

THE ELECTRIC AGE.

DEVOTED TO TELEGRAPHY, TELEPHONE, ELECTRIC LIGHTING AND ALL PHASES OF ELECTRICAL DEVELOPMENT.

VOL. VII—No. 9.

NEW YORK, OCTOBER 1, 1889.

} \$1.50 per annum.
} Single Copies 10 cents.

J. H. BUNNELL & CO.

106 and 108 Liberty St.,
—New York.—

Telegraph ≡
≡ **Instruments,**
BATTERIES, BELLS
AND ELECTRICAL
SUPPLIES.

The Largest Stock and best variety
of main line and short line instruments in
any American establishment.



New "No. 2" Improved Mechanical Telegraph
Instrument. (For Practice.)

Combined Key and Giant Sounder (without magnets—no battery required.) Works exactly like the very best Sounder and Key Combination Set, giving loud, clear sound, with slightest force on movement of Key. All made in first-class instrument composition. Brass, same pattern as best Giant Sounders. Price sent by mail, prepaid, with alphabet cards, etc. \$1.50. Complete Illustrated Telegraph Instruction Book sent free to any address.

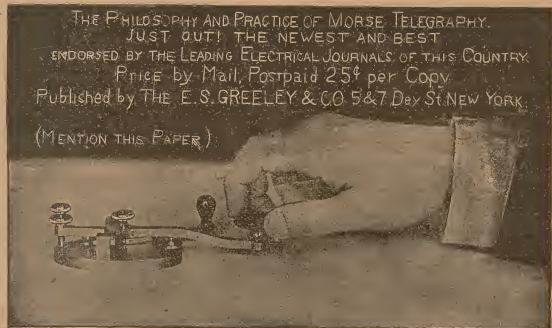
SEND FOR OUR
LATEST ILLUSTRATED PRICE LIST
AND CATALOGUE.

No. 10 OF MARCH, 1889.

containing over four hundred cuts of
Telegraph Instruments, Batteries and
Electrical Appliances, FREE; also
Manual of Telegraphy FREE to any
Address.

J. H. BUNNELL & CO.,
106 and 108 Liberty St., New York.

HALF PRICE TO OPERATORS.



THE PHILOSOPHY AND PRACTICE OF MORSE TELEGRAPHY.
JUST OUT! THE NEWEST AND BEST
ENDORSED BY THE LEADING ELECTRICAL JOURNALS OF THIS COUNTRY.
Price by Mail, Postpaid 25¢ per Copy
Published by THE E. S. GREELEY & CO. 5 & 7 DEY ST. NEW YORK.

(MENTION THIS PAPER.)

SPECIAL NOTICE.—To any TELEGRAPH OPERATOR in the UNITED STATES or CANADA, sending us his Office Address or other satisfactory evidence of his profession, together with twelve cents in postage stamps or otherwise, we will forward by mail, postpaid, a copy of the above book, entitled *The Philosophy and Practice of Morse Telegraphy*, just issued.

WHAT THE ELECTRICAL PRESS SAY:

"An excellent little work
"A rational and practical guide for the young telegrapher, intended to make him acquainted early in his career with a few underlying facts and laws that usually, without specific study, only come to his knowledge after years of service and practical observation."—*The Electrical World*, March 24, 1888.
The truth (referring to the true position of the telegrapher's hand in the act of "sending") exposed by a lightning wink of the instantaneous camera, and permanently fixed for our deliberate inspection by the science of photography, dawns upon the craft intellect accompanied with something of the amazement that startled the artistic world when the elaborate anatomical studies by Ross Bonheur of the Horse in the act of running were delivered over to universal ridicule by the subtleties of the same agent, instantaneous photography.—*The Electrical Review*, March 24, 1888.

The following diagram from *The Philosophy and Practice of Morse Telegraphy* gives an intimation of its scope.

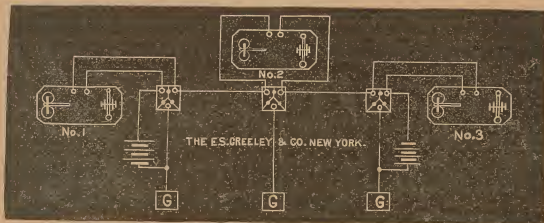


DIAGRAM No. 19.

Diagram No. 19, showing three Home Instruments or other shortline combination sets, connected up on a grounded circuit with Excelsior Lightning Arresters at three distinct offices. The Switch Pin in this case, when instruments are in use, must be kept in the "dead hole," which is the hole in the center of the middle plate.

