prejudices of his class, it was difficult to convince this member of an ancient guild that any advantage could be gained by the substitution of any other power for that of his own sinewy arm. Of late, however, his eyes have been open to the wonders of that subtel agent which is so rapidly transforming the mechanical work of the world, and today it is not a rare occurrence to find an humble weaver who can talk to you of dynamos and motors with the intelligence of a practical electrician. Already over sixty looms are being worked by electricity, the force being furnished by the Edison Electric Company. This company has for several years supplied the light to a large number of shops, hotels, and saloons in the city, but more recently, with commendable enterprise, it has undertaken to furnish electric force to the numerous looms in the district. To this end it has established an elaborate electric plant on the River Loire, at the foot of a picturesque village, St. Victor-sur-Loire, situated about 8 miles from St. Etienne. A water-fall of 900-horse power sets in motion three turbines which transmit the electric force through four cables, 7 millimeters in thickness, to its destination. As has been stated, over sixty looms are now in operation worked by electricity furnished by this company, and the director informs me that he anticipates a great increase in the number during the next six months.

Just now the ribbon business is extremely dull, but it is confidently expected that with the revival of trade every loom-owner will wish to take advantage of this mechanical force. The actual expense under this system is 350 francs per loom, including dynamo, pulleys, belts, etc., all of which become the property of the weaver. An additional sum of 10 francs per month is charged for each loom. If the loom remains idle for more than a fortnight in any one month, a proportionate deduction is made by the company. A weaver who is the owner of two looms driven by electricity recently told me that by this agency he can turn out 25 per cent. more work than formerly.

The large ribbon factories of St. Etienne are, as a rule, worked by steam power. There is one factory, however—that of Messrs. Forest & Co.—which is worked entirely by electricity. In this factory, which is of recent construction, there are one hundred looms for the manufacture of the various styles of ribbons—silk, velvet, fancy ribbons, etc.—and a number of others for the making of plush. All these looms are worked by electricity, furnished by two powerful dynamos situated on the ground floor, and put in motion by a large steam engine. Each loom has its own accumulator, regulating the velocity according to the article manufactured, and when it is stopped the current is turned off, so that no waste of electric power is allowed. This saving of expense can be readily appreciated, as it is well known that the weaver, for one reason or another, has to stop his loom very frequently during the day.

This firm owns another factory in the country about 50 miles from St. Etienne, which is run on the same electric system, with this difference—the electric power is conveyed to the factory, a distance of eight miles, by overhead cables. The generators are worked by water.

So far Messrs. Forest & Co. seem to be abundantly satisfied with their experiment. They claim that the advantages of the improvement are manifest, that the movement produced by electricity is more uniform and gentle than that obtained by steam, and that, while the cost of construction is not greater, there is more economy in the working and maintenance of electric machinery than under any other system.

In the neighborhood of Grenoble, in the department of the Isère, the application of electricity has had a marked effect upon its various industries. Electric bleaching of paper pulp is extensively resorted to in its paper mills. Near Grenoble, at a place called Lancey, there is a paper factory worked entirely by electricity. The current, feeding a motor of 200-horse power, is transmitted from a dynamo located five miles up the river. The largest aluminium manufactory in France, producing 200 kilograms a day, is also located near Grenoble. The Société electrometallurgique Française have in course of construction at La Praz, in the adjoining department of the Savoie, a factory which will produce 1,000 kilograms a day, and it is believed that its capacity will be increased to 10,000 kilograms.

A copper refining manufactory, that of M. Grammont, has been in operation for some years in the department of the Isère; these works turn out 1,500 kilograms of wire daily.

THE ELECTRIC PLANT IN THE MANHATTAN LIFE INSURANCE BUILDING.

The handsome building on lower Broadway, New York, just being completed for the Manhattan Life Insurance Company, from an electrical standpoint, represents the most modern development in electric lighting and other applications of electricity.

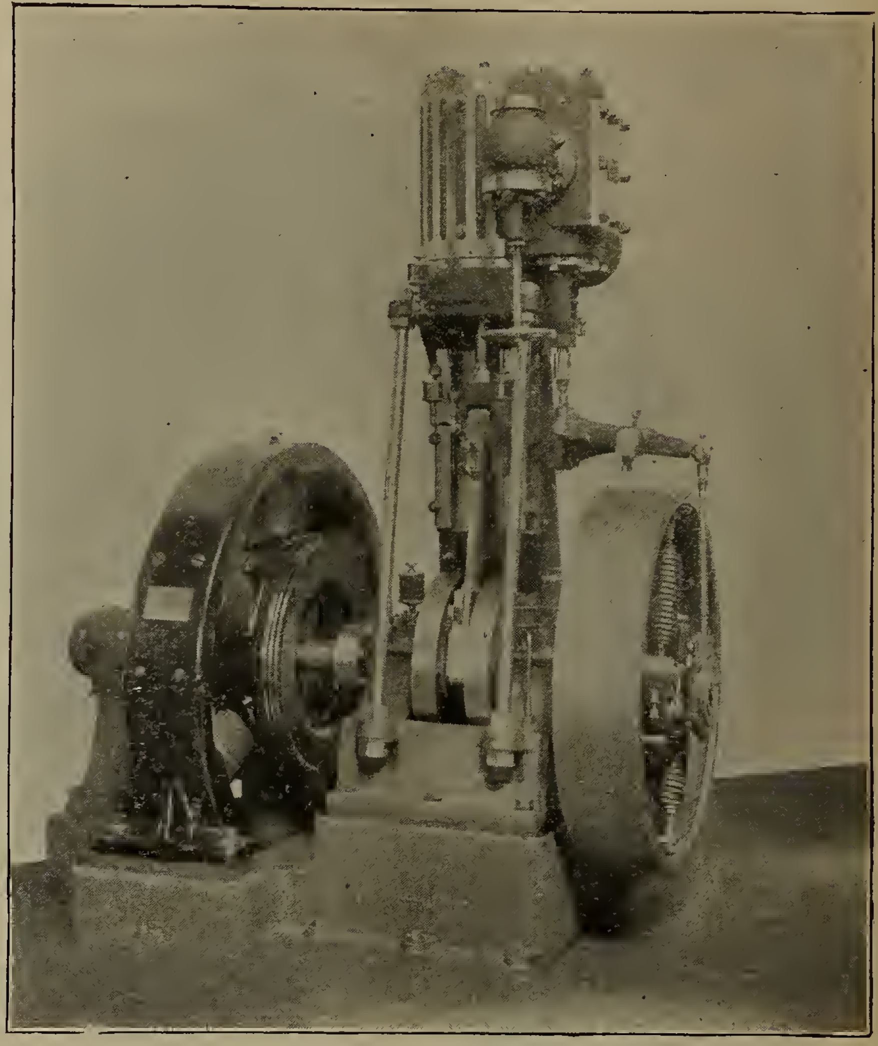
The plant consists of three 50 K. W., and one 25 K. W., iron-clad multipolar dynamos, of the General Electric Company's make. They are directly connected to the engine shafts. There are four engines, one of 40-H. P., with cylinders, 10 by 12, and three of 80-H. P., with 13 by 12 cylinders, and all are constructed without board bearings.

The engines are of the vertical type of the Armington & Sims make and were installed by E. P. Hampson & Co., 36 Cortlandt St., New York.

The Armington & Sims high-speed engines are among the best known and most popular in the electric light and power industries, and were among the first to attract the attention of electric light operators in the early days of the business. They were as well thought of then as they are now.

The advantages of the Armington & Sims engines are, extreme simplicity in construction, great regularity of speed, small cost, small space required, and general compactness. The bearings are large, the bed solid, and perfection of workmanship characterizes the whole machine.

The automatic cut-off regulator is attached directly to the valve rod and varies the point of cut-off as the



ENGINE AND DYNAMO COMBINATION, MANHATTAN LIFE INS. CO. BUILDING.

resistance requires, without changing the load. This is a feature peculiar to this regulator. It acts instantaneously, and whatever the change in load or pressure of steam, the speed remains constant. The variation in speed, from an extreme light load to the capacity of the engine, will not exceed two per cent.

The valve, which is an important factor in the economy of this engine, is perfectly balanced, and surrounded at all times by live steam. By its unique construction it permits the full boiler pressure to be maintained in the cylinder up to the point of cut-off. It is a hollow piston valve with cast iron ends, made very light with a body of steel tubing. It is accurately ground, perfectly balanced, and was adopted after trial of a great many valves of different types, and it gives a very quick admission of steam and high economy with a small amount of clearance.

In the wiring, the building is divided into sections, there being about 40 in all, the sections being so arranged that the circuits controlling light offices are separate and independent from those controlling the darker offices. The wires are run, in the main, through brass covered conduits, of the Interior Conduit & Insulation Company's manufacture, but with the exception of the leads from the main branch to the outlet, all the work is out of sight, yet accessible. Every circuit is protected by a double pole cut-out and double switch.

The building is wired throughout with the best grade of Habirshaw red core wire, which enjoys an excellent reputation The wiring is for 4,200 lights, for three Otis electric elevators and three ventilating fan outfits. Every circuit in the building has been tested for insulation, and some idea of the excellence of the work may be gained from the fact that each branch circuit measures fully a megohm. Each office has an independent system with a switch and cut-out for the same, located above the false ceiling in the hall-way, and so arranged that should an office become tenantless, the circuit for that particular office can be cut off in the hall. Should any additional outlets be required, they can be provided without disarranging the system or the cutting of plaster or woodwork.

While the main elevators are of the well-known Otis hydraulic vertical-cylinder type, there are two passenger elevators for special service, which are exclusively electric elevators of the over-balanced type as built by Otis Brothers & Co., the winding-engine of which is shown in the accompanying illustration.

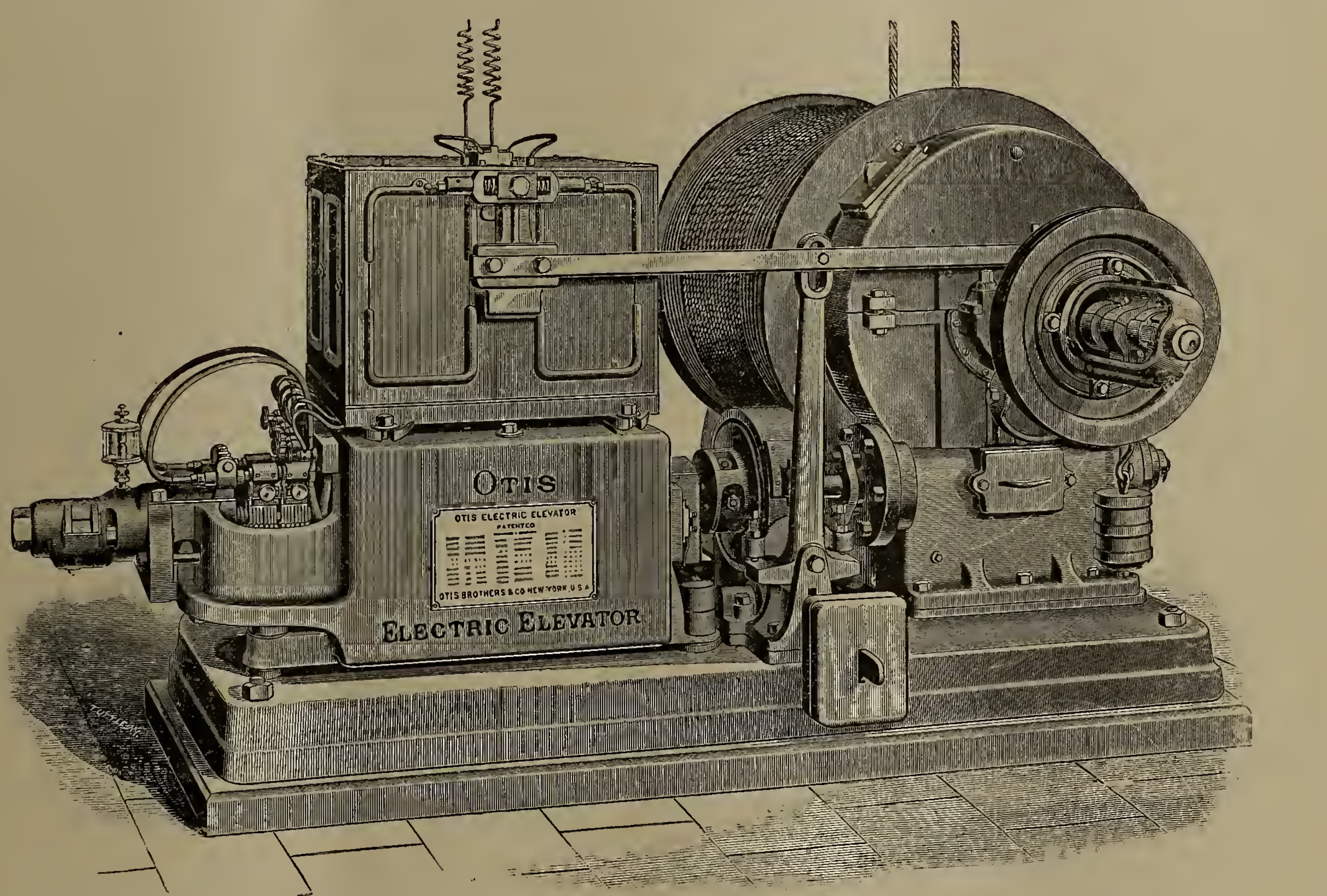
One of these elevators is for the private use of the officials of the company, and the other serves the tower.

The distinguishing feature of these elevators is their superior economy in operation. This result is obtained chiefly by the system of over-balancing adopted in building electric elevators by Otis Brothers & Co., and based upon very many years' experience, as it proportions the over-balance to the work actually to be done by the elevator, so that with an average load the minimum of power will be expended.

The main switchboard in the dynamo room is of white marble set out from the wall, rendering the back of the board of easy access. The bus-bars are solid copper, and all connections between them and the switch instruments are made by means of cones, sockets, etc. All the connections on the bus-bars are firmly bolted for the purpose of securing good contact. The switches are all of the knife-blade pattern, the blade of each pole being protected by a fusible link.

All of the switchboard instruments, including the voltmeters and ammeters, are of the best grade, manufactured by the Weston Electrical Instrument Company, of Newark, N. J.

The plant was installed by the New York Electrical Equipment Company, 59 Duane street, New York City.



OTIS ELECTRIC ELEVATOR—MOTOR AND WINDING APPARATUS.

NEW BOOKS.

A new book on "Electrical Boats and Navigation," will soon be issued by C. C. Shelley, of New York. The author is Mr. T. C. Martin, editor of *The Electrical Engineer*, and the work will include sections on primary battery boats, storage battery boats, screw and paddle-wheel boats, submarine boats, dirigible torpedoes, rowboats, gigs, pinnaces, catamarans, torpedo boats, lightships, ferryboats, etc. It will also include chapters by Mr. Joseph Sachs on the operation of canal-boats by electricity, etc. The book will be profusely illustrated.

THE MAGNETO HAND TELEPHONE is the title of a little work just published by Spon & Chamberlain, New York. The author of this book is Norman Hughes, a well-know telephone electrician. The work gives detailed information regarding the construction, fitting up and adaptability to every-day use of the telephone. The scope of the book may be appreciated by noting its contents under these general headings: Construction; Lines; Signalling apparatus; Batteries; How to test a line; Battery telephone. The book is written in very clear and concise language, and is one of the best of its kind that we have yet seen. The price of this valuable work is $1.00 per copy. Send to the ELECTRICAL AGE for a copy.

STREET RAILWAY NEWS.

RAPID TRANSIT IN NEW YORK.

On May 22, Governor Flower signed what is popularly known as the "Chamber of Commerce Rapid Transit bill." It amends seven sections of the Rapid Transit act of 1891, leaving the remaining thirty-one sections untouched, and inserts thirty-five new sections.

The original act of 1891 authorized the construction and ownership of the rapid transit system by a private corporation. The new sections added by this bill give to the city of New York the option of municipal construction and ownership. Such option is to be determined by the electors of the city at a general election. If the result of the election be in favor of municipal ownership, the original act of 1891 becomes permanently inoperative. If the result of the election be against municipal ownership, then the new sections added by this bill becomes permanently inoperative, and the efficiency of the original act of 1891 is restored, with only two changes of importance—first, the establishment of a new Board of Rapid Transit Commissioners, and second, the limitation to five cents for a single fare.

Before the people can vote upon the option of municipal ownership the new Board of Rapid Transit Commissioners must:

1. Determine whether it is for the interests of the public and the city that a rapid transit railway or railways should be established.

2. Determine the route or routes thereof, and the general plan of construction, with sufficient detail to show the general mode of operation, and the extent to which any street or public place is to be encroached upon, and the extent to which property abutting thereon will be affected.

3. Obtain the approval by the Common Council of such routes and plan.

4. Obtain the consent of the owners of one-half in value of the property abutting on that portion of each street to be used, or, if such consent cannot be obtained, obtain the determination, in lieu thereof, of the Commissioners appointed by the general Term of the Supreme Court, after due notice and hearing to all parties interested, that such railway ought to be constructed, and obtain an order of the General Term of the Supreme Court confirming the report of such Commissioners, on due notice and hearing.

5. Prepare detailed plans and specifications for the construction of such rapid transit railway, including suitable supports, turn-outs, switches, sidings, connections, landing-places, buildings, platforms, stairways, elevators, telegraph and signal devices, and such other appliances, devices and appurtenances as may be necessary or proper.

The Rapid Transit Commissioners, under the act of 1891, have already adopted a route, plan, and specifications, and obtained the requisite consents thereto. If the new Board of Rapid Transit Commissioners shall adopt the route, plan, and specifications of the old Board, there will be no difficulty in complying with the conditions preliminary to holding the election this fall. But if the new Rapid Transit Commissioners shall modify such route, plans, and specifications, or adopt wholly different ones, then they must obtain approval thereof by the Common Council before an election can be held.

In concluding his message the Governor says: "I sincerely hope that the new Rapid Transit Commissioners created by this bill, and the Common Council, may promptly agree upon the route and plan of a rapid transit system for New York City, and that the Rapid Transit Commissioners may be able to comply before Oct. 7 next with all the conditions preliminary to the submission of the question of municipal ownership to the city at the coming fall election, so that the people may promptly determine whether they wish to adopt the new system proposed by the bill."

THE AMERICAN STREET-RAILWAY ASSOCIATION.

The Executive Committee of the American Street-Railway Association announces that Machinery Hall, of the Piedmont Exposition Company, of Atlanta, Ga., has been secured for the exhibition of street-railway supplies and manufactures, in connection with the Thirteenth Annual Meeting of the Association, to be held in the City of Atlanta, commencing the third Wednesday in October (the 17th), 1894, and lasting three days.

The building has been engaged for two full weeks, beginning October 10 and ending October 24, thereby giving ample time for the removal of the largest exhibits.

The Convention Hall is in the same building and on the ground floor. The railroad facilities for freight purposes cannot be surpassed, inasmuch as the tracks on one side run the entire length of the building.

Some of those who exhibited at Milwaukee have already applied for space at Atlanta. This is, perhaps, the best evidence of the value of making exhibits at these annual meetings, where street-railway men gather in large numbers from all over the United States and Canada.

Applications for space should be sent to Mr. N. W. L. Brown, Chairman of Exhibits, Equitable Building, Atlanta, Ga., or to Wm. J. Richardson, secretary, 166 Montague street, Brooklyn, N. Y.

STATE OF MAINE, STREET RAILWAYS.

By J. M. Batchelor.

The *U. S. Investor* gives the following table of Maine street railways:

	New lines in 1892–3.	1893.	Old lines 1892.	1891.
Mileage,	17.28	58.86	58.26	52.32
Stock,	$250,000	$1,410,975	$1,178,275	$1,132,175
Debt,	216,400	868,743	637,877	445,944
Passengers carried,	901,145	6,698,917	5,871,539	5,113,359
Gross earnings,	*$53 352	$367,998	$298,285	$266,109
Operating expenses,	29,658	289,207	236,705	223,969
Net income,	23,694	78,791	61,580	42,140
Other income,	....	13,938	1,970	1,701
Total income,	23,694	92,729	63,550	43,841
Int. taxes, etc.	8,034	54,239	52,991	28,259
Balance,	15,660	38,490	10,559	15,582
Dividends,	....	12,000	12,000	12,000
Surplus,	15,660	26,490	†1,441	3,582

* Includes $4,852 freight, express and baggage earnings, and $1,755 miss. receipts.

† Deficiency.

This freight, baggage and express business is a comparatively new feature in street railway practice, and undoubtedly is destined to play a most important part in the future of nearly all street railways.

There is sound reason and profit in it, especially for new electric suburban service, and the quicker the managements of this service realize the fact, the quicker will their business assume an importance it does not now possess.

NEW CORPORATIONS.

The Mechanic Falls Water and Electric Light and Power Company, Lewiston, Me., has been incorporated with a capital stock of $7,500. A. J. Weston, president, and J. H. DeCoster is treasurer.

The Green County Electric Company, Roodhouse, Ill.; capital stock, $30,000.

The Hess Storage Battery Company, Springfield, O., has been incorporated, with a capital stock of $10,000.

The Pittsfield Water Company, Pittsfield, Me., has been incorporated for the purpose of furnishing the town with light, heat and power by electricity. Capital stock, $20,000.

The Western Electric and Accumulator Company, St. Louis, Mo., has been incorporated with a capital stock of $10,000.

A new street railway company is about to be organized in Cedar Rapids, Iowa.

Co-operative Electric Railway Company, Chicago, Ill.; capital stock, $1,000,000; incorporators, Morris S. Evinger, Charles E. Burnap and Isaac T. Dyer.

Consolidated Electric Improvement Company, Camden, N. J., manufacturing electrical appliances; capital stock, $100,000.

The American Electric Company, Toledo, Ohio, manufacuring electrical apparatus, etc.; capital stock, $10,000.

Northern Electric Street Railway Company, Philadelphia, Pa.; capital stock, $150,000.

Sylvan Avenue Passenger Railway Company, Pittsburgh, Pa.; capital stock, $12,000.

Indiana Telephone and Construction Company, Indianapolis, Ind.; capital stock, $300,000.

White-Crosby Company, Baltimore, Md.; capital stock, $250,000.

The Brown and Parrish Street Railway Company, Philadelphia, Pa , by Jas. F. Sullivan ; capital stock, $15,000.

The National Telephone Company, Salem, Ore., by E. P. Curtis, D. P. Dolsen and others. Capital stock, $100,000.

The Multnomah Telephone Company, Portland, Ore.; capital stock, $100,000. Organizers, Edward W. Curtis, Charles Perry and P. Dolan.

The Statesville Telephone Company, Statesville, N. C., by A. R. Klingender, Jas. T. Tindall and A. B. Cooper, to construct and operate telephone lines and exchange.

A charter was granted to the Diamond Street Railway Passenger Company, of Harrisburg, Pa., with a capital of $6,coo, for the purpose of constructing a double-tracked line on Diamond Street. The incorporators are Henry C. Moore, David C. Golden, Hyland C. Murphy, McClellan Hersh, Joseph C. Lungar and Thomas B. Foote.

The Rumson Improvement Company, Red Bank, N. J., has been incorporated by Applegate & Hope. Capital stock, $100,000.

The Automatic Coupler & Train Signal Company, Portland, Ore, has been incorporated.

The Palatka Telephone Company, Palatka, Fla., has been incorporated. Capital stock, $10,000. President, Marcus Loab, and George Mundee, secretary.

The Western Electric Accumulator Company, St. Louis, Mo.; incorporated by Herman Mensendick and others. Capital stock, $10,000.

The Packard Electric Company, Ltd., of Montreal, Canada; capital stock, $300,000. Incorporators, W. D. Packard, Jno. H. Howry, Chas. C. Paige, Alex. McKensie, Thos. C. Sims, J. W. Packard, H. K. Howry, and F. E. Cavanaugh.

POSSIBLE CONTRACTS.

An electric light plant is to be established in Mount Airy, N. C. For further particulars the Mayor of that place may be addressed.

The St. Augustine Electric Railroad Company, St. Augustine, Fla., is making plans for an electric light plant at North Beach, for the operation of its road.

An electric light plant is to be established at Grenada, Miss. Mr. L. C. Adams, the mayor of that place, can give further information.

The Mayor of Victoria, Tex., can give information concerning the proposed electric light plant in that place.

Congress has authorized the Washington, Alexandria and Mt. Vernon Electric Railroad Company to lay tracks in certain parts of that city.

Mr. W. J. Smith, of Kansas City, Mo., has organized a company to reconstruct and extend the East Fifth Street Railroad and use electricity thereon.

A new telephone company is to be organized at Bridgeport, Conn, by R. L. Andrews and Richard Schuey. Capital stock, $50,000.

The Council at Fort Wayne, Ind., has been petitioned to purchase an electric light plant.

The electric railway station at Sherman, Tex., was destroyed by fire on May 18. The loss is not less than $10,000. The company will rebuild at once.

W. B. Miller of Salisbury, N. C., is interested in the organization of a company to equip a telephone system.

The Vicksburg Electric Transit & Lighting Company, Vicksburg, Miss., is about to erect an electric power plant.

The East Tennessee Telephone Company, Knoxville, Tenn., will construct a line to Chattanooga.

The Leavensworth Electric Railway Company, Leavensworth, Kansas, has been granted a franchise to build the Soldiers' Home and Mount Muncie extension.

The Clarksville Electric Light Company, Clarksville, Tenn., it is reported, is about to sell its plant to St Louis parties, who will continue its operation and add $10,000 worth of new machinery.

An electric light plant is to be installed at Ellsworth, Me. The Mayor of that place should be addressed.

An electric light equipment is to be installed in Waterbury, Conn., in the new Catholic Church of St. Cecelia.

An electric light plant is to be installed in the Woman's Hospital in Philadelphia. Mr. W. Smedley, 435 Chestnut street, can give further information.

Tunkhannock, Pa., is to be lighted by electricity.

An electric road is to be established between Maysville, Ky., and Mt. Olivet.

The University Club of Philadelphia proposes to build an electric light station in the rear of 1316 Walnut street.

NEW YORK NOTES.

Office of the Electrical Age,
World Building, New York,
May 28, 1894.

On May 24 the Postal Telegraph-Cable Co. formally dedicated its new building on the corner of Broadway and Murray street. A banquet was held at which John W. Mackay presided. There were present 146 persons, including superintendents and managers from various cities. The occasion was also the fiftieth anniversary of the sending of the first telegram in the United States.

Julius T. Dudley & Co., 136 Liberty street, city, dealers in rolling-stock, equipment and supplies for steam, electric, horse and cable railways, have just closed a contract to supply $10,000 worth of electric railway material in Opelika, Ala. Other large contracts are about to be closed by this firm.

Mr. A. W. Field, of the Peckham Motor Truck and Wheel Co., has resigned his position as vice-president to take charge of the Boston office of the company, and Mr. H. C. Soop, of Kingston, N. Y., has been elected in his place.

The Metropolitan Telephone and Telegraph Company will on June 1 introduce a change in its charges for telephone service. By the new system the price charged will be in proportion to the service rendered. The long distance instrument, which at present costs $240 a year, will be furnished after June 1 for $150 a year, but the subscriber has the right to use his instrument only 1,000 times during the year. For every message after the first 1,000 an extra charge of from 5 to 15 cents will be made.

The Carpenter Enamel Rheostat Co., of this city, has just issued three very attractive blotters giving illustrations of its various standard rheostats, with tabulated statements of the various data and prices, which are very convenient for reference. W. T. H.

FINANCIAL.

The Hartford Electric Light Company, Hartford, Conn., has increased its capital stock from $250,000 to $350,000.

The Eddy Electric Manufacturing Company, Windsor, Conn., has increased its capital stock from $125,000 to $250,000.

THE CARPENTER ENAMEL RHEOSTAT COMPANY.

This company is moving its factory from Bridgeport, Conn., to Hoboken, N. J., in the new factory building erected by John C. Crevier, at the 14th street ferry terminal. It is continually improving the design and construction of its apparatus, and, on account of its rapidly increasing business and improvements in methods of manufacture, is making a great decrease in the cost of production, the benefit of which it is giving to its customers by very marked reductions in the prices.

The Company's factory will be very accessible in its new location, being less than 15 minutes distant from Union Square, which will be a great convenience to its various customers having offices in New York city.

The following is a list of the principal agencies of the Carpenter Company:

Chas. D. Shain, general selling agent, No. 136 Liberty street, New York city; The Central Electric Co., No. 173 Adams street, Chicago, Ill.; Walker & Kepler, No. 531 Chestnut street, Philadelphia, Pa.; Wm. Oswald, No. 42 Union street, New Orleans, La.; R. C. Wiggins, No. 31 Milk street, Boston, Mass.; The Robins Electric Co., No. 830 Liberty avenue, Pittsburgh, Pa.; Owen Ford, Rialto Building, St. Louis, Mo.

The officers of the company are: H. Ward Leonard, president; L. B. Gawtry, vice-president; Chas. E. Carpenter, secretary and treasurer.

FOREIGN NOTES OF INTEREST.

Heilmann Locomotive.—It is stated that the Heilmann electric locomotive is now making daily trips.

Day Load.—The Westminster Electric Supply Corporation, London, has decided to reduce the price of electricity for motive power, cooking and heating purposes, where the supply is taken through a separate meter.

The Halle Tramways.—It appears that the working of the electric tramway in Halle has adversely affected the horse lines. The company operating the latter proposed some time ago to acquire the electric tramway, but the Municipality placed in the way obstacles which have until now prevented the transfer of the line from the General Electricity Co. It is not known whether negotiations will be resumed.

Lifting a Cable.—The cable steamship "Minia," Capt. Trott, belonging to the Anglo-American Telegraph Co., London, has started from Queenstown for the North Atlantic. One of the Anglo-American cables has been found defective in mid-Atlantic, the defective portion lying at a depth of 2,500 fathoms. On lifting the cable it will have to be overhauled, and all the defective parts cut out and replaced by new cables. The "Minia" has aboard 500 miles of new cable, 200 miles of which, or perhaps more will have, it is calculated to be used.

Water Power in Switzerland.—A firm at Aaran, Switzerland, has just secured a concession to construct a canal in connection with the Rhine, with which no less than 15,000-h. p. will be made available. It is stated that the large aluminium works at Newhausen have already contracted for 10,000-h. p.

Personal.—Mr. F. C. Randall has gone to Chicago to take charge of the Western agency of the J. G. Brill Company, the well-known car and truck builders of Philadelphia. Mr. Randall is a good man for the Western business and Western orders ought to multiply now.

Decrease in Telephone Output.—The Bell Telephone Company's statement shows that on May 20, 1894, the total number of Bell Telephones in use in the United States was 570,011. This is 2,646 less than the number in use at the same time last year. The net output for the month ending May 20 was 3,664, a decrease of 2,092 compared with the same period last year.

Springfield, South Dakota, was lighted by electricity for the first time on May 19. The power which is used in driving the dynamos is obtained from an artesian well.

TRADE NOTES.

The New York Electric Equipment Co., 59 Duane st., has a good many contracts under way, among which are the following: Produce Exchange, 5,000 lights, two 100 K. W. dynamos, and engines and switchboard. Hanover Fire Insurance Co, 2,400 lights with two multipolar dynamos, engines and switchboard. Post-Graduate Hospital, 1,000 lights with two engines, multipolar dynamos and switchboard. Bloomingdale Brothers, 560 arc lamps, low tension, direct current, with dynamos, engines, etc. New Robertson Hotel, 72d street and Boulevard, 2,100 lights, with two engines and two 50 K. W. dynamos and switchboard. The Moore & Rankin Hotel, 3,000 lights. New Wallace Building, Pine street, 2,000 lights, two engines, and dynamos and switchboard. The wiring for the McCreary Building, 23d st. and 6th avenue. The wiring of the Adams Building, 15th st. and Sixth avenue. The wiring of the U. S. Custom House and Post-Office at Troy, N. Y. American Tobacco Works, 2,200 lights, engines, dynamos and switchboard.

E. P. Hampson & Co , 36 Cortlandt street, are putting in three horizontal Armington & Sims engines in the Home Life Insurance building, four similar engines in the Mutual Reserve Building, and two 150 H. P. engines in the establishment of Charles Broadway Rouss, on Broadway. This firm is also putting two direct connected engines in the Eye & Ear Infirmary, Second ave. and 13th street, New York city.

Ziegler Brothers, the well-known manufacturers of electrical instruments, etc., have moved from their old quarters 73 Federal street, Boston, to 141 Franklin street, where they will have much larger quarters. Their increasing business rendered it necessary to find larger space.

Mr. F. W. Darlington has opened an office at 503 Girard Building, Philadelphia. Mr. Darlington is an electrical engineer of long experience, having been connected with the Westinghouse Electric and Manufacturing Company for several years. He is now chief engineer of the Philadelphia Traction Company, and will carry on the profession of consulting and electrical engineer at his new quarters.

W. H. Weston & Co., manufacturers of the well-known Weston switches and switchboards, have moved into larger quarters at 1,309 Buttonwood street, Philadelphia. The demand for Weston switches continues unabated.

Electrical and Street Railway Patents.

Issued May 22, 1894.

520,033. Electric Battery. Wm. W. Burnham, Newton, Mass , assignor to the Electric Gas Lighting Co., Portland, Me. Filed Sept. 7, 1891.

520,044. Coin-Controlled Electrical Apparatus. John O. Frost, Greensburg, assignor of one-half to Minnie Johnson, Uniontown, Pa. Filed Dec. 30, 1893.

520,050. System of Electrical Conversion and Distribution. Thos. H. Hicks, Detroit, Mich. Filed Dec. 15, 1892.

520,083. Telephone Trunk-Line System. John I. Sabin and Wm. Hampton, San Francisco, Cal. Filed Feb. 12, 1894.

520,086. Telephone. Harry F. Slocum, New York, N. Y., assignor to the New York Electrical and Development Co., of New Jersey. Filed May 20, 1893.

520,088. Incandescent Lamp. Frank S. Smith, Pittsburgh, Pa. Filed June 28, 1893.

520,108. Electrical Train-Brake. Wendell C. Fletcher, St. Louis, Mo., assignor to Norman P. Willard, trustee, Chicago, Ill. Filed July 28, 1892.

520,111. Electric Locomotive. Rudolph M. Hunter, Philadelphia, Pa , assignor to the Thomson-Houston Electric Co., of Connecticut. Filed Apr. 25, 1893.

520,116. Electrical Primer. Wm. Mason, New Haven, Conn., assignor to the Winchester Repeating Arms Co., same place. Filed Jan. 15, 1894.

520,127. Electric Annunciating Apparatus. Horace E. Walter, Richfield Springs, N. Y., assignor by mesne assignments, to the National Electric Mfg. Co., Milford, Conn. Filed July 23, 1891.

520,128. Switchboard for High-Tension Circuits. James J. Wood, Fort Wayne, Ind. Filed Feb. 6, 1894.

520,152. Dynamo-Electric Machine or Electric Motor. Robert K. Welch, Philadelphia, Pa., assignor of one-half to Geo. E. Schlegelmilch, same place. Filed June 24, 1891.

520,156. Electric-Railway Trolley. Thomas M. Brown, Cleveland, Ohio. Filed Sept. 28, 1893.

520,169. Brush-Holder for Dynamo-Electric Machines or Motors. Andrew L. Riker, New York, N. Y. Filed Mar. 31, 1894.

520,184. Electric Clock Striking Mechanism. Fred. L. Gregory, Chicago, Ill. Filed Apr. 27, 1893.

520,213. Trolley-Wire Hanger. Thomas J. McTighe and Sumner W. Childs, New York, N. Y. Filed Jan. 23, 1893. Renewed Jan. 22, 1894.

520,223. Electric Advertising or Signaling Apparatus. George L. Schneider, San Francisco, Cal., assignor of seven-eighths to Wm. J. Pattosien, Fred. L. Waibel, Chas. Fisher, George Brandt, Gus. A. Paul. Fred Brandt and A. R. Paul, same place. Filed Jan. 20, 1894.

520,228. Electric Locomotive. Rudolf Eickemeyer, Yonkers, N. Y. Filed June 1, 1891.

520,232. Electric-Arc-Lighting System. Daniel Higham, Boston, Mass., assignor to the Higham Electric Company, Portland, Me. Filed Jan. 2, 1894.

520,233. Safety Attachment for Street-Cars. Henry A. Howe, Albion, assignor to himself, and Joseph Norwood, Brooklyn, N. Y. Filed Sept. 21, 1893.

520,246. Automatic Telephone System. Louis E. Simoneau, Montreal, Canada, assignor to the Automatic Telephone and Electric Company of Canada, same place. Filed July 11, 1893.

520,253. Electric Heater for Car Sand-Boxes. John M. Christopher, Baltimore, Md. Filed June 13, 1893.

520,255. Safety Car-Fender. Frank I. Clark, Baltimore, Md. Filed Jan. 29, 1894.

520,267. Electrical Governor. William H. Miller, New York, N Y., assignor to George H. Benjamin, same place. Filed June 18, 1884.

520,274. Electric Railway. Ernst W. Von Siemens, Berlin, Germany, assignor to Siemens & Halske, same place. Filed Sept. 30, 1892. Patented in Germany, July 28, 1883, No. 25,766; in England, Oct. 17, 1883, No. 4,945, and in France, Aug. 4, 1885, No. 134,765.

520,279. Electric Switch. Henry E. Werline, Lancaster, Pa., assignor of three fourths to Frank S. Barr, same place, and Edwin L. Reinhold and Henry Burd Cassel, Marietta Pa. Filed Feb. 15, 1893.

520,280. Automatic Device for Removing Resistances in Starting Electric Motors and Replacing Same. Geo. H. Whittingham, Baltimore, Md., assignor to the Automatic Switch Co., of Baltimore City, of Maryland. Filed June 13, 1893.

520,304. Conduit Electric Railway. Wm. R. De Voe, Shreveport, La. Filed Jan. 20, 1894.

520,306. Telephone-Transmitter. Henry M. Goodman and John Goodman, Louisville, Ky. Filed Jan. 25, 1894.

520,323. Block System for Trolley-Railways. Willard F. Lewis, Swampscott, Mass. Filed July 20, 1893.

520,329. Overhead Trolley-Conductor. Robert Muir, Brooklyn, N. Y. Filed Mar. 3, 1894.

520,340. Electric Traction Apparatus. Paul Schoop, Zurich, Switzerland. Filed Oct. 30, 1893.

520,351. Electrical-Contact Mechanism. John F. Blake, New Haven, Conn. Filed Mar. 3, 1894.

520,354. Car-Fender. Bernhard Cron and Werner Von Munchhausen, New York, N. Y. Filed Dec. 8, 1893.

520,356. Conduit Electric Railway. Guarantee Trust and Safe Deposit Co., administrator of Charles Wm. Siemens, deceased, Philadelphia, Pa. Filed Oct. 19, 1893. Patented in England Oct. 17, 1883, No. 4.945.

520,359. Apparatus for Electric Welding. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Johnson Co, of Pennsylvania. Filed Oct. 12, 1893.

520,360. Apparatus for Electric Welding. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Johnson Co., Pennsylvania. Filed Oct. 12, 1893.

520,361. Electrical Measuring-Instrument. Rudolph M. Hunter, Philadelphia, Pa., assignor to the Thomson-Houston Electric Co., of Connecticut. Filed Apr. 13, 1894.

520,364. Transferring Cable-Cars at Intersecting Points. John Kratz, Baltimore, Md., assignor of one half to Joseph H. Pfister, same place. Filed Apr. 6, 1893. Renewed Nov. 18, 1893.

520,367. Insulator. Fred. M. Locke, Victor, assignor of one-half to Geo. A. Paddock, Auburn, and Willard C. Page, Palmyra, N. Y. Filed Dec. 4, 1893.

520,378. Multiple-Electric-Fuse Box. Edward A. Parson, Ottawa, Canada, assignor of one-half to Haldane Millar, same place. Filed Jan. 16, 1894.

520,384. Car-Brake. Thomas H. Allen, Toronto, Canada. Filed Sept. 19, 1893.

EXPIRED.

191,130 Metrical Telegraph System. Theo. M. Foote, Brooklyn, N. Y. [Filed Nov. 28, 1876.

191,176. Chemical Telegraphs. Charles A. Randall, Brooklyn, N. Y. [Filed Oct. 16, 1876.]

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CONTENTS.

GAS MEN AS ELECTRICIANS.

The Western Gas Association, at its recent meeting in Cleveland, gave considerable attention to the subject of disintegration of gas pipes by escaping currents from electric railway circuits. The association appreciates the danger that threatens and is familiar with its causes; it also appreciates the difficulties that beset those who are earnestly striving to find a remedy for the trouble, and it is hoped that the two interests together can devise some way of effecting a remedy that will be satisfactory to both. No doubt united and honest effort will bring about the results desired.

THE SUN AND THE TROLLEY.

In an editorial note in the New York *Sun* of June 5, with reference to the alleged "dangers of the trolley," a statement is made that is rather surprising, appearing, as it does, in a paper that has the reputation of taking a common-sense view of all matters pertaining to public welfare. "Some plan must be devised," it says, "for doing away with the dangers of the trolley," and suggests that the trolley be legislated out of existence if it "cannot be used without killing people every day." The animus of the article, however, is revealed in the statement that "something is the matter with the system, and a remedy is sadly needed." This is an utterance worthy of a demagogue, and is of the class resorted to by tricksters to divert attention from the truth. There is a class of newspapers that gain cheap notoriety by arousing public feeling by means of sensational articles. Truth and reason are subordinated to sentiment and sensation, and the people who look to such journals for a plain statement of facts are naturally misled. We do not include the *Sun* in this class, but that paper is coming dangerously near when it allows such a statement to appear before the public through its own columns. Its premises, and not the system, are entirely wrong. There is nothing the matter with the system; the danger lies in the increased speed of the cars. The people have not yet accustomed themselves to the higher speed of the trolley cars, and do not make proper allowance for the same when attempting to cross the tracks. Those who take the risks do so at their own peril; it is not the fault of the system at all. If a person gets in front of a moving car, he will be run over, if the car cannot be stopped in time, whether it be a horse, mule, cable, electric or steam car. In large cities, scores of people are, every week, injured more or less seriously, if not fatally, by horse cars, and yet no one has thought to blame the system for such accidents. Electric cars are under more perfect control than those of any other system, and it is not fair to say that because people get run over by electric cars, it is the fault of the system. In nine cases out of ten such accidents are due entirely to the carelessness or ignorance of the victims. Children run out into the middle of the street in front of cars and wagons before the drivers can stop the vehicles, and grown people prefer to risk their lives in crossing tracks rather than exercise a little judgment, in spite of every precaution taken to prevent accidents. Under these circumstances accidents will happen whether the cars are propelled by electricity, horse or cable. The system of propulsion is not the cause, and has nothing to do with such casualties. The *Sun* is entirely in error.

NEW TELEPHONE SCHEDULE.

On page 276 of this issue we give the new schedule of rates for telephone service in this city. How the new system of charges will affect the companies revenues it is impossible to say, but it is certain that the users of telephones will likely not use their instruments so freely, now they pay by the "piece."

ALTERNATING CURRENTS AND FUSES*

BY PROF. DUGALD C. JACKSON AND R. J. OCHSNER.

This paper is a report of an investigation made by Mr. Ochsner in the electrical engineering laboratory of the University of Wisconsin. The results are positive and of sufficient practical value to justify consideration. They set at rest all questions regarding the direct effect of the alternating current upon the average commercial fuse wire. Practically speaking, there is no such action.

I.—THE EFFECT OF ALTERNATING CURRENTS ON THE RESISTANCE OF FUSES.

Samples of fuse wire of five amperes rated capacity were obtained from five different manufacturers, and to these were added a 30 ampere fuse wire which we happened to have, and a copper, a german silver, and an iron wire. Pieces of wire from each sample, each of them varying from nine to ten feet in length, were wound upon cylindrical pieces of pine wood about a foot long and one and one-half inches in diameter.

A simple rack was constructed, so that all the fuses could be put in series, the copper terminals dipping into mercury cups.

The resistances were determined by means of the Anthony bridge in the laboratory of the University of Wisconsin, the readings being taken to the fourth decimal place.

The fuses were now put on the alternating lighting circuit which furnishes the light for the laboratory. Enough resistance was put in series to give a current of about three amperes. The pressure is 110 volts, and the frequency, approximately, 125. The lighting circuit is run continuously, except for about nine hours on Sunday; but to have a check on the time that the fuses were subjected to the current a Thomson recording watt-meter was placed in circuit.

The resistances of the fuses were measured at fairly regular intervals, and the corrected results were plotted.

It was found practically impossible to get the temperature of the fuses correct within a few tenths of a degree, because the temperature of the room would vary in spite of all care, and the fuses would not follow this variation so rapidly as the thermometer indicated it. Nevertheless, far better results were obtained than before.

The result of this part of the work is shown by the curves, Figs. 1 and 2, between the two heavy vertical lines.

After this the fuses were again subjected to the alternating current for about 100 hours, measurements of resistance being made daily. Each day, as the current was turned off, they were cooled down rapidly by taking them into a cold room, and leaving them for some time, after which they were brought back to the working room and allowed to stand for about five or six hours before measuring the resistance. The results are shown by the last part of the curves. As fuse No. 3 seemed to show greater irregularity than the others, another piece of the same sample was added. It is the one numbered 10, and the curve is plotted directly under No. 3 for comparison.

From the fourteenth point on, the curves are all practically straight horizontal lines, the irregularities being about the same when no current passed as when it did. Nearly all the points on the curves before the fourteenth were considerably higher. This shows plainly that the fuses had not cooled down to the temperature of the room when the resistance measurements were made, the variations depending on the length of time they were allowed to stand.

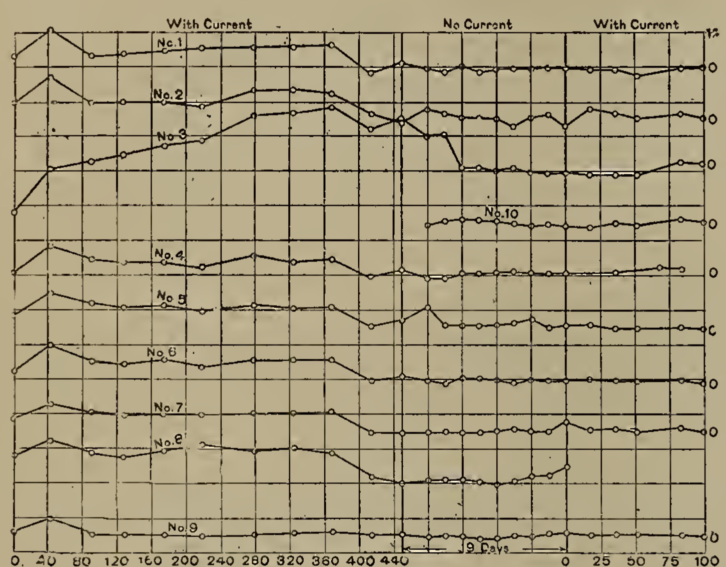


FIG. 1.—CHANGES IN RESISTANCE OF FUSE WIRES, SUBJECTED TO THE ACTION OF ALTERNATING CURRENTS.

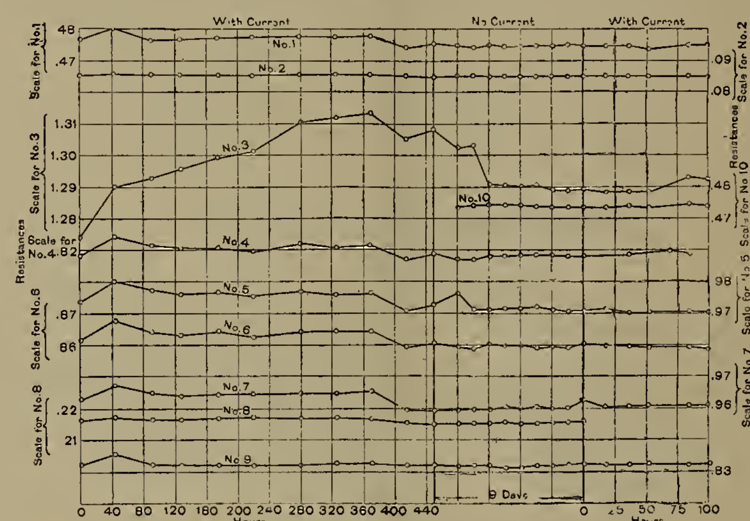


FIG. 2.—PERCENTAGE VARIATIONS IN THE RESISTANCE OF FUSE WIRES SUBJECTED TO THE ACTION OF ALTERNATING CURRENT, VERTICAL SCALE, 1 DIVISION EQUALS 1 PER CENT.

That the first point on each cnrve is nearly as low as the final values, is due to the fact that current had not been passing through the fuses before that measurement was made, and the fuses were, therefore, at the temperature of the surrounding air which was recovered by the thermometer. Another proof that the variations are due to temperature is shown by curve No. 9. This represents a wire which has a very small temperature co-efficient, and accordingly, it varies the least of any. While the actual rise in curve No. 3 is much greater than in any of the others, the percentage rise is only slightly greater, the resistance of the fuse being the largest of all.

These experiments proved that there is no appreciable rise of resistance in fuses subjected to alternating currents, at least not within a period of 550 hours. More accurate results might undoubtedly have been obtained, had the fuses been mounted in such a manner as to avoid contact with any large masses of solid material, but the accuracy is amply sufficient to prove the case.

2.—THE EFFECT OE ALTERNATING CURRENTS ON THE FUSING POINTS.

Next the fusing point before and after passage of current were determined. As the continuous current from the dynamo which was available was too variable, I was obliged to use a few storage cells for fusing the wires.

Only the five ampere wires were tested. A number

*Abstract of a paper read at the Eleventh General Meeting of the American Institute of Electrical Engineers, Philadelphia, May 16, 1894.

of pieces of each of these were tested; half of these had been subjected to the alternating current and half had not. Pieces of the old and the new of each sample were tested alternately, so as to eliminate the errors caused by a change in the temperature of the room. The results are given in the following tables:

FUSING CURRENTS.

Nos. 3 and 10 New.	No. 3 Old.	No. 10 Old.
7.40	7.25	7.30
7.30	7.10	7.29
6.98	7.10	7.10
7.19	7.09	7.20
7.30	6.80	7.05
Average, 7.23	7.07	7.188
	Lowered 2.22 per cent.	Lowered .58 per cent.

No. 4.		No. 5.		No. 6.		No. 7.	
New	Old	New	Old	New	Old	New	Old
8.75	8.50	8.90	8.82	8.85	8.80	8.80	9.07
8.83	8.60	8.90	8.84	8.60	8.69	8.96	9.06
8.80	8.60	8.20	9.12	8.87	8.88	8.90	9.02
8.70	8.70	9.20	8.88	8.78	8.98	8.89	9.05
8.76	8.65	8.95	8.88	8.75	8.98	8.90	9.10
8.70	8.70	9.10	8.97	8.60	8.80	9.06	8.85
8.62	8.64	9.06	8.70	8.75	8.74	9.10	8.95
8.71	8.64	9.08	8.80	8.50	8.70	8.78	9.10
8.50	8.64	8.93	8.79	8.96	8.95	8.66	8.80
8.88	8.65	9.09	8.83	8.77	8.90	8.90	9.12
Average 8.725	8.632	8.941	8.863	8.743	8.842	8.895	9.012
Lowered 1.07 p.c.		Lowered .87 p.c.		Rise of 1.13 p.c.		Rise of 1.32 p.c.	

In the light of the experiments herein described, and the statements made by Cockburn, Salomons and Matthews, is it neccessary to ascribe a slight change in the properties of the fuse to the disintegrating effect of the alternating current? I think not.

In practice, a fuse is seldom obliged to carry a current equal to its full rated capacity. In electric lighting, for instance, the lamps protected by a fuse are not likely to be all turned on at once, and, therefore, the fuse is seldom carrying more than a small part of its rated capacity. The experiments that I have made, therefore, represent the conditions of ordinary practice and prove that a fuse as used in practice is not directly affected by the alternating currents.

Fuses on alternating current circuits are sometimes found to blow without apparent reason, but something outside of the disintegrating effect of the current is the cause. Under some conditions the result has come about through the mechanical shaking to which an alternating current fuse is sometimes subjected when not tightly clamped by the terminal screws.

MEETING OF RAILROAD TELEGRAPH SUPERINTENDENTS.

The thirteenth annual meeting of the Association of Railway Telegraph Superintendents will be held at the Hotel Cadillac, Detroit, Mich., June 13 and 14 next. Suitable rooms for exhibits have been provided, and the Committee on Topics have secured a very interesting list of papers to be read and discussed. Mr. U. J. Fry, of the Chicago, Milwaukee & St. Paul Ry., Milwaukee, is president of this association, and Mr. P. W. Drew, of the Wisconsin Central Railroad, Chicago, secretary.

AN OPTICAL PHASE INDICATOR AND SYNCHRONIZER.*

BY GEO. S. MOLER AND FREDERICK BEDELL.

In starting a synchronous alternating current motor it is usual to bring the motor up to speed by some external means and to switch it into connection with the generator when the motor and generator are running synchronously, but are in opposite phase. Various devices have been employed to indicate synchronism and to show when the motor is in opposite phase to the generator, one of the simplest of these devices consisting of an incandescent lamp used as a pilot lamp. The lamp is connected directly in the circuit supplying the motor, so that all the current through the motor armature passes through it. Before the motor is started the lamp glows steadily. As the motor attains considerable speed, the lamp suddenly flashes up and dies out alternately, according to whether the electromotive force generated by the motor and the electromotive force

FIG. 1.

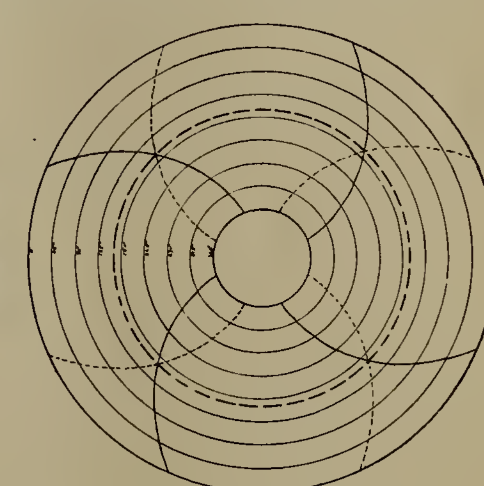


FIG. 3.

from the alternator are in the same or in opposite phases. Beats are thus produced which occur at longer intervals as the motor approaches synchronism with the alternator. When the intervals are long enough to be quite marked, the motor is connected directly to the generator circuit by cutting the lamp out at a moment when it is dark, indicating that the machines are in opposite phase. At the same time the external power, which has driven the motor to synchronism, is removed. Instead of one lamp, several lamps or a lamp together with dead resistance may be used where required.

This device is simple and efficient. It does not, however, indicate the moment when exact synchronism is reached, nor does it show whether the motor is running at a greater or less speed than that corresponding to the generator. It does not show the exact phase difference between the motor and generator, and does not indicate the phase relations after the motor has been connected to the alternator and is being driven by it.

The following instrument has been devised by the writers to give definite information in regard to the relative speeds and phase positions of the motor and generator in laboratory investigation: It shows

(1) When the machines are synchronous;

(2) Which machine is running the faster when they are not synchronous;

(3) The angle by which the motor lags behind the generator.

We will first describe the simplest form of the phase indicator. The motor and generator are placed together with shafts in line and abutting, but not quite touching.

* Paper read at the Philadelphia meeting of the American Institute of Electrical Engineers, May 17, 1894.

The two machines must have the same number of poles, so that a revolution of the armature of each represents the same number of alternations. The abutting ends of the shafts carry two discs, one connected rigidly with the motor armature, the other similarly connected with the armature of the generator, as shown in Fig. 1. In these discs are curved slits, one slit for each pair of poles of the machines. These slits are shown in Fig. 2 for an eight-pole machine. The two discs are in every way similar, the one being the reverse of the other. The two discs are practically superimposed and together form one disc with four holes, where the slits of one disc cross over the slits of the other. Evidently the distances of these four holes from the centre depend upon the relative positions of the two armatures; they move in and out as the armatures shift their relative positions. From the symmetrical arrangement of the slits, if one armature is stationary and the other is moved past two pole-pieces or through 90 degrees of arc (corresponding to a complete period of alternation, or 360 degrees of phase), the intersection of the slits will be the same distance from the centre as before. The curvature of the slits is such that the distance to or from the centre that the intersections of the two sets of slits move is proportional to the change in relative position of the two armatures.

When the two armatures are running at the same speed in the same direction and there is a source of light

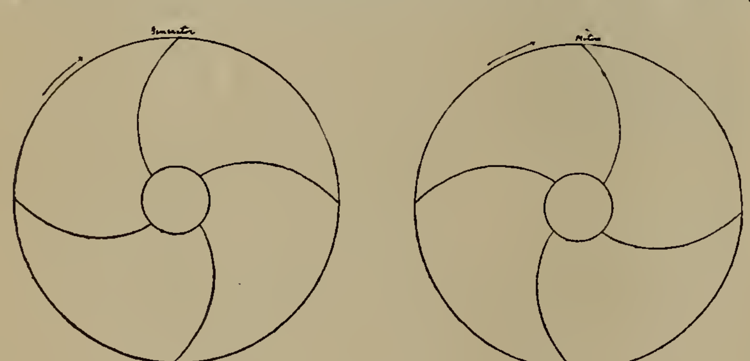


FIG. 2.

on one side of the discs, the intersection of the slits, as seen from the other side, appears as a continuous ring of light. A slight difference of speed causes this ring of light to move outward or inward, according to which disc is revolving the faster. The more rapidly the ring moves in or out, the greater the difference in speed of the two discs. If the ring is moving out, a new ring starts at the centre when one ring reaches the edges, and these rings keep following one another outward. If the difference in speed is the other way, the successive rings move inward.

In Fig. 3 the heavy dotted line represents the ring of light for a particular position of the two discs.

The position of the ring of light indicates the relative position of the two armatures. The discs may be secured to the shafts, so that when the armatures are in the same positions with reference to the pole-pieces (i. e., the machines are in the same phase), the ring of light will be at the inner or outer ends of the slits. The concentric rings in Fig. 3 represent the phase differences corresponding to positions of the ring of light in this case.

For convenience in operation the arrangement of the apparatus, which has thus far proved satisfactory, has been as follows: On one side of the pair of discs is placed an incandescent lamp enclosed in a box. One side of the box is close to the discs and has a slit in it about half an inch wide, extending from the shaft to the circumference of the disc. This slit is covered with a piece of oiled paper, so as to give a diffused light upon the discs. A complete ring of light is no longer seen from the other side, but only a small portion, corresponding to the width of the half-inch slit. A stationary scale is fixed so as to extend from the shaft to the edge of the discs on the opposite side from the lamps, so that the distance of the changing line of light from the centre may be read so as to give the phase difference of the two machines by direct reading. To enable one to see the scale and line of light most conveniently, a mirror is arranged at 45 degrees with the discs, so that the line of sight is at right angles to the shaft.

The discs may be arranged in the manner just described upon the abutting ends of the motor and generator shafts only in case the two machines have the same number of poles. Where such is not the case, one or both of the discs can be driven by gears, which will give the proper relative speeds of the two discs.

In operation, the instrument has proved quite satisfactory, giving exact and definite information concerning the changes in the armature lag of the motor. The fluctuations in this lag are usually quite marked, and the conditions which cause them can be readily investigated by this apparatus. For instance, this fluctuation is small with proper field excitation; as the field current of the motor is diminished, this fluctuation increases, the line of light moving rapidly back and forth through a greater and greater distance, which finally becomes so great as the excitation is weakened that it goes a distance beyond which it cannot recover; i. e., the motor gets out of step and stops. It would be possible to make a more detailed investigation of these fluctuations by means of a revolving mirror, and they may be photographed and made of permanent record by means of a moving plate.

The apparatus can be applied to other lines of work involving an investigation of phase differences and synchronism, and may be modified to meet the requirements of the problem in hand; but it is peculiarly suited for use in synchronous motor work, for which it was designed. The scope of the present paper admits only of a general description of the apparatus here given.

NEW SCHEDULE OF TELEPHONE RATES IN NEW YORK CITY.

In our issue of May 26 we mentioned the fact that the Metropolitan Telephone and Telegraph Company would, on June 1, introduce a new system of charges for telephone service. The following is a copy of the official schedule of rates for New York city, south of 110th street, which took effect on the 1st inst:

Number of Messages.	Two-Party Line.	Direct Line.	Excess Messages.
700	$100		$15.00 per 100
800	110		12.00 "
900	120		12.00 "
1000	130	$150	12.00 "
1100	138	158	10.00 "
1200	146	166	10.00 "
1300	154	174	10.00 "
1400	161	181	9.00 "
1500	168	188	9.00 "
1600	175	195	9.00 "
1700	182	202	9.00 "
1800	188	208	8.00 "
1900	194	214	8.00 "
2000	200	220	8.00 "

For more than 2000 messages Direct Lines only will be used and the rate of advance will be $5.00 per hundred, with $7.00 per hundred for excess messages.

For these rates, lines will be metallic circuit and equipped with long distance transmitters (wall or desk sets only.) For a cabinet set (wall or desk) $10.00 per annum additional will be charged. An installation charge of $15.00 will be made for each station. Where an established station is brought under a message-rate contract the installation charge will not be made.

WHAT ARE ATOMS?

BY PROF. PAYTON SPENCE, M.D.

Every physical inquiry, pursued to the end, brings us down to metaphysics. In the final analysis of matter we come to force. Such being the case, then, in any attempted synthesis of matter, we must begin with force as the ultimate cosmical constituent.

Leaving out the contradictory suppositions which Boscovich introduced into his celebrated theory of atoms, let us take only his basic idea, that atoms are dimensionless centres of force—mathematical points of force—and see what necessarily follows from it.

A mere mathematical point is, of course, not a centre of force. It is simply a negation—a nothing. A mathematical point, therefore, to be a centre of force, must be a point from which lines of force are constantly emanating.

Lines of force emanating from a mathematical point must be mathematical lines—lines having length only.

Lines of force must be frictionless because, being mathematical lines, they are unparticled.

Lines of force are necessarily straight until deflected by some obstruction.

Different lines of force cannot occupy the same place at the same time. They can neither cut each other nor interpenetrate each other, whether moving in the same or in opposite directions, or at angles to each other. Therefore, they must repel each other.

If we suppose a centre of force to be placed in a hollow globe one foot in diameter whose walls are impervious to lines of force, its lines of force will exert just as much pressure upon the whole internal area of that globe as it would upon the whole internal area of a similar globe three feet in diameter. But the area of the internal surface of the latter is nine times that of the former, and, therefore, the repulsive power of centres of force varies inversely as the squares of their distances.

The total energy of a centre of force must always be the same. We can conceive of nothing that can increase or diminish it.

Were the universe a perfect vacuum, the lines of force of a single centre of force would fill it instantly to its uttermost verge, there being nothing to retard their motion or limit their extension.

If we suppose a centre of force to be inclosed in a hollow globe whose walls are impervious to lines of force, the primary state of unstable confusion caused by the action of the lines of force upon each other and upon the walls of the globe, would necessarily ultimate in a condition of order and stability by the formation of a revolving vortex which, being frictionless and sustained by an exhaustless centre of force, would continue to revolve in the globe forever. Contract or expand the globe to any extent, or compress it into any conceivable regular or irregular shape, the vortex would continue its revolutions and would always completely fill the chamber in which it is confined. If we put two or more centres of force in the hollow globe, the lines of force being as impervious to each other as the walls of the globe are supposed to be, there would be formed an equal number of revolving vortices which would completely fill every particle of space within the globe, be it compressed or expanded into any size or shape whatever; and which would continue to revolve within the globe forever. But as the expansive pressure of the vortices against each other and against the walls of the globe increases inversely as the squares of the distances of their centres, it would require an infinite power to compress the globe so as to make the centres coalesce or interpenetrate each other. Centres of force, therefore, can neither occupy the same place at the same time nor make an impact with each other. Their lines of force hold them forever apart; or, in other words, centres of force repel each other; and any seeming attraction between them must be the result of repulsion—pressure.

Now, if we have a universe of centres of force, it is easy to conceive how they would act and react upon each other in the same way as those confined in the hollow globe, and thus crowd and deflect their lines of force into vortices of various sizes and shapes, which might ultimately be aggregated, through vast areas of unequal pressures, into clusters, and nebulæ, and solar masses here and there in the infinite expanse of a competely filled universe—a plenum.

Supposing such to be the origin of atoms, and that an atom is, therefore, a vortex consisting of a centre of force with its lines of force, let us sum up briefly the properties and relations that necessarily pertain to such atoms:

1. They are indestructible.
2. They are indivisible.
3. They are perfectly frictionless.
4. They are absolutely impenetrable.
5. They are infinitely elastic.
6. They are infinitely expansible.
7. They are infinitely compressible.
8. They can be moulded into any shape.
9. Their energy is forever the same.
10. Their vertical motion is eternal.
11. They repel each other with a force inversely as the squares of the distances from their centres.
12. All the phenomena of both matter and mind have their origin in a rhythmical motion—atomic vibration in the one case, and, in the other, what Spencer calls the pulsation of consciousness. Therefore, although a pulsatory emission of the lines of force from the centres of force is not deducible from the nature of such centres, yet we are justified in supposing, and are even obliged to suppose, that centres of force conform to the known method or law of nature, and send out their lines of force in pulsations or regular rhythmical emissions, thus giving rise to a perpetual vibration of the atoms.

The theory of atoms here proposed is, in this presentation of it, as impotent as all other theories to explain how atoms become linked, or hooked, or bound together into molecules and masses, which are more or less permanent, and to which the name, matter, is given.

A system of atoms, consisting of such as are not yet linked or hooked, or bound together into molecules and masses, could perhaps be made to fill the interplanetary spaces more satisfactorily than that vague, ill-defined and, to some extent, undefinable something called ether, which is supposed to be both matter and not matter, thus introducing a kind of semi-duality into nature; and which, moreover, every scientist who has a new theory of matter, or of light, or of electricity, feels at liberty to modify in any conceivable way that may be necessary to make it conform with, or sustain his theory.

It may be difficult, perhaps impossible, to adjust the present mathematics of light, electricity, ether, atoms and molecules to this necessarily imperfect and, perhaps, crude outline of a new theory of atoms. But all other theories of atoms may be erroneous. Certainly they are crude and incomplete, and far from being wholly satisfactory to anyone. And, as it is possible that, in their cases, mathematics may have been harnessed up to erroneous theories, there is some hope that the one here presented, if taken in hand by the mathematicians, may, in the course of time, be filled out, and modified until it presents quite a formidable and satisfactory appearance, if not a complete solution of the greatest riddle that confronts modern science.

ELECTRICITY, THE FACTOR OF MODERN PROGRESS.

BY MEYER BLOOMFIELD.

The historian who a century hence looks back upon the present era, wherein the smallness of the field and the intensity of the light enables him to see plainly what we now only dimly discern, will point out that the chief factor of this remarkable progress made by mankind during the last hundred years was the science of electricity and eventual applications. It is, however, surprising why this science should have produced such results, while many other equally useful and interesting sciences accompanies its development. The reason is, that electricity is what no other science has ever been, i. e., the parent of the most useful power, and this, to a great extent, at so little cost that it speedily revolutionized all the economic conditions.

As long as all that man possessed was the direct product of physical labor, his possibilities were limited indeed. This was the barrier that confronted the man of the past. True, the advent of the steam-engine materially aided in relieving this necessity; for the dynamo, however, the recognition and universal usefulness has been reserved. It would be proper to state right here, that these are no extravagant encomiums, but a simple statement of momentous facts which time will positively demonstrate.

Excepting those actually engaged in electrical pursuits contemporaneous writers have but scantily drawn attention to the immense influence exerted upon modern civilization by the applications of electricity. The actual cause of our industrial progress receives but trivial recognition in the recording literature. The study of this science is peculiarly interesting, inasmuch as its fundamental principles are extremely simple and can be readily appreciated. Its history is one long series of examples of man's energy and thought.

When we consider what new industries have been founded, what processes originated, what machines and instruments invented, we begin to understand the extent of this science, for we who are born under its benign influence but vaguely appreciate its value.

The products of all the great arts, the use of cheap and rapid transportation, the perfected instruments of peace and war, and the facilities enjoyed in domestic affairs are due to the agency of electricity. Following as a natural sequence of this potent influence upon man's social and physical conditions comes the question, can the ever-active mind of man and his skilful hand bring into being any other device as a substitute for it? As yet none can reply. Undoubtedly "there are more things in heaven and earth than are dreamt of" in our philosophy.

The waters, the winds, the rays of the sun, the weight and latent heat of bodies, the planetary movements and the rotation of the earth, the frigid Poles, and the interior of the earth, have locked up within them enormous stores of power, waiting, perhaps, for the ingenuity of man to unbind and convert them to his use.

But, when all shall have been realized which these as yet only faintly conceived-of forces and resources offer to man, when the practicability of the devices intended to diminish the physical exertions of man shall have reached its culminating point, electricity, owing to its convenience of application and multifold usefulness, will still remain man's valued servant, the criterion of human intellect, the conservator of the industrial world.

Another Eiffel Tower.—It is proposed to erect an Eiffel Tower outside of Copenhagen, Denmark, which will be lighted by electricity and whose lifts will probably be operated by electricity.

DE LAVAL'S METHOD OF ELECTRIC SMELTING.

The problem of economical and practical electric smelting is an interesting one, and therefore an account of the method, recently patented in Great Britain by Dr. C. P. G. de Laval, of Sweden, as given in *The Engineering and Mining Journal,* New York, will be of interest to our readers. In his specification, Dr. de Laval says that in the present method of smelting or heating iron or other materials by means of electricity, the heat requisite for the smelting is produced by conducting an electric current through a layer of molten material of slight conductivity—an electrolyte—which, owing to the resistance offered by it to the electric current, is heated so greatly that the metal, which in the case of iron, is supplied from above, and owing to its greater specific weight, sinks through said layer, obtains the temperature required for the smelting during its passage through this layer. The two pole-pieces are inserted in the furnace at each side of a transverse bridge, made of some refractory material, and under the electrolyte so that the current must pass above or beneath this bridge and through the electrolyte, in order to go from one pole to the other. As these pole-pieces are situated under the molten layer of slight conductivity, they will, during the process, become slightly fused so as to be transformed in the molten metal. As the pole is usually reckoned up to the point of contact between the metallic conductor and the electrolyte (in this case the layer of slight conductivity), the two poles will thus in the present method consist of molten metal. This is one of the characteristic features of the method in question. If it be desired to make the process continuous, the metal is supplied continuously, and the metal produced as well as the above situated layer of slight conductivity are maintained automatically at a constant or practically constant height.

The smelting is so carried out that the molten electrolyte is introduced into the furnace and heated still more by closing an electric current through the same. It may be convenient to use alternating currents for the purpose, in order that the electrolyte may not be decomposed. When the temperature has been raised sufficiently the metal is added in some form, either as free metal, or as a metallic combination, which latter in the furnace is reduced to free metal. If the metal or metal combination is of a greater specific weight than the electrolyte, it is introduced at the top of the furnace and sinks down through the electrolyte, during which passage it smelts and gathers in a fused state at the bottom of the furnace, from which it is removed in some suitable manner. If, on the contrary, the metal or metal combination is of less specific weight than the electrolyte, it is introduced from below and ascends through the electrolyte so as to gather in a fused state at the top of the furnace, from which it is removed. The bridge which holds the poles separated from each other is in the first mentioned case placed in the lower part of the furnace. In the latter case it is situated in the upper part of the furnace, for instance, suspended from the roof.

If a metal is to be brought in fusion the specific weight of which is less than that of the electrolyte, a furnace similar to the one described may be employed, but reversed; that is, having the bridge suspended from the roof. The electric current must then pass beneath the bridge and through the electrolyte in order to arrive from one pole to the other.

This method and furnace can also be employed to overheat a metal. The metal in this case introduced in fusion, and it obtains the overheat when passing through the electrolyte layer which communicates its heat to the molten metal. Though only metals are mentioned here above, which may be molten or heated in the described manner, the method may also be employed for other materials which are to be smelted or heated.

THE LOSS OF LIGHT FROM ARC LAMPS.

A recent issue of the *American Gas Light Journal* contains the results of some interesting experiments in connection with the loss of light from arc lamps due to the use of globes. In making the experiments, the lamp was suspended from the end of a frame which could be rotated about an axis parallel to the photometer bar. A rotating mirror was placed on this bar in such a position that by adjusting the mirror and the arm carrying the lamp, the light coming in any direction from the arc would be reflected along the bar, where it could be measured by a Bunsen photometer. An adjustable mirror was used sixteen inches in diameter, the reason for using such a large mirror being that the photometer might measure the light radiated from all parts of the globe and not merely from the arc. The measurement of the mean hemispherical candle-power of the bare arc gave about 450 candle-power, and the amount of light absorbed by the various globes averaged thirty-eight per cent. with clear glass, fifty-two per cent. with ground glass, and sixty-nine per cent. with opal glass.

"FREQUENCY" AND "PERIODICITY."

The *London Electrical Review* calls attention to the incorrect uses of the words "frequency" and "periodicity." These words are used to distinguish between single and double vibrations ; a single vibration may be represented by ⌣, a double vibration by ⌢⌣. The single vibration is of the same sign throughout its duration, rising from zero and falling to zero ; a series of such waves ⌢ ⌢ ⌢ form a unidirection pulsating current, and are produced by rectifying a single alternating current by a commutator driven by a synchronous motor. Such current has a "frequency" equal to the number of waves per second. The double vibration consists of + and — waves following each other alternately, hence forming what is called an alternating current represented by drawing the + wave above the zero line ⌢ and the negative wave below the zero line ⌣; such a current has a "frequency" equal to the number of double waves ⌢⌣ per second, that is, the "periodicity" is half the "frequency." There is no necessity for using both words; either of them would suffice in treating alternating currents, but "frequency" could be used for both alternating and pulsating currents.

THE PRODUCTION OF STEAM.

It has been found by trial that one pound of carbon perfectly burned, will give off 14,450 British thermal units, which is heat enough to evaporate 14.67 pounds of water already at the boiling temperature. When carbon is perfectly burned two parts of oxygen unite with one of carbon, forming carbonic acid, of which the chemical symbol is CO_2. For complete combustion about 12.5 pounds of air or 150 cubic feet at 62°, are required for each pound of carbon. If the combustion is not perfect because sufficient air is not provided, the carbon unites with one part of oxygen, forming carbonic oxide, which is a combustible gas. In the burning of carbon to carbonic oxide only about 4,400 heat units are evolved, which indicates calorific power sufficient only to evaporate about 4.5 pounds of water.

NEW COMPANIES.

In addition to the list of new companies of recent incorporation, given on page 283, the following are recorded :

Indiana Telephone & Construction Co., Indianapolis, Ind. Capital stock, $300,000.

The Mechanic Falls Water & Electric Light & Power Company, Mechanic Falls, Me., has been incorporated for the purpose of furnishing water, light and power. Capital stock, $75,000. The officers are : president, A. J. Weston ; J. H. DeCoster, treasurer.

The People's Telephone & Construction Company, Wheeling, W. Va., has been incorporated by J. J. Woods and others of Baltimore. Capital stock, $100,000.

The Interstate Construction Company, Des Moines, Iowa, with E. I. Rosenfeld as president and G. G. Fancher, secretary. Capital stock, $500,000. For the construction and operation of telegraph lines.

The New Orleans Construction Co., New Orleans, La. Capital stock, $50,000.

The Illinois Electrical Reminder Co., Chicago, Ill., by W. C. Jones, Geo. L. Cragg and Geo. S. Buell. Capital stock, $25,000. Will deal in electrical machinery, goods, etc.

The Consolidated Electric Improvement Company, Camden, N. J., for the purpose of manufacturing electric appliances, etc. Capital stock, $100,000.

The American Electric Co., Toledo, O., for the purpose of manufacturing electrical apparatus, etc Capital stock, $10,000.

The Butler Traction Co., Butler, Pa., for the purpose of operating street railway. Capital stock, $75,000.

Northern Electric Street Railway Co., Philadelphia, Pa. Capital stock, $150,000.

Sylvan Avenue Passenger Railway Co., Pittsburgh, Pa., for the purpose of operating electric railway. Capital stock, $12,000.

SUIT AGAINST THE BRUSH COMPANY.

Mr. J. E. Ridall of Pittsburgh, has entered a suit against the Brush Electric Light Company for $135,000, claimed to be due as commission on sales made in his territory for the company. In explaining the matter Mr. S. M. Hamill, secretary and general manager of the Brush Company, said the suit was for royalties which Ridall claims on the Brush double arc lamp patents. "These patents," said Mr. Hamill, have been broadly sustained by repeated decisions of the United States courts. Notwithstanding the fact that the Brush Co. has expended from $100,000 to $200,000 to sustain these patents and secure large yearly royalties from them, yet owing to delays in the United States courts and the reluctance of the courts to award damages for sales made prior to decisions, the Brush Co. has not as yet been able to collect very much from the infringement of these patents during the past. Mr. Ridall has no claim under his contract against the Brush Co. If he has any claim at all it would be against customers in his territory who have purchased infringing lamps, and even then he probably could not collect more than from $10,000 to $15,000, because his territory simply covers Pittsburgh and a small surrounding country. Under any circumstances, Mr. Ridall could hardly get anything from us until we secure damages from others.

LAW BATTERIES AND MEDICAL OUTFITS.

The electric battery, although a very old device for the generation of electricity, has not yet reached the stage of its existence where it is incapable of further improvement. It is being improved from time to time and the result each time is more current for the same, and frequently less cost. This is the object of all improvement—to get the greatest returns for the least expenditure—and it applies to every department of human activity, business, trade and profession.

One of the best known battery manufacturing concerns in the country, the Law Battery Company, 85 John street, New York, prides itself in the excellence of its batteries, also in the reputation they enjoy all over the land.

Fig. 1 represents its celebrated double cylinder cell. This cell consists of a double cylinder having 147 square inches of surface, of a jar, capable of holding 2½ pints of solution, and of a cover locking tight to the jar, thereby preventing evaporation, creeping of salts and corrosion. It goes without saying that the size of its negative element surface and the capacity of the jar affords great holding-up power, which makes it eventually the most economical, although it is a little dearer than some other cells at the start. The cover is provided with vent-holes to allow the escape of the hydrogen gas.

It is a splendid cell for all classes of work requiring open circuit cells, but it is particularly adapted to telephone work, because this character of work requires a cell of low internal resistance and one that must give uniformity of current from the time it is set up until it requires renewing.

Fig. 2 represents the Law Company's bichromate-mercury cell, for which the double cylinder cell jar and cover have been adapted, thereby making an acid cell, neat in appearance and cleanly to handle.

The company also makes single cylinder, clay and carbon porous-cup cells.

These batteries have attained an envious reputation for use in connection with medical outfits. They are at once compact and efficient.

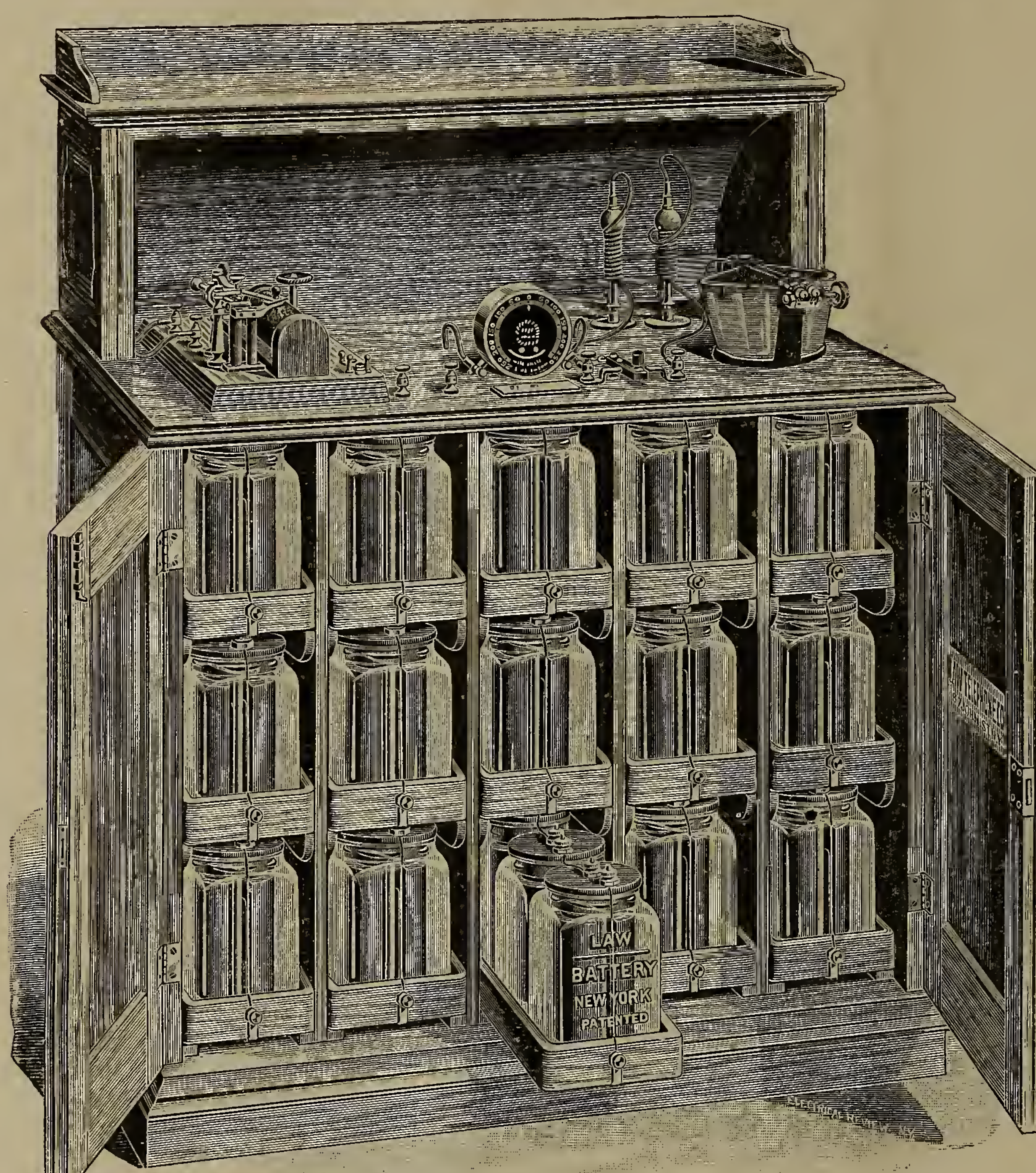


FIG. 3—LAW CABINET OUTFIT.

Fig. 3 shows a cabinet outfit made by the Law Battery Company. It consists of a highly polished antique oak cabinet on ball-bearing casters, containing fifteen trays, each holding four double cylinder cells, giving a total capacity of sixty cells; the well-known Bailey current controller; a Faradic coil; milli-am-meter; pole-changing-switch; electrodes and cords, etc.

The cells are automatically connected, thereby doing away with the mass of wires peculiar to the old style switchboard outfits. There is at hand a powerful galvanic and faradic current, or, if desired, the two combined.

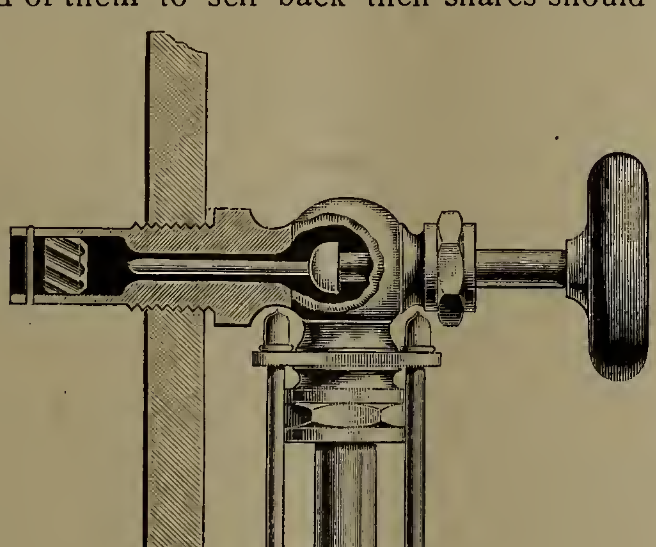
The advantages claimed for this outfit are: No complicated switching apparatus; no necessity for the attention of an expert; no poisonous fumes; no expensive renewals; current always ready; low cost; simplicity; cleanliness; serviceability and high efficiency.

THE ASHLEY CO-OPERATIVE ENGINEERING COMPANY.

The Ashley Co-operative Engineering Company (formerly the Ashley Engineering Company) of 136 Liberty street, New York, consists of a combination of mechanical and electrical engineers who control the

FIG. 1—LAW DOUBLE CYLINDER CELL.

stock of the company, and who are interested in the development of the business. The employees of this company each hold one share of the stock, so that no one man controls the business. All the shareholders of the company are directly connected with it, and it is required of them to sell back their shares should they



DUPLEX WATER GAUGE.

sever their connection with the company. Among the many steam specialties manufactured by this company, the one which probably enjoys the greatest sale is their duplex water gauge, which combines the best features of that kind of gauge. With these gauges there is no danger of being scalded by hot water or steam. Should the glass break in the night, as is often the case, the steam and water are instantly shut off, and the boiler is prevented from being burned by the water blown out with the fires banked. They are made in all sizes and in the best possible manner.

Their patent safety water column and alarm is very popular and is the result of careful study combined with practice. They are cheap, reliable and a positive prevention of boiler explosions or burned boilers from

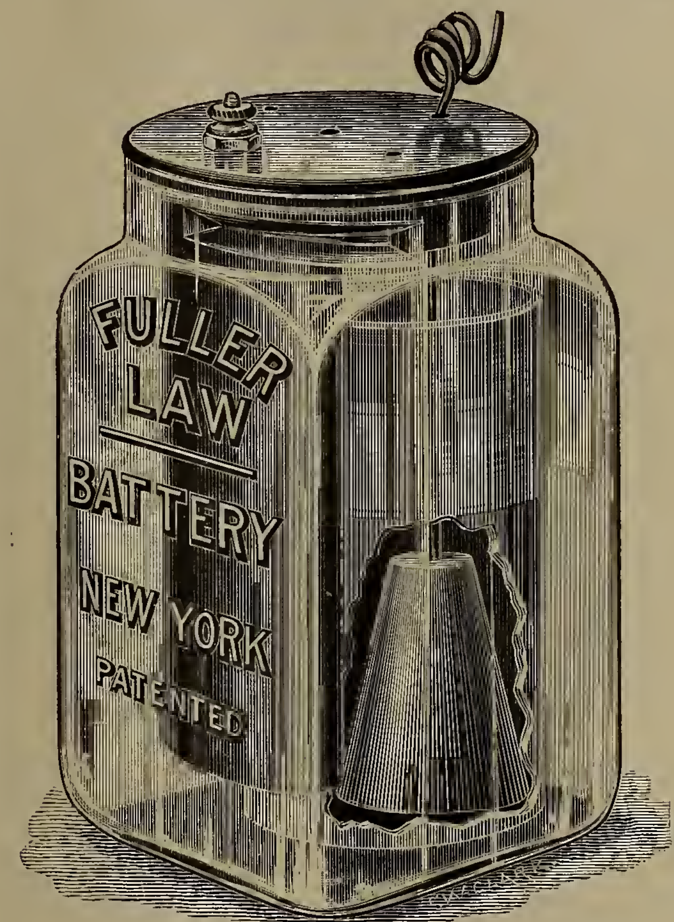
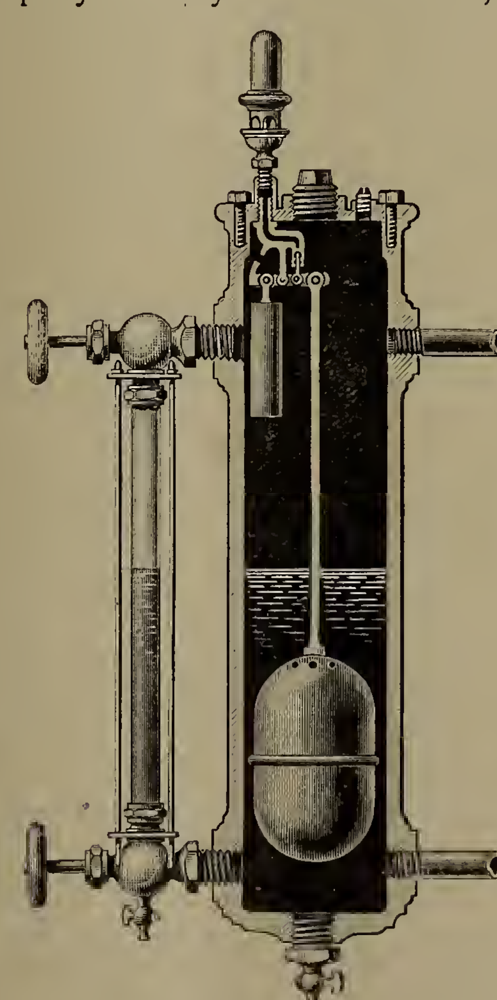


FIG. 2—LAW BICHROMATE CELL.

want of sufficient water in the boiler. The company has received scores of testimonials praising their efficiency.