THE E. S. GREELEY & CO.,
5 and 7 DEY STREET, NEW YORK.

MANUFACTURERS AND IMPORTERS OF, DEALERS IN and HEADQUARTERS FOR
*Telegraph, Telephone, Electric Light, District, Burglar Alarm, Electric
Bell, Experimental and General Electrical Supplies.*

SOLE MANUFACTURERS OF THE VICTOR TELEGRAPH INSTRUMENTS

Electrical Business Directory.

ANSONIA BRASS & COPPER CO.,
Wires, New York and Chicago.

BOGART, A. M. L., MANUFACTURER
of Electric Gas Lighting Supplies,
22 Union Square, N. Y.

BROOKFIELD, W., MANUFACTURER
of Screw Glass Insulators and Battery
Jars, 83 Fulton St., N. Y.

BUNNELL, J. H. & CO., ELECTRICAL
Supplies, 106 and 108 Liberty St., N. Y.

CARY AND MOEN CO., SPRINGS,
234 W 29 St., N. Y.

COLBURN, I. W. & CO., DYNAMOS,
130 Main St., Fitchburg, Mass.

DAY'S KERITE, WIRES AND CABLES,
16 Dey St., N. Y.

EDISON MACHINE WORKS, WIRES
&c. 19 Dey St., N. Y.

ELECTRICAL ACCUMULATOR CO.,
stored electricity, 44 B'way, N. Y.

GREELEY THE E. S. AND CO. ELEC-
trical Supplies, 57 Dey Street, N. Y.

DR. GASSNER'S DRY BATTERY. THE
Best open circuit battery in the mar-
ket. A. Schorling, Sole Agent and Man-
ufacturer, No. 111 Chambers St., N. Y.

HEISLER ELECTRIC CO., ELECTRIC
Lighting,
809 to 817 So., 7th St., St. Louis, Mo.

LAMARCHE'S SONS, H., 83 JOHN ST.,
New York. Zincs, Finest quality Zinc,
Annuator, Office, Magnet and Electric
Wire of all kinds.

LECLANCHE BATTERY CO., BATTER-
ies, 149 W. 18th St., N. Y.

LYMAN, A. B. KEYS AND SOUNDERS,
34 and 36 So., Water St., Cleveland, O.

LAW TELEPHONE CO., BATTERIES,
113 Liberty St., N. Y.

MOORE BROS., ELECTRICAL SUP-
plies, 108 Liberty St., N. Y.

MAVER, WM., ELECTRICAL EXPERT,
81 Nassau St., New York.

MARSHALL, WM., MANUFACTURER,
ELECTRIC CONDENSERS,
Standards a Specialty,
Room 2 & 4, University B'g, N. Y.

OKONITE CO., WIRES AND CABLES,
18 Park Row, N. Y.

PATRICK AND CARTER, ELECTRICAL
Supplies,
114 So. 2nd St., Philadelphia.

STANDARD UNDERGROUND CABLE
CO., Cables, Pittsburg, Chicago and
New York.

SABINE, J. B., ELECTRICAL PA-
tents, 181 B'way, New York.

SPON, E. and F. N. ELECTRICAL
Books, 12 Cortlandt St., N. Y.

SHAVER CORPORATION ACOUSTIC
Telephones, 78 Cortlandt St., N. Y.

VAN NOSTRAND, D. CO., ELECTRICAL
Books,
23 Murray St. & 27 Warren St., N. Y.

LEGS AND ARMS WITH RUBBER FEET AND HANDS.

MARKS' PATENTS.—Over 9,000 in actual use throughout the civilized world. The use of rubber hands and feet on artificial limbs simplifies the construction so that limbs can be worn for many years without requiring repairs. Men engaged in every conceivable occupation operate on rubber feet or use rubber hands to great advantage.

ITHACA, TOMPKINS CO., N. Y.
Mr. A. A. MARKS: Jan. 15, 1888. }
DEAR SIR:—Rubber feet are wonders of the world. I have challenged every maker in the world to produce me a man that has a pair of artificial feet to walk with me. I can walk a mile in thirteen minutes and not hurry myself any. I do not take a back seat for any unprofessional with two good natural feet in a one mile walk. I have the pleasure of announcing that my record in walking professionally is unbroken in the world by any one with artificial legs.

THOS. CLEARY.

By a copyright formula furnished by us on request, applicants can supply us with all the data necessary to secure fit and satisfactory results while they remain at home. One-half the legs and arms furnished by us are made from measurements and produce without seeing the wearer. This new method is a great convenience for those living at a distance. Fit always guaranteed.

A treatise of 400 pages, with 250 illustrations and nearly a thousand endorsements and testimonials, sent to those needing artificial legs or arms who will give a description of their case. The same will be sent to physicians and surgeons free of charge. Address,

A. A. MARKS,
701 Broadway, New York.



The highest awards received at every exhibition. Indorsed by the U. S. Government, and commissioned by the Surgeon-General of the U. S. Army to supply limbs to the pensioners of the U. S.

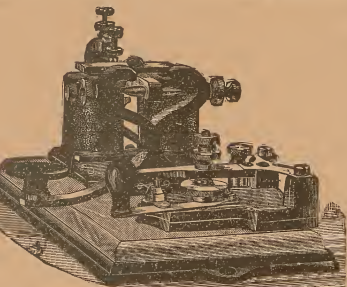
LIBERAL DISCOUNT TO DEALERS, SEND FOR REDUCED PRICE LIST.

No. 2 O. K. OUTFIT,

WITH SOUNDER AND KEY

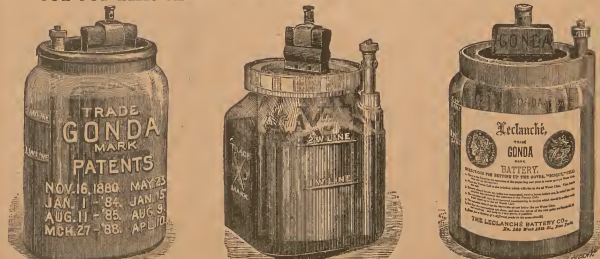
On same base, or separate, as ordered.

Complete Outfit, - - -	\$3.75
Sounder, - - - - -	2.25
Key, - - - - -	1.00
Sounder and Key on one	
Base, - - - - -	3.25



The above Outfit consists of a beautiful Sounder wound to 20 ohms, and one of my unrivaled Nickel Plated, Legless, Steel Lever Keys; One Cell 6x7 Battery (or 6x8 Battery, 10c. extra); 15 ft. Insulated Office Wire, 1 lb. Vitriol, 1 Instruction Book, all safely packed and will be shipped on receipt of price, or sent C. O. D., subject to inspection, if you send me \$1.00 with order. State whether you wish Key and Sounder on same Base or separate. Write your address plain and full, also state by what Express Co. wish goods shipped. Address, **A. B. LYMAN, 34 and 36 South Water Street, CLEVELAND, OHIO.**

Do Not Be Deceived.
CUT OUT THIS CARD AND KEEP IT AS A GUIDE WHEN BUYING.



"GONDA" BATTERY COMPLETE. "AXO" BATTERY COMPLETE with jar adapted for Sealing. GENUINE "GONDA" POROUS CUP" BATTERY COMPLETE.

THESE ALONE ARE THE GENUINE BATTERIES.
The Leclanche Battery Co. 149 W., 18th St., N. Y.

J. H. BUNNELL & CO'S
STEEL LEVER SOLID TRUNNION KEYS.



PRICE,
1.75

Over 73,000 now in use.
THE ONLY PERFECT KEY.

J. H. BUNNELL'S PATENT,
Feb. 15th, 1881.



Legless Pattern Steel Lever Key.

Telegraphers cannot fail to have noticed that upon the introduction of the BUNNELL STEEL LEVER KEY over eight years since, it at once achieved a vast popularity, such as never before attached to any speciality in Telegraph Instruments, and that this popularity has continually increased, and is still increasing.

It will also be noticed by Telegraphers, that since the STEEL LEVER KEY was introduced, a brood of "improved" keys has been hatched and put forward from various sources from time to time each one made to look as much like the STEEL LEVER KEY as possible, or made with some kind of a "steel lever," or "patent lever," and in every case claiming all the merits possible and impossible that language could describe. Most of these "improved keys" have become exterminated by the force of their own worthlessness. Years of practical test in the use of THOUSANDS of BUNNELL STEEL LEVER KEYS throughout America demonstrates their perfection and popularity. BE NOT DECEIVED BY THE ABSURD IMITATIONS.

THE BUNNELL STEEL LEVER KEY is more durable, and in every respect better than any other for rapid and perfect sending for the following reasons:

The Lever is only one-half the weight of the ordinary brass lever as generally made.