The company's factory is in Hawthorne, N. J.



SAFETY WATER COLUMN.

ACCORDING to the latest tests the Edison kineto-phonograph has practically attained a high state of perfection. Mr. Edison is directing his energies toward the perfection of this machine.

Street Railway News.

ELECTROLYSIS OF GAS AND WATER PIPES.

At the annual meeting of the Western Gas Association, held at Cleveland, Ohio, May 16, 17 and 18 last, the subject of electrolysis of gas and water pipes received considerable attention. The Committee on electrolysis made an exhaustive report on their investigations. They discuss the causes of the trouble and the remedies therefor as far as known, quoting from the paper of Isaac H. Farnham, which was recently read before the American Institute of Electrical Engineers.*

In concluding their report the Committee says :

"In justice to the railway companies it must be said that they are fully alive to the serious character of the problem which confronts them, and are equally anxious with ourselves to remedy and avert the trouble. They have a vital interest in the matter apart from the liability under which they rest for damages to other underground metallic systems, for the solution of the electrolytic question means to them a marked reduction in operating expenses, greater efficiency of the motors, and relief from the menace of interrupted water supply. But they naturally hesitate to accede immediately to demands which would involve the reconstruction of so considerable a portion of their plants ; and as one of the electrical journals states, while the double trolley would remove all cause for complaint, the railway companies will exhaust every other means before going to the expense which that remedy would involve. But with recognition of the justice of claims for indemnity for injuries to our distributing lines, and a clear demonstration—such as is now being afforded in several directions — of the futility of any half-way measures, we think that the street-railway world will eventually concede the superiority of the double trolley and its kindred systems."

They then summarize their findings as follows :

First : Electrolysis from the grounded currents of electric roads is rapidly injuring gas and water pipes, and it is admitted by street railway people that the injury does proceed from their operations.

Second : Complete relief from its action *cannot* be reached by any device applicable by those injured, but *is* attainable by certain changes in the electric railways.

Third : The gas and water interest should unite in demands for remedial measures which shall secure the adoption of systems undoubtedly effective, and which will thereby avoid a revival of the question a few years hence.

Fourth : Pending the discussion or completion of the relieving systems, the pipes should be protected at exposed points, at which the policy of increasing the resistance by insulation should be followed rather than that of increasing the conductivity by wiring.

Considerable discussion followed the reading of the report, and the following resolutions were adopted :

"*Whereas*, investigation has showed that the use of an earth return in electric street railway systems necessarily causes a gradual but sure destruction of street mains and service pipes ; and,

Whereas, The owners of these buried metallic systems are unable of themselves to prevent this destructive action ; therefore, be it

Resolved, That it is the sense of this Association that the electric street railway companies can and should promptly adopt such measures as shall insure to all other interests immunity from the injurious electrolytic effects of their operation, and that, failing to do so, they should be held liable for all damages and loss resulting from said operation ; and be it further

Resolved, That the gas companies represented in the membership of this Association should unite with the water and other interests affected with them in securing from the electric street railways prompt attention and action in the directions indicated in the report of the Committee on Electrolysis.

* Electrical Age, April 28, 1894, page 198.

STREET PAVEMENTS.

The question of street pavements is one in which all street railroad companies are directly concerned, and the opinions and experiences of those most familiar with the subject are always of interest.

Paving and Municipal Engineering for June, contains a lengthy article on "Street Pavements," by Mr. William Fortune, from which we reproduce a portion relating to the distinct and peculiar uses of various kinds of paving, which abstract will be of interest to street railway men generally.

The character and requirements of a street, says Mr. Fortune, are to be first considered in determining how or with what materials it should be paved. A thoroughfare where travel from other streets converges should have such a surface as will best facilitate the movement of vehicles, wear the longest without repair, and be most easily cleaned. A street used chiefly for heavy hauling should have a pavement which, while presenting as little resistance as possible to traction, will have the most durable qualities. A residence street, on which there is much driving, should be paved with the materials which will give the smoothest surface, cause the least noise, and afford the best protection against unsanitary conditions. A street of similar character on which there is less travel, should have about the same qualities in its paving, except that equal aid to traction would not be required. Suburban streets and those so remote from the main lines of travel that they are used comparatively little, should have like treatment, but it may be made adequate in lighter form. These distinctions as to the most essential requirements for streets of varying character would permit the use of different kinds of materials, each peculiarly suitable, and it is believed preferable, though there could be some restriction of selections, without cause for dissatisfaction. Suitability would be determined by compliance with the common demand for the lowest requisite expenditure of money, while the cost would be measurably proportionate with the service and the realizable value of the improvement to those who would be compelled to pay for it. A comparison of the qualities of the different kinds of materials and an approximate knowledge of the cost of each, which may not be precisely the same in any two widely separate localities, will enable any person to decide what paving suits a particular street with less danger of making a mistake than in following general recommendations which possibly might not be applicable in special instances.

Montreal.—The Montreal Park & Island Railroad Company, Montreal, Que., has seven miles of its road in operation. Construction work is now being prosecuted. During the present season it is expected that about forty miles of line will be completed and in the next two years 100 miles more will be added to the system. This will make a complete network of electric railroads all over the island of Montreal outside of the city system. Mr. Albert J. Corriveau is general manager of this company.

NEW CORPORATIONS.

The Hess Storage Battery Company, Springfield, Ohio, maufacturing electrical storage batteries; capital stock, $10,000.

The Coshocton Telephone Company, Coshocton, Ohio; capital stock, $10,000.

The Honesdale Electric Railway Company, Honesdale, Pa.; capital stock, $100,000.

The Marion Telephone Exchange, Marion, Va.; capital stock, $5,000.

The Nonpareil Electric Company, Philadelphia, Pa., to manufacture storage batteries, dynamos, etc.; capital stock, $3,100,000.

The Harrison Telephone Co., New London, Ohio; capital stock, $1,000.

The Crescent Electric Co., Chicago, Ill., manufacturing armatures, windings, etc.; capital stock, $10,000.

National School of Electricity, Chicago, Ill.; capital stock, $100,000.

The Pratt Telephone Co., Chicago, Ill.; capital stock, $200,000.

The Indiana Electric Railway Co., Goshen, Ind.; capital stock, $25,000.

The Fort Wayne Electric Manufacturing Co., Fort Wayne, Ind.; capital stock, $10,000.

Quindaro Park Electric Railway Co., Kansas City, Kansas; capital stock, $200,000.

The Van Choate Electric Co., Portland, Me., manufacturing and dealing in electric apparatus and machinery; capital stock, $6,000,000.

The Bucksport Light and Power Co., Bucksport, Me., for furnishing electric light; capital stock, $10,000.

The Gardner Electric Street Railway Company, Gardner, Mass.; capital stock, $50,000.

The O. C. White Co., Worcester, Mass., manufacturing adjustable electric lights, etc.; capital stock, $16,000.

The Water Valley Electric Light and Power Co., Water Valley, Miss.; capital stock, $10,000.

The Western Electric Accumulator Co., St. Louis, Mo.; capital stock, $10,000.

The Electro-Chemical Reduction Co., Camden, N. J.; capital stock, $50,000.

The Buffalo Valley Telephone Co., East Aurora., N. Y.; capital stock, $2,000. Address F. R. Whaley.

Welling Manufacturing Co., New York, N. Y.; capital stock, $25,000.

The Montauk, Orient & New York Telephone and Telegraph Co, Greenport, N. Y.; capital stock, $5,000.

The Salisbury Telephone Co., Salisbury, Md., by A. J. Benjamin, president, L. W. Gunby, vice-president, and J. D. Williams, secretary and treasurer. The company will establish a telephone system, which is to be extended to neighboring towns.

The Texas Burglar and Fire Alarm Co., San Antonio, Tex., by G. S. Simons, Chas. W. Ogden, and others; capital stock, $10,000.

A company is to be organized at Tampa, Fla., by W. H. Hendrick and R. N. Ensley, who intend to build an electric railway from Ybor City to Talm Beach.

The Sioux City Traction Company, Sioux City, Iowa, has been incorporated with a capital stock of $1,000,000. Directors, D. L. Wright, E. F. Stone and J. C. French, of Sioux City, and M. L. Koehler and J. W. Hamer of Philadelphia.

The Bellevue Mutual Telephone Company, Bellevue, Ohio, has been incorporated. Capital stock, $12,000.

The Norwalk Telephone Company, Norwalk, Ohio, is about to be organized with a capital stock of $20,000. The incorporators are H. B. Hanford, W. W. Graham, A. C. Greene, J. G. Gibbs and F. W. Van Dusen.

The Pinegrove & Tremont Electric Light and Power Company, Pinegrove, Pa., has been incorporated. Capital stock, $25,000. Incorporators are W. C. Hock, A. Gilbert, John F. Werntz and Theo. Barr.

A new telephone company has been organized at Monroe, Mich., under the name of the Harrison Telephone Company, for the purpose of building and operating a telephone and messenger service in Michigan and Ohio. Capital stock, $250,000.

Waterport Electric Light and Power Company, Waterport, N. Y., has been incorporated by Captain Lina Beecher. Capital stock, $40,000.

POSSIBLE CONTRACTS.

A new electric railway is proposed between Lancaster, Ky., and Nicholasville, a distance of twenty-two miles. For further information address Fred. Balcom.

The Citizens Street Railroad Company, Memphis, Tenn., has been surveying for an electrical railroad to Binghamton.

The City Electric Light & Power Co., of Danville, Ill., is about to be granted a franchise for the erection of a plant.

Arrangements are being made for the connection of Chattanooga and Knoxville, Ga., a distance of over 100 miles, by telephone.

A telephone exchange is to be erected at Bellevue, O.

An electric light plant is proposed for the State Normal School, West Chester, Pa. Address A. P. Hall.

An incandescent electric light plant is to be installed in the Mt. Aloysius Convent, Cresson, Pa. Address Longfellow, Alden & Harlow, Vandergrift Building, Pittsburgh, Pa.

The Palmer & Monson Electric Company, Palmer, Mass., has been succeeded by the Central Massachusetts Electric Company.

The Hillsboro Electric Light Company, Hillsboro, Tex., will establish an electric light plant with 750 incandescent electric lights and 30 arc lights. Address E. G. Shields for further information.

L. C. Ketcham, Palestine, Tex., has petitioned the City Council for a franchise to construct a telephone system.

A project is on foot in Hammond, Ind., to run a new electric street car line through West Hammond and Burnham.

An electric street car line is proposed between Brazil, Ind., and Terre Haute.

An electric road is to be built from Newburg to Orange Lake, N. Y.

The Chester Traction Company, Chester, Pa., has decided to extend its lines to East 7th Street.

A company in Little Rock, Ark., is applying for the right of way to construct a telephone line from Little Rock to Fort Smith, Ark.

A $10,000 electric light plant is to be erected at Cuthbert, Ga. Address, Robert L. Moye, Cuthbert, Ga.

The Brazoria County Abstract Co., of Brazoria, Tex., is said to be interested in the telephone line to be projected to Angleton, Velasco and Brazoria.

An electric light plant is to be established in Paris, Tenn. The Mayor of that place can give further information.

The Hillsboro Power and Electric Co., Hillsboro, Tex., has purchased a site and will erect an electric light and power plant.

A meeting of the stockholders of the Orleans Street Railway Co., New Orleans, La., will be held on June 16, to act on a proposition to change its line to electric power. Peter Cougout is president.

The American Construction Co., Lancaster, Ky., is in the market for the equipment of an electrical railroad and machinery for a power plant. This company is endeavoring to secure the right of way for an electric road from Stanford to Nicholasville, Ky. The right of way has been secured for a road from Manchester to West Union.

An electrical railroad is to be built in Brooksville, Ky. Y. Alexander, cashier of the Bracken County Bank, is interested.

The Virginia Electric and Railroad Co., Richmond, Va., is seeking a franchise to build an electric road to Chimborazo Park.

THE SUBURBAN ELECTRIC EQUIPMENT AND SUPPLY COMPANY.

During the past year a company of considerable promise has come into existence in New York city. The name of this corncern is the Suburbau Electric Equipment and Supply Company, and its headquarters are at 11 Park Row. The officers are: Geo. E. Wyman, president and general manager, and W. W. Higgons, secretary and treasurer. Mr. Wyman was for a long time connected with the Western Electric Company and is thoroughly familiar with the business part of the electrical trade. Mr. Higgons has for several years been engaged in construction work, and has an intimate knowledge of all the details and requirements of electric installations, either isolated plants or central stations.

This company makes a specialty of equipping stores, offices, etc., with all kinds of electrical apparatus, and gives estimates on wiring for incandescent lighting, the installation of motors for power and ventilation. The company installs fan motors of any make, at moderate cost, in any part of the Middle and Eastern States, and takes contracts for the installation of arc and incandescent plants anywhere in the Eastern States. They carry a complete line of general electrical supplies, including incandescent fittings, office and household specialties, and undertake the purchase of supplies for out-of-town dealers at moderate rates of commission.

ELECTRICAL TABLES.

"Electrical Tables and Memoranda," is the title of a valuable little reference book for engineers, electricians and others interested in the electrical science. It contains a great deal of valuable information and a number of illustrations and diagrams. It is only 1⅞ by 2⅝ inches in size, and can easily be carried in the vest pocket. The author of this convenient little work is Prof. S. P. Thompson, and the price is only 50 cents per copy. For sale by the Electrical Age Publishing Company, World Building, New York.

NEW YORK NOTES.

Avery P. Eckert, formerly of the Kerite Co.. who is an old hand at this business and has considerable influence, is now with the Safety Insulated Wire and Cable Co., of 234 West 29th street, New York.

Some changes have been made in the telephone facilities on the New York Stock Exchange, with a view to the better accommodation of those entitled to use them. There are over 200 instruments in use on the floor of the Exchange.

The General Electric Launch Co. is building at Morris Heights, on the Harlem River, an electric launch for Congressman Sorg, of Ohio. The launch is to be 46 feet over all, carrying two motors, twin screw, and 144 cells of the Consolidated Electric Storage Company's battery; and will have a speed of 12 miles an hour.

The big German search light which was one of the features of the electrical exhibition at the World's Fair last year, was operated for the first time on the night of June 4, at its new and permanent location at Sandy Hook. It was handled by Mr. Tischendoerfer, who had charge of it at the fair. The light, or lamp, was made by Schuckert & Co., the well-known German electrical firm, and was bought by the United States Government at the conclusion of the exhibition for use at Sandy Hook.

The Elson & Brewster Engineering Co., 143 Liberty street, New York, are the New York agents for the W. S. Hill Electric Co., of Boston. This company handles electric generators, motors and fans, and carries on a general electrical and mechanical engineering and contracting business. The stationary and rotating fan motors of the W. S. Hill Electric Co. have been put on the market with the guarantee that they are first-class and serviceable machines in every way. The rotating fan motor keeps the air in every part of the room in motion and will run continuously throughout a season without care. W. T. H.

TRADE NOTES.

The Emerson Manufacturing Company, 1108 and 1110 Charles street, St. Louis, Mo., has just issued a new catalogue on the Meston Alternating Current Motor. These motors are giving general satisfaction, and are adapted to a great variety of uses for small power purposes.

Rouquette & Co., of 47 Dey street, (formerly of 12 Wooster street,) New York, consists of a firm of electrical and mechanical engineers and contractors who give particular attention to repairs, rewinding armatures, and overhauling engines. The firm deals in electrical and mechanical supplies, and takes contracts for electric heat, light and power.

Those wishing to have any burglar alarms and house wiring promptly attended to should see C. R. Nething, of 143 Centre street, New York, who manufactures a large assortment of electrical and telegraphic instruments.

Dolan & Lowe, of 110 Fulton street, New York, makers of special machinery, patterns, tools, dies, etc., make a specialty of wood and metal patterns.

Electrician Fremont Wilson, of 106–108 Fulton street, New York, appraises fire losses on electrical specialties, makes plans and specifications for interior lighting and personally supervises all work given to him. His desk blotter reminds his patrons that he is "on deck."

Abendroth & Root Manufacturing Company, 28 Cliff

Street, New York, has issued a very complete catalogue entitled "A Few Plain Facts Concerning Water Tube Boilers." It is artistically illustrated, and gives information that every steam user should know.

THE ELECTRICAL AND MECHANICAL ENGINEERING AND TRADING CO.

A little more than a year ago Mr. J. H. Vail organized the Electrical and Mechanical Engineering and Trading Co. This company carries on a business varied in its nature. Among the electrical contracts now under way may be mentioned the following: car house, cars, motors, trucks and generators for the Hoosick Railway Co., Hoosick, N. Y.; an electric light station complete at Rumsen Neck, N. J., for the Rumsen Improvement Co.; contracts for an electric light plant in the new addition to Buckingham Hotel, New York city; and an underground conduit system for telephone and other electrical conductors for J. C. Hoagland and Raymond Hoagland, Rumsen Neck, N. J. Mr. Vail is consulting engineer for the Trinidad Electric Light and Power Co., Port of Spain, Trinidad. He is also surveying and consulting engineer for the Poughkeepsie City and Wappinger Falls Electric Railroad Co. This system includes a 600-H. P. steam plant, compound condensing engines, and direct driven generators. It will include some fine long distance work, as one section of the road extends 10 miles from Poughkeepsie to Wappingers Falls and New Hamburgh. The steam plant consists of Stirling boilers, and Ball & Wood compound condensing engines and General Electric generators driven directly. The car equipment includes 800 General Electric motors. Mr. Vail gives all the business of his company his personal attention, and the engineering and construction work is of the best character. The company is also filling another contract in Rumsen Neck, N. J., for an electric light system for Edward Kemp, which includes underground conduits. The Electrical and Mechanical Engineering and Trading Co. has pleasant and commodious offices at 39 Cortlandt street, where a corps of expert and experienced engineers are constantly employed.

FOR SALE.

A standard testing galvanometer, for the measurement of electrical instruments, lines, batteries, wires and any object of from $\frac{1}{100}$ to 10,000 ohms or more. This galvanometer is extremely sensitive and of substantial construction.

Also a combination Wheatstone Bridge and Rheostat. This instrument contains $\frac{1}{100}$ to 11,000 ohms direct resistance, and 10 to 500 ohms in each side of the Bridge. Both instruments guaranteed accurate and first-class. Price for both, $65.

Address The Electrical Age Pub. Co.,
World Building, New York.

BUSINESS NOTICE.

The Consolidated Electric Storage Co. has published two new circulars, Nos. 9 and 10—devoted the first to "Isolated Lighting" and the second to prices, weights, &c., of batteries. They may be secured of the company at Edison Building, New York, or Drexel Building, Philadelphia.

Electrical and Street Railway Patents.

Issued May 29, 1894.

520,406. Magneto-Telephone. Arthur F. Boardman, Somerville, assignor of one-half to James D. Leatherbee, Braintree, Mass. Filed Mar. 24, 1894.

520,412. Insulator. Chauncy E. Conover, Cincinnati, Ohio. Filed May 20, 1893.

520,427. Circuit-Closer. George W. Hey, Syracuse, N. Y. Filed Mar. 11, 1893.

520,429. Electric Battery. Samuel H. Hoggson, St. Louis, Mo., assignor of one-half to William H. Stevenson, same place. Filed Mar. 6, 1893.

520,445. Electric Cigar-Lighter. David Misell, New York, N. Y., assignor to Nathaniel S. Rosenau, same place. Filed Dec. 5, 1893.

520,446. Electrically-Illuminated Clock. David Misell, New York, N. Y., assignor to Nathaniel S. Rosenau, same place. Filed Dec. 5, 1893.

520,474. Switch. Henry P. Ball, Bridgeport, Conn. Filed Mar. 12, 1894.

520,510. Electric Cattle-Guard. David H. Wilson, Chicago, Ill. Filed May 18, 1893. Renewed Mar. 12, 1894.

520,527. Electric-Railway Turn-Table. Rudolph M. Hunter, Philadelphia, Pa. Filed Feb. 2, 1893.

520,543. Testing System for Multiple Switchboards. Charles E. Scribner, Chicago, Ill., assignor to the Western Electric Company, same place. Filed Aug. 24, 1891.

520,585. Electric Clock Striking Mechanism. Chas. D. Warner, Ansonia, Conn. Filed Apr. 6, 1893.

520,614. Element for Secondary Batteries Sigmund A. Rosenthal and Villeroy C. Doubleday, London, England. Filed Dec. 5, 1892.

520,620. Alternating-Current Motor. Wm. Stanley, Jr., Pittsfield, Mass., assignor to the Stanley Laboratory Co , same place. Filed Feb. 1, 1894.

520,644. Cable Railway. Chas. W. Hunt, West New Brighton, N. Y. Filed Feb. 20, 1894.

520,661. Electric Railway-Signal. Chas. Selden and Henry V. Riley, Baltimore, Md. Original application filed Feb. 16, 1894. Divided and this application filed Apr. 12, 1894.

520,710. Electric Railway-Signal. Chas. Selden and Henry V. Riley, Baltimore, Md.; said Riley assignor of one-fourth to said Selden. Filed Feb. 16, 1894.

520,722. Electric Pump-Motor. John F. Blake, New Haven, Conn. Filed Sept. 7, 1893.

520,737. Trolley-Wire Support. Budd J. Jones, Sioux City, Iowa. Filed Feb. 5, 1894.

520,748. Method of Operating Electric Motors. John S. Bancroft, Philadelphia, Pa., assignor to the William Sellers & Co., incorporated, same place. Filed Dec. 10, 1892.

520,758. Conduit-Railway Trolley. Wm. Lawrence, New York, N. Y. Original application filed Aug. 17, 1892. Divided and application filed June 27, 1893. Again divided and this application filed Aug. 2, 1893. Renewed May 4, 1894.

EXPIRED.

191,478. Electro-Magnetic Motors. R. J. Sheehy, Boston, Mass. [Filed Feb. 20, 1877.]

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T. R TALTAVALL, Secretary and Editor.

ADDRESS ALL COMMUNICATIONS TO

THE ELECTRICAL AGE PUBLISHING COMPANY,

First Floor, World Building.
NEW YORK.

BROOKLYN HEADQUARTERS:—G. H. Wise Electrical Company, 199 Fifth Ave., ELECTRICAL AGE on sale and advertisements taken at regular rates.

Electrical books of all kinds can be procured at this office. Libraries can be furnished with a complete set of electrical works at a liberal discount from catalogue prices.

Copy for advertisements or changes therein should be in our hands before the Saturday preceding publication day.

NEW YORK, JUNE 16, 1894.

CONTENTS.

HOT WEATHER AND FANS.

The busiest men these days are the dealers in hokey-pokey, electric fans and icemen. The coal men and plumbers and car-heater men have gone to Europe to spend the summer. Electricity can always be depended on to render our daily lives comfortable; if it is too hot electric fans cool our fevered brows, and if it is too cold, electric heat sends the warm blood coursing through our veins, spreading a healthy warmth throughout our bodies. However, the electric fan is all that concerns us just now. The demand has come and the supply is ready to meet it. See our reading columns for further particulars.

A NEW DANGER.

The Brooklyn trolley system may be set down as the most diabolical engine of torture ever devised by man in this or any other age! The other day a Third avenue car in that city struck a truckman, causing the loss of his eyesight and his reason. The physical condition of the man probably had a good deal to do with the results of the accident, but that does not concern those who are blackguarding the trolley, and we are informed that suit was promptly commenced against the railroad company. There is always some one ready to bring suit against the railroad company whether the cause is just or not; indeed some folks thrive in this way.

TROLLEY SAFEGUARDS.

A very interesting point has developed recently in connection with the operation of electric street railroads. An order was lately issued by the Consolidation Traction Company, of Newark and Jersey City, requiring that the eyesight of the motorman be examined for color blindness, etc. It is believed at headquarters that many of the accidents in streets involving electric cars are due primarily to defective vision of the motorman, and the contention is apparently a reasonable one. In support of this argument, an accident having some peculiar features is referred to. It seems that a collision occurred in Jersey City, which is attributed to the "far-sightedness" of the motorman. He miscalculated the distance between his car and the wagon that was run into—or rather his eyesight deceived him. He probably thought his calculation was all right, but at the investigation, the question of defective eyesight was brought up and the man's vision was found to be defective. This circumstance opened up a new line for investigation, and the officials of the company have determined to examine the sight of all their employees engaged on the line, for defective vision as well as color perception. This discovery will no doubt lead to important results, and will probably be taken up by other roads.

NIAGARA WATER POWER IN CANADA.

A dispatch from Buffalo states that active work has been commenced in the utilization of the Niagara water power on the Canadian side, in the same manner as that adopted on the American side. Plans for the development of the great water power were accepted by the Commissioners of the Queen Victoria Niagara Falls Park on June 10; the contract and necessary papers were signed, and a corps of engineers was set to work at once staking out the pit and site for the power house. The plans adopted are very similar to those carried out in the American enterprise. Three turbines of the same size as those employed on this side of the Falls will be laid down, and the plans provide for the extension of the pit 1200 feet, should it be necessary.

ELECTRICAL SANITATION.

The question of how to practically and safely get rid of the enormous quantity of sewage matter produced every day without endangering the health of the community, and without unduly increasing municipal expenses, has led to the trial of several plans.

Attention has been directed says the London *Electrical Review* to some recent experiments in the purification of sewage matter by means of electricity, according to M. Hermite's process, which consists in treating the excreta, before they are conveyed into the drain, with water that holds in solution the chlorides of sodium and magnesium, and that has been subjected to electrolysis.

The process is a very simple and practical one, being really a combination of the system by which everything is conveyed to the sewer either with or without the liquid being drained off, with chemical disinfection which is effected—and herein lies the most essential points as regards the public health—immediately after the addition of any fresh sewage matter, which under no circumstances whatever can arrive at or circulate in the systems of sewers without having first been completely sterilized. To effect this M. Hermite subjects some sea-water to electrolysis, or in default of sea-water an aqueous solution of chloride of magnesium and chloride of sodium. Under the influence of the electric current, the water and the salt are decomposed. At the positive pole we get an oxygenated compound of chlorine, very unstable, which possesses a considerable oxidizing and consequently disinfecting power; at the negative-pole an oxide is formed which has the power of precipitating certain organic substances. Thus, by this one operation, we get a liquid possessing properties which completely destroys the organic substances resulting from putrefaction and also the gases, such as sulphuretted hydrogen, hydro-sulphate of ammonia, the carburets of hydrogen and also germs or microbes, and which precipitates certain substances, such as albuminoids, etc., and consequently clears the liquids.

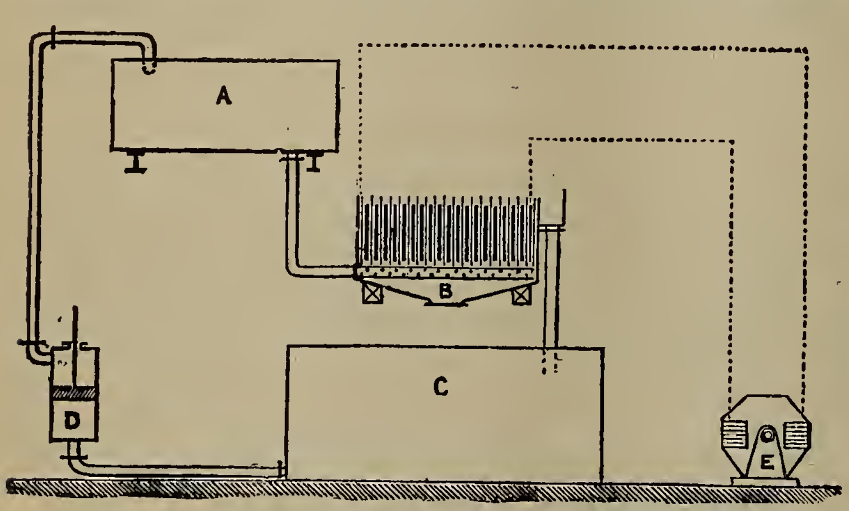

FIG. 1.

This disinfecting liquid, when obtained, is sent instead of ordinary water into water-closets, sinks, gutters, and in short, into all places where sewage-matter is likely to be produced and to collect. In short, then, M. Hermite's system requires a central station for the production of electrolyzed water, and a system of pipes for the conveyance of the disinfecting liquid to all those points where it is likely to be required. In all cases the installations are of a similar nature, only differing in the quantity and power of the apparatus used, and the extent of the mains distributing the disinfecting liquid.

Fig. 1 shows the plant of a central disinfecting station, which comprises a dynamo, E, generating the currents required for electrolysis; and electrolyzing apparatus, B, and a pump, D, which pumps sea-water or salted water directly into a trough, C, whence it is conveyed into a second trough, A, passing thence into the electrolyzing apparatus B, after which it falls back again into the trough, C, and is finally conveyed into the mains.

The electrolyzer consists of a galvanized iron trough, at the bottom of which is a tube pierced with a number of holes and provided with a zinc tap. It is through this tube that the sea-water or chloride solution enters the electrolyzer. The top of the trough, which is of galvanized iron, has a rim forming a gutter; the liquid flows into this and escapes by a pipe. Thus a continual circulation is kept up.

The negative electrodes consist of a number of zinc discs mounted on two axles, which turn slowly.

Between each pair of zinc discs are placed the positive electrodes, the active surface of which consists of sheets of platinum, wound on glass rods, 12 millimeters in diameter, the upper part of which is received into tubes of copper encased in tubes of ebonite, which are intended to protect the copper from any alteration. The various positive electrodes are connected together by a bar of galvanized iron, and each positive electrode communicates by means of this said bar of galvanized iron, with a bar of copper passing through the electrolyzer,

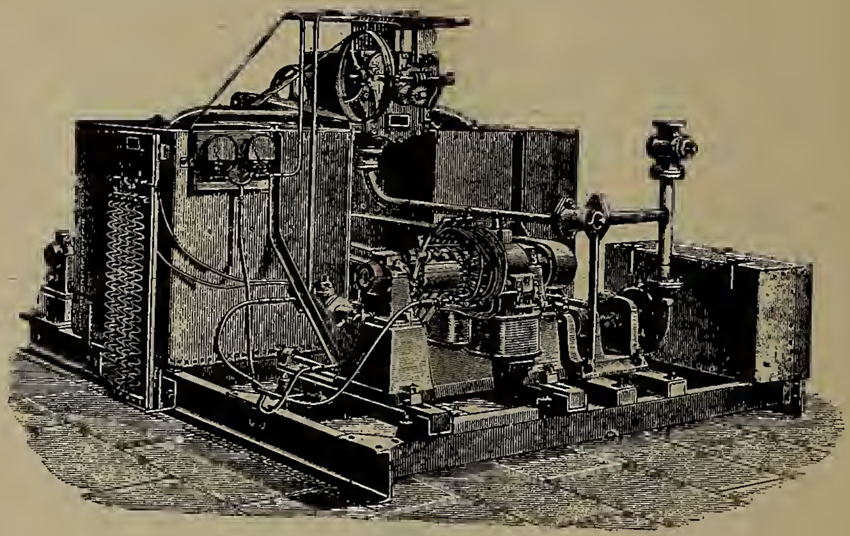

FIG. 2.

and in communication with the poles of the dynamo. Four of these positive electrodes correspond exactly to one negative electrode.

The current is distributed into all the platinum electrodes, whence it passes through the liquid into the zinc discs, forming the negative electrodes and communicating by the iron box with the negative pole of the dynamo. In order to keep the negative electrodes perfectly clean, flexible knives of zinc are placed between them; these knives bear continually against the zinc discs, and as these latter slowly turn, any deposit formed on their surfaces is, of course, removed at once.

At the lower part of the trough is a door that can be opened for cleaning purposes; a tap enables the apparatus to be emptied when necessary.

Lastly, strong, simple measuring instruments placed in the circuit, show at each moment whether the apparatus is working satisfactorily, and what force is absorbed.

Fig. 2 represents the installation of the plant.

ELECTRIC COLORING OF HIDES.—According to *Electricité*, a new process for coloring hides consists in spreading the skin on a metal table, covering all the surface with the exception of the edges with the coloring liquid and passing an electric current between the liquid and the table. The effect of the current is, as in electric tanning, to open the pores of the hide, thus allowing the solution to penetrate more readily and to give a more durable color.

STANDARDIZING ELECTRICAL MEASURING INSTRUMENTS.*

BY ELMER G. WILLYOUNG.

The necessity of a complete outfit of proper measuring instruments, voltmeters, ammeters, ground detectors, etc., as a factor of economical operation in all kinds of lighting and power systems, is now almost universally conceded, and we find such instruments all over the country in vast numbers. In the stations we have the station instruments; for general all-round testing work, measuring drops, joint and switch resistances, etc., the portable instrument is useful.

As at present made, all of these various instruments have in them dangerous elements of change.

This being so, we must, therefore, frequently examine these various instruments and determine if such changes have taken place, and, if so, what has been their magnitude. As a rule, this is done at present, not by the owner of the instrument, but by the instrument maker, the instrument being taken down and sent back to the maker from time to time for recalibration, or, if they are not, they should be. This, in itself, is expensive—express charges must be paid—time must be spent in correspondence—often, if not always, a charge is made for the work of restandardizing.

FIG. I.

Consideration of the above long ago convinced me that this restandardizing should be done by the stations themselves, in all cases except when quite small, and that some arrangement of apparatus should be devised which would make the utilization of some absolute standard method inexpensive and convenient, and possible to any one of ordinary intelligence. After a good deal of thought and personal experience, I became convinced that the only method which could be made to at all satisfy these requirements was the potentiometer method.

Broadly, the potentiometer method consists in opposing some known *proportion* of the drop of an unknown E. M. F., through a given resistance to a definitely *known* E. M. F., the proportion being so chosen that no current is produced by the latter known source. This condition being established, an equation involving the unknown E. M. F. as the only unknown quantity immediately obtains. The method in general is fairly well-known, being variously called the standard cell method, the Poggendorf or Rayleigh-Poggendorf compensation method, the Rayleigh method, etc.; it is not by any means so widely known, however, as it deserves to be.

The advantages of the potentiometer are:

(1.) It is a zero method; a calibrated galvanometer is therefore not necessary.

(2.) Accuracy depends only upon a standard cell and a standard resistance, and results obtained by the best authorities over a number of years show that both of these may be relied upon within extremely small limits of error, with proper treatment for a practically indefinite time.

(3.) It requires but simple apparatus, always obtainable, and ordinary care. It can be used without inconvenience in regions of great mechanical instability aad of intense and variable magnetic fields.

AN IMPROVED DIRECT READING POTENTIOMETER.

This instrument, invented by the writer and illustrated in Fig. 1, is capable of being used for measurements of voltage from 0 up to 1,500 volts, and of current from 0 up to any required upper limit, with a maximum error of not over $\frac{1}{10}$ per cent.

A diagram of the arrangement of circuits in my improved form of apparatus is shown in Fig. 2.

In order to make the measurement of any unknown

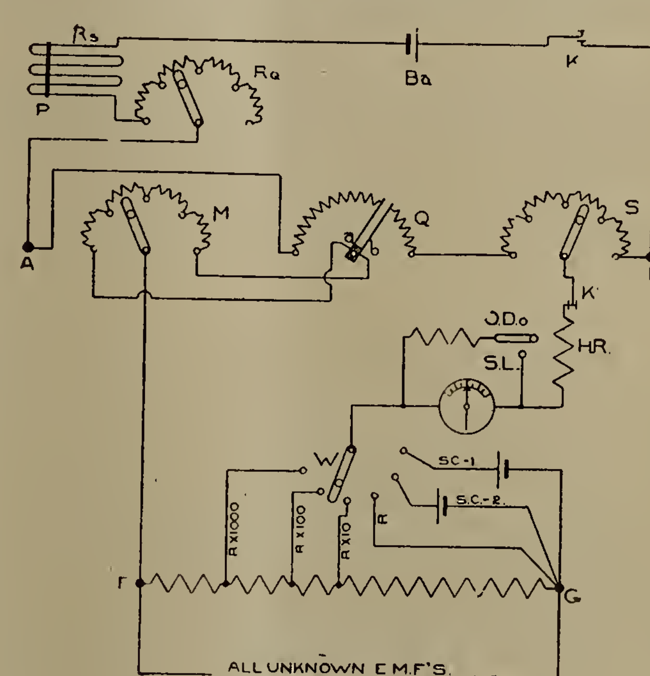

FIG. 2.

potential convenient and quick, a suitable arrangement of switches is provided. In the lower part of the diagram, R is a high resistance connected between two points F and G. To F is permanently joined one derived circuit terminal. The other derived terminal passes, by way of a key, K', through a galvanometer and thence to a switch, W, which plays over a number of contact points connected as shown. The two points, S. C.–1 and S. C.–2, are joined each to a terminal of a Carhart one volt cell, the other terminals of which are joined in common to G.[1] The remaining points are connected to points along F G, dividing the whole resistance in the ratio $\frac{1}{16000}$, $\frac{1}{100}$, $\frac{1}{10}$ and $\frac{1}{2}$. In this way, with W on one or the other of the standard cell contacts, we may by proper setting of Q, M and S, and adjustment of the regulators R_s and R_q get the E. M. F. between A and B accurately 1.5 volts; we may, also, compare the two cells with one another, and thus detect any possible variations in either, as the probability that both would change alike, in the event of any change taking place, is extremely small. By now setting W on R any unknown E. M. F. joined to F and G and less than 1.5 volts immediately becomes measurable. Should the E. M. F. be greater than 1.5 volts and less than 15 volts, W is set on R $\times$ 10 instead of on R; greater than 15 and less than 150 volts on R $\times$ 100; greater than 150 and less than 1,500 volts on R $\times$ 1,000. When measuring current, leads are brought to F and G from the shunt ter-

*Abstract of a paper presented at the Eleventh General Meeting of the American Institute of Electrical Engineers, Philadelphia, May 17, 1894.

minals and the E. M. F. measured like any other unknown E. M. F. In order to avoid the risk of accidentally getting too strong a current through either of the standard cells a high resistance, H, R, of about 10,000 ohms is permanently placed in the galvanometer circuit. A shunt is also placed around the galvanometer which may be thrown in or not, as desired, by means of the little switch placed for the purpose.

THE AMERICAN STREET RAILWAY ASSOCIATION ATLANTA CONVENTION.

The Association extends a cordial invitation to all manufacturers and producers of street railway supplies to exhibit their machinery and wares at its next convention, which will be held in Atlanta, Ga., on October 17, 18 and 19 next.

A diagram of the floor space of the exhibition hall is given herewith.

The following is a copy of the rules and regulations governing the exhibition:

1. Applications for space must be made on blank forms.

2. Space will be allotted on June 15 to all exhibitors whose applications have been filed with the Secretary and accepted on or before that date. Applications for pace received and accepted after June 15 will be allotted remaining space, if any, in the order of their acceptance.

3. The space will be charged for at the rate of fifteen cents a square foot, and no space less than 100 square feet will be rented, nor more than 2,000 square feet, unless by special arrangement with the Secretary.

4. Space allotted cannot be transferred without permission, and must be taken possession of on or before October 16.

5. Articles placed on exhibition cannot be removed without the written permission of the Secretary, except as provided in Rule 16.

6. All goods shipped to the Exhibition should be plainly marked "Street-Railway Exposition, Atlanta, Ga." It is advisable to secure a time-limit delivery. Be sure to allow plenty of time for transportation.

7. On and after October 10 exhibitors and their agents and workmen will be admitted to the building for the purpose of preparing necessary structures.

8. The general reception of articles for exhibition will commence on October 10.

9. Exhibitors of machinery in operation must have everything in running order, in readiness to start their machinery on the morning of the opening day.

10. All goods intended for exhibition must be on the premises and properly displayed on or before Tuesday evening, October 16.

11. Exhibitors must provide all counter-shafts, pulleys, belting, switches, switch-boards, etc., necessary for the operation of their machinery.

12. No platform or other structure must be nailed to the floors or walls.

13. Exhibitors must not place any sign or circulate advertisements, except such as pertain to their own business (and those only in their own space) without written permission from the Secretary.

14 Electric power will be furnished to those who use power. The charge therefor during the entire time of the Exposition will be 45 cents per rated K. W. of machine actually using current. The minimum charge for power will be fifteen dollars.

15. All machinery will, if possible, be exhibited in motion, and should be kept in motion at regular work during the hours 9 to 12 A. M., 2 to 6 and 7 to closing P. M.

16. Sale priveleges. Parties desiring to sell and deliver in the building any articles whatever, must first obtain a written permit from the Secretary, for such consideration as may be determined upon.

17. Any permit to sell may be revoked at any time at the pleasure of the Association.

18. Every possible precaution will be taken to guard against fire, and a full corps of watchmen will be on duty day and night; but the Association will not be responsible for loss or damage to articles on exhibition by theft, fire or otherwise.

19. The Association reserves the right to charge an admission fee to the citizens of Atlanta should it so determine, but the admission of exhibitors and their agents will be free.

For further particulars address N. W. L. Brown, Chairman, Committee on Exhibits, Equitable Building, Atlanta, Ga., or W. J. Richardson, Secretary, American Street Railway Association, 166 Montague St., Brooklyn, N. Y.

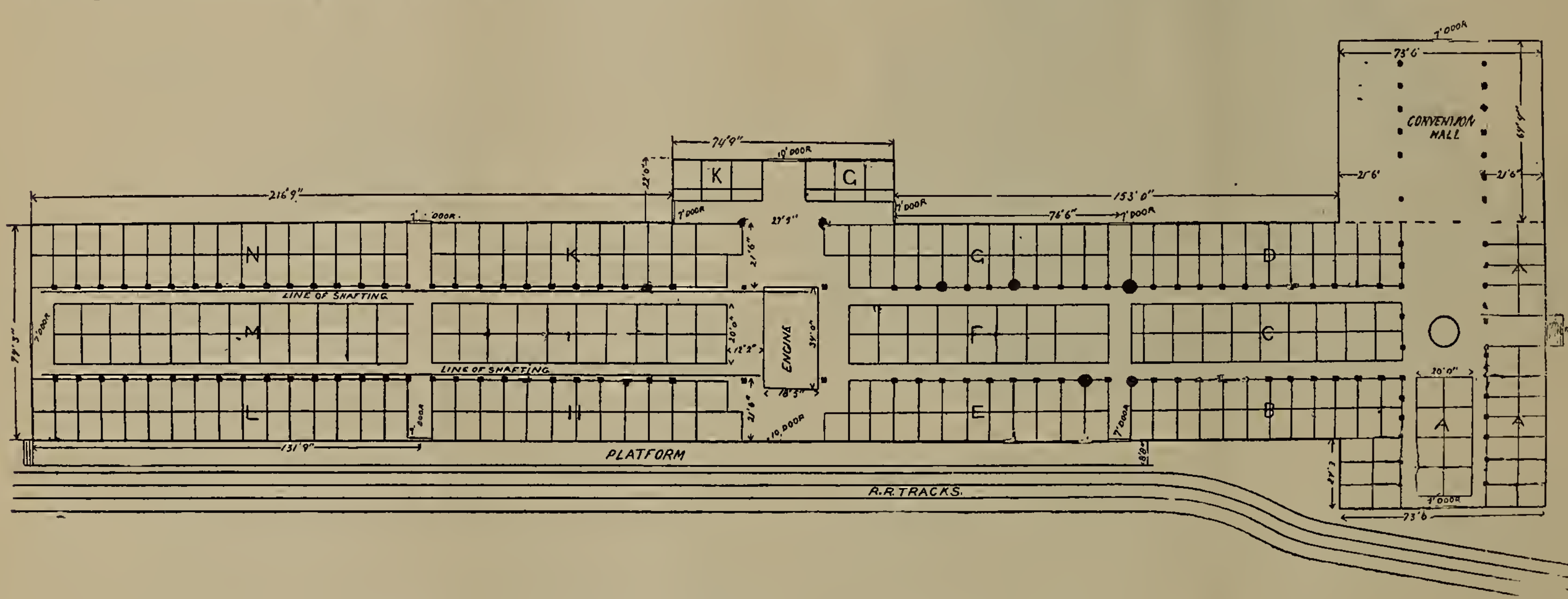

DIAGRAM OF EXHIBITION HALL FLOOR, ATLANTA, GA.

STREET CAR FENDERS.—The man who invents a practical and useful fender for trolley street cars will make a fortune. Many devices of this nature have been evolved, but none seems to have captivated the fancy of railroad managers.

TO TEST THEIR EYESIGHT.—The Consolidated Traction Company, of Newark and Jersey City, N. J., is testing the eyesight of its motormen for color blindness and other defects. It is asserted that some of the accidents on the lines of the company are due to far-sightedness, or other defects of vision of the motormen.

CONCERNING OVERHEAD WIRES.*

BY C. H. MORSE, CAMBRIDGE, MASS.

The question which we are to consider is whether it is reasonable to require the various companies to place their wires underground; and if reasonable, who shall own the conduit in which they are placed. Is each company to have its own, or one company construct the necessary conduit and lease space to the various companies? Or shall the municipalities assume the position of landlords?

In answer to the first question, as to whether it is reasonable to ask a company to bury its wires, allow me to say that the Chief of the Electrical Bureau of the City of Chicago has repeatedly stated, over his signature, that the City of Chicago maintains 1,100 arc lamps of 2,000 candle-power each, which burn every night and all night, and that the cost does not exceed 19 cents per lamp per night. In that city every inch of this arc light city wire is underground in conduits owned and maintained by the city. Compare this with 40 cents per night, which is paid by the City of Boston for the same class of service, with all the wire overhead, and I think the question of the economy of underground construction is settled.

The telephone company has acknowledged that it is better for them to bury their wires, by voluntarily doing so.

The important question for us to consider is whether it is necessary that each company operating wires shall build its own subway, or whether all wires could be safely operated in one.

From the standpoint of superintendents of s reets, I have no question you would unanimously vote for one conduit, if the same were practicable. No one questions for a moment, that it is perfectly safe to operate all kinds of telephone and telegraph wires, which are commonly called low tension wires, in one conduit. But when the question comes, can we safely place high tension wires in the same subway, a very important addition is made to the question. Theoretically, there are difficulties in the way. But after years of practical success in the cities of New York, Chicago and Philadelphia, where the cities have low tension wires in the same conduit with high tension wires, it certainly seems that the theorist who claims this cannot be done, must acknowledge that it is practically a success.

Prof. Barrett, City Electrician of the city of Chicago, who has had the largest experience in underground construction of any man in this country, is an advocate of municipal ownership of subways, and is positive in his assertion that it is perfectly safe and practicable to operate all kinds of wires in different ducts in the same subway.

It is but natural that each company should prefer to own its own conduits, as this gives to them franchise rights of great value, which are practically perpetual. And with the telephone companies, the ownership of their conduits means, of course, the perpetuation of their monopoly, as at the expiration of their patents all the principal streets in our cities would be provided with telephone conduits, and the people would not be willing to have the streets torn up for the admission of a competing company. If, however, the conduits were owned by the municipality or a conduit company, space could be leased to individuals for private line instruments, and if thought best, to a competing telephone company. Therefore, I think you will readily see the motive which induces the telephone company to fight this proposition to the bitter end.

The question of municipal ownership of electric light plants is being vigorously discussed, and there is no doubt that many of our large cities will operate their own plants within a comparatively few years. And it would be very much to their advantage to own the subways for their wires, and have a right to require the telephone and telegraph companies and the railway companies to operate their wires in this city subway, at a fair rental.

Thus from an economic standpoint, we would all agree that for a medium sized conduit it would be better to have this joint occupancy, with separate manholes for high and low tension wires, and only one trench.

As the citizens are to pay the interest on the money invested by all of these corporations, they have the right to demand that the work should be done in the most economic manner.

And as street men, I feel sure that I need not enlarge upon the advantages of municipal control of our streets, which, under existing laws, is gradually being taken away from the municipalities.

In conclusion, I would say that the question to be considered has resolved itself into one of three methods. Shall each company be allowed to construct its own subway, which would make in some streets in the city of Boston eight different subways, as is now the case in one street in Philadelphia? Or shall the right be given to a corporation to construct one or two subways and lease space to the various companies? Or shall the municipality, for the sake of the control of its own streets, construct these subways and lease space to the companies?

*Abstract of a paper read before the Massachusetts Highway Association.

THE HISTORY OF THE STORAGE BATTERY.

BY MEYER BLOOMFIELD.

No science presents such a variety of subjects for toil and thought as that of electricity, one of the most important of which is the storage battery. Though the present applications of this battery are comparatively slight, its future usefulness seems so evident that it may be of interest to review its history alone, and to take a look ahead into the future.

The storage of electricity, or rather the possibility of creating and retaining a potential difference within a glass or metallic vessel, first evinced itself in the discovery of the Leyden jar, which occurred in 1745. But this discovery, further than to show the possibility of electrical storage, has but little to do with our subject.

The observation of polarization in a simple cell led to some experimental investigations by Ritter and Gautherot, in the early part of the present century, the result of which was that the latter, in 1801, demonstrated the principle of electrical storage by immersing two plates of the same metal in acid, and having subjected them to the action of an electric current in one direction connected the plates to a galvanometer and observed the production of a secondary current in an opposite direction.

In 1842 Grove constructed a gas battery, on the principle that the oxidization of the copper anode in an electrolytic cell produces electrical storage, which consisted of a three-necked flask, containing acidulated water, into which was inserted two inverted tubes containing respectively oxygen and hydrogen. Platinum wires sealed into the upper ends of these tubes were connected with platinum electrodes in contact with the gases above and the water below, thus the external circuit was completed through copper conductors whose terminals dipped into mercury cups. When the circuit was closed the gases recombined to form water, thus generating an electric current, which in the cell flowed from hydrogen to oxygen and externally from oxygen to hydrogen; and whose E.M.F. was equal to that required to electrolyze water, so that the storage of electrical energy by chemical decomposition was recovered by chemical recomposition.

Other investigations followed, but in 1859 Gaston Planté's discovery of the special adaptation of lead plates for this purpose, opened the way for the practical use of electrical storage. Planté constructed a cell using as electrodes two large sheets of lead rolled together and electrically insulated from each other by strips of gutta-percha. They were then immersed in acidulated water, in a tall glass jar, and subjected to the action of a battery current supplied by two or more cells. The chemical reaction which followed resulted in creating a difference of potential between the terminals which manifested itself in the discharge of the cell.

The tedious and expensive process requisite for the electrical formation of Planté's plates led to the invention of Camille A. Faure, about 1880, of plates prepared by covering sheet lead with a paste made of red lead and sulphuric acid; the coating being confined to the surface by a covering of paper and by felt placed between the plates, which also served the purpose of insulation. Thus prepared and rolled together, they were placed in a glass jar with acidulated water, and the coating subjected to electrolysis and with alternation of current, was, in a few days, changed to a spongy lead of different chemical composition than at first, the cell then being ready for practical use.

While the Faure cell could be produced much more economically than the Planté, and was equal to it in electrical energy, it had such serious defects that its utility was circumvented. The felt preventing the free circulation of the current, and seriously impeding electrolysis, it soon became corroded by the acid and partly removed in patches, and ceased to insulate. The coating failed to adhere properly, sloughed off, and fell to the bottom. Hence, in a short time, the cell proved worthless. But its invention serving to direct the attention of men like Brush, Swan and Sellon in this field, resulted in the inventions of many greatly improved storage batteries.

The storage battery of today, though not perfect, has nevertheless rendered much valuable service. Its applications are varied, and while not as yet very extensive, they are sufficient to indicate that storage batteries may in the near future occupy a very important place in the electrical industries. A fortune awaits the lucky man who invents a storage battery that will overcome all of the objections to those now in common use; and can confine electricity in considerable quantities within a small vessel, which will ever be ready to do man's bidding. Verily, the field of the future application of the storage battery is a vast one.

COMING DEVELOPMENTS IN ELECTRICITY.

BY GEO. D. SHEPARDSON.

PART III.

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In the transmission and distribution of power by electricity rapid progress is being made, and we may expect further development in the use of alternating currents at high potential. The necessary legislation has been secured for the use of electrical propulsion for boats along the Erie canal, and arrangements are being made for carrying on actual experiments on a commercial scale. Contracts have already been let for transmitting many thousand horse-power from Niagara Falls to more or less distant points, by electrical methods. A single company has contracted for nearly 8,000 horse power to be used in the electrolytic reduction of aluminum. The use of high potentials is making possible the economical transmission of energy to greater distances. At Pomona, California, power from a 150-horse power generator is being transmitted to a distance of 28 miles, at a potential of 10,000 volts.

Many novel and interesting phenomena are being obtained by the use of alternating currents of very high frequency. These point towards the transmission of signals and possibly of power through space, without the use of any conductors whatever.

A number of workers have studied the problem of transmitting speech across the ocean. As submarine cables are constructed at present, their capacity is so high as to retard and weaken sudden changes in the current passing through them. The currents used in telephony are alternating, and would be entirely obliterated if sent into a cable having any considerable capacity. Theory indicates that submarine cables may be constructed in such a way that the self-induction may exactly neutralize the capacity. If such a cable be constructed, it is probable that telephonic communication could be carried on successfully between New York and London, and that high speed telegraphic apparatus might be used in a similar way.

The chemical effects of the current are being used in a variety of ways. Electric tanning has proved to be an unqualified success, and is being adopted in many places. A single tannery turns out annually over 70,000,000 pounds of electrically tanned leather. A number of chemical products are being manufactured by electrical methods, and the field for investigation along this line is limited only by the number of chemical compounds in existence. One prominent scientist has suggested that some method might be discovered for combining the elements which enter the composition of food products. Grape sugar is now made artificially, and it does not seem impossible that, at some time, we may be independent of the farmer, and make flour and other foods in factories.

A number of electro-metallurgical processes combine the heating and chemical effects of the current. The electric furnace gives the highest temperature obtainable by any known method. This is being used in the reduction of refractory ores. By combining high temperatures with great pressures, considerable success has been met with in the artificial production of rubies, diamonds and other precious stones. The manufacture of carborundum, a sort of black diamond, is being carried on commercially in Pennsylvania.

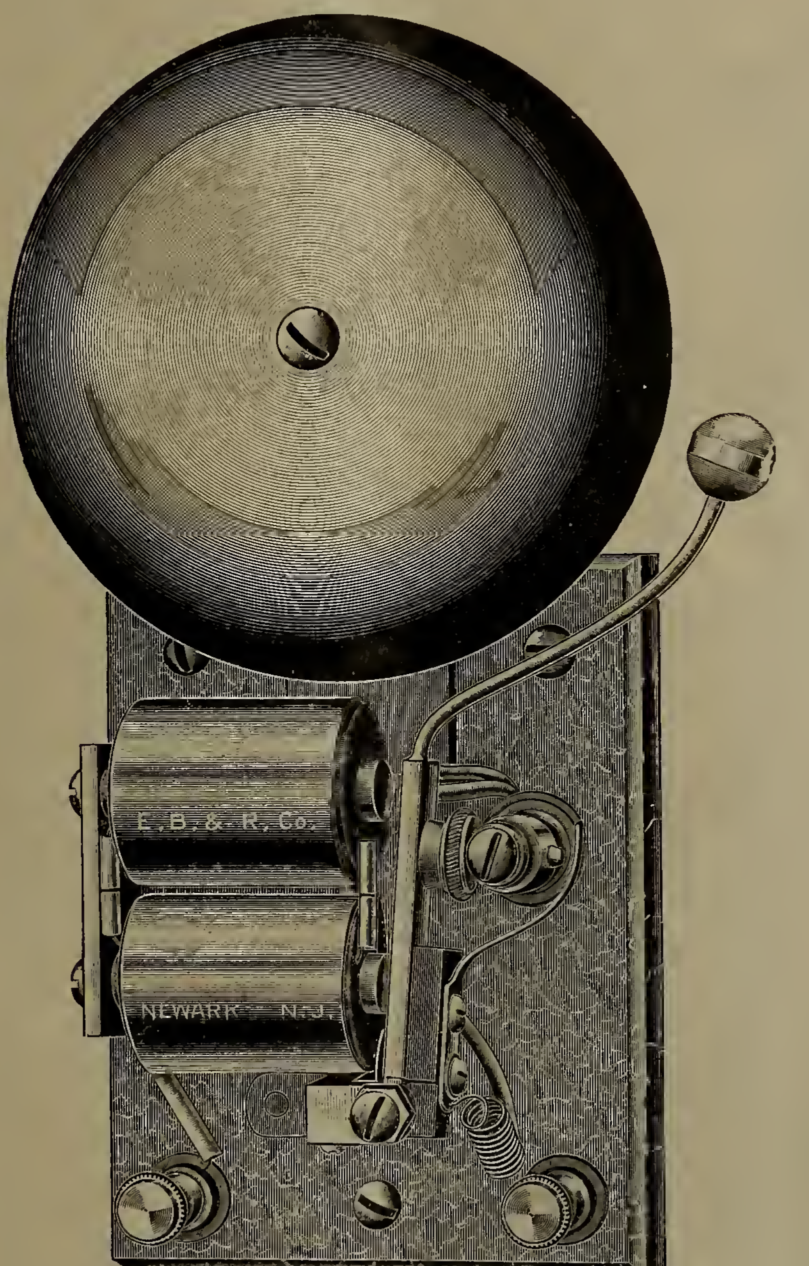
There is room for much investigation in the reduction and purification of metals by electrical methods. In a large number of gold mines the cost of production has become so high as to make further working unprofitable. The electrical transmission of power has rendered it possible to work some of these mines at a profit. It seems, however, that some ores and some mines cannot be worked economically until new and cheaper methods are discovered for reducing the metal from the ore. There are very few people who have a thorough knowledge of both chemistry and electricity. Most promising fields are open to those who command a knowledge of both.

The present methods of lighting are open to great improvement. All lights, with the exception of that from the firefly, phosphorous compounds, and possibly a few others, come, directly or by reflection, from some body heated to a high temperature. In the electric light, the carbon filament of the incandescent light and the ends of the carbon rods of the arc light are heated by the passage of the electric current. With the candle,

Continued on Page 294.

HIGH RESISTANCE ELECTRIC BELLS.

The Electric Bell and Resistance Company, 46 Lawrence street, Newark, N. J., recognizing the unnecessary expense and trouble in using batteries where dynamo currents are available, are now making bells to work on circuits, from 50 to 500 volts, either direct or alternating, and without external resistance. The novel features in these bells consist in winding a new high resistance conductor on the outside of the magnet coils, and so connecting it that there is no inductive spark at the armature contacts, a feature which users will readily appreciate. No batteries whatever are required, and therefore the trouble of renewing zinc, solution, and cleaning the batteries is not experienced.



HIGH RESISTANCE BELL.

The accompanying illustration of this company's 110 volt bells will give an idea of the construction of these devices.

The bells are mounted on marbleized slate bases, which insure perfect insulation and present a very superior appearance. They are made in sizes from 2½ to 12 inches in vibrating, and are specially adapted for railroad crossings, stations, steamships, office buildings, apartment houses, trolley cars and electric light stations. In single stroke bells they are made in any size up to 13,000 pound bells for tower clocks, church chimes and fire alarm purposes.

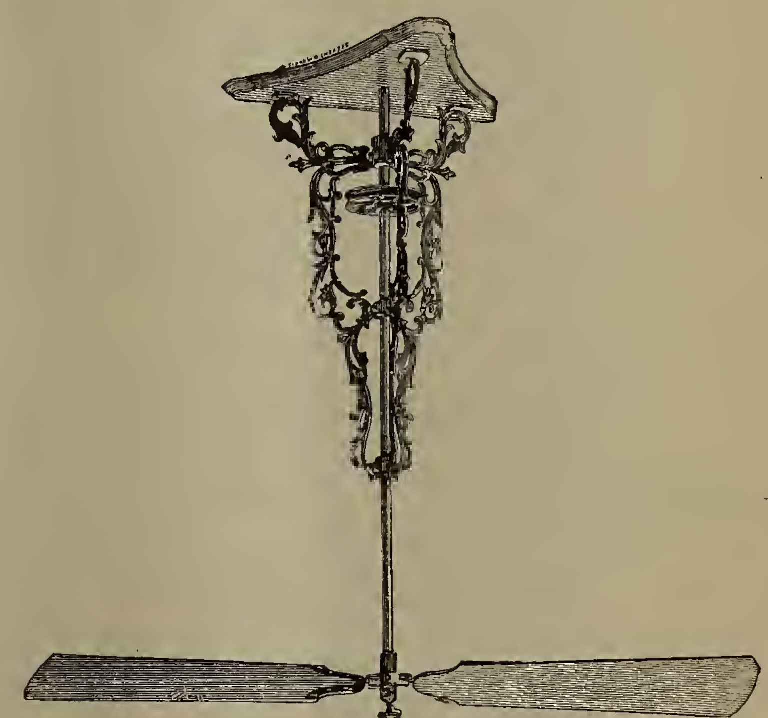
The company has just brought out 500 volt bells, for trolley cars, without external resistance.

Besides these unique bells the company manufactures high resistance coils, which retain a constant coefficient through wide range of temperature; also electrically operated church chimes, fire alarm and tower clock bells.

SEYMOUR ROTARY FAN.

The fan illustrated herewith is the Seymour Rotary Ventilating Fan, which is operated by any power by means of the usual belt. The ease with which these fans can be regulated, in addition to their simplicity of construction, is one of the most important features of the device. The regulation feature admits of change of speed according to the temperature, and in the hottest of weather a cool and pleasant circulation of air is maintained.

These fans are very largely used in hotels, offices, stores, dining rooms, etc , throughout this country and in Canada, Mexico, Central and South American cities, where they are giving great satisfaction.


ROTARY FAN.

The regulation of these fans is accomplished by pulling down or pressing upward the cup at the lower end of the shaft, and any one fan can be regulated independent of all others, where a number are used.

Seymour & Whitlock, 43 Lawrence street, Newark, N. J., are the manufacturers of these fans, as well as others of various styles, including columnar fans, exhaust fans, electric office ventilators, etc., and all of the necessary parts of these apparatus.

Dunkirk.—The proprietors of the Dunkirk and Fredonia (N. Y.) Street Railway Co. have submitted a proposition to the Village Trustees offering to purchase the municipal electric lighting plant at an appraised value, the company agreeing to furnish the arc lights maintained for lighting purposes at the rate of $25 per annum. The probabilities are that the proposition will be accepted.

Light.—The Bradford (Pa.) Electric Light and Power Co. offer to maintain sixty standard 2,000-candle power arc lights on public account at the rate of $85 each per annum ; if eighty arc lights are ordered the price is to be $82.50 each ; if 100 are agreed upon the price is to be $80 each.

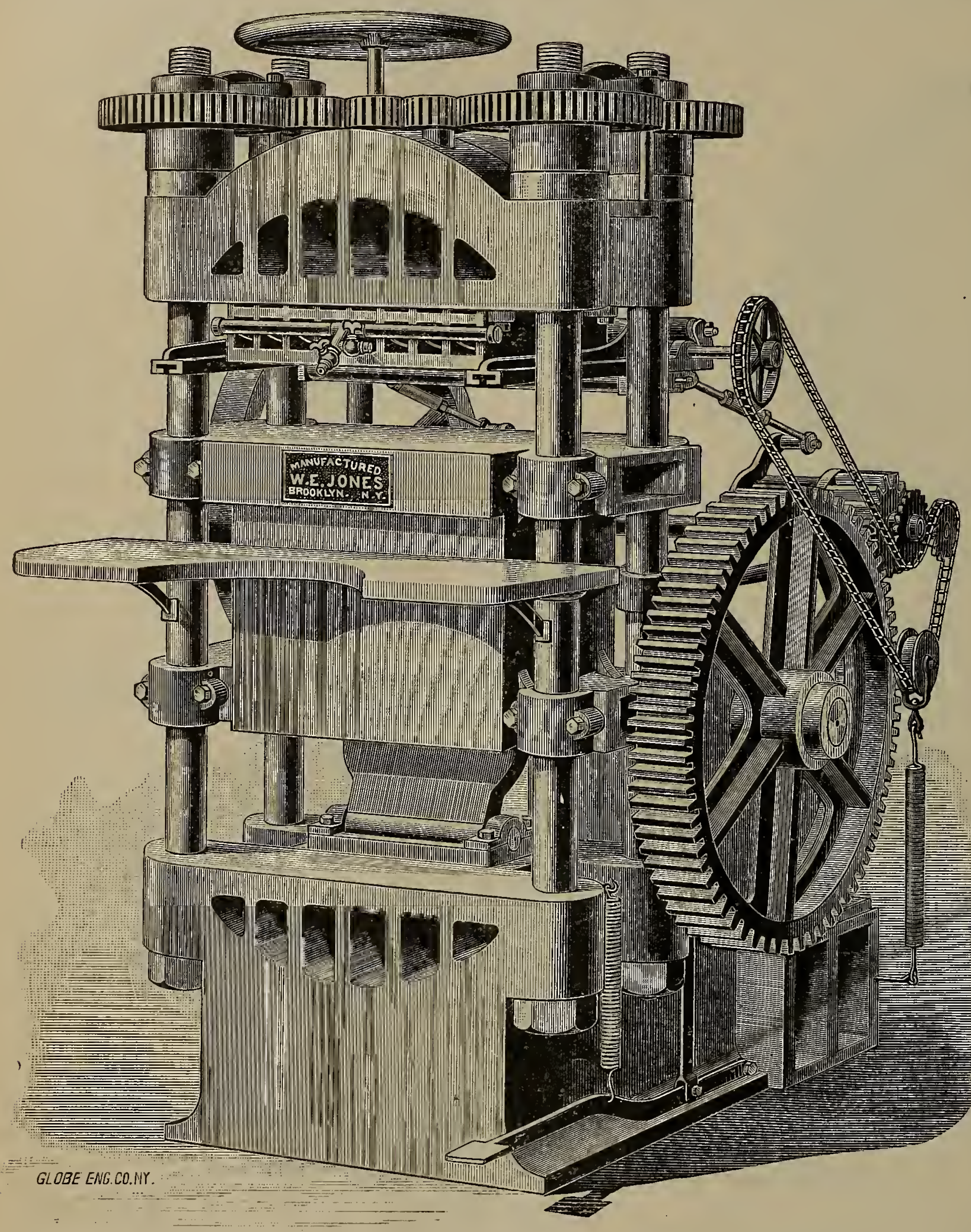
Suit Against the Interior Conduit Co.—The Chicago Electro Wire Company is suing the Interior Conduit and Insulation Company, of New York, for infringement of the H. B. Cobb patents on interior conduits.

Continued from Page 292.

oil lamp, and the common forms of gas burners, "the flame consists of a column of heat and gases which rise rapidly and carry off, by convection, 80 per cent. or more of the heat of combustion. The flame owes its luminosity entirely to the fact that near the base of the column a few particles of carbon, as yet unoxidized, are heated to incandescence." If combustion was perfect the temperature would be much higher, but the flame would be non-luminous, as in the case of the Bunsen burner. The energy which is radiated by the comparatively few incandescent particles consists largely of heat rays, only a small proportion being of wave length suitable to affect the organs of vision. The efficiency of any source of light may be considered to be the ratio of the energy of the light radiated to the total energy expended by the source of light. In the case of gas light the total efficiency is still lower, if we consider not the energy in gas, but that of the coal from which it is made. Likewise, in the case of the electric lamp if we assume that 10 per cent. of the energy in the coal is realized as electrical energy (a figure that is actually obtained in some cases), the total efficiency is reduced to .005 for the incandescent and .010 for the arc. Even with this correction, the electric lamps stand higher than any other artificial light in commercial use.

(*To be Continued.*)

ADJUSTABLE TOGGLE EMBOSSING PRESS.



We illustrate herewith an improved embossing press manufactured by W. E. Jones, of 14–16, Water street, Brooklyn, N. Y. This press has a number of new features especially designed to overcome the objections in presses now commonly used for smashing and embossing purposes. It is provided with an inking attachment, also an improved heating head, heated either by steam or gas. It is powerfully constructed, having an immense stroke and adjustment whereby a great amount of work can be accomplished. The floor space occupied is 4 by 6 feet, having a solid base upon which its working parts are surmounted. It is driven by pulleys 4 by 20 inches, geared 6 to 1, having an improved clutch worked by a foot-treadle to start it and will stop positively at each stroke. The driving shaft is of 3-inch steel. The cam and shaft are in one solid steel casting, the shaft being 4¼ inches in diameter. The cam, with rolls and links operating the toggles, have lengthened bearings. These raise the slide. The upper head is powerfully geared and can be adjusted five inches. The inking-roll frame is carried on the adjustment head; it has a fine adjustment and travels the full length of the head. The four columns are of 3-inch steel, which answer as a guide for the slide, having eight finely fitted boxes four inches long with bearings of 32 inches. The slide requires no cushion as a support; on the downward motion its working parts are as smooth and as noiseless as possible for a press of its speed and weight. The distance between uprights, front and back, is 26¾ in.; sides, 18 in.; distance from slide when down and head when up, nine inches. Total weight about 9,000 pounds.

AIR AND COMBUSTION.—An excess of air above that required to furnish complete combustion means a waste of fuel, in two ways, viz: in heating this large body of air to the temperature of the chimney gases and discharging it in the flue, and also because the air acts to prevent the attainment of the highest temperature in the furnace.

THE NATIONAL SCHOOL OF ELECTRICITY.

We have received a communication from Mr. J. P. Barrett, the president and member of the Faculty of the School, in which he gives a detailed account of this institution. Members of the faculty, he writes, are now actively engaged in the work of preparing the educational course. The course is to be of a practical nature, but the management of the school does not promise to fit students for expert electrical service after taking the course. It is intended, however, to be sufficiently elementary and exhaustive to give students an insight into the science and to introduce them, as it were, to the subject in a way that will permit them to prosecute its study in an intelligent and comprehensive manner, and if taken in connection with either practical or theoretical work will be of vast aid to them in their attempt to master the subject. The course is to be practical to the extent that apparatus is to be employed in the demonstration of principles and in full explanation of theories and practice. There are now organized nine classes in Chicago, and new classes are organized nearly every night. These classes contain from thirty to seventy-five members, and meet one evening in each week. The instructors are men thoroughly familiar with the theoretical side of the subject, and have had practical experience. The school has received the indorsements of the most prominent men in Chicago, and the organizers feel they ought to start classes like these in every State in the Union. The present offices of the school are at 1,428 Monadnock Block, Chicago.

SUIT.—The Edison Electric Light Company, of Chicago, has brought suit in the United States Circuit Court against the Star Electric Light Co., Empire Electric Light Company, Chicago Incandescent Light Co., and the Co-operative Electric Light Company, all of Chicago, for infringement in manufacturing incandescent lamps. The suits are brought under the original patent granted to Edison, in 1880, for the invention of the carbon filament, which made incandescent electric light practicable.

ELECTRIC RAILROAD IN LÜBECK.—An electric "tramway" has just been opened in Lübeck, Germany. It was installed by the General Electric Company of Berlin.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL AGE,
FIRST FLOOR, WORLD BUILDING,
NEW YORK, JUNE 11, 1894.

An explosion of gas on June 7, in the subway at the corner of Fifth avenue and Fifty-ninth street, blew the manhole cover off, which struck a passing cab horse. Beyond that no injury was done.

The La Burt Automatic Electric Block Signal System and Car Coupler Company, whose office was at 203 Broadway, has had James J. Nealis appointed its receiver on the application of Asa J. Stott, a judgment creditor for $341. The company, with a capital of $5,000,000, was organized two years ago under West Virginia laws.

The Fort Wayne Electric Corporation has opened offices at 115 Broadway, where the president, Mr. R. T. McDonald, will be glad to meet his friends when he is in town. Mr. H. C. Adams, Jr., is the New York agent for this corporation.

At the last meeting of the Board of Electrical Control, it was stated that several gas companies were laying pipes containing electrical conductors. This is a violation of their contracts with the subway commissioners. Mayor Gilroy offered a resolution directing Commissioner of Public Works Daly to make an investigation and have the conductors taken out wherever they are found. The Mayor explained that the gas companies laid their pipes at night, when there was no one to watch them. One of the principal gas companies of the city was detected laying a gas main in one of the leading avenues for the purpose of putting in an electrical conductor for its own use. There are now in violation of the law, he said, electrical conductors at 36, 49 and 51 New street; in front of the Edison building, one across Exchange place, and one at the Mills building. One gas company had been discovered laying a conductor in Sixty-fifth street. The Mayor's resolution was passed.

The Manhattan General Construction Co., 50 Broadway, New York, sold over 1,200 Fleming wire gauze brushes during the month of May, and has increased its output to 450 per week. These brushes are made in sizes from half inch up to three inches wide, and all lengths and thicknesses. This company is the general agent for the Buckeye Electric Co., manufacturers of the famous Buckeye incandescent lamp, which has been sustained by the courts as against the Edison lamp.

James Goldmark, of Wallace & Sons, 29 Chambers street, New York, is the eastern agent for the Wallace Electric Company, 307 Dearborn street, Chicago., Ill. This company is making a specialty of the Wirt dynamo brush, which has been adopted by the Siemens & Halske Company, on their low potential dynamos. Mr. Goldmark is carrying a stock of these brushes at 32 Frankfort street.

Mr. A. A. Knudson, of the Phillips Insulated Wire Company, 39 Cortlandt street, New York, manufacturers of the celebrated O. K. and Ideal wires, has just returned from an extensive trip throughout the principal cities in the east. Mr. Knudson brought some nice orders with him for Ideal and O. K. wires. He recently secured some excellent orders from the New York Fire Department.

P. Claus & Co., makers of the well-known Claus dynamos, have removed to 107th street and First avenue, city.

J. Jones & Son, 67 Cortlandt street, city, report that their stock of A. B. C. goods is fast disappearing, under the influence of the reduced prices. Mr. E. A. Lowe, the manager, reports a lively trade in these goods.

An attachment for $500,000 was issued to the sheriff on June 8, against the property in this state of the Fort Wayne Electric Company, which is an Indiana corporation, in favor of the General Electric Company, for money advanced between May 1, 1892 and May, 1894. The attachment was issued on the affidavit of Joseph P. Ord, second vice-president of the General Electric Company. Deputy Sheriff McGinnis levied upon some office furniture at 44 Broad street, but H. C. Adams, Jr., the agent there, said they belonged to the new Fort Wayne Electric Corporation. He put in a formal claim that previous to the notice of the attachment the property of the Fort Wayne Electric Company in this city had been transferred for value, and by and with the approval of the Supreme Court of Indiana to the Fort Wayne Electric Corporation, organized under Indiana laws, and there is now no property of any kind in New York City or State belonging to the company. Prest. C. A. Coffin, of the General Electric Co., stated that the attachment was made in order to protect his company, as the Fort Wayne Company owed the General Electric money. He said there was no objection to the company acting independently. The Fort Wayne people claim that the attachment will not hold against the new corporation.

The new Rapid Transit Commission met on last Friday afternoon at the Mayor's office and effected an organization. The seven members present were Mayor Gilroy, Comptroller Fitch, Alexander E. Orr, president of the Chamber of Commerce, Seth Low, John Claflin, William Steinway and John H. Starin. Mr. J. H. Inman was elected to fill the vacancy created by the resignation as an individual member of Mr. Alex. E. Orr, who becomes a member of the board by virtue of his election as President of the Chamber of Commerce. Mr. Orr was elected permanent chairman of the Commission.

W. T. H.

NEWARK, N. J., NOTES.

Alfred Sommers, 171 Halsey street, Newark, N. J., has refitted with bells and calls the target house to the shooting house in Schutsen Park, for the purpose of indicating when the bull's-eye is struck. The wires are laid in interior conduit and on reels between the two houses. He has also fitted up the Engine house No. 8 with 50 incandescent lamps, wiring, switches and automatic connection to light the building when an alarm comes in. Mr. Sommers is an electrician of great experience and therefore has an extensive patronage.

L. M. Wilcox, 219 Market street, Newark, N. J., is still manufacturing annunciators and burglar alarms. He is at present making two large annunciators, one to contain 150 and the other 60 calls, for hotels.

Hard times have had but little effect upon the Hanson Van Winkle Co., Newark, N. J., manufacturers of electro-plating outfits, dynamos, and anodes, who are doing as brisk a business as ever.

Gould & Eberhard, the noted manufacturers of electric gear cutters, planers, etc., are increasing their output weekly. Their machines are largely used by electrical manufacturers.

POSSIBLE CONTRACTS.

The General Electric Co. will build a 400 horse-power combined generator and motor for the Woonsocket Electric Machine and Power Co.

The Electric Storage and Power Co., Boston, Mass., may establish its plant at Haverhill, where 75 operatives will be employed in making electric batteries, etc.

The Bellfontaine Electric Co., St. Louis, Mo., is to enlarge its power plant, by erecting a $5 000 building.

An electric lighting system is to be established in El Paso, Cal. For further information inquire of J. R. Perry.

The Fredonia Electric Light, Heat and Power Co., Fredonia, N. Y., will shortly erect a new incandescent electric lighting plant.

The Hingham Electric Co., Boston, Mass., has leased the works of J. H. Long, 164 High street, for the manufacture of its newly invented incandescent arc lamp, and will start on the production of several thousand of them at once.

For information concerning the electric lighting contract, address the Hon J. T. Browne, Mayor of Houston, Texas.

For information concerning the proposed erection of an electric light plant, including one 30 horse-power engine, one dynamo, thirty 2,000 candle-power lamps, 600 incandescent lamps, about two miles of wire, etc., address Irwin Chase, City Clerk, Evart, Mich.

Address W. H. Finch, City Clerk, Brunswick, Mo., concerning the proposed construction of an electric light plant, including one 60 horse-power engine, two 18 K-W. incandescent dynamos, switchboards and fixtures, fifteen 2,000 candle-power arc lamps, two miles of circuit, three-wire system, etc.

The Nantucket Electric Light Co., Nantucket, Mass., is advertised to be sold under foreclosure.

The Electrical Association, incorporated, Waterbury, Conn., has contracted with the Berlin Iron Bridge Co. for their new power-house, which will be 66 feet by 183 feet.

L. C. Ketcham, Palestine, Tex., has been granted a fifteen-year franchise for a telephone system, and will construct the same at once.

Mitchell Bros. and Decherd, Wheelock, Tex., will construct a telephone line to Franklin.

For information concerning the recently organized company, with a capital stock of $5,000, to establish a telephone line to Middlebrook, Va., address W. A. Taylor, Danville, Va.

The Niagara Falls Electric Light and Power Co., Niagara Falls, Can., has increased its capital stock from $40,000 to $75,000.

Messrs. Hanford & Denton, Batesville, Ala., is the name of a firm that is engaged in exploiting a new process of generating electricity. The members of the firm are J. S. Hanford and Frank D. Denton.

The municipal electric lighting plant in Allegheny City, Pa., is to be enlarged at a probable expenditure of $35,000.

NEW CORPORATIONS.

The Suburban Electric Light and Power Co., Little Rock, Ark.; capital stock, $50,000.

The New Electric Power and Light Co., San Francisco, Cal.; capital stock, $10,000,000.

The Groff Telephone Co., Chicago, Ill., manufacturers of magnetic and electric telephones, etc.; capital stock, $1,000,000.

The Electric Kindling Wood Co., State Line, Miss.; capital stock, $15,000.

The Monroe City Telephone Co., Monroe City, Mo.; capital stock, $3,000.

The Poppowitsch Electric Co., Jersey City, N. J., manufacturers of electric batteries, etc.; capital stock, $100,000.

The Mutual Automatic Telephone Co., Camden, N. J., constructors and operators of electric telephones; capital stock, $200,000.

The Electric Telephone Construction Co., Cincinnati, O.; capital stock, $10,000.

The Union Electric Co., Cleveland, O., manufacturers of electrical and mechanical apparatus; capital stock, $25,000.

The Monterey and Staunton Telephone Co., Monterey, Va.; capital stock, $5,000.

The Electric Car Lighting Co., New York, N. Y.; capital stock, $2,000,000.

(*Continued on Page 298.*)

CORRESPONDENTS' COLUMN.

Correspondence from practical men upon topics of interest relating to electricity or kindred subjects, will find a place in this department; our readers are invited to avail themselves of this department when desirous of seeking or imparting information.

Names and addresses must accompany all letters. This is for our own information and not for publication.

The editor, while not holding himself responsible for the opinions expressed, will gladly put the letters in proper shape if necessary.

Address all communications for this column to the "Correspondence Editor," ELECTRICAL AGE, *World Building, N. Y.*

(1) "Martin" writes:—1. It is said that there are only two kinds of electricity—static and dynamic. Is the induced electricity from an induction coil static? If not, what is the difference between static and induced electricity? *A.* There is really only one kind. Static electricity means electricity at rest; dynamic electricity denotes electricity in motion. In the popular conception, high tension phenomena are usually referred to static electricity. 2. What current is the most injurious to man? *A.* High and rapidly changing current is the most injurious.

(2) S. E. I. asks:—1. How do you connect two Bell telephone receivers so as to use one as a transmitter and one as a receiver? *A.* Connect them in parallel. 2. How can I best magnetize a circular disc of iron or steel? *A.* It depends on how you want the magnetism distributed. By placing it within a coil and passing a strong current through the coil it will become magnetized diametrically. By rotating it over the poles of a horseshoe magnet, keeping its centre over one pole and its periphery moving over the other, it may become magnetized radially. By spinning it horizontally in front of a strong pole, circular polarization may be produced. Any method may give only partial success, as consequent poles will probably be produced. 3. Have telephone transmitters been made which operate by the vibrations opening and closing a circuit around the induction coil? *A.* The operation described is not adapted for telephoning, the variations are so sudden. 4. *A.* See answer to "Martin."

(2) Loewing asks:—What is the latest and best definition of electricity? *A.* Practically there is no good definition, for with the present knowledge of the subject itself, it is impossible for anyone to give a satisfactory definition of it. However, here are two definitions which are at present in use.

"The Standard Dictionary of the English Language" says: "An imponderable and invisible agent producing various manifestations of energy, and generally rendered active by some molecular disturbance, such as friction, rupture, or chemical action."

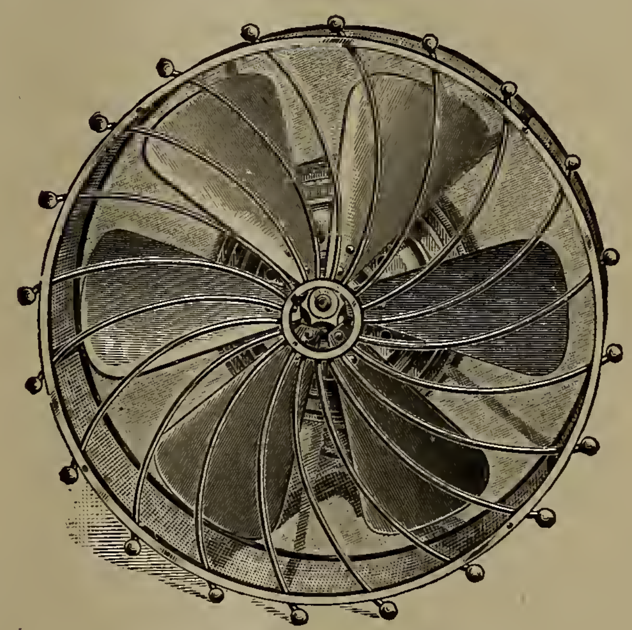
"Weale's Dictionary of Terms" says:—"is one of those hidden and mysterious powers of nature which has thus become known to us through the medium of effects." 2. What also is the nearest correct theory as regards the magnetism of the earth? *A.* Ampere's theory holds that currents of electricity circulate around it approximately parallel to the equator.

(4) M. B. asks:—Will you please inform me through your valuable paper, how the carbon for arc lights is made, and with what materials? *A.* A simple process for its manufacture is the following: Clean pieces of coke are pulverized and passed through a fine sieve. It is then thoroughly mixed with about one-seventh of its bulk of wheat flour, both being very dry. The mixture is moistened with water containing a small percentage of molasses. It is then allowed to stand for two or three hours in a closed vessel so as to prevent the evaporation of the water, after which the mixture may be pressed into moulds of any desired form, then removed from the moulds and dried, slowly at first, afterward rapidly, in an ordinary oven at a high temperature. When the rods or plates thus formed are thoroughly dried they are packed in an iron box and completely surrounded by coke dust. The box, being closed by a non-combustible cover, is placed in a fire and heated to a red heat for an hour or so; then the carbons are removed and boiled for half an hour in thin syrup or molasses water; then they are baked in the oven and recarbonized, as already described.

WAGNER FAN MOTOR.

The Wagner Electric Manufacturing Co., St. Louis, Mo., of which the George L. Colgate Company, 136 Liberty street, New York, is selling agent, have issued a neat little catalogue, describing their excellent fan motors. The motors, they guarantee, will run three months without attention or repair of any kind. Each motor has self-feeding carbon brushes, which will run a season without renewing, and self-oiling bearings which hold an ample supply of oil for several months' run. All the motors are adjustable in speed by means of a button conveniently placed.

The accompanying illustration shows the motor with



WAGNER FAN MOTOR.

close meshed fan guard. The motor is finished in black enamel with gilt trimmings, and polished brass fan and caps. These brass end caps entirely enclose the ends of the motor, protecting the armature, commutator and bearings from dust and dirt.

The motor is very efficient, and the company congratulates itself upon its success.

The New England Magazine for June, 1894, contains a very interesting article on the "Telephone of Today," written by Mr. Herbert Laws Webb. The article is written in a popular way, and is so clear in its language that any novice by reading it can get a good idea of the wonderful telephone. Many excellent illustrations are used in the text.

THE STORAGE BATTERY CASE.—The argument on the motion of the Consolidated Electric Storage Co. against the Electric Storage Battery Co., manufacturers of the Chloride battery, for a preliminary injunction was brought to a close on the 7th inst. before Judge Green in the U. S. Circuit Court at Trenton.