The entire Lever and Trunnions together being made of but one piece of fine wrought steel, the common defect of loose trunnions is avoided, the strength of a heavy brass lever is obtained with much less weight of metal, and, by the perfect bearing which the solid trunnion gives, together with the use of hardened platinum points, sticking is absolutely prevented.

The size and proportions are such as to make it the most perfect operating key possible to obtain, either for the hand of the skilled and rapid expert, or the beginner.

Price, \$1.75. Finely Finished, and Lever Nickel Plated.

Steel Lever Keys sent by mail, post-paid to any part of the United States or Canada on receipt of price, by Registered Letter or Money Order.

SEND FOR OUR NEW CATALOGUE No. 10 of MARCH, 1889.

J. H. BUNNELL & CO., 106 and 108 LIBERTY STREET, NEW YORK.

—THE—
SHAVER MULTIPLEX TELEPHONE.

Capacity for private lines 2 miles.

TRUNK LINES comprising a number of Telephones upon one circuit, and EXCHANGES for short lines switching direct one station with another. The only mechanical phone which works during rain and wind storms.

AGENTS WANTED.

THE SHAVER CORPORATION,
78 CORTLANDT ST. NEW YORK.

ELECTRICAL

J. B. SABINE,
COUNSELOR AT LAW,
181 BROADWAY,
NEW YORK.
—
SPECIALTY
ELECTRICAL PATENTS.

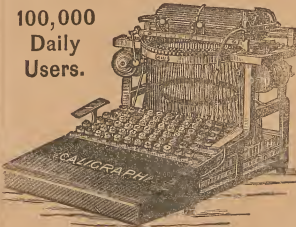
PATENTS

CALIGRAPH

GREATEST SPEED ON RECORD!!

T. W. Osborne wrote 179 words in one single minute on the CALIGRAPH, the Champion Machine of the World.

100,000
Daily
Users.

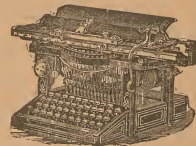


G. A. McBride wrote 129 words in a single minute, *Blindfolded*, thus in each case proving the falsity of many of the statements of our competitors.

For full and correct account of above test, address
THE AMERICAN WRITING MACHINE CO.,
HARTFORD, CONN.

BRANCH OFFICES:—237 Broadway, N. Y.;
14 W. 4th Street, Cincinnati, O.; 1003 Arch
Street, Philadelphia.

Remington



Standard Typewriter

HAS BEEN FOR

FIFTEEN YEARS

THE STANDARD,

AND

Embraces the Latest and Highest Achievements of Inventive Skill.

WYCKOFF, SEAMANS & BENEDICT,
327 BROADWAY, NEW YORK.

THE ELECTRIC AGE.

PAILLARD NON-MAGNETIC WATCHES,

Are especially adapted for the uses of electricians and all workers among electrical appliances.

ADJUSTED TO TEMPERATURE, ACCURATE FOR TIME, AND ABSOLUTELY UNAFFECTED BY MAGNETISM.

ENDORSED BY ELIHU THOMSON, N. S. POSSONS, EDWIN J. HOUSTON, AND SCORES OF OTHER LEADING ELECTRICIANS.

These Watches are cased in a superior manner and cost no more than other makes in equal grades.

FOR SALE BY ALL JEWELERS.

**NON-MAGNETIC WATCH CO. OF AMERICA,
177 AND 179 BROADWAY, NEW YORK.**

J. T. GILLILAND, GENERAL MANAGER.

CHAS. P. BRUCH, SECRETARY.

NEW YORK

THE BABCOCK & WILCOX CO.

VALUABLE BOOK ON

STEAM

THE BABCOCK & WILCOX CO.
80 CORTLANDT ST. N.Y.

BY HOPE ST
GLASGOW, SCOTLAND.

THE BABCOCK & WILCOX COMPANY.
NEW YORK AND GLASGOW.

FREE ON APPLICATION

WATER TUBE STEAM BOILERS

BRANCH OFFICES

BOSTON, MASS.
8 OLIVER ST.

PHILADELPHIA, PA.
32 N. 5TH ST.

CHICAGO, ILL.
45 S. JEFFERSON ST.

NEW ORLEANS, LA. 57 CARONDELET ST.

SAN FRANCISCO, CAL.
561 MISSION ST.

LONDON, ENG. 114 NEWGATE ST.