(*Continued from Page 296.*)

The Indiana Electric Railway Co., Goshen, Ind.; capital stock, $25,000.

The Los Angeles, Pasadena and Altadena Railway Co., Los Angeles, Cal., by C. C. Green, of Woodbury, N. J., Andrew McNally, Chicago, Collin P. Stewart, Baltimore, George H. Baker, of Philadelphia and others, to build and operate an electric line between the points mentioned.

The Shelbyville Water and Electric Light Co., Shelbyville, Ky.; capital stock, $40,000. Louis Channing is president.

The Farmer Electric Co., St. Louis, Mo.; capital $60,000.

The Ryan Dynamo Co., Hamilton, O.; capital stock, $10,000.

The Pittsburgh Automatic Lighting Co., Pittsburgh, Pa., by C. H. Covell and others; capital stock, $10,000.

The Stanstead Electric Light Co., Stanstead, Quebec; capital stock, $25,000.

The Sweet Electrical Manufacturing Co.; capital stock, $100,000.

The Electrical Contractors' Exchange (Protective), Detroit, Mich.

The Economic Electric Engine Co., Chicago, Ill., by Chas. A. Jackson and others, to manufacture and sell electric motors, engines, etc.; capital stock, $100,000.

Jacob Edmunds, Augusta, Ga., is reported to be organizing a telephone company with a capital stock of $10,000.

The Inland Electric Co., Chicago, Ill., by Carl Pherson and others; capital, $100,000.

The Carroll County Electric Light and Power Co., Westminster, Md., by Milton Schaeffer and others; capital stock, $5,000.

The Standard Light and Power Co., Berlin, N. H., have purchased the Kinney Mill site.

TRADE NOTES.

Nicholls & Granger, of 582–588 Hudson street, manufacturers of Nicholls' Patent Gas Tubing, have issued a circular in which they give a list of reduced prices of their tubings.

E. P. Roberts & Co., Mechanical and Electrical Engineers, Cleveland, O., have added to their firm Mr. W. B. Stewart, who is an experienced engineer and mechanic. Considering the numerous contracts now on hand it is evident that the company is getting its full measure of business. It has no reason to complain of the hard times.

The Belknap Motor Company, Portland, Me., has recently put one of its 350 light dynamos in the Hotel Normandie, Washington, D. C. The machine is doing excellent work.

The Holtzer-Cabot Electric Co., Boston, Mass., has just issued an illustrated circular giving some plain facts concerning the Holtzer Cylinder Battery and its vindication by the courts. The company claims that the strength of the battery is fully equal to any open-circuit battery in the market. The battery is extremely simple and moderate in price. The company has also been very successful in the manufacture of magneto-machines. The New York office, at 114 Liberty street, is managed by Mr. David Chalmers.

The Chicago Electric Wire Company's interior conduit is claimed to be the best on the market. It is flexible and covered with lead to prevent corrosive action by surrounding materials. This conduit is guaranteed to be waterproof. Its flexibility is an important feature. The India Rubber Comb Co., and the Goodyear Hard Rubber Co., 9–13 Mercer street, are the sole agents for this tubing.

Mr. Phillip G. Roeder, 664 Cedar avenue, Cleveland, Ohio, has just issued an "Exporters' Hand Book of Mexico," which will be of great value to all those who have, and are trying to foster trade relations with Mexican business houses. It is a trade directory of the principal places in Mexico, and is classified according to cities and trades. It also contains some valuable information regarding the business methods of that country, and gives some general shipping directions. Electrical machinery and appliances find a ready market in Mexico.

The Creaghead Engineering Co., electrical engineers and contractors, electrical supplies and machinery, 296 Plum street, Cincinnati, O., has just issued its new catalogue of electric railway overhead line material.

During the past week the Clonbrock Steam Boiler Works, Brooklyn, N. Y., closed the following named contracts for climax boilers: The United Electric Light and Power Co., East 29th street, New York city, 10,000 H. P.; Thomson-Houston Electric Co., East 24th street, New York city, 1,000 H. P.; Newark Electric Light and Power Co., Newark, N. J., 2,000 H. P.; Central Railway and Electric Co., New Britain, Conn., 1,000 H. P.

Electrical and Street Railway Patents.

Issued June 5, 1894.

520,763. Multiphase-Current Motor. Louis Bell, Boston, Mass., assignor to the General Electric Company, of New York. Filed Nov. 4, 1892.

520,772. Fuse-Box. Axel Ekström, Lynn, Mass., assignor to the General Electric Company, of New York. Filed Nov. 29, 1892.

520,773. Armature for Dynamo-Electric Machines. Hermann F. T. Erben, Schenectady, N. Y., assignor to the General Electric Company, Boston, Mass. Filed Feb. 9, 1894.

520,776. Lightning-Arrester. John W. Gibboney, Lynn, assignor to the General Electric Company, Boston, Mass. Filed Feb. 6, 1893.

520,780. Electric-Motor Truck. John C. Henry, Westfield, N. J. Filed Aug. 27, 1892.

520,781. Dynamo-Electric Machine. Albert B. Herrick, Schenectady, N. Y., assignor to the General Electric Company, Boston, Mass. Filed Jan. 25, 1894.

520,782. Electric Motor. Alfred Hinman, Olympia, Wash. Filed Dec. 14, 1893.

520,784. Electric-Motor Controller. William J. Hopkins and Theodore Stebbins, Boston, Mass., assignors to the Thomson-Houston Electric Company, of Connecticut. Filed Sept. 19, 1891.

520,786. Ear-Pad for Telephone-Receivers. James W. Kinniburgh, Wellington, New Zealand. Filed Nov. 10, 1893.

520,787. Electric Locomotive. Walter H. Knight, Lynn, assignor to the General Electric Company, Boston, Mass. Filed Jan. 18, 1894.

520,788. Stand for Controlling Electric Circuits. Edward R. Knowles, Middletown, Conn., and Edwin H. Park, Millbury, Mass., assignors to the Schuyler Electric Company, of Connecticut. Filed Mar. 31, 1893.

520,789. Voltmeter. Edward R. Knowles, Middletown, Conn., assignor to the Schuyler Electric Company, of Connecticut. Filed Dec. 5, 1893.

520,794. Electric Elevator. William D. Lutz, Philadelphia, Pa. Filed Mar. 10, 1894.

520,795. Electroprotective System for Locks. Morris Martin, Malden, assignor of one-half to Benjamin W. Wells, Boston, Mass. Filed Nov. 23, 1893.

520,800. Alternating-Current Motor. Olof Offrell, Middletown, Conn., assignor to the Schuyler Electric Company, of Connecticut. Filed Nov. 29, 1892.

520,809. Means for Preventing Arcing in Electric-Power Stations. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed Sept. 1, 1890.

520,810. Electric Reciprocating Motor. Elihu Thomson, Swampscott, Mass., assignor to the Thomson-Houston Electric Company, of Connecticut. Filed July 10, 1891.

520,811. Electric Meter. Elihu Thomson, Swampscott, Mass. Filed Feb. 21, 1894.

520,822. System of Circuit Control for Electric Machines. Chas. E. Davis, Chicago, Ill., assignor to John H. Leslie, same place. Filed Oct. 16, 1893.

520,852. Electric-Switch Box. Edward R. Knowles, Middletown, Conn., assignor to the Schuyler Electric Co., of Connecticut. Filed Dec. 5, 1893.

520,855. Feed-Wire Insulator. Chas. A. Lieb, New York, N. Y., assignor to the General Electric Co., Boston, Mass. Filed Apr. 12, 1894.

520,857. Fender for Railway-Cars. John E. McBride, New York, N. Y. Filed Feb. 24, 1894.

520,860. Railway-Rail Chair. Henry O'Shea, Johnstown, Pa., assignor, by mesne assignments, to the Johnson Co., of Pennsylvania. Filed Apr. 24, 1893.

520,908. Electric Circuit Regulator. Harry F. Waite, New York, N. Y. Filed Jan. 25, 1893.

520,912. Fare-Register. Frederick C. Boyd and Chas. E. Gurding, New Haven, Conn., assignors to the New Haven Car Register Co., of Connecticut. Filed Apr. 20, 1893.

520,937. Trolley-Wire Support. Louis McCarthy, Boston, Mass. Filed Mar. 3, 1894.

520,938. Closed Conduit for Electric Railways. Paul Plodeck, Sr., Cleveland, Ohio. Filed Feb. 21, 1894.

520,940. Dynamo-Electric Machinery. Coleman Sellers, Philadelphia, Pa. Filed Oct. 27, 1893.

520,963. Ammeter. Edward R. Knowles, Middletown, Conn., assignor to the Schuyler Electric Co., of Connecticut. Filed Dec. 9, 1892.

520,964. Voltmeter. Edward R. Knowles, Middletown, Conn., assignor to the Schuyler Electric Co., of Connecticut. Filed Dec. 14, 1893.

520,965. System of Electrical Distribution. Benjamin G. Lamme, Pittsburgh, Pa., assignor to the Westinghouse Electric and Manufacturing Co., same place. Filed Mar. 27, 1893.

520,970. Method of Economizing the Energy of Alternating Currents. Chas. F. Scott, Pittsburgh, Pa., assignor to the Westinghouse Electric and Manufacturing Co., same place. Filed Aug. 7, 1893.

520,971. Electric-Railway Overhead Switch. Miller A. Smith, Brooklyn, and Wm. Clabaugh, New York, assignors to the New York Electrical Works, New York, N. Y. Filed Feb. 21, 1894.

520,973. Trolley. Edgar M. Tousley, Jamestown, N. Y. Filed Jan. 9, 1894.

520,975. Converter System for Electric Railways. Geo. Westinghouse, Jr., and Chas. F. Scott, Pittsburgh, Pa. Filed July 31, 1893.

520,991. Electric-Arc Lamp. Louis E. Howard, Plainfield, N. J. Filed Aug. 19, 1893.

520,996. Electric-Arc Lamp. Louis B. Marks, New York, N. Y., and Clarence Ransom, Passaic, N. J. Filed Jan. 9, 1894.

521,010. Conduit Electric-Railway System. James Brand, Milwaukee, Wis. Filed Mar. 19, 1894. Patented in Canada, Apr. 24, 1894, No. 45,878.

521,014. Railway-Switch. Harry B. Büttel, Newark, N. J. Filed Sept. 19, 1893.

521,018. Connection for Electric Wires. James Y. De Mott, Newark, N. J. Filed Jan. 6, 1894.

521,034. Car-Brake. John Mayer, Amsterdam, N. Y. Filed Feb. 6, 1894.

521,046. Electrical Annunciator. Frederick W. Ross, Boston, Mass., assignor to the Electric Gas Lighting Company, of Maine. Filed Jan. 12, 1894.

521,051. System of Electrical Distribution by Alternating Currents. Charles F. Scott, Pittsburgh, Pa. Filed Feb. 26, 1894.

521,065. Electric Alarm-Clock. John S. Whitehead, Detroit, Mich. Filed Jan 2, 1894.

521,085. Electrical Governor for Water-Wheels. Carl S. English, Lowell, Mich., assignor of one-half to Charles A. Church and Otto C. McDannell, same place. Filed Dec. 23, 1893.

521,089. Electric Meter. Warren B. Reed, New Orleans, La. Filed Feb. 13, 1894.

521,099. Electric Heating Apparatus. George D. Burton, Boston, Mass. Filed Aug. 11, 1893.

521,120. Reversible Car-Chair. Peter Little, St. Louis, Mo., assignor to Sanford G. Scarritt, same place. Filed Dec. 8, 1891.

521,121. Car-Seat. Peter Little, St. Louis, Mo., assignor to Sanford G. Scarritt, same place. Filed May 12, 1892.

521,124. Section-Insulator. Henry B. Nichols and Frederick H. Lincoln, Philadelphia, Pa. Filed Jan. 25, 1894.

521,125. Electric Subway. James J. E. Philips, Brooklyn, N. Y., assignor to the Empire City Subway Company, Limited. Filed Aug. 29, 1893.

521,131. Incandescent Lamp. Dètlef C. Voss, Boston, Mass. Filed Nov. 23, 1893.

521,138. Electric Motor for Dental Engines. Walter A. Crowdus, Chicago, Ill., assignor to the Turney Electric Manufacturing Company, same place. Filed Oct. 22, 1892.

521,144. Annunciator. Thomas J. Thompson, Chicago, Ill., assignor to Julian M. McDermid. Filed Sept. 30, 1891.

EXPIRED.

191,732. Electric Railroad Signals. J. P. Tirrell, Somerville, Mass. Filed May 18, 1876.

ELECTRICAL AGE

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CONTENTS.

THE BERLINER PATENT SUIT.

Argument in the suit of the United States against the American Bell Telephone Company, and Emile Berliner, was begun in Boston on June 14. The object of the suit is the annulment of the Berliner transmitter patent, issued November 17, 1891, about 14 years after the application for the same was filed. It has been alleged that there was a tacit understanding between the Bell interests and the patent office officials in regard to the issue of this patent, and that it was the wish of the telephone company that it should be delayed. The obvious effect of such delay, should the action be sustained by the court, will be to prolong the monopoly for nearly 17 years. This is the principle involved, and it would be rank injustice to extend the monopoly on so flimsy a pretext as that given. The law never contemplated such a thing, and to adopt such tactics as were used in this case is simply a travesty on justice. The circumstances connected with the case look very suspicious all the way through, and it would be an extremely difficult undertaking to convince the American people that the Bell Telephone Company has acted with any philanthropic motives. It has been a power in its day, but that power should end in the manner the law intended it should. There is no reason founded on right or justice why the monopoly should be given a new lease of life, and the ELECTRICAL AGE stands for these principles every time; therefore it is opposed to any further telephone monopoly.

THE TELEPHONE AND THE TELEGRAPH.

It is evident that the telephone is destined to largely supersede the telegraph in railroad work, and judging from what was said at the Convention of Railway Telegraph Superintendents at Detroit last week, it has already gained a strong foothold in this direction. It has been supposed that owing to well-known inherent peculiarities the telephone could not be relied on for the accurate transmission of words composed entirely or in part, of certain sounds, and for this reason could not be used with safety. This objection, however, would seem to be disposed of by the adoption of the plan of telephonic transmission suggested by Mr. Selden. He recommends that when messages are transmitted by telephone they be spelled out, letter by letter, and written down by the receiver. This method he claims overcomes the dangers referred to, and renders the telephone as accurate as the telegraph for the transmission of messages of every character. This is a very good suggestion and its adoption would no doubt save a great deal of annoyance, time and money.

RAILROAD TELEGRAPH SUPERINTENDENTS.

The annual convention of the Association of Railway Telegraph Superintendents was held in Detroit last week, and it was the most interesting and profitable of any yet held by that organization. Railroad telegraph superintendents are a pretty wide-awake lot of men; and their enterprise is felt in every department of railroad service, directly or indirectly. Several of them are inventors of repute, and have devised apparatus for various purposes which are in regular operation on many railroads. They are constantly improving the train service, and most always in a way that strikes the managers of railroads most favorably; that is, while they are improving the service they also reduce the expenses. These men have the ability to improve existing methods and they should be given every opportunity and the widest latitude by their companies to exercise this privilege. What is paid out by railroad companies on account of telegraph service is money well spent, especially if that service is in charge of a man of ability. Railroads could no more dispense with the telegraph than they could with their engines.

SOME STORAGE BATTERY PHENOMENA.*

BY W. W. GRISCOM.

The first section of this paper is devoted to the study of a complete curve of discharge of a storage battery. Such a curve discloses three rather sharply defined changes in P. D., which are found to be those of E. M. F. The reason for these changes and which plate is responsible for them are fully discussed, and then the author considers the storage battery in its commercial aspect.

Perhaps the most striking peculiarity about the modern storage battery is the diversity of opinion among professional electricians as to its utility and commercial value. Men of the highest rank as electricians and engineers are ranged on either side of the question. Men of affairs who have put them to a commercial test exhibit a like divergence of views. Men who have tried the storage battery for a year or two have written about it in the most flattering terms and have discarded it later. Men who have used accumulators ever since their introduction, when they were much less efficient machines than now, continue to use them, and would under no circumstances be induced to part with them. Unmitigated praise on the one hand, and unmitigated contempt on the other. Broadly stated the European consensus of opinion, both technical and commercial, may be said to be in favor of storage batteries. The American view until now has been mainly the opposite. What is the ground for this wide discrepancy? Why is cautious, conservative Europe so far ahead in the race? Why is America a laggard in the running?

The answer is not far to seek. Storage batteries are almost always an economical success abroad, while here they have been too often an economical failure in the past. And the reason is that the European always demands a margin for safety, while the American, with less capital and keener competition, is tempted to sail too close to the wind.

A storage battery continually worked to its commercial rating is a commercial failure. A storage battery worked sufficiently within its capacity is invariably a commercial success.

The writer has had occasion to watch with the closest scrutiny a considerable number of plants, aggregating perhaps some millions of plates. These batteries were rated like all reputable makes, well within their capacity in ampere hours, measured by charging the battery to about 2.65 volts and then discharging it until the potential difference was 1.8 volts per cell. Some batteries have been spoiled by bad management and neglect, and some by false economy or bad engineering at the very start; by eliminating these, there remain a very large number which were successful or were failures for no apparent reason. The utmost care was exercised at the factory. The constituent materials were analyzed as soon as purchased. Able engineers watched the processes of manufacture, but while the quality of the battery was improved until no flaw, mechanical, electrical or chemical seemed to remain, still an occasional failure occurred in actual practice and the cause eluded our search.

Finally, by classifying the failures and successes, the truth dawned upon us. Wherever the battery was exhausted to its full capacity daily, its life did not exceed 500 discharges, but wherever it was worked within two-thirds of its capacity, complaints were unknown.

Exhaustive tests were undertaken and some curious phenomena heretofore unknown to the writer were disclosed, and after some hesitation he concluded that they might be of interest to this society.

* Abstract of paper read at the Eleventh General Meeting of the American Institute of Electrical Engineers, Philadelphia, May 16, 1894.

It is natural to ask why the rating should not be changed so that the owner of the battery would not be tempted to work it to the danger limit. That is a commercial question. In these days of close commercial figuring it would be difficult to sell a battery which appeared *cæteris paribus*, to cost 50 per cent. more than its competitors. The present rating is strictly accurate and has the sanction of custom the world over. It is only necessary for the engineer to remember to add 50 per cent. of the capacity as a factor of safety to his maximum load, just as he allows several hundred per cent. in calculating the strength of a bridge, or an axle.

This additional amount is not a dead loss in investment. It produces many countervailing advantages. It saves the necessity for regulation in most instances. It provides a very effective and safe reserve for cases where the charging apparatus breaks down and for many other cases, and it improves the actual efficiency of the battery, which rises from about 80 per cent. to nearly 90 per cent. when used with a sufficient reserve. And for cases where it is necessary to maintain a constant difference of potential, such as electric lighting, it raises the efficiency much more, because in these cases the commercial efficiency must be rated not from the average point of electromotive force but from the lowest point to which the battery falls on discharge, and whell used in this way the P. D. drops only 2½ per cent. An the E. M. F. above the lowest point must be wasted in order to secure regulation, unless the troublesome method of regulating by the introduction of extra cells is adopted.

In circuits where this regulation is of no consequence as *e. g.* motor circuits for cars, all the E. M. F. is utilized in increasing the car miles per unit of energy.

In this connection it is perhaps worth while to call attention to a very common misapprehension on the part of engineers. A storage-battery for trolley systems or other central stations for the production and utilization of electricity has heretofore been regarded in this country as a very expensive addition to the plant. But this is not always the case. There are many opportunities for introducing storage-batteries as a part of the original plant without increasing the cost, as for example in cases where the maximum output is two or three times greater than the average output. In the tables here given I have taken Emery's figures for a basis for the steam plant.

1,000 HORSE-POWER DIRECT SYSTEM.

Cost of steam plant	$70,000 00
Electric plant, 750 kilowatts, at $30,00 per kilowatt	22,500 00
	$92,500 00

1,000 HORSE-POWER STORAGE SYSTEM.

One-half steam plant	$35,000 00
One-half electric plant (375 kilowatts)	11,250 00
1,500 kilowatt hours, accumulator capacity, at $30 00 per kilowatt hour	45,000 00
	$91,250 00

Now that batteries are made in large units and in much more compact shape than formerly, with increased facilities for handling, it is to be hoped that the engineers in this country will begin to give the subject of their introduction more attention, especially as a cell having a capacity of twenty-four kilowatt hours occupies a floor space (exclusive of connections) of less than a square yard.

A battery's discharge should be stopped after its E. M. F. has fallen to 2 volts, or at furthest to 1.9, unless it be desirable to draw upon its reserve. It should be under stood that a full discharge, that is, to 1.8 volts is working a battery to the danger limit and is unadvisable for the following reasons:

a. Regulation is troublesome.
b. Efficiency is low.
c. Dangerous molecular changes take place (as indicated by changes of internal resistance and changes of electromotive force as well as occasional buckling.)
d. Uneven plates discharge into one another after the circuit is interrupted.
e. The life of the battery is diminished.

CONVENTION OF RAILROAD TELEGRAPH SUPERINTENDENTS.

The annual convention of the Association of Railway Telegraph Superintendents was held at the Hotel Cadillac, Detroit, Mich., on the 13th and 14th instants. The meeting was called to order at 10 A. M., Wednesday, June 13, by President U. J. Fry, who introduced Mr. George W. Balch, an old-time telegraph superintendent and now a prominent business man of Detroit. Mr. Balch made a few remarks of an appropriate nature, which were fittingly responded to by Secretary Drew on behalf of the association.

The secretary then read letters from the Western Union and Postal Telegraph Companies, and the Long Distance Telephone Company, extending the free use of their lines during the convention, and from the Grand Trunk and Michigan Central Railroads and various steamboat companies, offering like courtesies on their systems and lines.

A telegram was read from the Train Dispatchers' Association, which was in convention in Chicago, announcing that that body had eliminated from its constitution the protective clauses. These clauses, it was explained, related to strikes.

After the transaction of some routine business the meeting took a recess till evening.

The afternoon was spent in a sail down the river to Des-chree-shos-ka, where a stop of about an hour and a half was made.

The superintendents reassembled in convention at 8 P. M. A dispatch from the Train Dispatchers' Association announced that the next meeting of that body would be held in Minneapolis on the second Tuesday in June, 1895.

The committee on standing rules for the government of operators then read its report. The rules, of which there were 51, were considered *seriatim;* some were eliminated and others slightly modified, after which the report was adopted.

The next business called up was the report of the committee on uniform circuit signals. The report was read, but its consideration was deferred until next day.

The meeting then adjourned until 9 A. M. Thursday.

At the opening of Thursday morning's session the secretary read a telegram from Assistant Superintendent W. J. Lloyd, of the Western Union Telegraph Co., Chicago, asking that the association give its indorsement to the Telegraphers' Mutual Benefit Association. A committee consisting of Messrs. Selden, Greene and Lang, was appointed to consider this request and report.

The election of officers for the ensuing year was then taken up with the following result: President, O. C. Greene, of the Northern Pacific, St. Paul, Minn.; Vice President, E. R. Adams, of the Philadelphia and Reading, Reading, Pa.; Secretary-Treasurer, P. W. Drew, of the Wisconsin Central, Chicago.

The next order of business was the selection of the place and date for the next annual meeting. New Orleans, April 17, 1895, was selected as the place and date, but this action was reconsidered at the night session, as will be noted later on.

The reading of papers was then taken up as the next order of business, and the first one called for was by J. W. Lattig, of the Lehigh Valley Railroad, entitled "Machine Currents and Railroad Telegraph Lines." An abstract of this paper appears on another page.

An interesting discussion followed. Mr. W. W. Ryder, of Chicago, referred to the value of storage batteries for the operation of local sounders. He had been using some cells in Chicago for this purpose for the past 2½ years, and they had not given the slightest trouble since they were put in. The current was always even and the cost of maintenance less than that for primary batteries.

Mr. E. R. Adams did not favor the use of storage batteries where a large number of sounders were used. He thought machine current more economical in such cases.

The discussion having touched upon the question of the transformation of alternating currents for telegraph purposes, Mr. Frank B. Rae, of Detroit, who was present, was invited to make a few remarks on the subject.

Mr. Rae referred to the experiments made in California by Stephen D. Field and himself, in the direction of using dynamo currents for telegraph purposes. Respecting the transformation of alternating currents into direct ones for telegraph work, he thought a motor-dynamo to accomplish this could be made to give satisfactory results. He referred briefly to an experimental machine constructed by himself several years ago, with this very object in view, and experimentally it worked very well. It had not been, however, carried beyond the experimental stage, and he merely referred to it to show that the idea was practicable.

A paper was then read by Mr. A. R. Swift, of the Chicago, Rock Island and Pacific Railroad, Chicago, on the subject of strikes.

He thought that a strike where the men were thoroughly whipped was a good thing. His company did not know what good service was until it had gone through such an experience. He compared employes of the present day with what they used to be years ago. In the early days there used to be a disinterested service; now men toil for wages, not for honor. In those days no one ever thought of charging for overtime, and work was done with zeal. Now how is it? he asked. It is almost impossible to get a civil answer from a railroad employe, because he is not paid for it. Men are now paid for overtime work and yet there is a howl that they are overworked and must have extra help. He did not wish to go on record as being opposed to employes organizing, if the object is for mutual benefit—insurance for instance; he did, however, think that telegraph employes should not be bound together by the obligations that these organizations require. An operator is in one sense a confidential agent of the railroad officials and the public. He could not fulfil his obligations to his society and preserve the secrets of the railroad company and public that are entrusted to him by reason of his position.

He thought the best and only way for employes to succeed was on their own merits. Walking delegates have little influence upon those who have the power to promote their men. He believed in treating the men civilly and cordially. If complaints are made against a man, give him a chance to explain his side of the case that justice may be done.

In the discussion of this paper there was no difference of opinion regarding the treatment of operators in case of complaint. Mr. Lattig said that if the employes were fairly treated, they would not bother themselves so much about organizing for strikes.

Mr. Selden thought that all organizations which require a man to surrender his individuality are wrong, and Mr. Swift added that he thought organization was a detriment to the promotion of men.

"Protection of Highway Crossings by Electric Bells" was the subject of the next paper, which was written by Mr. R. J. M. Danley, of Columbus, Ohio, and read by Mr. Geo. C. Kinsman. The paper related mainly to what a perfect railroad crossing signal should be and should do.

Mr. A. R. Lingafelt followed Mr. Kinsman with a paper entitled "The Universal Inefficiency of the Ordinary Telegraph Operator to Properly Test and Locate Wire Trouble." During the discussion Mr. Lattig explained the method in use on the Lehigh Valley road to meet these conditions. He has a general inspector who visits all offices and gives the operators instructions regarding wires and instruments; their uses, etc.

Mr. Charles Selden, of the Baltimore & Ohio R. R., Baltimore, then read an interesting paper entitled "The Telephone and the Railroad," an abstract of this paper appears on another page.

In the discussion of this paper, Mr. Selden referred to the use of the Long Distance Telephone by the Pennsylvania Railroad, and being called upon to give some details regarding this installation, Mr. Henry G. Bates, from the home office of the Long Distance Telephone Co., New York, explained that the Pennsylvania Railroad Co. did not use the telephones for the handling of trains but for the transaction of executive business between the important points along the line. The private residences of the officials in Philadelphia were equipped with long distance instruments, so that, at any time of night these officials can be reached, as well as by day. He was glad to hear so favorable an opinion from railroad men of the use of the telephone on railroads, and was glad to know that the telephone is becoming recognized by the railroads.

Mr. Lattig stated that telephones are extensively used on the Lehigh valley Railroad. Every division superintendent on the line was provided with a long-distance connection. He believed all the offices between New York and Albany, on the New York Central, were similarly equipped.

Mr. U. J. Fry described a long distance telephone circuit used by his road (the Chic. Mil. & St. Paul), which he believed was the first circuit of this character to be used for railroad purposes This use of telephones was a very great convenience in railroading. He thought the telephone would not diminish the telegraph business to any extent. The system was a saving to the railroad in the saving of time.

Mr. P. W. Drew referred to the wonderful developments made in late years in the transaction of railroad business. He asserted that it was a saving to the railroads to adopt new methods of conveying information quickly, and he did not believe the use of the telephone on railroads would affect the telegraph business. Experience has always proved that the greater are the facilities provided the greater becomes the business.

The meeting then, at 12:30 P. M., adjourned until 8 P. M.

After dinner the members and ladies were given a ride on the electric cars out Woodward avenue, then to the Water Works, and on their return to the starting-point took the steamer to Belle Isle, where a couple of hours were pleasantly spent in the enjoyment of the beauties and attractions of this pretty resort.

The final meeting was called to order at 8:30 P. M., when the secretary made formal announcement of the death of a member, Mr. J. W. Stacey, of the Texas Pacific road, Houston, Texas, in July last.

He also announced the transfer to honorary membership of J. J. Burns, of the Denver and Rio Grande R. R., and E. E. Rittenhouse, of the Colorado Midland R. R.

The report of the committee on Uniform Circuit Signals was then taken up for consideration and adopted.

Mr. Ralph W. Pope, of New York, then described the Kinsman Block Signal System, which provides electro-mechanical means for stopping locomotives approaching each other on one track.

The principle of the system is in closing the throttle valve of the locomotive by the operation of an electro-mechanical device on the engine. It works independently of the engineer and it makes little difference whether he is asleep or awake, the train is automatically stopped in case of emergency. This system is of the Kinsman Block System Co., 143 Liberty streeet, New York.

The vote on the selection of New Orleans as the place of meeting next year was reconsidered, Montreal, Canada, being finally decided upon. The date was also changed to June 14.

A paper was then read by Mr. M. B Leonard, of the Chesapeake and Ohio R. R., on the subject of lighting railway trains by electricity.

Mr. Leonard referred briefly to the efforts made in the past in this direction and what is now being done. He gave comparative figures showing the cost of the various systems and described the Lewis system, which has received considerable attention lately. This paper was complete in figures and details, and the conclusion arrived at was that the Lewis system appeared to be the most economical of all yet devised. He briefly described the dynamo used in this system, which is a radical departure from standard practice.

Mr. Fry described a telephone circuit devised by himself and used on his road. Three wires are used, all the magnetos being connected in series on the third wire and the talking done on the other two wires—forming a metallic circuit. The connections of the system are such that the resistance of the magnetos is cut out of circuit when it is desired to carry on conversation. The elimination of the resistance is the object of the arrangement.

The committee appointed to consider the request of W. J. Lloyd for an endorsement of the T. M. B A. made a report recommending the passage of a resolution to the effect that in the opinion of the association the T. M. B. A. was the safest and best organization of its character.

The report was carefully worded, and in the discussion it was argued that it was not the association's business to endorse this or any other association. If one was endorsed others had as good a right to ask the same recognition.

A paper by L. D. Wells, of the Long Island Railroad, Long Island City, entitled "Manner in which Buildings should be Protected against High Potential Currents," was then read and was followed by one of a similar nature on "Fuse Wires as Protectors," by Geo. L. Lang, of the New York and New England road.

President-elect Greene then announced the appointment of committees as follows: On Arrangements and Exhibits — Fortune, Magiff and Lang; On Topics — Messrs. Kinsman, Lattig and Ryder.

After tendering the thanks of the association to the various railroad, steamboat, street-car and telegraph companies and others for courtesies extended to the association, and especially to J. W. Fortune, of the Chicago and Grand Trunk, and E. E. Torrey, of the Michigan Central, for their personal efforts to make the visit a pleasant one, the convention at 11 P. M. adjourned.

On Friday the party went to Port Huron, where the St. Clair Tunnel was inspected. A special car and locomotive were provided and a stop was made at the portal on the Canadian side to give the visitors an opportunity to examine the construction of the great submarine tube. After the tunnel trip an elegant dinner was given to the party at the Port Huron station, by Mr. J. W. Fortune. A boat ride was taken as far as Lake Huron, and on the return the regular steamer for Detroit was boarded. The trip down the St. Clair and Detroit rivers and Lake St. Clair was a delightful one, and very much enjoyed by all. During the trip Mr. Urban, the Detroit agent for the Edison Phonograph, entertained the party with a phonograph concert in the cabin, and it was one of the most interesting features of the day. The boat reached Detroit at 9:30 and then the party disbanded, the members taking the night trains in every direction for their respective homes.

The following is a list of the names of the members present:

U. J. Fry, C. M. & St. P. Ry., Milwaukee, Wis.; Geo. T. Williams, Cleveland, Ohio; G. C. Kinsman, Wabash, Ry., Decatur, Ill.; G. L. Lang, N. Y. & N. E., Boston; A. R Swift, C., R. I. & Pac., Chicago; C. W. Hammond, Mo. Pac., St. Louis, Mo.; Chas. Selden, B. & O. R. R., Baltimore, Md.; O. C. Greene, N. Pac., St. Paul, Minn.; E. E. Torrey, Mich. Cent'l., Detroit; W. W. Ryder, C., B. & Q., Chicago; M. B. Leonard, C. & O., Richmond, Va.; J. W. Fortune, Chic. & Grand Trunk, Detroit; H. C. Hope, C., St. P. M. & O., St. Paul, Minn.; H. C. Sprague, K. C. Ft. S. & M., Kansas City, Mo.; M. Magiff, Central Vermont, St. Albans, Vt.; S. K. Bullard, M. K. & T., Sedalia, Mo.; E. R. Adams, P. & R, Reading, Pa; E. A. Chenery, T R. R. Assn., St. Louis; C. G. Sholes, A. T. & S. F., Topeka, Kan.; G M. Dugan, Ills. Cent'l., Chicago; F. S. Spafard, B., C. R. & N., Cedar Rapids, Iowa; A. R. Lingafelt, C. R. I. & P., Topeka, Kas.; C. F. Annett, Ills. Cent'l., Chicago; N. McKinnon, T., St. L. & K. C., Toledo, Ohio; J. W. Lattig, Lehigh Valley, South Bethlehem, Pa.; J. S. Evans, N. Y. C. & St. L., Cleveland, Ohio; H. B. Ware, B. & M. R. R., Wymore, Neb.; Ralph W. Pope, P. W. Drew, N. B. Patterson, W. S. Logue, Thomas R. Taltavall, Electrical Age, New York; E. A. Smith, Fitchburg Railroad, Boston; Horace Johnson, B. & O.; S. W., Chillicothe, Ohio; Frank B. Rae, Detroit; Henry G. Bates, American Telephone and Telegraph Company, New York; C. Corbett, Superintendent Western Union Telegraph Co., Cleveland, O.; H. J. Kinnucan, Assistant Superintendent Postal Telegraph Co., Detroit.

LADIES.

Mrs. P. W. Drew, A. R. Swift, G. C Kinsman, C. Selden, J. S. Evans, F. S. Spafard, J. W. Fortune, W. C. Matheson, W. W. Ryder, J. A. Hammond, M. Magiff, W. H. Post, Geo. Williams, Geo. Dugan, M. B. Leonard, J. W. Lattig, A. R. Lingafelt. Misses Torrey, Stork, Patton, Selden, Lake, Lattig, Hammond.

THE EXHIBITS.

Mr. W. S. Logue represented the Electric Selector and Signal Company, of 45 Broadway, New York. He had in the meeting-room a transmitter in connection with the telegraph instrument, which was placed there for the convenience of the members. The transmitter was connected with selecting apparatus at Mt. Clemens and Milwaukee Junction. The former place is 25 miles distant, and from both points the answer back signal was received distinctly and clearly on the telegraph instrument. Mr. F. P. Voorhees, treasurer of the company, was also present.

The Strowger Automatic Telephone Exchange, of 947-949 The Rookery, Chicago, was represented by T. G. Martin. Mr. C. Selden is interested in the Strowger Company, and it was through his efforts that this exhibit was made.

There were four telephone instruments placed in different parts of the room, also a 100-wire exchange. By pressing a button on any one instrument any one of the other three could be communicated with at will, the operation of the selection of the individual circuits being witnessed on the switchboard or exchange, in the room. This automatic exchange system is a very ingenious contrivance. Any subscriber can automatically connect his line to that of any other subscriber without the services of an operator at the central station. Messrs. Selden and Keith, the latter of the Strowger Co., took great pleasure in explaining the details of the system.

Mr. Charles Selden exhibited an "S & R" automatic crossing signal. This was in practical operation and attracted much attention. It has many points of merit.

The room was ventilated by a Diehl ceiling fan of elegant design, hung over the desk of the presiding officer; also a Smith disc ventilator driven by a Crocker-Wheeler 1 H. P. electric motor.

Mr. W. S. Logue also looked after the interests of the Edison phonoplex. This apparatus is in regular use between Detroit and Port Huron, on the Grand Trunk road, a distance of 66 miles.

ECHOES.

At Port Huron there was a spot that possessed deep interest to the telegraphers present; it was the office where Thos. A. Edison learned to telegraph. It is in the old Port Huron station, and the very room in which Mr. Edison learned the rudiments of the art that has brought him world-fame, remains practically the same as when he pounded the key and "murdered Morse" in his early career. This room was visited, and all sorts of fancies were conjured up in the mind touching the associations of the spot. It was suggested by some of the visitors that this place could very properly be regarded as the Mecca of telegraph operators. This visit to the "hallowed spot" was not, however, the only interesting incident of the pilgrimage. Mr. Edison's father, an old gentleman of 92 years, as straight as a hickory, was at the landing to see the party, many members of which have the honor of acquaintance with his famous son.

An extra force of Her Majesty's police had to be employed on the occasion of the visit to "Fighting Island," on Wednesday afternoon. It was rumored that "Watchman" Selden and Mr. E. R. Adams would engage in an encounter, based on Marquis of Queensberry rules, but the counsel of those less impetuous, and the awful dignity of the aforesaid officials—especially the latter—prevailed. What threatened to lead to an international unpleasantness resulted in a shaking hands and an adjournment to the pavilion to find the English equivalent for Des-chree-shos-ka.

MACHINE CURRENTS AND RAILROAD TELEGRAPH LINES.*

BY J. W. LATTIG.

For such a valuable adjunct to the telegraph, it is surprising how little has been said and written in relation to the use of machine currents for telegraph lines, and it is even more surprising how slowly the system has been adopted.

The first regular installation of the sort was put in operation in this country by the Western Union Telegraph Company, in its New York office, in the summer of 1880, and the first person to apply or suggest machine currents for telegraph purposes is believed to be Mr. S. D. Field, who operated some Western Union

* Abstract of a paper read before the Association of Railway Telegraph Superintendents, Detroit, June 14, 1894.

wires in California a year or two prior to 1880. At the time of the introduction of the dynamo, the Western Union Telegraph Co. was enabled to dispense with 45,000 cells of battery and reclaim about 15,000 square feet of valuable room. There are now operated from 195 Broadway about 1,100 lines, exclusive of branch office loops, etc., which to operate with battery power would require more than 100,000 cells, and would occupy about 25,000 square feet of floor space.

In addition to the main lines which are fed by these machines there are about 1,000 sounders supplied in like manner.

The potentials on the lines vary from 45 to 350 volts. Lines of unequal resistance are sometimes made uniform by the use of resistance coils. The grades of potentials are 45, 80, 150, 250 and 350.

There are operating at present 53 machines on telegraph service, and the maximum number of lines operated from one machine is about 300. The machines are of Edison and Crocker-Wheeler build.

The invention of the transformer, known sometimes as the motor-dynamo, has been the instrumentality in bringing about great economy in the system. It can be applied wherever there is a source of direct current supply to run a motor, if indeed it cannot soon be made available where the service is alternating, although the writer has up to this time been unable to find an alternating current motor of ¼ horse-power which is sufficiently economical to warrant its application upon that score alone.

There is no doubt a time coming, and that shortly, when a motor-dynamo with the motor, or primary side, A. C., and the dynamo or secondary side, D. C., will be available for such service.

The cost of generating electricity chemically is so great that there is economy in feeding wires from these [direct current transformers—motor-dynamos] even where comparatively few wires are employed and current costs as much as one and one-quarter cents per ampere hour. [Even when the loss in transformation is as great as 50 per cent.]

The Philadelphia and Reading Railroad operates the 63 wires running out of the Philadelphia terminal station with machine currents. Thirty-one wires have 100 volts negative polarity and 32 with 80 volts of positive polarity. The current on the lines varies from 25 to 60 milli-amperes per wire. Forty milli-amperes seem to furnish the most satisfactory results.

The writer has recently installed at Easton, Pa., on the Lehigh Valley system, two Crocker Wheeler motor-dynamos, running one in the daytime and the other at night.

These machines cost, with wiring, rheostats and everything complete, $200.

They replaced 162 jars of battery, which at 57 cents each would make the net cost of the installation of about $108. They cost for current to run about $6. per month, or less than the cost of bluestone alone. We are, therefore, saving on this plant monthly about $10. in zincs, coppers and jars, to say nothing of the cost of attendance. These machines feed seven lines, all being balanced as nearly as possible by resistance coils.

In Bethlehem, Pa., a similar plant has been installed but operated by Backus water motors. The apparatus consists of 24-inch Backus water motors rated at 1½ H. P., with water pressure at 75 lbs., and specially wound Crocker-Wheeler dynamos. This plant has proven itself so satisfactory that we have decided to purchase another of the same kind in every particular, to be located at Sayre, Pa. The plant costs $285 with everything complete, and, deducting the cost of batteries, leaves the net cost $201.

In conclusion, I would recommend to the members of this association machine currents with either water-power or direct-current transformers wherever their service may require, for as low as five or six wires, even on the ground of economy, to say nothing of the many advantages in other directions.

THE TELEPHONE AND THE RAILROAD.

BY CHARLES SELDEN.

Mr. Selden refers to the disappearance from use of the Morse register and says :

Railroad men were especially impressed with the register in the early days because it gave a "record." Whenever a question arose as to whether a word had been transmitted this way or that way, the register told the straight story and no question of veracity ever arose between men and the register tape. By and by as time progressed it was discovered that the human ear could discern, distinguish and read the symbols, and that the hand could indite the messages without any reference to the tape, and the era of "receiving by sound" was upon us, and that era has been with us for many a year. If, however, you should ask a railroad officer, or for that matter a business man, whether in his opinion he could depend upon the telephone instead of the telegraph, he will promptly answer "no"; and when you ask him why, he will say "because you have no record." But as a matter of fact there is telegraphically no record in the Morse system It is true a man writes a telegram and files it; that is a record of what he had to say therein; the intelligence conveyed thereby is transmitted by the Morse system and there is delivered at the point of destination a written communication conveying the same intelligence, and that is "a record"; but, I repeat, not a telegraphic one. There is no record between what transpires at the hands of the sending operator and the ear of the receiving operator. I believe it is as safe under proper rules and restrictions to move trains by telephone as it is to do so by telegraph, and in order to bring to your minds more clearly of what the difference would be in the present method of using the telephone, and *my* method, if you will excuse the assumption on my part. The use of the telephone up to this time has been, on the part of the sender and the receiver, about such a state of affairs as exists between a person dictating to a stenographer, or two persons conversing together. In other words, they use the wire and its instruments in exactly the same way as they would the air in a room, and they have become so accustomed to doing this with but little or no interruption on the part of the receiving party that they cannot help but carry this out in the transmission even of messages which have been written, which the receiver has to write down and which are to be delivered, as would be an ordinary telegram I wish to say here and now that when a person writes out a message to be transmitted by telephone, and the operator transmits by word of mouth and the receiver indites it and delivers it, that there is as full, complete an all around record as exists with any Morse telegram that has been transmitted; therefore, if messages are written first, transmitted by telephone, written again and then delivered, so far as "record" is concerned, we stand absolutely on the same ground as we do in the telegraph. Ah! but you say, the chances for error are greater because "fifty-five" may be written "sixty-five," and "thirty-five" may be written "certified."

This is true, and I might cite instances wherein Morse errors of this character creep in; but I am willing to allow that with the telephone in the ordinary method of use the chances for error are greater than

*Abstract of a paper read at the Convention of Railroad Telegraph Superintendents, Detroit, June 14, 1894.

they are through a misinterpretation of Morse signals or a bad transmission of the same. I assume, for instance, that we wish to send by telephone a message as follows:

TOLEDO, OHIO, June 1, 1894.

To JOHN GORDON, Chicago, Ill.

When in conscience sake will you be conscious enough to send me thirty-five certified copies of our act of incorporation? Answer.

W. L. BROWN.

Now, I will try in a brief way to delineate to you about what the transaction would practically be. I assume now that this is not a public service, simply just such a service as might happen to be between any of the stations on your railroad.

Mr. Selden then gives the conversation that would likely ensue at both ends in an effort to transmit and receive the message above quoted, and afterwards explains how he would send the same message by his method. This consists of uttering every letter in the message, from beginning to end, thus spelling out the words precisely as would be done in transmitting by Morse telegraph.

This example is given to show that "the trouble is not in the art, but is largely in the method of handling the art."

Then he continues:

By perusing the course which I here lay out the receiver is not at all hurried; he can easily keep up in copy with the sender and even novices may do comparatively excellent work, so far as speed is concerned. The general manager, with telephonic communication of a good character stretched out to his general superintendents, can in five minutes' conversation every morning with each one get not only the whole situation but all the minor details which would be brought about by verbal report, that now frequently take hours in their transmission by telegraph.

The recent expiration of a very important patent in the telephonic art brings this subject closer to the railroads than before, and for that reason I thought best to call your attention to it with this in view, that if at the moment without large expense you could not cover your entire system, you could to a very large extent cover reasonable distances at a very slight expense indeed, and be educating properly a corps of people whom in your hour of need you would find to be a safe and strong body upon which to lean.

LEGAL.

The Edison Electric Light Company, of Boston, has obtained an injunction against the Boston Incandescent Lamp Company, prohibiting the latter from manufacturing incandescent lamps.

Chancellor McGill, Trenton, N. J., has rendered an opinion that the electric railway system is nothing more than a modification of the horse railway system, and that the companies operating such roads have the right to erect poles on the edge of the sidewalks, and string wires on such poles without the consent of abutting property owners and without recompensing the latter. The sidewalks, he holds, are portions of the highways and as such are subject to public easement.

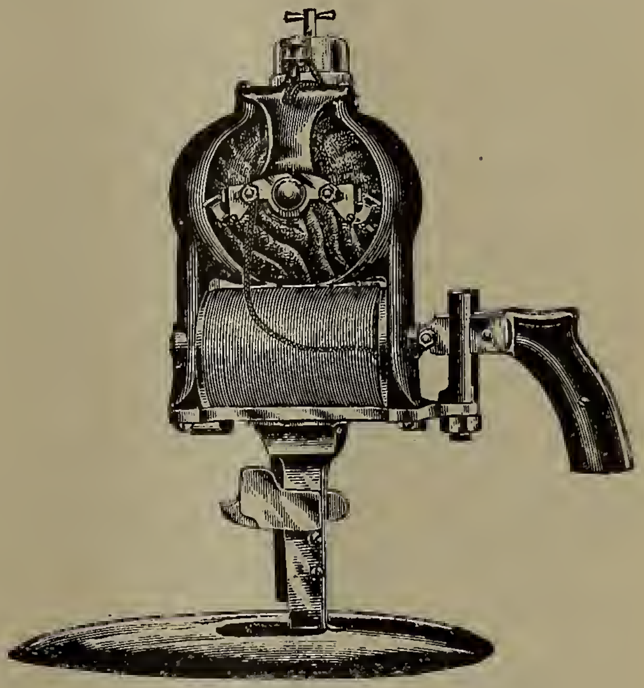
HONORS TO MR. TESLA.—On June 13 the degree of L. L. D. was conferred upon Mr. Nikola Tesla by Columbia College. Mr. Tesla's many friends will be glad to learn of the honor paid to his worth.

AN ELECTRIC CLOTH-CUTTING MACHINE.

One of the most ingenious devices for adapting electricity to perform manual labor is exhibited in the machine herewith described and illustrated, was exhibited at the World's Fair, where it met with much praise and enjoyed the patronage of the largest clothing houses of the city.

The cutting is done by a knife with a vertical edge, which is reciprocated 2,500 times per minute and in a curved line of travel, finishing the stroke exactly at right angles with a base plate that passes under any number of layers not exceeding a depth of three inches. The cutting is done with the front edge of the blade, not with the bottom, and the mechanism controlling the action is such that a draw cut is made not disturbing or pushing the goods in any manner. With this machine it is possible to cut a line, and, turning the machine in the goods, leave a square corner; the knife may be left in the unfinished cut and not draw a thread into the knife.

The knife is actuated by two electric motors with one common shaft. Two motors are used rather than



ELECTRIC CLOTH-CUTTING MACHINE.

one, in order to balance the machine and lessen the vibration. A crank, pitman, and crosshead permit the direct application of power without the use of gears or belts. A direct current of four amperes and sixty volts will drive the knife at a speed of 2,500 revolutions per minute. The controlling switch is situated on the motor itself.

The accompanying illustration, which represents the machine in operation in the shop of Kuh, Nathan & Fischer's Co., Chicago, will give an idea of its appearance and method of use. One man operating this machine does the work of five markers. Its makers, Roquette & Co., of 27 Dey st., New York, guarantees each machine and claims for it rapidity and accuracy. The company has received many testimonials praising the efficiency of this cutter.

MERIT REWARDED THANKS!—When in a recent lecture, published in most papers, it was stated that "the influence of this electrical age will manifest itself for centuries to come," an atmosphere of relief seemed to pervade our office. After eleven long years of hard work we are glad to observe that our ELECTRICAL AGE has advanced so far.

ROYAL ELECTRIC CO. OF PEORIA, ILL.

One of the best alternating current dynamos on the market is that manufactured by the Royal Electric Co , Peoria, Ill. It is constructed on principles different from most alternators, contains no brushes, revolving armature, commutator or revolving coils, and therefore no trouble from sparking or burned-out armature is encountered. The regulation is practically automatic and has self-oiling bearings. The machine is very economical, efficient and extremely simple.

Their direct current dynamos are carefully constructed, simple and efficient. Its automatic regulation is a matter of moment to its operator, for, though nine-tenths of the load be suddenly thrown off there need be no shifting of the brushes, and there is no sparking.

ELECTRIC CLOTH CUTTING MACHINE IN PRACTICAL OPERATION

The Royal Electric Transformers have been very extensively used during the past four years with entire satisfaction to its purchasers.

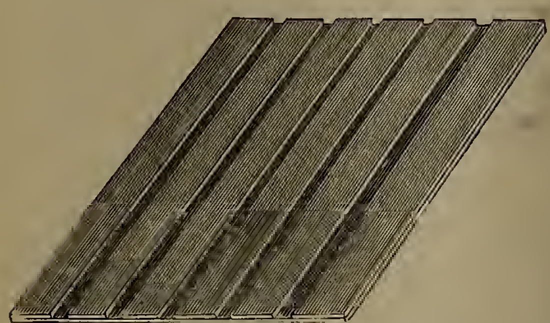
The different parts which make up this transformer have been designed so as to reduce the heating to a minimum, to make the regulation perfect and the insulation the very best. The secondary or lamp circuit can be so connected that either 50 or 100-volt lamps can be used. They are provided with a separate and most convenient fuse-box, so constructed that they can be re-fused with ease and safety, while the current is on the main line.

The transformers, made in various sizes, are all guaranteed.

The handsomely illustrated pamphlet issued by the company gives detailed descriptions of their excellent machines.

SHULTZ GROOVED BELTING.

The Shultz Patent Grooved Sable Rawhide Belting, which is giving so much satisfaction to its users, is tanned only on the surfaces instead of all the way through, thus preserving an interior of rawhide and retaining its original strength and great durability, while providing a driving surface which, to the touch, much



SCHULTZ GROOVED BATTERY.

resembles kid, and is therefore capable of better contact with the pulleys. Its grooves run lengthwise, and serve the purpose of channels to permit the escape of air from between the belt and the pulleys, and to such a degree that the air cushion is overcome, which makes it possible to run it very nearly as slack as link belting. Besides this, the grooves are kept constantly clean by the current of air passing through them, and are a decided advantage over perforations, which soon clogs with dirt and grease. It is also posible to run this belt satisfactorily with either slack top or bottom, and it is practically noiseless ; it is guaranteed to transmit 25 to 33 per cent. more power than any other belt.

This excellent belt, which is guaranteed in every detail, is made by the Shultz Belting Company, St. Louis, Mo.

THE KENNELLY COMBINATION GALVANIC AND FARADIC ADAPTER.

One of the most urgent inquiries of physicians today is for an instrument which can be used with the Edison 110 or 120-volt direct current for all the varied forms of electro-therapeutic treatment with absolute safety to the patient, and at the same time be able to graduate and control it within the finest limits, and also accurately measure the strength of the current employed.

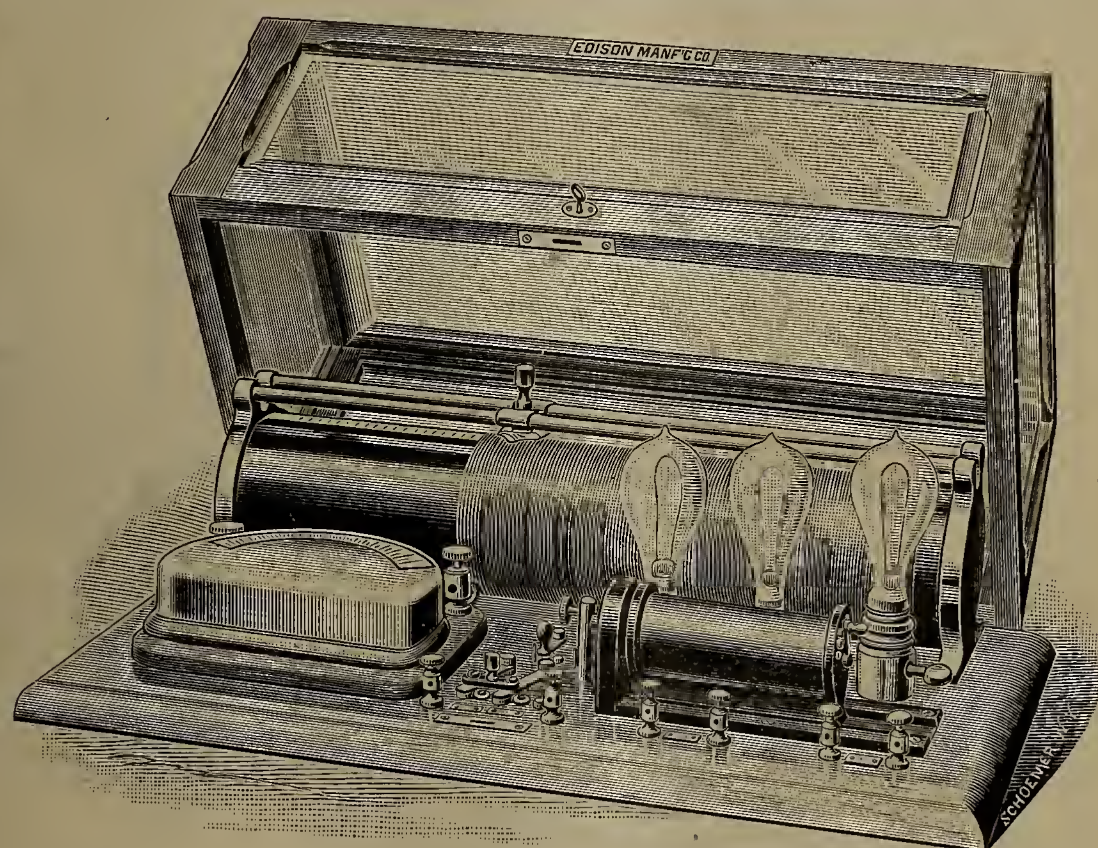
Such an apparatus is illustrated herewith, and has been designed by Mr. A. E. Kennelly (late chief electrician of the Edison Laboratory) with the special view of fulfilling all these requirements.

It consists of a hard rubber cylinder, upon which is wound in suitable grooves, cut on the face of same, several hundred feet of German silver wire having a very high resistance.

Near the end of the cylinder on the left, very high resistance carbon blocks are introduced into the circuit, making the total resistance about 33,000 ohms. This rheostat is regulated by the sliding contact which travels along the two rods above and parallel with the cylinder.

A 16 c. p. lamp is placed in circuit with each of the leading-in wires, to effectually protect the patient and apparatus should a short circuit occur on any part of the electric light circuit.

A third lamp shown on the extreme right, provided with a key, is arranged in shunt with the rheostat. When the key is turned on, the voltage of the galvanic current is reduced to 60 volts. With this shunt in operation, and all the resistance of the rheostat thrown into the circuit by moving the sliding contact to the extreme left, a current of one milli-ampere is obtained when the binding-posts are connected together by a short piece of wire, *i. e*, short-circuited. On moving the sliding contact to the right, the resistance is very gradually diminished and the current correspondingly increased.



COMBINATION ADAPTER.

When a stronger current is required, the lamp is cut out by turning off the key and the current is used unshunted.

The well-known Kennelly milli-ammeter is mounted on the left of the base, the pole-changing switch is placed in the middle of the board, while on the right is shown the Faradic coil, which is also operated by the street current.

This is of the Du Bois Raymond type, the secondary being wound upon a separate spool, removable at will. This secondary winding consists of 18 layers of No. 34 wire, having a total length of about 1,800 yards. The winding is tapped in 6 places, so as to divide the coil into 6 sections, each section consisting of 3 layers of wire, the whole being connected in series.

By this arrangement 3, 6, 9, 12, 15, or 18 layers of secondary winding can be used as required, by moving the switch shown on the end of the coil.

Each section produces an entirely different sensory effect.

The current in the primary is at a minimum when it is entirely covered up by the secondary coil, which in this case must be short-circuited by a switch provided for that purpose, and it is increased by sliding back the secondary coil to the right.

When the switch at the back of the pole-changing switch is turned on, and the vibrator set in motion, the current from the galvanic binding-posts is now of a pulsating character, as the primary of the Faradic coil is superposed on the straight galvanic current, thereby producing the pulsating current as described by Dr. de Watteville. The strength ot these two combined currents is controlled by the rheostat in the ordinary way. It is thus possible to obtain from this instrument: 1st. The direct galvanic current of 120 volts. 2d. The direct galvanic current of 60 volts. 3d. The primary Faradic current capable of 6 variations of strength, depending upon the number of sections of the secondary coil that are short circuited. 4th. The six secondary Faradic currents. all of which manifest distinct characteristics. 5th. The primary Faradic current superposed on the 120-volt galvanic current. 6th. The primary Faradic current superposed on the 60-volt galvanic current. The instrument is handsomely mounted on a polished quartered oak base and enclosed in a bevelled plate glass case, provided with lock.

AUTOMATIC RAILROAD CROSSING SIGNAL.

Among the exhibits that attracted the most attention at the recent convention, in Detroit, of the Association of Railway Telegraph Superintendents, was that of the "S. & R." automatic railway and highway crossing signal, in charge of Mr. Charles Selden. The practical operation of the system was illustrated, and it seemed to be looked upon by all the members with considerable favor.

This system is the joint invention of men who have been engaged in the railway and telegraph service for many years.

There are no intricate wheels, clock-work or weights to be wound up, but on the other hand the whole system is as simple as a telegraph key and sounder, and can be erected by any ordinary lineman and trackman. and no adjustment of magnets is necessary. Any good battery will operate this system, but at different points users may find it advantageous to employ different forms of battery, dependent upon the conditions. The rail need not be cut, insulated, or changed in any way. For economy, efficiency and simplicity this system can hardly be equalled.

"S. & R." CROSSING SIGNAL IN OPERATION.

More than one hundred of these signals have been in operation for over a year on the Baltimore and Ohio railroad, where they have given much satisfaction.

Mr. Charles Selden, Baltimore, Md., is the general agent for this device.

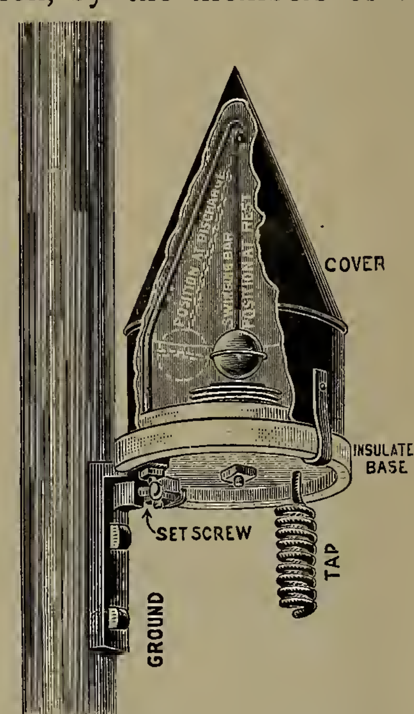
SWINGING BALL LIGHTNING ARRESTER.

This celebrated arrester continues to forge ahead solely on its merits. Others come and disappear from view, like a meteor, flashing for a little while, but the Swinging Ball stays and does satisfactory service. It has been doing good work in all the leading central stations for five years or more, and it is said has never failed to protect.

From all reports this arrester is truly a reliable one; one that is not reliable is really worse than none at all. The "Swinging Ball" has the merit of being simple in construction as well as reliable in use, and the fact that so many of them are used is evidence that they are well thought of.

The Geo. L. Colgate Co., 136 Liberty street, New York, has bought the sole rights and interests in this device, and the company is pushing it to the front with the knowledge that they have a good thing.

Postal Telegraph Company.—This company's new building, corner Broadway and Murray street, has been open every evening this week for inspection, by invitation, by the members of various electrical and other societies, and the daily and technical press. The societies invited included the American Institute Electrical Engineers, New York Electrical Society, American Street Railway Association, National Electric Light Association, etc.



SWINGING BALL LIGHTNING ARRESTER.

"S. & R." SIGNAL ON POST.

THE MANNER IN WHICH BUILDINGS SHOULD BE PROTECTED AGAINST HIGH POTENTIAL CURRENTS.*

BY L. S. WELLS.

The lightning arresters, which are attached to the ordinary switchboards, serve the purpose for which they were designed with fair results so far as protecting offices from lightning is concerned, but experience shows that their efficiency is not absolute, even in this connection, and they merit but little consideration when confronted with a constant current taken from a trolley or electric light wire.

After giving the spring-jack arresters a thorough trial we have found them to be inefficient by reason of their failure to respond at all times to a heavy charge. In numerous instances the points of contact have become melted at the time they were called into service, and considerable difficulty has been experienced in consequence of dust or dirt being insinuated between the points, causing the circuit to open.

During the past two or three years this form of protector has gradually been substituted by spider-wire arresters, which I believe are a vast improvement over any device that has yet come to the surface, and I understand they are being generally adopted in the larger buildings throughout the country. A most important feature, however, is to have the arrester properly located and perfect connections. It should be situated near the entrance of the building, keeping a safe distance from all material susceptible to combustion, and I have in some instances deemed it advisable to have the arrester encased in a box, lined with asbestos, to prevent the liability of the ground plate becoming sufficiently heated to cause inflammable material to become ignited, or overcome the possibility of a conflagration from sparks or other causes. The wire leading to the arrester should be fireproof, and the ground wire should be of sufficient size to carry an abnormal flow of current without becoming heated. If still further protection is for any reason deemed necessary, safety fuses can readily be inserted at the switchboard, but under ordinary circumstances I do not consider this essential.

NEW LINES.—The Brooklyn City Railroad Company proposes, if it can get the consent of property owners, to lay tracks on Raymond and Navy streets, Brooklyn, for the purpose of relieving the traffic on Fulton street.

CORRESPONDENTS' COLUMN.

Correspondence from practical men upon topics of interest relating to electricity or kindred subjects, will find a place in this department; our readers are invited to avail themselves of this department when desirous of seeking or imparting information.

Names and addresses must accompany all letters. This is for our own information and not for publication.

The editor, while not holding himself responsible for the opinions expressed, will gladly put the letters in proper shape if necessary.

Address all communications for this column to the "Correspondence Editor," ELECTRICAL AGE, *World Building, N. Y.*

(5) Col. Bloch asks:—1. If a motor wound to have a resistance of 3 ohms be connected to a battery whose E = 5 and C to 10, what is the strength of the current in the motor, and what is the e. m. f.? 2. Is watts = C E correct for motor? 3. By what rule or formula can one determine as to what the C E, and the internal resistance of a battery must be, to be most efficient to drive a motor having a known resistance? 4. For a plunge battery what must be the proportion of water, sulphuric acid and potassium bichromate: *A.* 1. If your e. m. f is 5 volts and your current is 10 amperes, the resistance of your battery must be ½ ohm. ½ + 3 = 3½. 2. Yes. 3. The resistance of the battery should be equal to that of the external circuit. 4. Make a saturated solution of water and bichromate of potash; to this slowly add one-fifth its weight of sulphuric acid.

(6) O. C. asks:—How long will a Bunsen 1 pint cell last, run steady on a motor for 13 hours at a time for 6 days in every week? *A.* If the motor has a high resistance the cell might operate for a week with the renewal of the electropoin fluid at the end of the third day. If the resistance is small, the cell might fail in 10 hours, or it might run forty hours, all depending on the amount of current used.

(7) Jacob Popper asks:—Would it be possible to converse by means of two telephone receivers if the binding posts were connected each to each, or would it be necessary to introduce a cell or more? *A.* The sound will be weaker than when a transmitter is used.

(8) "Siegfried S." asks:—What kind of glass jars must I use in making Leyden jars? I have tried several kinds but obtained poor results. Is it the composition of glass? *A.* Use glass which contains no lead. A great deal depends upon the composition of the glass and thickness of the walls of the jar. They should be rather thin.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL AGE,
WORLD BUILDING, NEW YORK,
JUNE 18, 1894.

Mr. Williams, of the Safety Insulated Wire and Cable Co., has gone West to look after some special business for the company, and will close some big deals. We wish him success

E. E. Dexter, formerly superintendent of the 26th street T.-H. plant, N. Y., is now superintending the installation of the 40-mile, 1,000,000 circular mils, underground cable, made by the Safety Insulated Wire and Cable Co., for the Philadelphia Traction Co., Philadelphia, Pa.

The regular quarterly dividend of 1¼ per cent. was declared by the Western Union Telegraph Company, on June 13. It is stated that the business of the company is improved and that the dividend has been earned.

Van Derwerken, Rickerson & Brainard, 8 Fifth avenue, Brooklyn, are doing a large business in their electric telephone outfits, and new V. R. B. fan motors and battery combination.

Henry V. Parsell has purchased a new and handsome electric launch from the General Electric Launch Co., and shipped the same to Schroon Lake for use there this coming summer. The launch is equipped with batteries of the Consolidated Electric Storage Co.

F. M. Hawkins, 47 East Ninth street, N. Y., is now resident sales agent for the Electrical Engineering and Supply Co., manufacturers of electric light, railway supplies and switchboards; factory, Syracuse, N. Y.

J. Jones & Son, 67 Cortlandt street, N. Y., the manufacturers of the "anti-thunderbolt" insulating paper, are receiving many letters praising their excellent paper, which is used by all the leading electric light and railway companies.

Louis F. Massa, civil and contracting engineer, has lately opened with W. K. Freeman & Co., electrical engineers and contractors, 136 Liberty street, N. Y.

* Abstract of paper read before the Convention of the Association of Railway Telegraph Superintendents, Detroit, Mich., June 14, 1894.

C. L. Splitdorf, 17 Vandewater street, is manufacturing very fine low-tension fan motors for 110-volt circuits. He also makes a specialty of winding electro-magnets and armatures for all kinds of electrical apparatus.

Central station managers are finding out that the swinging ball lightning arrester will do the work of a high priced lightning arrester at one-third the cost. Thousands are in use and the satisfaction they are giving is verified in the duplication of orders sent to Geo. L. Colgate Company, 136 Liberty street.

J. F. Kelly, one of the popular electrical men of the trade, is meeting with great success in selling Stanley Electric Company's fan motors for alternating currents. He is making his headquarters at Room 14, World Building.

Dave Chalmers, the New York manager of the new Holtzer-Cabot salesrooms, 114 Liberty street, sold 18 direct current and alternating fan motors in a couple of hours on last Tuesday.

The Suburban Electric Equipment and Supply Co, 11 Park Row, makes a specialty of equipping out-of-town residences, offices, factories and other buildings with telephones, systems of electric calls, electric light and power apparatus, etc. They are installing a large number of fan motors throughout the city, and are doing an excellent business generally.

Stanley & Patterson, 32 Frankfort street, are selling a great many telephone receivers, telephone transmitters, magnetos and complete outfits. Their general electrical supply business is increasing daily, for they believe in pleasing a customer.

The Postal Telegraph-Cable Company's new building was open for inspection on last Monday night and a great many newspaper-men attended. This handsome building, situated on the corner of Broadway and Murray street, is fourteen stories high and absolutely fireproof. The latest developments in telegraphic appliances are employed. Six electric elevators are used for conveying people to the various floors. The operating room contains a complete tube system of wiring, electro-pneumatic message-conveying system, and thoroughly equipped operating tables. The ground floor is richly furnished and is used as the receiving department. The last three floors are devoted to the company's use, while the other floors are leased as offices. The power plant beneath the ground floor is interesting, containing six directly coupled alternators of 300 amperes each, a large and novel switchboard for combining street and interior circuits, dynamotors for generating telegraph currents, machines for the electric elevators, and a complete battery of boilers. W. T. H.

NEW CORPORATIONS.

The Citizens' Electric Light and Power Co., Norway, Mich. ; capital stock, $10,000.

The Solar Arc Lamp Co., New York, N. Y., by Jacob Rice and others, to manufacture arc lamps, electrical appliances and machinery ; capital stock, $25,000.

The Illinois Electro-Medical and Optical Institute, Chicago, Ill., by Jas. A. Manning and others ; capital stock, $1,000.

The Berkeley Electric Lighting Co,, Berkeley, Cal., by Walter E. Sell and others ; capital stock, $100,000.

The Terre Haute Electric Railway Co., Terre Haute, Ind., by P. T. Thomas and others ; capital stock, $500,000.

The Dobbs Ferry Light, Heat and Power Co, New York, N. Y., by Geo. C. Todd and others ; capital stock $150,000. This company is a consolidation of the Irvington and Greenburg Gas Co. and the Dobbs Ferry Lighting Co.

The Chicago Suburban Electric Co., Chicago, Ill., by Ralph H. Bradley and others ; capital stock, $1,000,000.

The Union Electric Co., Cleveland, O., manufacturing electrical and mechanical apparatus ; capital stock, $25,000.

The Cuyahoga Suburban Railway Co., Cleveland, O., operating street railway ; capital stock, $10,000.

The International Telephone Construction Co., Chicago, Ill. ; capital stock, $200,000.

The McDermid Manufacturing Co., Chicago, Ill., to make annunciators, electrical specialties, etc. ; capital stock, $5,000.

The Fort Wayne Electric Corporation, Fort Wayne, Ind. ; capital stock, $500,000.

The Electro-Chemical Co., Rumford Falls, Me, chemical and electrical manufacturing business ; capital stock, $300,000.

The Steen's Creek Telephone Co., Steen's Creek, Miss., capital stock, $5,000.

The Lampasas Water, Ice and Electric Co., Lampasas, Tex., furnishing electric light, water and ice ; capital stock, $30,000.

The Leavenworth Electric Railroad Co., Leavenworth, Kan., by W. D. Bethel, of Memphis, Tenn. ; H. N. Smith, of Boston, Mass. ; Newman Erb, of New York ; J. P. Edrington, of Denver ; M. Summerfield, of Lawrence, Kan., and others ; capital stock, $300,000.

A New Electric Power and Light Co., San Francisco, Cal., is reported to be incorporated with a capital stock of $10,000,000.

The Van Choate Electric Co., Portland, Me., manufacturing and dealing in electrical apparatus and machinery; capital stock, $6,000,000.

The Ryan Dynamo Co., Hamilton, O, by C. L. Cornell and others, to manufacture and deal in electrical machinery and apparatus ; capital stock, $10,000.

The Danville Telephone Co., Danville, Va., by W. A. Taylor and others, to establish telephone systems ; capital stock, $20,000.

The Citizens' Electric Light and Power Co., Pensacola, Fla., by T. E. Wells and others, to erect electric light and power plant ; capital stock, $20,000.

The Nashville Traction Co., by Francis W. Hunter and others.

POSSIBLE CONTRACTS.

The City Clerk, Alexandria, La, can give information concerning electric lighting contract, for which bids will soon be invited.

Address Mayor, Ocala, Fla., for information concerning company organizing to build and operate telephone lines.

The Jackson and Suburban Street Railroad Co., Jackson, Tenn., will erect a new electric plant.

S. P. Dunn, Scotland Neck, N. C., will establish an electric lighting plant.

The Cumberland Electric Light and Power Co., Nashville, Tenn., will enlarge its electric plant.

The Chester Telephone Co., Chester, S. C., will construct a telephone system.

The St. Charles Street Railway Co. will change its motive power to electricity, and has applied for a franchise.

Address Mayor, Crisfield, Md., concerning proposed electrical railroad.

The City Passenger Railway Co., Baltimore, Md., will shortly begin the extension of its electrical road to Clifton, Md.

Address W. A. Rowan, Alvin, Tex., concerning the construction of an electrical railroad to Velasco.

For information concerning the underground cable for the propulsion of its cars, address the Columbia Railway Co., Washington, D. C.

The Chevy Chase Electric Railroad, Chevy Chase, Md., is to be extended to Kensington, Md.

Address Secretary Chamber of Commerce, Staunton, Va., for information about the proposed electrical railroad from Staunton to Monterey.

C. S. Hutter, Lynchburg, Va., can give information concerning proposed electric railroad from Lynchburg to Bedford City, Va.

J. C. SPAETH.—A letter has been received at this office for Mr. J. C. Spaeth. Will that gentleman please send us his address so that we may forward the letter, or call for it.

TRADE NOTES.

The Clonbrock Steam Boiler Works, of Brooklyn, N. Y., have closed a contract for climax boilers of 4,000 H. P. for the first district, Pearl street station, of the Edison Electric Illuminating Company, Brooklyn.

One of the handsomest catalogues in print has been issued by the Standard Electric Co , Chicago, Ill., and contains detailed descriptions of their excellent machines and apparatus, while the accurate illustrations which adorn every page of this book give a clear idea of the appearance of the Standard dynamo, alternators, arc lamps, electrical measuring instruments, and other apparatus.

De Veau & Company, 32 Frankfort street, New York, manufacturers of telephones, magneto bells, transmitters and receivers, are doing an extensive business with their excellent productions. The company while selling these goods at the lowest possible prices guarantees all its goods. A perusal of their circulars and price lists will prove beneficial.

Electrical and Street Railway Patents.

Issued June 12, 1894.

521 160. Driving Mechanism for Electric Elevators. Charles E. Geiger, Louisville, Ky. Filed Feb. 27, 1892.

521,163. Contact-Trolley. Robert W. Hawkesworth, East Orange, N. J. Filed Mar. 15, 1894.

521,168. Thermo-Electric Battery. Ernst W. Jungner, Skara, Sweden. Filed Mar. 9, 1894.

521,170. Printing-Telegraph. Oscar L. Kleber, Pittsburgh, Pa., assignor of one-half to R. J. Stoney, Jr., and Henry Braun, same place. Filed Apr. 13, 1893.

521,183. Police Signal-Telegraph System. Charles A. Rolfe, Chicago, Ill. Filed Oct. 22, 1892.

521,184. Trolley. Henry Scheele, John P. Scheele, and Henry A. Rust, Milwaukee, Wis. Filed Feb. 23, 1894.

521,188. Magneto-Telephone. Alfred Stromberg and Andrew Carlson, Chicago, Ill. Filed Mar. 9, 1894.

521,220. Electric Telephone. Wilton L. Richards, Malden, assignor to the American Bell Telephone Company, Boston, Mass. Filed Dec. 14, 1893.

521,238. Bond for Electrical Conductors. John Herr, Philadelphia, Pa. Filed May 11, 1894.

521,260. Electric Battery. Fred. Dubero and Peter Mohrdieck, San Francisco, Cal. Filed Jan. 15, 1894.

521,274. Telephone-Switch. Joseph B. Smith, Manchester, N. H. Filed Apr. 27, 1894.

521,294. Safety-Guard for Street-Cars. Stephen Norton and William H. Rice, Rochester, N. Y. Filed Sept. 20, 1893.

521,303. Busy-Test for Multiple Switchboards James A. Wotton, Atlanta, Ga. Filed Apr. 20, 1894.

521,307. Pilot or Guard for Cars. Robert A. Crawford, Allegheny, Pa. Filed Sept. 27, 1893.

521,311. Trolley-Wire Finder. Theophilus E. Gressle, Indianapolis, Ind., assignor of nine-twentieths to Frank Hittle, Baltimore, Md. Filed Oct. 28, 1893.

521,321. Method of Making Car-Wheels. William A. Pearson, Schenectady, N. Y. Filed Dec. 8, 1893.

521,322. Incandescent-Lamp Socket. Luke R. Peck, St. John's, Mich., assignor of one-half to Robert G. Steel, same place. Filed Feb. 23, 1894.

521,325. Telephone-Transmitter. Joseph B. Smith, Manchester, N. H. Filed Apr. 27, 1894.

521,326. Conduit Supply System for Electric Railways. Harry Alexander, New York, N. Y. Filed Jan. 9, 1894.

521,331. Electric Apparatus for Automatic Weighing. Chas. E. Buzby, Philadelphia, Pa., assignor to Frederick A. Riehl, same place. Filed July 12, 1893.

521,362. Electric-Arc Light for Magic Lanterns, Chas. Beseler, Jersey City, N. J. Filed Mar. 16, 1894.

521,396. Electric Clock-Winding Mechanism. Adolph E. Vidal and Gaston Hervieu, London, Eng. Filed Sept. 30, 1892. Renewed Nov. 1, 1893.

521,422. Telephone-Call Recorder. Wm. F. Smith, San Francisco, Cal. Filed May 5, 1893.

521,423. Automatic Electro-Magnetic Cut-Out. Lucius T. Stanley, Brooklyn, N. Y., assignor to Henry B. Cutter, Philadelphia, Pa. Filed July 18, 1893.

521,434. Duplex Electric-Arc Lamp. Geo. F. Edens, and John B. Brewer, Xenia, Ohio. Filed Mar. 31, 1894.

521,435. Automatic Electric Signal-Lamp. John R. Farmer, St. Louis, Mo., assignor by direct and mesne assignments of two-thirds to O. M. Schmidt and W. B. Grable, same place. Filed Apr. 9, 1894.

521,436. System of Electrical Distribution. Thomas J. Fay, New York, N. Y., assignor to the C. & C. Electric Co., of New Jersey. Filed Feb. 15, 1894.

PATENTS EXPIRED.

191,781. Electro-Magnetic Engineer. W. E. Sawyer, New York, N. Y. [Filed Mar. 26, 1877.]

191,836. Electrical Railway-Signals. Jos. I. Conklin, Jr., New York, assignor to himself and Chas. A. Dresser, Brooklyn, N. Y. [Filed Nov. 14, 1876.]

191,887. Duplex Telegraphs. Chas. H. Rudd, Chicago, Ill. [Filed Jan. 20, 1875.]

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Electrical books of all kinds can be procured at this office. Libraries can be furnished with a complete set of electrical works at a liberal discount from catalogue prices.

Copy for advertisements or changes therein should be in our hands before the Saturday preceding publication day.

NEW YORK, JUNE 30, 1894.

CONTENTS.

THE ELECTRIC CLUB.

The movement on foot to revive the electric club in this city, on a modified basis, will no doubt meet with a hearty response in the electrical trade in and about the city. Many of the large commercial industries have exchanges and clubs, and surely the electrical trade is large enough and important enough to support a similar organization. We hope to see a vigorous growth of the efforts now being put forth in this direction.

IN FAVOR OF THE BROADWAY LINE.

Judge Ingraham, in the Special Term of the Supreme Court, has just rendered a decision in the case of the Empire City Subway Company against the Broadway and Seventh Avenue Railroad Company. The subway company sought to restrain the railroad company from laying electric wires in its cable conduit for the purpose of signaling and otherwise facilitating the operations of the road. The subway company in effect claimed that it owned the earth hereabouts, but Judge Ingraham does not coincide with this interpretation of the franchise. The decision is a rather crushing one as regards the subway company, but it is a perfectly just one. The Judge says that the Empire City Subway Company's franchise does not give that company the exclusive right to maintain subways in this city.

ILLNESS OF MR. EDISON.

Mr. Thomas A. Edison last week received a fall from the effects of which he has since been laid up. It seems that he was last Friday evening sitting in a chair on the porch of the house where he resides in Ogden, N. J., when the chair gave way under him. He was thrown backward rather heavily on the porch and received a severe shaking up. His friends ran to his assistance but he got up himself, and said he felt no pain or ill results from the fall He returned to his home in Orange on Saturday and on Sunday became ill, suffering a good deal of pain. His physician states that Mr. Edison is suffering primarily from an attack of bowel trouble, and that there is no danger. The doctor is of the opinion that overwork and the hot weather are the first causes of the intestinal disorder from which his patient is suffering. The fall is now thought to have little to do with his illness, although it was feared by Mr. Edison's friends at one time that he might have suffered some internal injury. Mr. Edison, at last reports, was on the mend and the doctor says that with a few days' rest and quiet he will be around again all right.

AN INVENTION NEEDED.

A great many New York business men live in suburban towns in New Jersey, and New Jersey is the place where the only original mosquito is born and bred. Those who are unfortunate enough to reside in New Jersey are just now asking themselves whether life is worth living—in New Jersey at least—the mosquitoes are so thick and hungry this year. One prominent New Yorker who lives across the border suggests that electricity might solve the mosquito problem; and wonders why some inventive genius has not turned his attention to the relief of the suffering humanity in New Jersey. The gentleman in question asks if Mr. Edison can not convert his ore crusher into a mosquito crusher. Mr. Edison works at one thing at a time; perhaps when he gets through with his ore crusher experiments he will direct his attention to the annihilation of the pestiferous insect. In the meantime some one else should tackle the problem. Anything that will accomplish the work will surely find a ready sale; every family in New Jersey will buy a machine.

COMING DEVELOPMENTS IN ELECTRICITY.

BY GEORGE D. SHEPARDSON.

Part IV.—*Continued from page* 294.

The following figures fairly represent the total efficiency obtained in practice :

Gas, .0005 to .002 ; candles or oil lamps, .001 to .003 ; incandescent electric lamps, .003 to .0056 ; arc lamps, .095 to .016 ; magnesium, .080, to .12 ; sunlight, more ; Geissler tube, .327 ; firefly, 1.000.

We may possibly learn the secret of the firefly, whose light is produced without the waste of heat. The recent experiments of Tesla and others give hopeful indications of ultimate success in adapting the Geissler tube to illuminating purposes

Electricity is being applied to medicine in a much more intelligent way than formerly. The indications are that electro-therapeutics is to be reduced to an exact science, so that prescriptions may be given in terms of volts, milli-amperes, periodicity, seconds, etc. New uses are being discovered continually, and there is room for much development along this line.

Some attention may properly be given to possible developments in the application of electricity to agriculture. Electricity has been applied to agriculture in a number of different ways. Static electricity has been applied to seeds and to growing plants. Current electricity has been applied to the soil. Growing plants have been exposed to the action of electric lights. The heating effect of the current has been used in a number of processes more or less directly connected with agriculture. The mechanical effects of the current are being used to an enormous extent.

The opportunities for electricity in farming may be considered under two general classes. The first, in which it is applied directly to the growth of plants or animals ; the second, in which it is applied, in various ways, to assist the farmer in his work. In the latter class electricity is applicable in four ways : for furnishing power, light, heat, and for the operation of telephones, signals, etc. The problems connected with utilizing electricity for furnishing power, light, heat, etc., are largely mechanical. A number of electric railways are already being built through farming districts. In such places it is an easy matter to arrange stationary electric motors for doing much of the work now done by hand, horse or steam power. On large western farms steam plows are being used to a considerable extent. The difficulties in connection with the use of these are great, and it is reasonable to expect that electric power may here find an extensive use. Strong argument may be advanced for the use of portable electric light plants in connection with threshing outfits. It is well known that enormous amounts of grain are lost because of the inability to get the grain under cover or to get it threshed before it is ruined by exposure to the fall and winter weather. If threshing outfits were provided with electric light plants, they could operate two gangs of men, and do nearly twice the amount of work in the short season available for threshing.

Electricity has been applied directly to the growth of plants and animals in a number of different ways. One has been that of turning light into day by placing electric light into hot-houses. Experiments show that periods of darkness are not necessary to growth and development of plants. The electric light promotes assimilation ; it often hastens growth and maturity ; it is capable of producing flavors and colors in fruits ; it often intensifies colors of flowers and sometimes increases their productiveness. The experiments along this line have led to conflicting and indefinite results. Under some conditions the presence of electric light at night is a great advantage, but in other cases it is detrimental. Considerable work has been done in this field which is a promising one. A market gardener in England is reported to have increased his profits twenty-five per cent. by using electric light for forcing lettuce.

Static electricity has been applied both to seeds and to growing plants. N. Spechnew soaked various kinds of seeds until they swelled and then subjected them to the influence of induced currents for one or two minutes. He found that electrified seeds developed in about half the time, and the plants coming from them were better developed, having larger leaves and brighter colors. The final yield was not affected. It is believed that static electricity is a potent factor in the economy of nature, and has more to do with the growth and development of plants than is generally supposed.

Currents of electricity have been applied to the soil by many different experimenters and in several different ways. LaGrange had a number of pointed conductors in the air connected with a net-work of galvanized wires buried in the soil. Others have buried plates of zinc and copper, which were connected by insulated wires so as to form an earth battery. Still others have buried in the ground plates or wires which were connected with a battery or other source of current. By each of these three methods current is sent through the soil and affects the vegetation in the vicinity, apparently, by electrolytic action upon the soil. The results obtained with currents of electricity applied in these ways have been as contradictory as those obtained from the application of static electricity or the electric light. Under some circumstances the current through the soil seems to exert a beneficial effect. In other cases it seems to be detrimental.

The present state of the art is practically this :—Electricity, doubtless, has an action upon vegetation, but the conditions for its best application are but little better understood today than they were years ago. In view of the contradictory results obtained from experiments, we are forced to the conclusion that for most, if not all, plants, a certain amount of static and current electricity is valuable. For knowledge further than this we must have, carried on with greater care and intelligence, experiments in which a study may be made of the best methods of applying electricity and the proper amount to be applied under various conditions.

Many experiments have been carried on with a view to killing smut-germs on seed-wheat and other pests of vegetable life. Smut-pores may be killed by subjecting the infected wheat to the action of hot water for a short time. The same result may be accomplished by treating the wheat with a solution of copper sulphate or of some other chemicals. These processes seem to be successful when carried on under proper conditions, but experience shows that the ordinary farmer is unwilling to take proper precautions necessary for success in such work. It seems possible that some simple electrical device may be more successful and more popular.

There are certainly great opportunities for development in the various applications of electricity to agricultural operations. He who enters this field must expect much discouragement, but there is a fertile field for an industrious, patient investigator who has ample theoretical and laboratory experience and is backed up by sufficient capital for carrying out the experiments.

The Kennelly Adapter.—The Kennelly Combination Galvanic and Faradic Adapter, which was described and illustrated in our issue of last week, is manufactured by the Edison Manufacturing Co., 110 East 23rd street, New York city. The name of the makers was inadvertently omitted from the original article.

RELATIVE ADVANTAGES OF TOOTHED AND SMOOTH CORE ARMATURES.*

BY ALTON D. ADAMS.

The principal disadvantages of toothed, compared with smooth core armatures, are greater first cost, large change of lead, excessive sparking, when used with too short air gaps, and the production of heat in pole-pieces; their advantages are, that inductors are positively driven, large solid inductors, protected from eddy currents, and that a reduction may be made in the length and consequent magnetic resistance of the air gap.

Change of lead may be fixed within any desired limits, and sparking abated by such proportions of air gap and teeth as give them sufficient magnetic resistance.

Heat in pole-pieces may be reduced by their lamination, by the use of very narrow teeth and slots, by forms of teeth that present a nearly continuous surface of iron to the pole-pieces, and still more, by the use of openings in core discs which do not cut through their outside surface, or a continuous magnetic sheath outside the teeth.

For any given form of tooth the heating of pole-pieces is less, the longer the air gap.

The mechanical strength of armature teeth, as usually employed, is far in excess of that required to hold inductors in position, even under conditions of short circuit, and driving pins inserted in the core, at proper intervals, are much cheaper and take up much less valuable room on the armature circumference.

Either teeth or substantial driving pins are, of course, preferable mechanically to the slender bits of hard fibre which have been much used, and frequently give way under the heavy strains to which large generators are subject.

When large wires or copper rods are used as inductors, their protection from eddy currents is an important matter, but proper stranding of inductors reduces the eddy loss in them, when used on smooth cores, to a very small amount, and has the further important advantage that inductors may be bent into the proper shape at armature ends, and the joints, necessary when rods are used, avoided.

The chief possible advantage, then, to be gained by the use of toothed armatures, is through a reduction in the length of the air gap, and the consequent reduction in the ampere turns required on field magnet, weight of copper, or energy in winding, and the length and weight of iron core. To make this advantage available, it must be practical to use air gaps shorter than are required for insulation, winding and clearance.

As is well understood, the armature winding of a dynamo or motor, in operation, has a magnetizing action which is measured in ampere turns for a bipolar machine, by one quarter the product of all the inductors of the armature, into the total armature current. The ampere turns on the armature evidently tend to set up a flow of magnetism, having a complete circuit through the armature core, twice across each air gap, and through the iron of pole-pieces.

About half the ampere turns furnished by the inductors under pole-pieces evidently act against the field ampere turns in each air gap at the polar tips, and the ratio between the armature and field ampere turns at this point necessary to give sparkless reversal there, must determine whether the required magnetic resistance be greater or less than that of an air gap long enough for insulation, winding, and clearance with a smooth core armature.

As an armature coil in an operating dynamo or motor passes under the brush, the current flowing in it must stop, and one in the opposite direction be set up; and if this action is to be accomplished without sparking, a sufficient electromotive force must be provided in the coil while in direct contact with the brush. In the ordinary dynamo or motor, magnetism forced across the path of the coil, by the field ampere turns expended in air gap, must provide this reversing electromotive force.

If it be desired to build machines having an expenditure of field ampere turns in the air gap not much greater than those of the armature, we need not resort to toothed cores.

Take, for example, the case of a 260 ampere dynamo with 120 inductors on its armature in one layer, an air gap induction of 25,000 lines per square inch, and 80 per cent. of inductors under the pole-pieces.

An air gap of .45 inch between the armature and each pole-piece will be sufficient for insulation, winding and clearance, and the field ampere turns expended in each air gap will therefore be 3,500, while the armature ampere turns active under each pole tip will be 3,100.

A considerable change of lead and sparking can be readily predicted for this machine.

In some types of small machines the room required by insulation, winding and clearance, makes the air gap longer than necessary for sparkless operation, and in such machines the utility of teeth seems to depend on their cost compared with the saving to be effected by their use.

As the ampere turns, furnished by the inductors under any pole-piece, grow less in a machine of given capacity when the number of poles is increased, very short air gaps may be used, if the number of poles is sufficiently large.

As an increase in the number of poles usually makes a machine of given capacity more expensive, however, the question at once comes up, to what extent the number of poles may be increased without a greater expenditure than the saving of iron and copper to be effected.

The seeming opportunity to save material by the use of toothed armatures is very attractive, and we cannot but hope it may some day be practical; in the light of present knowledge, however, there seems little to be gained by their use in medium and large bipolar machines.

* Abstract of a paper read at the Phila. Meeting, Am. Inst. Elec. Engrs., May 16, 1894.

ELECTRICAL SIGNALLING BALLOON.

The electrical signalling balloon, which recently found such favor with the Italian war department, is very simple in principle. A little ladder surmounted by six incandescent lamps is fixed inside a balloon with a translucent envelope, and the lamps are connected with a battery on the ground through a wire running side by side with the cable tethering the balloon. By means of a pre-arranged code of signals consisting of long and short flashes, which illumine the balloon, messages can be telegraphed to distant points, the only requisite condition being a clear night. This balloon, the invention of Mr. E. S. Bruce, is made of cambric, and has a diameter of 18 feet and a gas capacity of about 3,200 cubic feet. The lamp-holder for containing the six incandescent lamps, which are suspended inside the balloon, is in the shape of a ladder, to admit of easy introduction into the narrow mouth of the balloon. The balloon has the ordinary equipment, *i. e.*, net, valve-top, sand-bags, etc.; also a special, ventilated case for sea transport. The lamps are 16 candle-power, 55 volts, and are specially constructed for the purpose. There is a complete electrical equipment within, to regulate the signals.

The weight of the whole thing amounts to less than 150 pounds, and it can be packed into a small receptacle,

THE VETTER CURRENT ADAPTER.

A new and simple device for utilizing the incandescent current in electro-therapeutics is that known as the Vetter current adapter. As shown in fig. 1, it resembles an ordinary incandescent lamp socket, provided with a switch lever, and binding posts numbered 1, 2 and 3. When connection is made with posts 1 and 2 it gives the current in series with the lamp, the quantity of current passing being regulated by the candle-power of the lamp. When posts 2 and 3 are used, the current is obtained in parallel and the adapter can then be used like the ordinary socket plug for extending drop lights, running motors, etc., with the additional advantage that the lamp in the fixture can also be lighted by means of the switch lever, without interfering with the current obtained from posts 2 and 3.

An electrician is not required to attach the adapter; anyone, however unfamiliar with electrical appliances, can do it. It is only necessary to detach a lamp from its fixture and place the adapter in its stead; then attach a lamp (of requisite intended candle-power) to the adapter in the same manner as it would be attached to the fixture. The switch on the fixture is used as formerly for turning on the current, while the switch lever is used for lighting the lamps only.

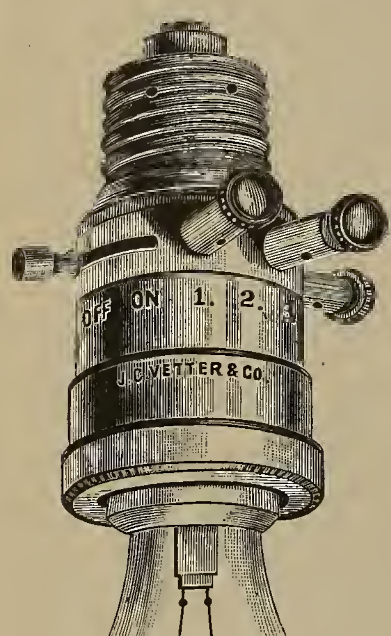


FIG. 1.

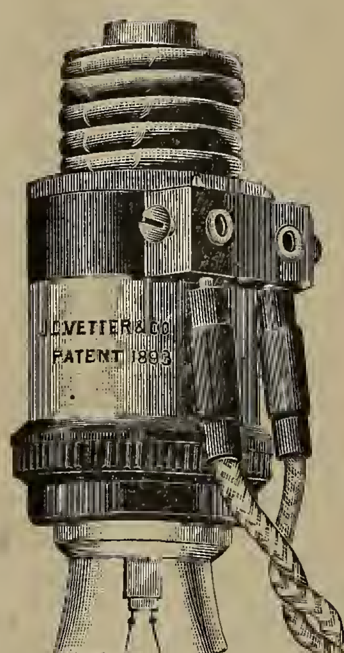


FIG. 3.

To adapt the incandescent light current for the operation of various translating devices requiring different intensities of current, it is only necessary to adjust a lamp of suitable candle-power into the adapter and by means of conducting cords convey the current from the binding-posts of the adapter.

This device furnishes a handy and clean method of easily charging storage batteries, as shown in fig. 2, at practically no expense, if the charging is done at a time when the lamp would ordinarily be in use, as the overflow is sufficient for the purpose.

This current adapter is used by many eminent New York physicians, and also in the nervous department of the Manhattan Eye and Ear Hospital, where it gives perfect satisfaction. Fig. 3 illustrates the Vetter incandescent current tap, which will undoubtedly supersede the ordinary socket plug, as it does not dispense with the lamp in the fixture whence the current is taken.

J. C. Vetter & Co., 104 East 23d street, New York, are the manufacturers and patentees of this ingenious device.

The Bellefontaine Electric Road will build an addition to its plant that will cost $5,000.

ELECTRICITY IN NAVAL AND LAND WARFARE.

BY MEYER BLOOMFIELD.

Of the many uses made of electricity nowadays, nowhere has its extension been more remarkable than on ships of war.

It is but seven years since the frigate "*Trenton*," the first vessel in our navy to contain an electrical plant, sailed equipped with an incandescent lamp plant, and the apprehensions entertained at the time concerning the practicability of the scheme have long since vanished, for today a vessel is hardly considered to be perfect in equipment without an electric plant. Foreign countries have not been slow in following the example set by the United States, hence electricity now plays nearly as important a part on water as on land. It must, however, be remembed that plants on shipboard differ in many respects from those on land. Great ingenuity was used in the installation of electrical plants on shipboard.

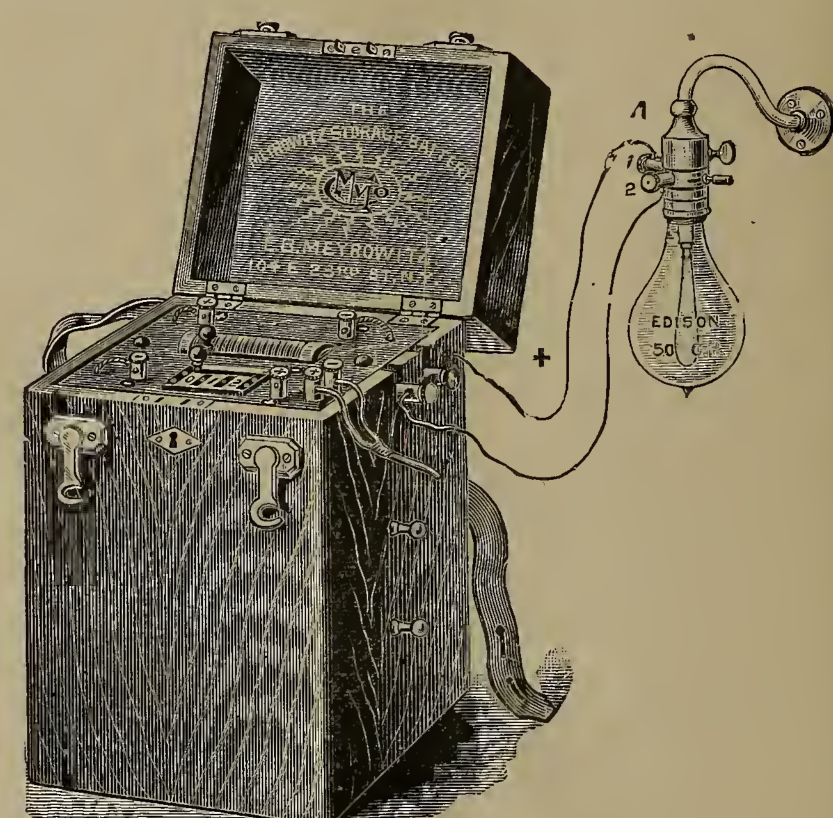


FIG. 2.—CHARGING STORAGE BATTERY FROM VETTER TAP.

The principal, and therefore the most important, electrical instrument on shipboard is the "search-light," which, as its name to some extent suggests, is used to detect the presence of an enemy.

One type of search light consists of an arc light of about 25.000 candle-power, contained in a metallic cylinder of about 35 inches long by 30 inches in diameter. One end of the cylinder is closed by a silvered, concave reflecting lens; and the carbon points of the lamp are placed in such a position within the cylinder as to bring them in the focus of the lens. The front end of the cylinder is fitted with a glass door through which the beam of light passes. The whole apparatus is mounted on a pivot, so that it may be revolved around the centre, and the beam of light be thrown in any desired direction. The rays can also be projected high or low; only one man is required to operate the instrument. In times of war ships at night would constantly sweep the surrounding waters with their search-lights, illuminating in succession every part of the circle around them, in order to detect the presence of the enemy.

So efficient is a search-light of today that with a 20,000 candle-power lamp no difficulty is experienced in lighting up objects at a distance of 2½ miles.

Another use made of this valuable instrument is in signalling messages where the distances over which they are to be sent are very great. The signalling is done according to a pre-arranged code, the signals being indicated by a combination of flashes at certain intervals and of stated durations.

In the manipulation of torpedo boats electricity has played and is playing a most important part. Other uses of electricity on shipboard are in cooking, lighting, heating, and calling, *i. e.*, electric bells, alarms, and annunciators.

The development of electricity is progressing so rapidly that no limit to its future naval applications can be defined But it is certain that the vessel of the future will be a huge example of the multifold usefulness of electricity.

In "the abominable art of annihilating mankind" electricity also occupies a conspicuous place. The electric chronograph is a device for measuring the velocity of a cannon ball, and consists of a wire stretched across the front of the muzzle of the gun, and at a short distance away from it, this wire forming a part of a complete electric circuit, which includes also an electric battery and an electro-magnet. When the gun is fired this wire is broken, the circuit interrupted and the armature of the magnet released at the instant the ball reaches the wire; a second wire is stretched across the path of the shot, at a point one hundred feet in front of the first one, with a similar arrangement of electric circuit, battery, and electro-magnet. The breaking of this second wire by the flying projectile releases the armature of the second magnet, and if the interval of time between the release of the two armatures can be determined, the velocity of the projectile can be calculated; therefore a recording apparatus, and certain attachments for making the necessary adjustments, etc., are connected with the instrument, thus making it a perfect recording apparatus for the velocity of a cannon-ball.

The telegraph plays an exceedingly important part in military operations. Dynamite, gun-cotton, gunpowder, or other explosives are fired by means of the electric spark with great ease and facility.

Of course the regular application of electricity, such as lighting, telephoning, etc., are widely used in the army.

Inventions and improvements are constantly made in the electrical apparatus of the army and the navy. Not a day passes but that something is done in this direction. But recently have we been startled by the announcement of the invention of an electrical mitrailleuse which will fire 25,000 bullets per minute.

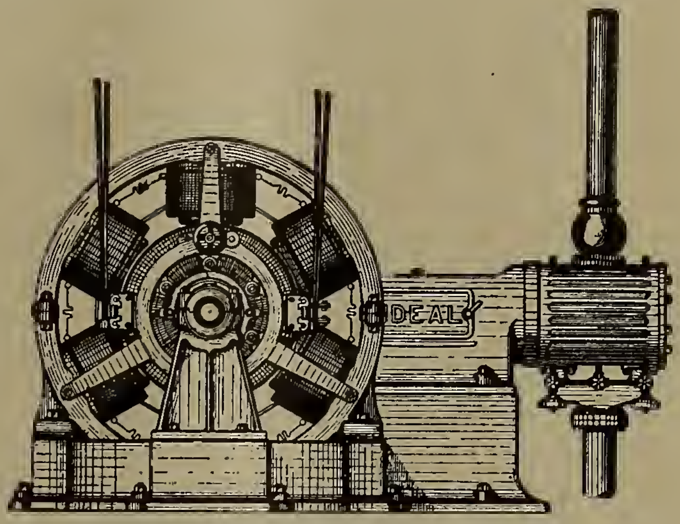
It is truly gratifying to electrical people to see what universal application our pet science and work is receiving, but I am sure that not few of us regret to see that the energy and thought of a man should be directed to the making of machines calculated to destroy life. We would much rather see electricity used for the convenience and aid of man; however, the time is not distant when electricity will be the king of peace and comfort, and war and its arts a history—a thing of the past.

THE NEW STEAMER "PRISCILLA."

The trial trip of the new Steamer "Priscilla," of the Fall River Line, was made on June 21, the invited guests including many electrical people. The "Priscilla" is a triumph of marine architecture and her fittings and decorations are exquisite. She is the largest steamer of her class in the world, and has accommodations for 1,500 passengers. A trip was made up the Hudson River as far as Spuyten Duyvil, thence to the Scotland Lightship, off Sandy Hook, and back home. An elegant lunch was served to the guests, and a fine orchestra entertained the party with music.

The electrical features of the "Priscilla" are worthy of special notice. The electric light plant is in the bow of the boat and is very complete and compact. It is in a well lighted and airy apartment, and its appearance shows that as much care has been bestowed upon this department of the boat's outfit as any other. There are three General Electric multipolar dynamos, each of 50-K. W. capacity, directly connected to "Ideal" engines. The light plant was contracted for by W. R. Fleming, of New York city, and installed by the General Electric Company. The engines and dynamos are arranged radially on the floor of the room, for economy of space, with the rears of the engines turned toward the centre. The switchboard forms a part of the general circle, and the plant is so compact that the engineer hardly needs to move to attend to any of the engines, dynamos or the switchboard, everything is so conveniently arranged.

The steamer is lighted by 1,900 incandescent lights, and the lighting fixtures are of the most elaborate description. In wiring the boat 45 miles of wire were used for the electric light alone. Sixteen miles of wire were used for the electric bell and automatic fire alarm installation. There are 384 electric call-bells, and 610 thermostats.



DYNAMO AND ENGINE ON "PRISCILLA."

The electric light fixtures and decorations in the main saloon are of the most superb character. The principal feature is in the form of an inverted dome, dependent from the ceiling and the mast, which is nearly central in the grand saloon. This dome is constructed of metal ribs or bars running from base to apex of the dome, these holding in place sections of opalescent glass, a material, by the way, which enters largely into the lighting system in every part of the boat. Within this dome are fifty electric lights; and running away from it forward and aft, conforming always with the general architectural design of which they are an element, are lines of opalescent pendants. The lighting of this saloon is, therefore, something magnificent; indeed, the profusion of thoroughly artistic work and effects on every hand in this part of the boat is something wonderful, and the results achieved merit more than a passing notice.

The elegant dining-room is lighted by a soft electric light entering through panels of stained glass around the sides of the room next to the ceiling; and along the ceiling itself are several lines of lights enclosed in rich opalescent shades, all diffusing a light of marvelous softness throughout the room.

The quarter-deck is lighted by clusters of incandescent lamps placed around the tops of the pillars, in the form of capitals, each cluster being surrounded by a shade made up of sections of opalescent glass, supported in a bronze frame of handsome design.

The electric lighting of the "Priscilla" is a triumph of the electric art, and is well worth going many miles to see.

The electroliers were supplied by the General Fixture Company, of New York, and the automatic fire-alarms and watchmen's clocks by the American Fire-Alarm Co., Boston.

The "Priscilla" is 440 feet 6 inches long, and has a registered tonnage of 5,398. Her engines are of 8,500 horse-power.

Among the electrical people aboard on her trial trip were W. R. Fleming, J. H Vail, and many others.

Mr. O. H. Taylor, the general passenger agent, and other officials of the company did their best to entertain their large party of guests, and it is needless to say that they succeeded beyond expression.

THE MANHATTAN ARC LAMP.

This lamp is now ready to be placed upon the market and is considered to be practically perfect. It has many new features that are radical departures from existing types of lamps; for this reason a full description of the lamp will be of interest. It is designed to present the following named advantages over existing lamps: 1. Fewness of working parts and decrease in cost of repairs. 2. Susceptibility of artistic design. 3. Economy in trimming and carbons. 4. An inclosed globe to act as a spark arrester and to prevent insects from collecting in the globe. 5. Where desirable a series arc lamp that would burn at a high potential and small current. 6. An arc lamp that will burn one in series on incandescent circuits. 7. A lamp that would generally be more regular in feed and positive in cutting out.

To embody these features in one lamp, a radical departure from the prevailing types of lamps was necessary and an inspection of the general appearance and detail construction will at once show a bold and thoroughly practical handling of the problem.

Only one form of construction satisfied all requirements and that was to have the mechanism concentric to the central stem-magnet, armature, clutch, mechanism, cut-out, device, globe and carbon holding-frame.

The main line circuit runs through a switch in the cap. To take down a lamp, it is only necessary to give it a quarter turn when it drops out of the cap, leaving the circuit to pass uninterrupted. The wires enter the cap through inclined insulated openings which exclude the weather.

Fig. 1 shows a general view of the Manhattan Lamp. Fig. 2 is a view of the skeleton of the lamp, the air-tight shell at centre being removed to show the feed mechanism. Fig. 3 shows all of the parts of the lamp.

In Figs. 2 and 3 A is the magnet, B the armature carrying the clutch pan C, and engaging through suitable slots in the armature the clutch rings D, which have radial play within the slotted tube K. In the upward travel of the armature B, the flaring pan C engages the clutch rings D against the inserted upper carbon, raising it to form the arc. J is a cast-iron box containing brushes for conveying current to the upper carbons. J^1 is a sectional view of the box and J^2 shows the box with cover removed and carbon inserted, showing gravity contact of the brush rings against the carbon surface. E is the negative terminal casting, having an embossed cut-out seat P. A cut-out ring N, held out of contact with seat P by an insulated spring O, is secured to the negative terminal casting E. The negative carbon frame F threads into the lower part of casting E. The slotted tube K passes through the opening in casting E, the brush box J being screw-threaded to the end of slotted tube K and insulated from casting E.

In Fig. 2 the brush box J is concealed from view by the carbon frame F; G is the negative carbon clamp suitably insulated from a dust pan H. which has yielding contact against the lower opening in air-tight globe. L is the upper carbon holder or sheath removable with the carbon. M is a resistance path to cut-out ring N. M^1 (part of same resistance coil) is a shunt on the main coil of magnet to regulate the length of arc.

The cut-out used on this lamp is said to be the most perfect ever devised. It is called into service only in cases of obstruction to the prompt descent of the upper

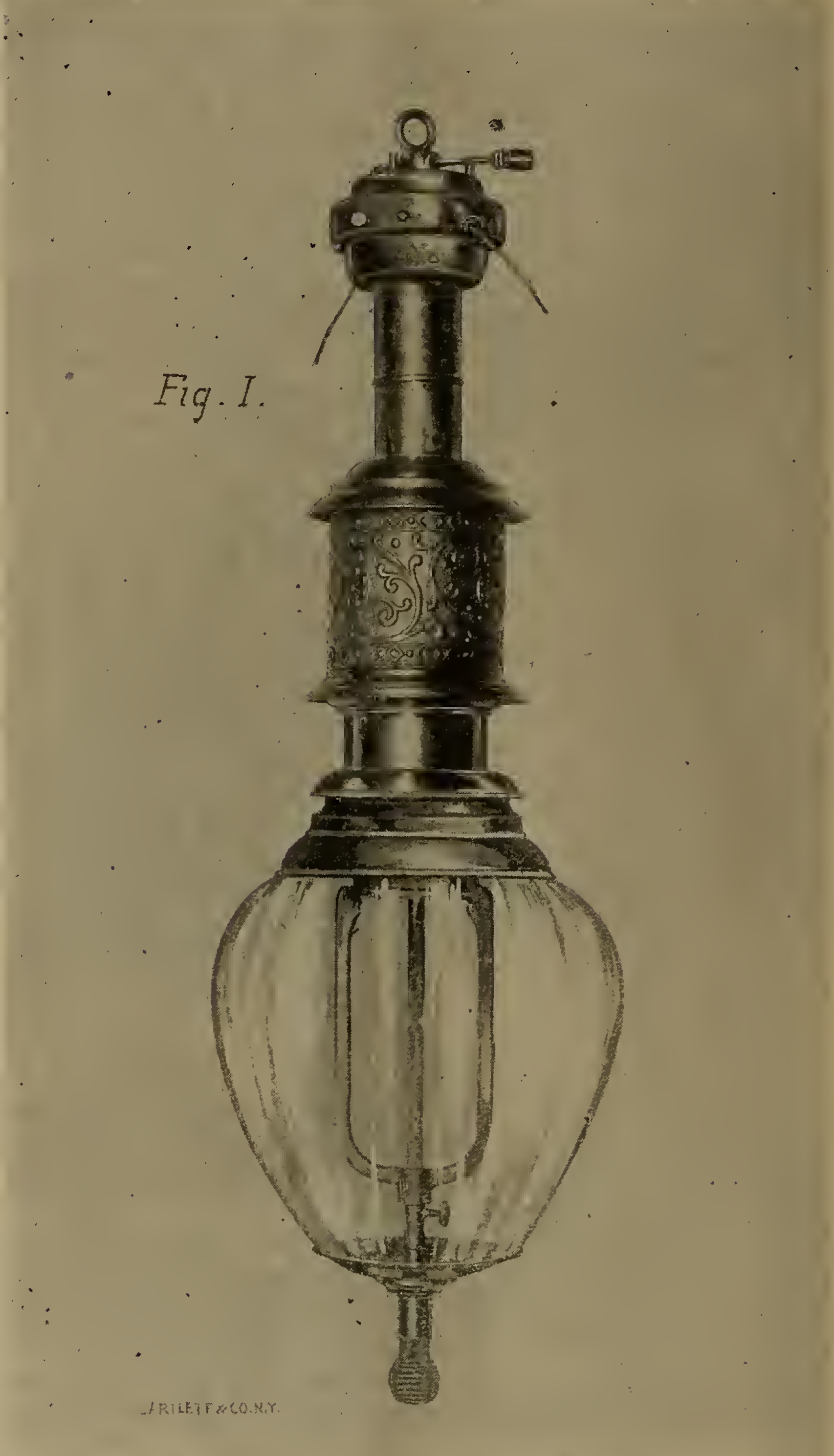


FIG. I.

carbon, which is a rare occurrence. In all other cases the cut-out is effected through the carbons themselves, after being consumed to the predetermined point.

To shorten the lamp the customary carbon rod has been dispensed with and a carbon sheath or holder, feeding through the clutch rings with the bare carbon, substituted, and though the diameter of the sheath is appreciably larger than the carbon carried, they both feed through the clutch rings without any variation in voltage. This is due to a cushioned clutch feed, which feature gives a smooth and imperceptible feed.

If preferred the carbon-holder or sheath may be dispensed with and the carbon fed direct. It may be thought desirable by some to use an 18 inch carbon, which will cut out when burned down to the proper point, say, within five inches of the end. This stub may then be used as a lower carbon for another run.

A very important feature of the lamp, covered by broad claims, is the enclosed globe. The globe is air-tight at all points except at the bottom, which is closed by the yielding-pan, H. This is said to be the only practicable method of preventing oxidation of carbons by closure that has yet been devised, as it makes practical the trimming and cleaning of globes without disturbing any air-tight bearings. The globe is cushioned in its upper portion on soft asbestos gaskets and there made air-tight. The lower part of the globe has a hand-hole large enough to conveniently permit of cleaning and trimming. This hand-hole is yieldingly closed by a detachable dust-pan.

tion of voltage in the arc, and copper-covered carbons, with their objectionable features, are unnecessary.

This lamp does not require a special grade of carbon, and it is found that ordinary carbons burned in this enclosed chamber will last about five times as long, and a better quality of cord carbons about six times as long, as the carbons burning in the open air.

The lamp illustrated in fig. 1 is designed to burn one week on half-night service without re-trimming or renewal of carbons. A similar lamp is made to burn about four nights on all night service, or will require trimming but twice a week.

In central station service, and particularly where lamps are distributed over considerable territory, the item of saving of labor in trimming will make the lamp particularly attractive commercially. The saving in cost of carbon and trimming, with such a lamp, will amount to

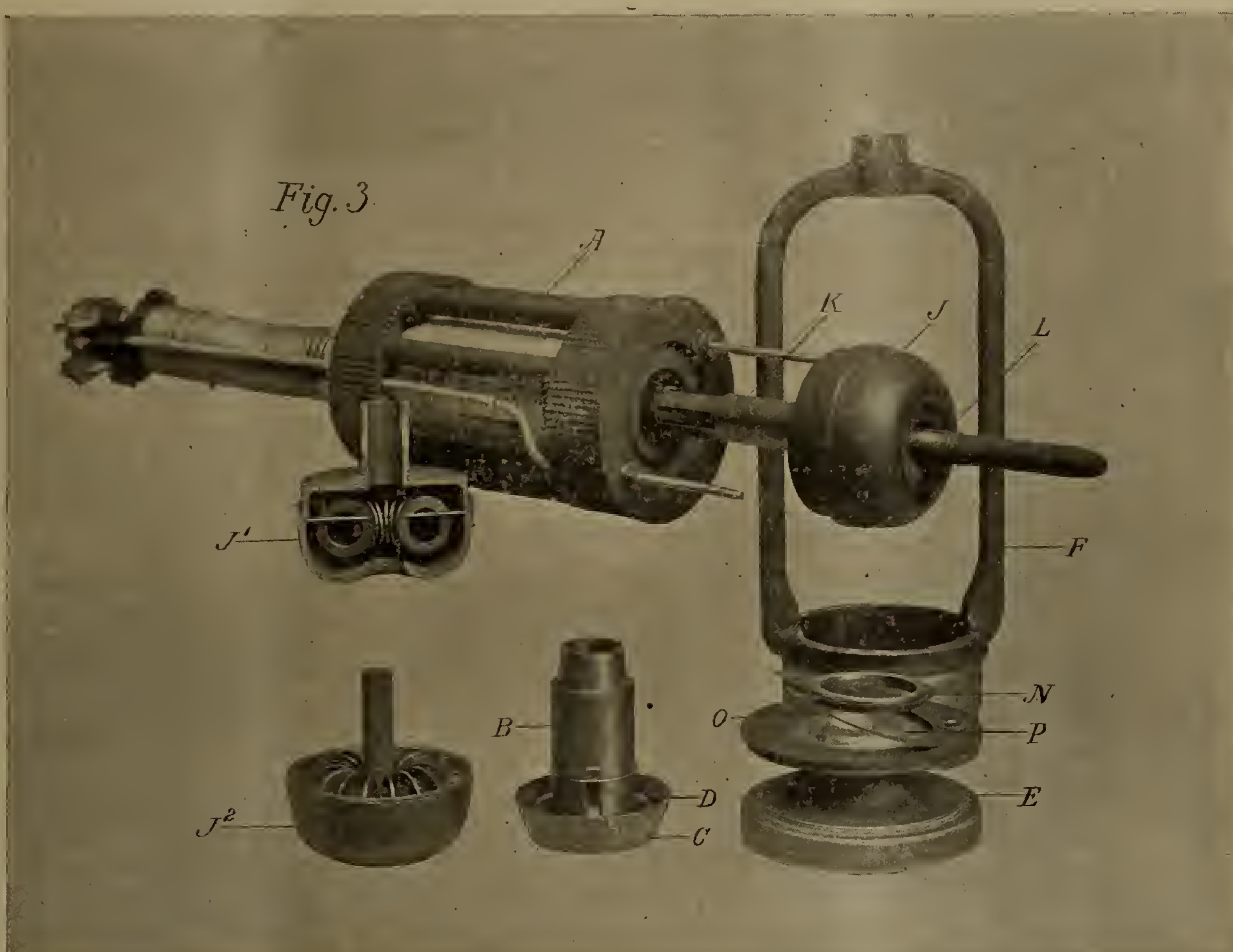


FIG. 3.

On the formation of an arc the enclosed air is heated and rarefied, the surplus air escaping through the lower vent. The contained oxygen is soon reduced by combustion with the carbon points to carbon monoxide, and this, with the remaining nitrogen, surrounds the arc and protects the points from further combustion.

The lower carbon is secured in a socket fixed to the yielding-pan. There are no set screws to adjust or carbon rods to keep clean.

The clutch rings grasp the carbon radially at the upper part and the brush rings centre it at the lower, thus insuring a perfectly vertical feed and preventing wedging of carbons.

The distance between the brush rings conveying current to the top carbon and the socket holding the lower is only about eight inches, and this small distance between the two carbons being constant, and the resistance remaining constant, there is introduced no varia-

about $10 to $12 a lamp a year, or in most cases a good return on the entire cost of an arc light plant. In a municipal plant this represents the saving of the interest charges on the entire issue of bonds necessary to construct the plant.

It has been found that in this inclosed chamber it is possible to successfully burn a longer arc than in the open air, and where desirable in series arc work a 2,000 candle-power lamp can be run at about 75 volts and six amperes.

The advantages claimed for this lamp are the great saving in trimming and the fact that ordinary carbons may be used, but aside from this, the mechanism is by far the simplest of any lamp that has been put on the market. The main features of this lamp were patented by Mr. William Janders, in 1887, who has since been working on the perfection of the mechanism.

These lamps will be sold exclusively by The Manhattan General Construction Co., No 50 Broadway, New York, and 753 Monadnock Building, Chicago, Ill., or their duly authorized agents.

TEST OF A CLOSED-COIL ARC DYNAMO.*

BY ROBERT B OWENS AND C. A. SKINNER.

. The immediate object of the present paper is to show something of the nature of the armature reactions which occur in arc light machines of the closed-coil type, maintaining constant current by automatically shifting the brushes to correspond with changes in load in the external circuit, and to point out certain alterations in design which it is believed may be adopted with advantage.

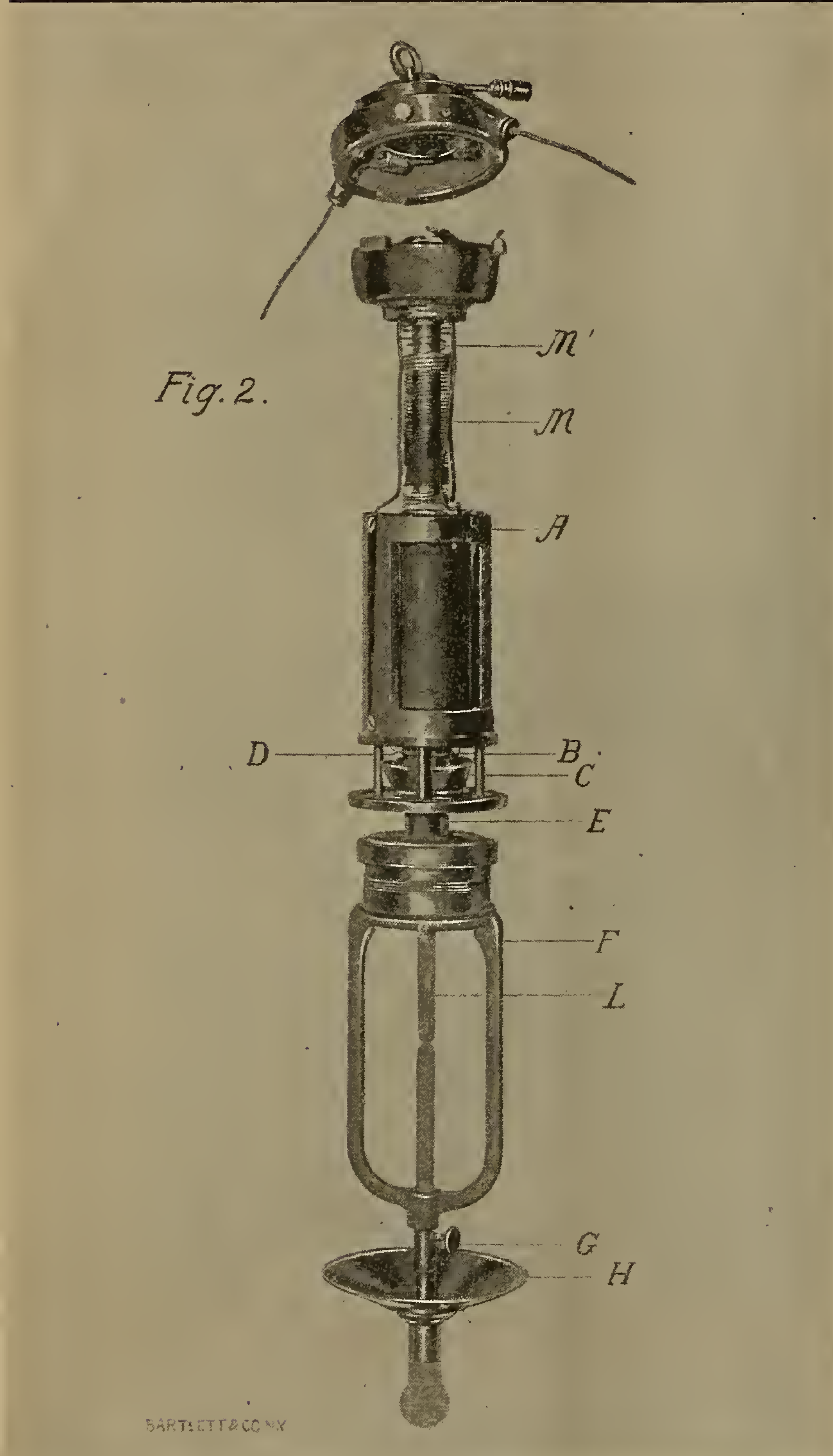


FIG. 2.

The machine on which the experiments were made is a No. 6 25-light 2,000 c. p. Wood arc dynamo. The dynamo was securely bolted to a firm foundation of masonry, and driven through a 7 in. belt by a small 8 in. x 10 in. high-speed automatic Atlas engine making 250 revolutions per minute. The automatic regulator of the dynamo was removed together with one pair of opposite collecting brushes and the remaining pair reduced one-half in width parallel to the commutator bars, to allow of easier manipulation of the exploring brushes, their angular width being of course adjusted for each load to prevent sparking.

Two water rheostats 4 foot x 1 foot x 1 foot, with carbon electrodes were used as load for the dynamo They were found to work quite satisfactorily; their resistance was not considerably less than when cold, but it changed so gradually that no trouble was experienced in correcting it by adjusting the electrodes.

The distribution of the induction entering the armature at different loads was obtained by taking the E. M. F. at various points on the commutator between two small pilot brushes moved around and in contact with it.

The exploring brushes as finally used were pieces of steel watch springs firmly held in small fibre holders. These, in turn, were rigidly secured by brass studs to a graduated sliding ring, moving within another stationary ring, attached to and insulated from the dynamo frame and carefully centred with the commutator.

Two brushes were used in each holder to better insure good contact. Copper, brass and phosphor bronze exploring brushes were tried at first but found as satisfactory as steel. It was also found very necessary at all times to keep the brushes and commutator as clean as possible.

The sliding ring was marked off into one hundred divisions, the number of commutator segments, and the exploring brushes made to cover just two commutator bars of one-fiftieth of the circumference, but the ring might have been divided into degrees if desired.

The electrical instruments used were a Weston 0.15 amperemeter for current measurements. A Weston 0.15 and 0.150 voltmeter for potentials between pilot brushes and a 0.150 and 0.1500 Weston voltmeter for total electromotive forces. All instruments were previously calibrated.

RESULTS OBTAINED.

Fifteen sets of readings, fifty readings per set, were taken around the commutator with currents in armature and field of 8, 10 and 12 amperes at positions of the collecting brushes approximately corresponding to loads of 5, 10, 15, 20 and 25 lights Three sets of readings were also taken with currents in the field of 8, 10 and 12 amperes and no current in the armature.

Briefly, we see that the total induction in armature varies very slightly with lead and the displacement of the neutral plane decreases with lead angle, but varies less than 10 degrees from no load to the maximum load used.

All electromotive forces on one side of the neutral plane are of the same sign but differ in sign from those on the opposite side.

On a developed diagram the electromotive forces between collecting brushes would be proportional to the difference between the whole area of curve on one side of the line of commutation and the area of the curve included in the angle of lead; the lead angle being defined as the angular advance of the collecting brushes from the neutral plane. Of course a machine of the design tested with extended pole tips requires an automatic widening of the brush with increased load or independent control of sparking, but it would seem that the waste field at all loads would be less and its weight efficiency greater, or cost for a given output less, than if its pole tips were cut away. Cutting away the pole tips, or at least not extending them, would have the advantage of allowing the use of collecting brushes of constant width within a certain range, but whether this advantage more than compensates for the decreased range of its output is open to question. Further experimental evidence is, however, needed in this regard.

Regarding the relative amounts of iron in field and

* Abstract of a paper read at the Eleventh General Meeting of the American Institute of Electrical Engineers, Philadelphia, May 16, 1894.

armature, we see no reason for the present practice for using so little iron in the armature, as compared with the field. The necessity of a very high field induction or a thoroughly stiff field is apparent; but why, when the lines are once generated by the field, it is not sought to collect and utilize them all by means of an armature with a generous amount of iron is not so easily seen. The number of commutator segments would of course have to be increased to prevent sparking, but the regulating qualities of the machine would, it is believed, be impaired. The result would be a larger output and greater efficiency.

Regarding the rates of ampere turns on armature and field, such ratio will depend largely on the shape of the pole-pieces and desired width of brush, but is in all cases much less than in constant potential machines.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

At the regular monthly meeting of Council held June 20, the following Associate Members were elected:

Wm. K. Archbold, Westinghouse Electric and Mfg. Co., 620 Atlantic avenue, Boston, Mass.

John B. Blood, Assistant Engineer, Railway Department General Electric Co., Schenectady, N. Y.

Edwin H. Bennett, Jr., Electrician and Engineer, Diehl & Co., Elizabeth, N. J., and 17 E. 33d street, Bayonne, N. J.

Geo. S. Bliss, Electrical Engineer, Central District and Printing Telegraph Co., Telephone Building, Pittsburgh, Pa.

Frank W. Brady, Post Graduate Student, and Laboratory Assistant, Purdue University, Lafayette, Ind.

Francis C. Caldwell, Assistant Professor of Electrical Engineering, Ohio State University, Columbus, Ohio.

C. C. Chesney, Electrician, Stanley Laboratory, Pittsfield, Mass.

Arthur Edwards Childs, *B. Sc. M. E. E. E.* Electrical Engineer, Westinghouse Electric and Mfg. Co., 302 Girard Building, Philadelphia, Pa.

John E. Criggal, Electrician, Davis Electrical Works, 143 Tenth street, Springfield, Mass.

A. L. Croxton, Electrical Engineer, Standard Electric Co., Midwinter Fair, San Francisco, Cal.

H. C. Eddy, Salesman, Western Electric Co., 227 So. Clinton street, Chicago, Ill.

Philip G. Gossler, Assistant Electrical Engineer, United Electric Light and Power Co., 107 Montague street, Brooklyn, N. Y.

Frederick L. Hutchinson, Westinghouse Electric and Mfg. Co., Newark, N. J.; 355 Morris avenue, Elizabeth, N. J.

Geo. H. Harris, Superintendent, Electric Car Shops, Birmingham, Ala.

Frank H. Knox, J. G. White & Co, 2116 N. Charles street, Baltimore, Md.

L. G. Lilley, Electrical Inspector, Underwriters' Association of Cincinnati, Wyoming, Ohio.

Herbert Lloyd, General Manager, Electrical Engineer and Chemist, The Electric Storage Battery Co., Drexel Building, Philadelphia, Pa.

James P. Malia, Electrician, Armour & Co., 5314 Union avenue, Chicago, Ill.

Jos. Carl Mayrhofer, Electrical Engineer, 165 West 82d street, New York city.

Maurice Oudin, Electrical Engineer, General Electric Co., Schenectady, N. Y.

Chas. Plumb, Proprietor and Electrician, The Charles Plumb Electrical Works, 89 Erie street, Buffalo, N. Y.

Albert Scheible, Secretary and Assistant, with George Cutter, 486 North Park avenue, Chicago, Ill.

Joel W. Stearns, Jr., Treasurer, Mountain Electric Co., Box 1545, Denver, Col.

Geo. Stephens, General Superintendent, Canadian General Electric Co., Ltd., Peterboro, Ont.

Paul A. N. Winand, Engineer and Superintendent, Schleicher, Schumm & Co., 3200 Arch street, Philadelphia, Pa.

The following associate members were transferred to full membership upon recommendation of the Board of Examiners:

George M. Mayer, 71 Randolph street, Chicago, Ill.

Franklin S. Holmes, Electrical Engineer, with C. H. Davis, 120 Broadway, N Y.

Hollon C. Spaulding, P. O. Box 454, Exeter, N. H.

Henry H. Wait, Assistant Electrical Engineer, Western Electric Co., Chicago, Ill

Ernest P. Warner, Electrical Engineer, Western Electric Co., Chicago, Ill.

H. Fleetwood Albright, Electrical Engineer, Western Electric Co., Chicago, Ill.

F. N. Waterman, Electrical Engineer, Westinghouse Electric and Manufacturing Co., 120 Broadway, New York city.

D. McFarlan Moore, Electrical Engineer, General Electric Co., 44 Broad street, New York city.

Caryl D. Haskins, General Electric Co., Boston, Mass.

Francis G. Daniell, Electrical Engineer, Fairhaven and Westville R. R. Co., New Haven, Conn.

Daniel W. Shea, Assistant Professor of Electrical Engineering and Physics, University of Illinois, Champaign, Ill.

Le Conte W. Stevens, Professor of Physics, Rensselaer Polytechnic Institute, Troy, N. Y.

Arthur Newhall Mansfield, Assistant Electrician, American Telephone and Telegraph Co, New York city.

Gano S. Dunn, Electrical Engineer of the Crocker-Wheeler Electric Co., Ampere E, Orange, N. J.

Charles Wirt, Consulting Engineer and Proprietor The Wirt Laboratory, 56 Fifth avenue, Chicago, Ill.

The next meeting of Council will be held September 19th; thirty applications for membership are now on hand for consideration on that date.

NEW YORK ELECTRICAL SOCIETY.

The New York Electrical Society held its 159th meeting in the Postal Telegraph-Cable Building on the evening of June 19, at which the following officers were elected for the ensuing year: President C. O. Mailloux; vice-presidents Dr. W. J. Morton, Dr. M. I. Pupin, Luther Steiringer, F A. Pickernell, W. S. Barstow, C. S. Bradley; secretary, Geo. H. Guy; treasurer, H. G. Sinclair. The Hon. Seth Low was elected honorary member of the society.

According to the treasurer's report the finances are in a healthy condition, there being $107 in the treasury, and the secretary's report showed a net increase for the season of 40 members—43 having been elected, and three struck off the rolls for non-payment of dues—and a total membership of 350.

An interesting feature of the meeting was the presentation of a number of electrical books as a testimonial to Mr. Joseph Wetzler, the retiring president. The books, which were presented on behalf of the members of the society by Dr. C. E. Emery, bore the inscription

"NEW YORK ELECTRICAL SOCIETY,
Presented to
JOSEPH WETZLER, ESQ
By the Members of the Society as a slight
recognition of faithful service on his part, for

seven years, in the capacities of Secretary, Vice-President and President. New York, June 19, 1894."

Mr. Wetzler thanked the members in a few appropriate words.

After the business of the meeting was finished the members on invitation of the Postal Telegraph-Cable Company inspected the new building from cellar to roof.

CORRESPONDENTS' COLUMN.

Correspondence from practical men upon topics of interest relating to electricity or kindred subjects, will find a place in this department; our readers are invited to avail themselves of this department when desirous of seeking or imparting information.

Names and addresses must accompany all letters. This is for our own information and not for publication.

The editor, while not holding himself responsible for the opinions expressed, will gladly put the letters in proper shape if necessary.

Address all communications for this column to the "Correspondence Editor," Electrical Age, *World Building, N. Y.*

(9) O. I. F. writes:—When I turn the plate of the Wimshurst influence electrical machine, I notice the very peculiar odor which arises. Is it injurious to inhale it? *A.* The odor you describe is due to "ozone," and is not especially injurious, but if inhaled continuously will produce a headache; curiously enough it often cures a headache.

(10) J. I. C. asks:—Is the trolley wires insulated or not? *A.* It is supported by insulators but has no insulating cover.

A NEW ELECTRIC CLUB FOR NEW YORK.

About forty members of the late New York Electric Club met at the Imperial Hotel, on the evening of June 21, and sat down to an elegant dinner. Among those present were R. B. Corey, C. D. Shain, E. E. Bartlett, F. R. Chinnock, E. G. Bernard, of Troy, N. Y.; F. Lozier, of the General Electric Co.; H. Ward Leonard, T. C. Martin, W. J. Johnston, J. H. Reese, of the General Electric Co.; C. E. Carpenter, E. F. Peck, F. W. Royce, C. O. Baker, Jr., H. L. Webb. Geo. F. Porter, H. J. Smith, B. F. Greene, P. H. Alexander, Geo. Cutter, S. L. Coles, J. W. Godfrey and others. It is not at all improbable that this meeting will be followed by others of a like character, and if sufficient support is given the movement it is likely that a new society will be evolved. Messrs. E. E. Bartlett, H. Laws Webb, Chas. D. Shain, T. C. Martin, P. H. Alexander, G. F. Porter and Major Everts were appointed a committee to consider the question of reorganization. That a society or club among the electrical fraternity of this city is a necessity is evident from these occasional manifestations of latent *esprit du corps*; all that is necessary is to have some one make a start, and the effort will be reinforced. The best way to hold the members together is to have them meet at dinner at regular intervals. Such meetings promote good feeling among the members and keep those interested in touch with things outside of their own particular field.

Most great inventions are the results of years of thought and experiment. The first telegraph message sent in this country was in 1844; yet Morse in 1832 conceived the idea of signaling at a distance by electricity.

OBITUARY.

C. I. HAGUE.

The numerous friends of Mr. Clinton Irving Hague of the New Haven Insulated Wire Co., will be distressed by the news of his accidental death on Whitney Lake, near New Haven, on Saturday, June 16. Mr. Hague's thirty-third birthday fell on that day. With his partner, Mr. W. H. Bean, he was out in a canoe, and in changing seats the boat was upset. Mr. Hague could not swim. The boat had drifted away, and with some effort, Mr. Bean, who is an expert swimmer, managed to carry Mr. Hague to the upset canoe. When Mr. Bean had recovered his breath and looked about, he found that Mr. Hague had loosened his grasp on the canoe, and had sunk, Mr. Bean then dived repeatedly, but was unable to recover the body. Boats in the vicinity came to his aid and Mr. Bean was taken out of the water in an exhausted condition. The body was not recovered until Wednesday forenoon.

The funeral was held at the house of his father, Mr. Benjamin Hague, in New Haven on the 21st inst., and was largely attended by many personal and business friends.

Mr Hague was well known to the electrical trade, and many persons who attended the Washington convention will call him to mind. Everyone who had the advantage of knowing this gentleman intimately will testify to his upright character, his electrical and mechanical accomplishments, his superior intellectual attainments, and all his intimate associates will grieve over the untimely end of the brightest and most faithful of friends.

Mr. Hague was a member of the New Haven Yacht Club, the New Haven Naval Reserve, and other local organizations, in which he was prominent, including musical societies.

Personal.—Mr. Edward Caldwell, editor of the *Street Railway Gazette*, has returned to New York, where he will remain permanently, the publication office of the *Gazette* having been transferred from Chicago to New York.

Mr. Ira W. Henry, well known in the electrical trade, and electrician for the Bishop Gutta Percha Company, was recently married to Miss Frances Scrivener in this city. Mr. W. W. Marks and Mr. Henry D. Reed, of the company, acted as best man and usher, respectively.

To Keep Their Coats Buttoned Up.—It is said that the Atlantic Railroad Company in Brooklyn has ordered its motormen and conductors to keep their coats buttoned up while on duty. As they are obliged to wear white shirts they are at a loss to see why such a rule should be made. There is a strong disposition among the men to ignore the order, and the matter will come up before the next meeting of the District Assembly.

Owing to increase of business the Electric-Heat Alarm Company, West First, between E & F streets, South Boston, Mass., has leased a factory for a term of years where they will have double the present room. The new factory will be occupied about the first of July. It will be equipped with all modern machinery, so that first-class work, at the lowest possible prices, will be turned out.

—"What part of a dynamo reminds you of a soldier chewing tobacco?" asked our witty electrician. "Give it up."

"Why, the armature (army chewer)," and he skipped.

The word "strain" is frequently used in referring to certain electrical phenomena. What does it mean? Any change of form whatever is called a strain.

AN OLD TIMER.

The friends of Walter K. Freeman, of 136 Liberty street, New York city, the consulting electrical engineer, are availing themselves of his excellent services to such an extent that he has found it necessary to extend his quarters. He has enlarged his office, drafting and designing departments about three times the original size in order to meet the requirements, and will be glad to meet all old friends at the above address, fourth floor, front. He occupies the handsome suit of offices on the north-west corner of the Electrical Exchange. In his experience in the electrical business, for the past fifteen years, his work stands today as a monument to his skilful workmanship. It includes over 300 electric light plants, using from 500 to 4,000 16-C. P. lamps. Mr. Freeman's time has been principally devoted to incandescent lighting, and he has produced generators of his own invention and design with a capacity of over 3,000 16-C. P. lamps. For seven years he was with the U. S. Electric Light Co., who controlled his inventions for incandescent lamps, and other electrical devices. He invented and designed all the apparatus made and sold by the National Electric Mfg. Co., Eau Claire, Wis., and the Fort Wayne Electric Co. is operating under his inventions, relating to the transformer system. At the present time Mr. Freeman is devoting his time as consulting electrical engineer for electric plants of all dimensions, also designing and preparing for building special electric light machinery. Some time ago we noted the sale of two 200-K. W. special generators of Mr. Freeman's design for the Gold Bluff Mining Co., of Downieville, Cal. This company has contracted for additional apparatus to the extent of an 85-K. W. generator, two 35-H. P. hoists and pumps, air compressors and ventilating system for its mines. When this plant is installed it will operate the stamp mills, elevators and crushers, and will be the first mining plant entirely operated by electricity.

FINANCIAL.

The Central and South American Telegraph Company has declared its usual quarterly cash dividend of 1¾ per cent., payable July 2, and the Mexican Telegraph Company its usual quarterly dividend of 2½ per cent , payable July 8.

The Westinghouse Electric and Manufacturing Company has declared its usual quarterly dividend of 1¾ per cent. on the preferred shares.

The Edison Electric Illuminating Co., of New York, on June 22, declared a quarterly dividend of 1½ per cent., payable August 1, next.

It is reported that the General Electric Co. is considering the advisability of selling the controlling interests in a number of local electric companies throughout the country.

The United States Rubber Co. has declared a semi-annual dividend of four dollars per share on preferred stock, payable July 14.

NEW YORK NOTES.

OFFICE OF THE ELECTRICAL AGE,
FIRST FLOOR, WORLD BUILDING,
NEW YORK, JUNE 25, 1894.

Doubleday, Mitchell & Co., 136 Liberty street, agents for canvas jacket flexible conduit, are receiving an unusual number of orders for this conduit, and have within the past couple of weeks sold nearly 200,000 feet of it. They are also selling the New Haven motors, with ½ inch fans, quick break switches for switchboards, Hart snap switches of all sizes, from 5 to 75 amperes, and Hart flush switches.

W. K. Freeman, the consulting engineer of 136 Liberty street, will open an office on July 1, in the Exchange Building, 50 State street, Boston.

Geo. L. Colgate Company, third floor, 136 Liberty street, is having a large demand for its Wagner direct and alternating fan motors. They claim that the wind created by these motors will stop the fans of other makes, when the two machines are set face to face, and this is done with each machine taking the same amount of current. The Wagner fan motors are said to be very efficient and made to last.

The Railroad Commissioners heard the application of the Metropolitan Street Railway Co. and the Broadway and Seventh Avenue Railway Co., last week, for permission to build a cable road from Broadway and Seventy-third street to Lexington avenue, and thence to Thirty-sixth street. In presenting the petition Counsellor Robinson said he had secured the consent of 50 per cent. of the property owners, of the Board of Aldermen, and of the existing street railroads on Twenty-third street. There was no opposition to the petition and the commision will reserve decision for a week. This concession if granted will give the Metropolitan Traction Company a continuous line of cable from South Ferry to the Harlem River.

If you want to dispel this oppressive heat from your house or place of business write to A. H. Ryder & Co., 180 Broadway, New York, who will furnish you with one of the best fan motors in the market. The Diehl electric ceiling fans are handled by this house. They are extensively used and very efficient. The firm carries in stock a large assortment of fans, and does general repairing.

Julius T. Dudley & Co., the well-known dealers in rolling stock, equipment and supplies for steam, electric, horse and cable railroads, have taken larger quarters in the Electrical Exchange, 136 Liberty street, city, in order to better handle their growing business. They have received some large orders recently, and they are kept very busy. This firm also does a large business in buying, selling and exchanging new and second-hand equipment.

Mr. Wm. A. Vail has sold out his business at 136 Liberty street and has joined forces with the American Telegraph & Telephone Company, better known as the Long Distance Company. Mr. Vail is an old telephone man. During his long and successful career in the general electrical supply trade he has largely extended his circle of friends, all of whom wish him every success in his new, or rather *old* field.

Bateman & Miller, authorized by the Edison Electric Light Co., contractors for electric light wiring and construction, 143½ East 23d street, are completing their contract on the new annex to the Buckingham Hotel, 49th street and 5th avenue. The annex is 100 x 40 feet and twelve stories high, with basement and cellar. They secured this contract, over many other bids, for wiring 800 lamps; also put up a system of electric calls, annunciators and speaking-tubes. They are using the brass armored interior conduit for all lamp and bell work, Hart switches for circuit wiring, and Ajax switches for main line. Habirshaw Standard Core Insulated Wire and Cables are used throughout the work, of which there are eighteen miles. The annunciators and bells were made by the Western Electric Co. They have lately completed the contract requiring an installation of 600 incandescent lamps, on the Edison system, for the Jackson Architectural Iron Works, 28th street, New York. W. T. H.

HE WANTED PLAIN ENGLISH.

An agent of one of our large, enterprising, electrical corporations called on a would-be customer who wanted a plant of about 2,500 16-c. p. lamps. "Well," said the agent, "we can give you one of our 150 kilo-watt generators for——"

"Hold up!" said the customer, "we have no desire to do any killing about our place. What I want to know is the price of a dynamo that will furnish light for 2,500 lamps, and if you will kindly give it to me in plain, United States, every-day language, I will talk business with you; no 'kill or whats' around here, understand?"

"Well, I would like to explain"——

"You will be sick, not well, if you persist in kill-a-whats."

"I have got to uphold the dignity of my profession," pleaded the agent, "and"——

"Dignity be blowed," howled the customer, "so did Lil., of the Sandwich Islands, until she found out that Uncle Sam's rights were paramount. My rights to plain English facts are paramount. Kill-a-whats be——!"

Our enterprising agent stepped off the "dignity of his profession" and sold the customer what he wanted.

Variable Incandescent Light. — A German firm, in Berlin, has patented an incandescent lamp with three filaments. The filaments are of different candle-powers, viz.: 5, 10 and 20, and by using them separately, or in combination, any degree of illumination can be obtained. A switching apparatus is contained in the socket.

POSSIBLE CONTRACTS.

The Westinghouse Electric Co., of Pittsburgh, will erect 150 dwellings for their employees, at Brinton, Pa.

Address City Clerk, Springfield, Mass., concerning proposed erection of $80,000 electric light plant.

The Town Clerk of Cuba Village, N. Y., can give information concerning contemplated electric light plant.

The Vicksburg Electric Transit and Light Co , Vicksburg, Miss., will erect an electric light plant.

Address Hon. F. C. Latrobe, mayor of Baltimore, Md., concerning electric lighting contract for a period of five years.

Address H. J. Witte, St. Bernard, Ohio, concerning contemplated electric light plant.

Address R. L. Moye, Cuthbert, Pa., concerning proposed electric light plant.

The City Clerk, Paris, Tenn., can give information concerning proposed electric light plant to cost $40,000.

George A. Stuck, Rome, Ga., and others have been granted a franchise to construct and operate a telephone system.

Address J. M. Burrows, Hawkinsville, Ga., concerning an electric light plant to be established.

The Mayor of Front Royal, Va., can give information concerning $8,000 electric light plant to be established by the city.

The Schuyler Electric Co., Hagerstown, Md., is endeavoring to secure a franchise to build an electric railway.

The Chattanooga Cotton Oil Co., Chattanooga, Tenn., is in the market for an electric light plant. Address E. G. Richmond for particulars.

The Orleans Street Railway Co., New Orleans, La., is about to employ an expert engineer to make surveys and estimates for the changing of its motive power to electricity.

The Citizens' Electric Light and Power Co., Pensacola, Fla., T. E. Welles, president, is in the market for entire outfit for electric light plant.

The St. Louis and Kirkwood Electric Railway Co., St. Louis, Mo., has obtained a franchise to construct an electric road. Address J. D. Housman for information.

The Clayton and Creve Coeur Electric Railway Co., Clayton, Mo., obtained a franchise to construct an electric road. Address Philip Deuser, the president of the company.

The Joplin Electric Railway and Motor Co., Joplin, Mo., will extend its lines to Vienna.

The American Telephone Co., Pittsburgh, Pa., has purchased a lot on the corner of Park street and Frankstown avenue, and will erect a three story building for a telephone exchange.

Senator Pfeffer's bill for the establishment of an electrical experiment station, appropriating $100,000 thereto, has been reported favorably from the committee on agriculture, in the United States Senate.

NEW CORPORATIONS.

The Bi-Metallic Electric Transmission Co., Plainfield, N. J.; capital stock, $100,000.

The Mutual Telephone Co., Wichita, Kan., by G. W. Dixon and others; capital stock, $100,000.

The Columbia Motor Co., Chicago, Ill., by Walter E. Sparks and others; capital stock, $1,000,000.

The Diamond Electric Co., Peoria, Ill., by J. H. Francis and others; capital stock, $60,000.

The Bradford Electric Railway Co., Bradford, Pa., by Louis Emery, Jr. and others; capital stock, $100,000.

The Carroll County Electric Light and Power Co., Westminster, Md., by F. D. Nutter and others; capital stock, $5,000.

The Louisiana Auxiliary Fire-Alarm Co., Limited, New Orleans, La., to manufacture electrical apparatus, etc.; capital stock, $100,000.

The New Orleans Construction Co , New Orleans, La., to do electrical and other construction; capital stock, $50,000.

The Little Rock Telephone Co., Little Rock, Ark.; capital stock, $25,000

The Berkeley Electric Lighting Co., Berkeley, Cal.; capital stock, $100,000.

The San Francisco Ground Electric Co., San Francisco, Cal., to deal in patents relating to electrical inventions; capital stock, $1,000,000.

The Connecticut Electrical Co., New Haven, Conn., to maintain telephones, electric light and power lines, etc.; capital stock, $10,000.

The Economic Electric Engine Co., Chicago, Ill., to manufacture electric motors and engines; capital stock, $100,000.

The Terre Haute Electric Railway Co., Terre Haute, Ind.; capital stock, $500,000.

The Michigan Harrison Telephone Construction Co., Grand Rapids, Mich.; capital stock, $50,000.

The North Jersey Street Railway Co., Newark, N. J.; capital stock, $5,000,000.

The Ohio Harrison Telephone Construction Co., Norwalk, Ohio; capital stock, $20,000.

The Roxborough, Chestnut Hill and Norristown Traction Co., Philadelphia, Pa.; capital stock, $5,000.

The Philadelphia and Trenton Street Railway Co., Philadelphia, Pa ; capital stock, $150,000.

The Bradford Electric Street Railway Co., Bradford, Pa.; capital stock, $100,000.

The Electric Fire-Proofing Co., New York, N. Y., by E. A. Bradley and others ; capital stock, $150,000.

The Infinity Manufacturing Co., New York, N. Y., by J. L. Solomon, D. B. Hart and J. J. Hart, to manufacture electric dry batteries and other electrical apparatus ; capital stock, $4,000.

The Electric Medical Association, of Wheeling, West Va.; capital stock, $5,000.

The Columbia Motor Co., Chicago, Ill , by W. E. Sparks and others ; capital stock, $1,000,000.

TRADE NOTES.

The Higham Electric Company, No. 164 High street, Boston, has leased a large factory and will manufacture arc lamps for incandescent circuits. Mr. Higham, of the company, states that his lamp will beat all competitors.

The United States Head-Light Company, of Utica, N. Y., has purchased the machinery, tools, patents, etc., of the head-light business of various concerns throughout the country, including thirty-two letters-patent and a number of applications for patents, covering head-lights and improvements.

There has been great difficulty experienced in obtaining a battery suitable for running the Edison Phonograph, but the Mason Perfected Phonograph Battery, which has stood the test for eight years and found considerable favor with its purchasers, seems just suited for this work. The battery can be quickly replenished at any time and place, can be recharged in less than five minutes, and will not exhaust itself without giving sufficient warning. This battery is extremely suitable for all kinds of light power work, such as operating phonographs, graphophones, sewing machine motors, electric pianos, ventilating fans, dental lathes, and many other useful purposes, where a constant, reliable and economical battery is desired. The maker of this excellent battery is James H. Mason, Mason's Electric Exchange, 943 Fulton street, Brooklyn, N. Y., who has just issued a descriptive circular of his goods.

The Consolidated Car Heating Company, of Albany, N. Y., has adopted the Pope system of car lighting, and has acquired the ownership for, and sole right of introducing the system into the United States. The illuminant is compressed oil gas, and is said to be superior to the Pintsch light, or any other kind of light now in use. This system is very extensively used by the English railways, and those desiring to investigate its merits, with a view to purchasing, are guaranteed against any damages for infringement, provided the Consolidated Company is allowed the exclusive right of defense. The Pope apparatus is interchangeable with that of the Pintsch system.

The Clonbrock Boiler Works, of Brooklyn, N. Y., has just closed a contract to supply the Cleveland General Electric Company, of Cleveland, O., with Climax boilers, aggregating 4,000 H. P.

Electrical and Street Railway Patents.

Issued June 19, 1894.

521,455. Electric Railway-Signal. Charles R. Alsop, Middletown, Conn., assignor to Lucy C. Alsop, same place. Filed Oct. 12, 1893.

521,477. Safety Appliance for Street-Railway Cars. Oswald R. Routh, Jersey City, N. J. Filed Dec. 16, 1893.

521,500. Cable Street-Railway. Fred Hoch, Wauwatosa, Wis. Filed Oct. 27, 1893.

521,514. Telephone-Switch. Alfred Stromberg and Andrew Carlson, Chicago, Ill. Filed Jan. 26, 1894.

521,550. Printing-Telegraph. Edwin Pope, Quebec, Canada. Filed June 20, 1890.

521,553. Electric Railway-Signal. Barney Samuels, St. Joseph, Mo. Filed July 26, 1893.

521,562. Conduit Electric Railway. Thomas Armat, Washington, D. C. Filed Mar. 28, 1893.

521,587. Car-Wheel. Louis J. Hirt, Somerville, Mass. Filed Dec. 21, 1893.

521,602. Trolley-Pole Catcher. Owen G. Cates, Jr., St. Louis, Mo. Filed Mar. 12, 1894.

521,651. Electric-Railway-Car Motor. John C. Henry, Westfield, N. J. Filed Aug. 25, 1892.

521,666. Alternating-Current Regulator. Olof Offrell, Middletown, Conn., assignor to the Schuyler Electric Company, of Connecticut. Filed Dec. 12, 1892.

521,669. Coupling for Electric Locomotives. Edward D. Priest, Lynn, assignor to the General Electric Company, Boston, Mass. Filed June 21, 1893.

521,670. Safety Car-Fender. Freidrich H. Reich, Baltimore, Md. Filed Dec. 4, 1893.

521,671. Armature for Dynamo-Electric Machines. Edwin W. Rice, Jr., Schenectady, N. Y., assignor to the General Electric Company, of New York. Filed Apr. 19, 1894.

521,684. Meter for Recording Measurements of Electric Power. Elihu Thomson, Swampscott, assignor to the General Electric Company, Boston, Mass. Filed Jan. 31, 1894.

521,685. Electric Meter. Elihu Thomson, Swampscott, Mass., assignor to the General Electric Company, of New York. Original application filed Feb. 21, 1894. Divided and this application filed Apr. 14, 1894.

521,709. Car-Truck. Samson Fox, Harrogate, England, assignor to the Fox Solid Pressed Steel Company, Chicago, Ill. Filed Mar. 6, 1889. Patented in England July 30, 1888, No. 11,017; in France, July 9, 1889, No. 199,490; in Belgium, July 10, 1889, No. 86,924; in Italy, Dec. 31, 1889, No. 60; in Spain, Feb. 1, 1890, No. 10,151; and in Austria-Hungary, Apr. 22, 1890, No. 53,984.

521,711. Supply System for Electric Railways. Thomas Harris, Detroit, Mich. Filed Apr. 28, 1893.

521,721. Electric Lamp for Bicycles. George Mayr, Brooklyn, assignor of one-half to Elkin Farmer, New York, N. Y. Filed Nov. 7, 1893.

521,741. Car-Fender. James Tobin, Indianapolis, Ind. Filed Dec. 28, 1893.

INDEX TO ADVERTISERS.

DIRECTORY FOR BUYERS.

Advertisements for 4 lines or less under this head $20 per year, additional lines at proportionate rates.

National Electric Light and Street Railway Associations.

NATIONAL ELECTRIC LIGHT ASSOCIATION.

President, M. J. Francisco; First Vice-President, C. H. Wilmerding; Second Vice-President, Frederic Nichols; Secretary, Geo. F. Porter, 136 Liberty street, New York City; Executive Committee, Chas. R. Huntley, A. J. Markel, W. W. Carnes.

AMERICAN STREET RAILWAY ASSOCIATION.

Next meeting, Atlanta, Ga., October, 17, 18 and 19, 1894

President, Henry C. Payne, Milwaukee, Wis.; First Vice-President, W. J. Stevenson, Washington, D. C.; Second Vice-President, James R. Chapman, Grand Rapids, Mich.; Third Vice-President, Lewis Perrine, Jr., Trenton, N. J.; Secretary and Treasurer, Wm. J. Richardson, Brooklyn, N. Y.; Executive Committee, The President, Vice-Presidents, and D. F. Longstreet, Denver, Col.; Thomas H. McLean, Indianapolis, Ind.; Edward Whittaker, St. Louis, Mo.; W. Y. Soper, Ottawa, Can.; and E. S. Goodrich, Hartford, Conn.

NEW YORK STATE STREET RAILWAY ASSOCIATION.

Next meeting, Syracuse, N. Y., third Tuesday in September, 1894.

President, Daniel B. Hasbrouck, New York City; First Vice-President, G. Tracy Rogers, Binghamton, N. Y.; Second Vice-President, James H. Moffitt, Syracuse, N. Y.; Secretary and Treasurer, William J. Richardson, Brooklyn, N. Y.; Executive Committee, John N. Beckley, Rochester; Daniel F. Lewis, Brooklyn; Chas. Cleminshaw, Troy.

OHIO STATE TRAMWAY ASSOCIATION.

Next meeting, Cincinnati, O., fourth Wednesday in September, 1894.

President, Albion E. Lang, Toledo; Vice-President, W. J. Kelly, Columbus; Secretary and Treasurer, J. B. Hanna, Cleveland; Chairman Executive Committee, W. A. Lynch, Canton.

MASSACHUSETTS STATE STREET RAILWAY ASSOCIATION.

President, J. H. Cunningham, Boston; Secretary and Treasurer, A. E. Butler, Lawrence; Executive Committee, Samuel Winslow, Alfred A. Glazier, Boston; P. F. Sullivan, Lowell; E. C. Foster, Revere; Horace B. Rogers, Brockton; A. E. Smith, Springfield; Prentiss Cummings, Boston.

THE STREET RAILWAY ASSOCIATION OF THE STATE OF NEW JERSEY.

President, Thos. C. Barr, Newark; Vice-President, W. S. Scull, Camden; Secretary and Treasurer, Charles Y. Bamford, Trenton; Executive Committee, Officers and C. B. Thurston, Jersey City; H. Romaine, Paterson; S. B. Dod, Hoboken.

PENNSYLVANIA STATE STREET RAILWAY ASSOCIATION.

Next meeting, Reading, first Wednesday in September, 1894.

President, H. R. Rhoads, Williamsport; First Vice-President, R. L. Jones, Secretary, S. P. Light, Lebanon; Treasurer, W. H. Lanius, York.

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Next regular meeting first Wednesday in February, 1894.

President, W. R. Wood, Portland; Secretary and Treasurer, E. A. Newman Portland; Executive Committee, W. R. Wood, Portland; George E. Macomber, Augusta; F. M. Laughton, Bangor; Frank W. Dana, Lewiston; Amos F. Gerald, Fairfield.

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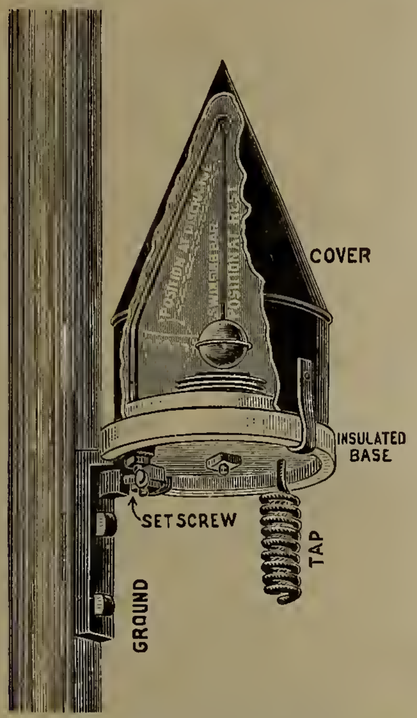

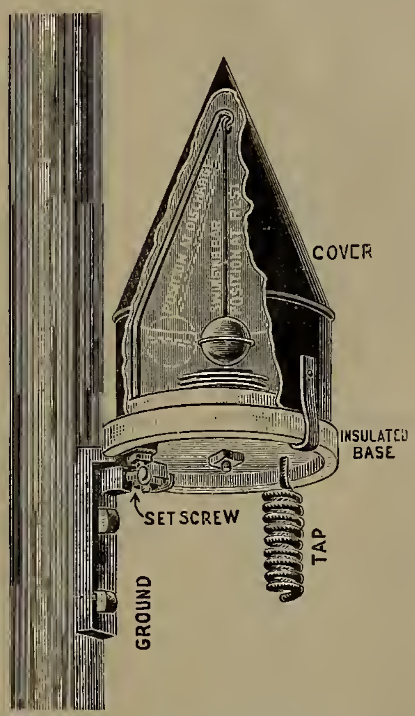

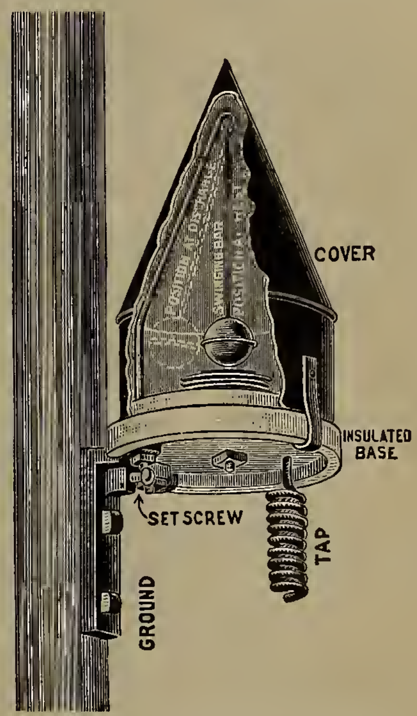

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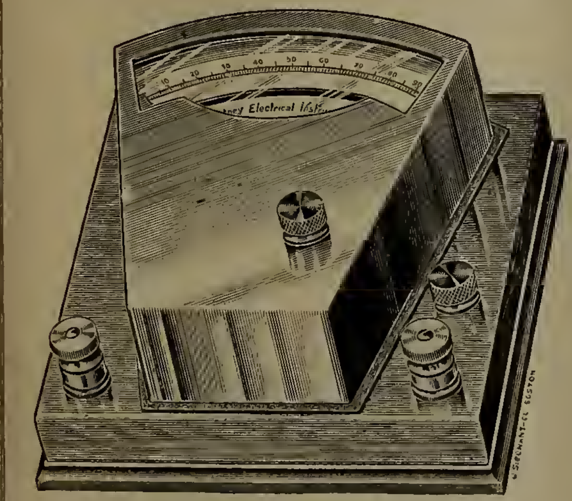

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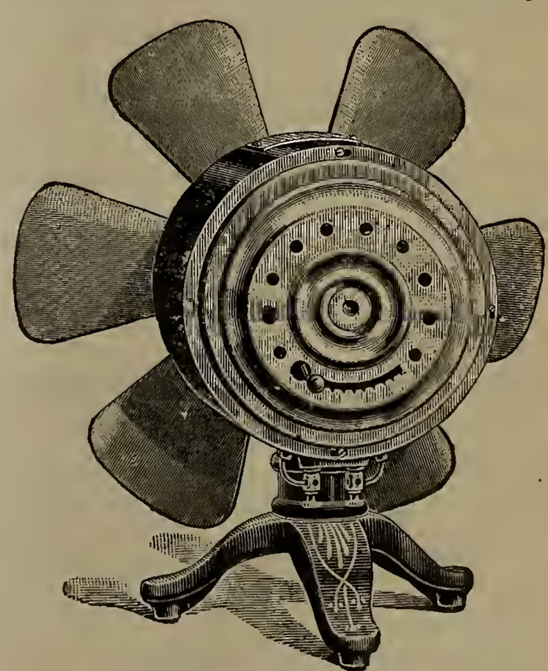

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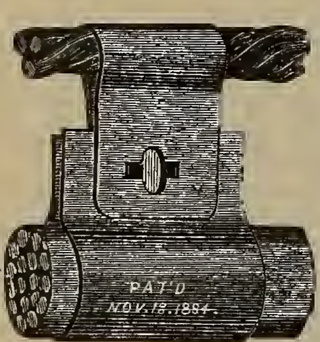

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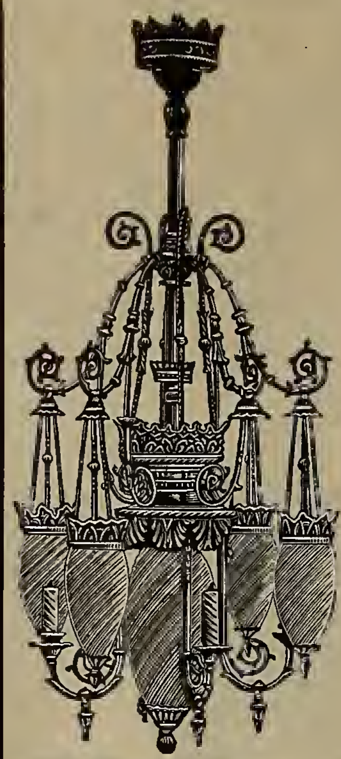

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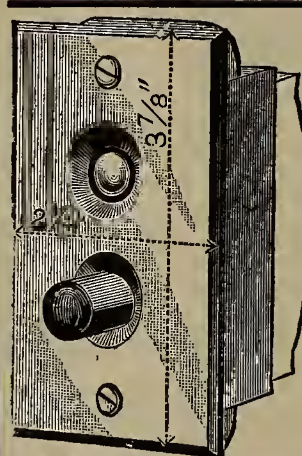

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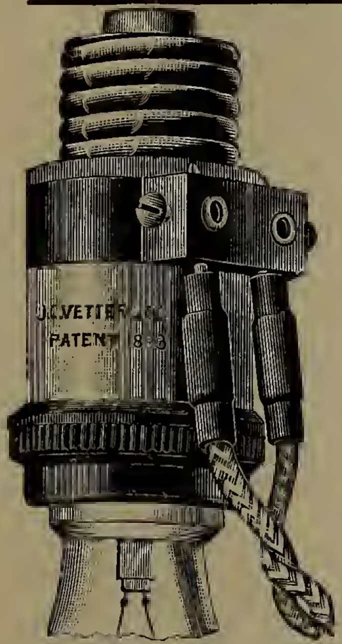

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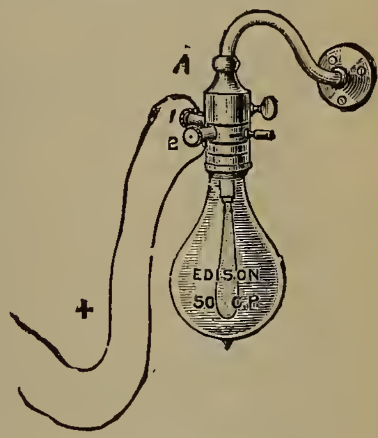

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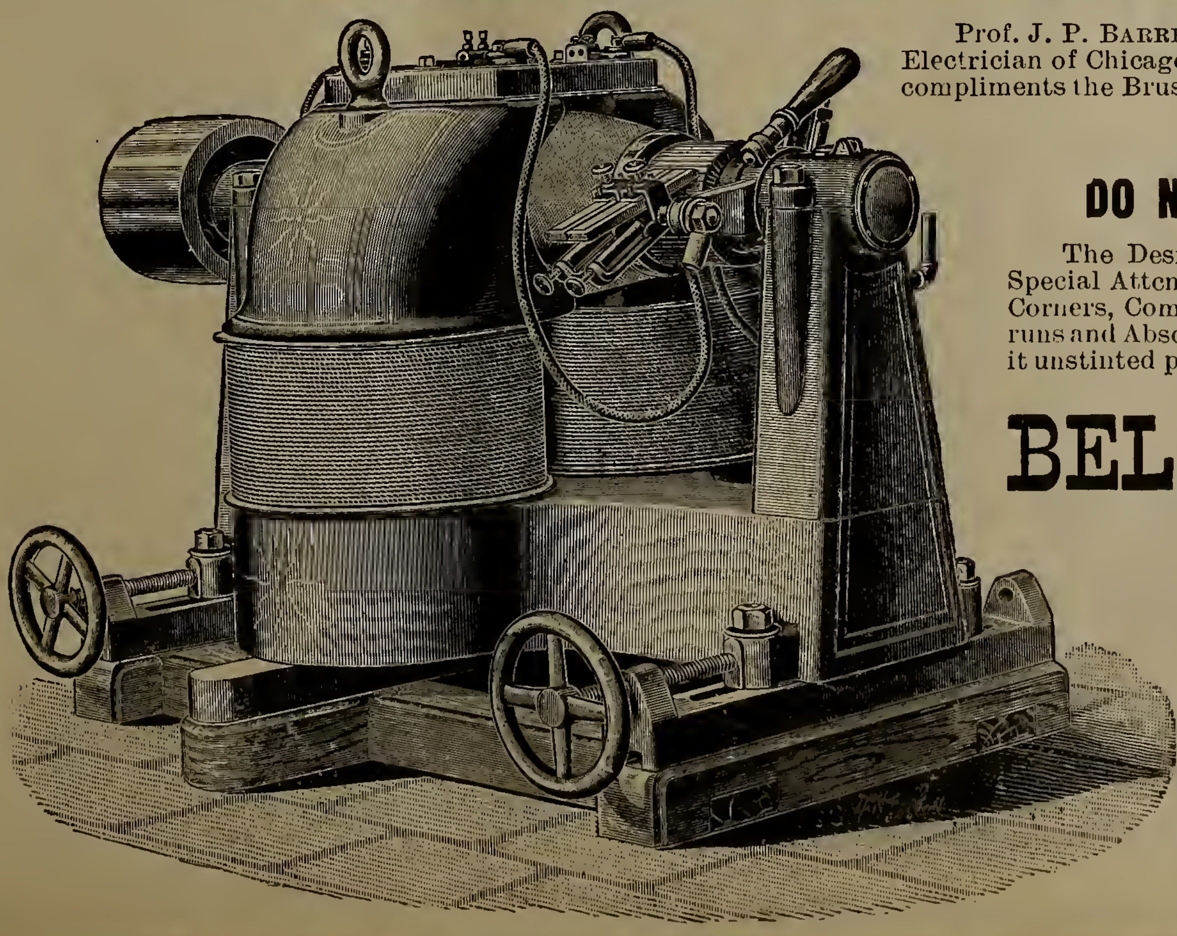

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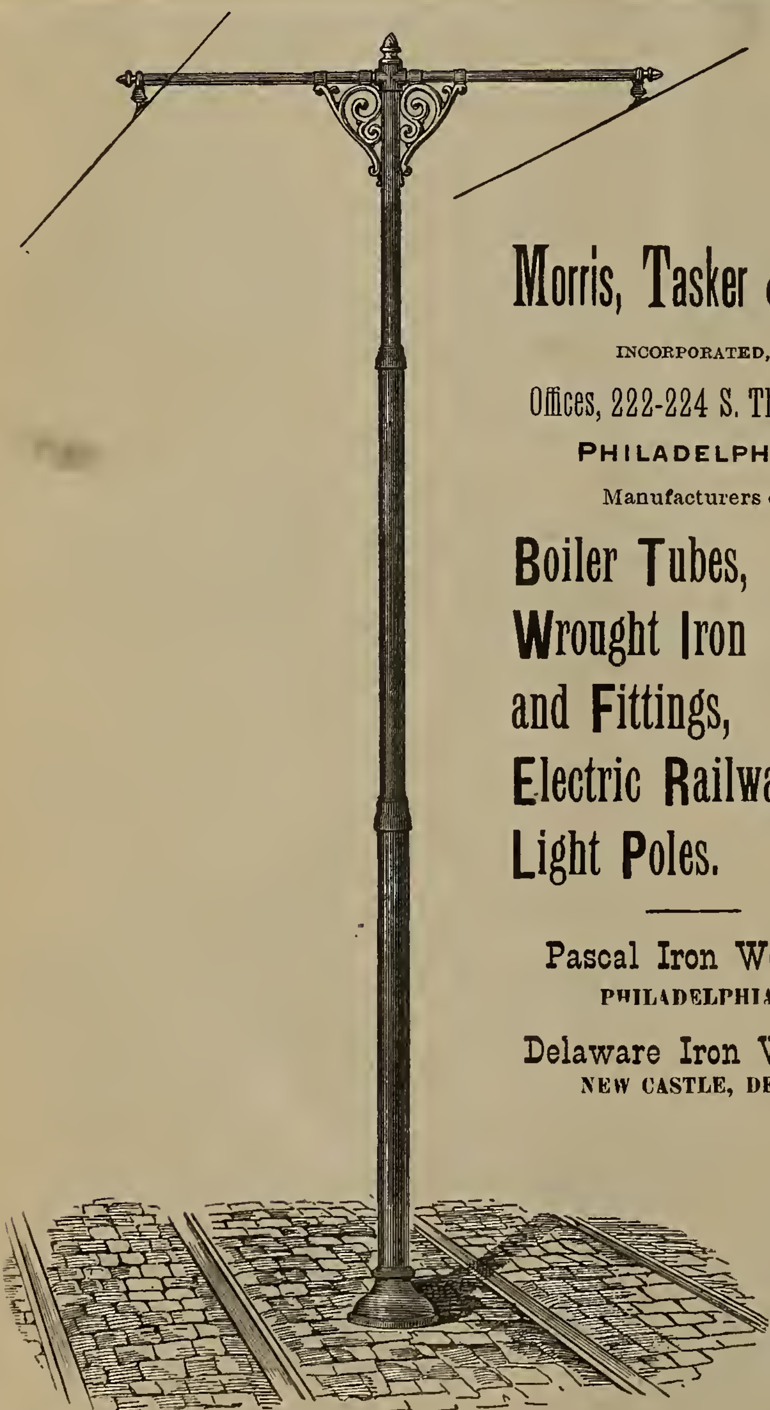

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