MANCHESTER, ENG. 2 VICTORIA BUILDING

(PARIS, FRANCE)
20 BOULEVARD VOLTAIRE

HAVANA, CUBA
116 CALE DE LA HABANA

MELBOURNE, AUSTRALIA

GLASGOW

STYLUS

AGATE, STEEL, BONE, PORCELAIN AND GUTTA PERCHA

MOUNTED ON

EBONY, PEARL AND CEDAR HANDLES.

A GREAT VARIETY.

SEND TO THE MANUFACTURERS FOR PRICE LIST.

Rogers Manifold and Carbon Paper Co., 75 Maiden Lane, N. Y.

HEADQUARTERS FOR

Manifold Books, Carbon Paper, T. W. Ribbons, &c.

SEE CUT OF STYLUS PAGE 10, AUGUST 1, 1890.

CARBON PAPERS,

SUPERIOR QUALITIES FOR USE WITH

TYPE WRITER AND STYLUS.

J. UNDERWOOD & CO.,

30 VESEY ST., NEW YORK.

163 La Salle St., Chicago.

10 Johnston St., Toronto, Ont.

72 Page Illustrated Catalogue of
RUBBER STAMPS

Steel Stamps, Stencils, Seals, &c.

Sent Free on Application by Postal to

S. W. REESE & CO,

29 CHURCH ST., NEW YORK

FOUNTAIN AND STYLO PENS.

Fountain Pens, \$1.50 and upwards



The FOUNTAIN PEN consists of a highly finished hard rubber holder, fitted with superior 14-kt. GOLD PEN to suit any writer.

"INDEPENDENT" STYLOGRAPHIC PEN. PRICE, \$1.00 AND UPWARD. EVERY PEN WARRANTED SIMPLEST AND CHEAPEST. Writes as smoothly as a Lead Pencil and is ALWAYS READY FOR USE.

J. UNDERWOOD & CO., 106 and 108 Liberty st., New York.

ELECTRICAL BOOKS.

SEND FOR
AND
CATALOGUE.

D. VAN NOSTRAND CO.,
23 MURRAY ST., 27 WARREN ST., NEW YORK.

THE ELECTRIC AGE.

Published on the 1st and 16th of Every Month.
BY THE ELECTRIC AGE PUBLISHING CO.

ENTERED AS SECOND-CLASS MAIL MATTER.

REGISTERED CABLE ADDRESS, "ELECTAGE," NEW YORK.

TERMS OF SUBSCRIPTION:

One Copy, one year, - - - - -	\$1.50
One Copy, six months, - - - - -	.75
Great Britain and other Countries, - - - - -	2.00

Subscribers should promptly notify us of any change in their addresses, giving the old as well as the new one, that they may receive all the papers they pay for.

ADVERTISING RATES: \$2.00 PER INCH.

Reading Notices, 25 cents per line.

Four Line "Want" Notices, 50 cents each.

J. B. TALVALL, Editor.

R. J. GRAY, Manager, Advertising Department.

No. 5 Dey Street, New York.

H. I. JOLLEY, Agent, 195 Broadway, New York.

W. J. ANDERSON, Agent, 7 Wellington Street, East, Toronto, Ont.

J. J. SEITZ, Agent, G. N. W. Tel. Co., Hamilton, Ont.

C. S. LOEWENTHAL, Room 28, 130 E. Madison St., Chicago.

F. B. BEACH, 292 Porter Street, Detroit, Mich.

NEW YORK, OCTOBER 1, 1889.

CURIOS SOURCES OF POWER.

The curious source of power for some of the dynamos of the lighting plant connected with the Ponce de Leon Hotel, at St. Augustine, Fla., is an artesian well, the water of which drives the dynamo. That installation, however, does not stand alone, being equalled, if not exceeded in its remarkable character by the installation of the Yankton Electric Company, of Yankton, Dakota. The source of power there is a flowing well 600 feet deep. The water comes up through a six inch casing and passes into an old boiler, which acts as a trap to catch the stones which are sometimes thrown up by the well. A pipe leads to a twelve inch Fleniken turbine, with a fall of thirty feet. The turbine, which is controlled automatically by a Pritchard electric governor, drives the dynamo. The pressure in the boiler is seven pounds under full head, and fifty-seven pounds to the square inch when the well is closed.—*Economic Value of Electric Light and Power.*

ANSWERING BY PHONOGRAPH.—Sergeant Dunn, the head of the New York Weather Bureau, has adopted an ingenious method of relieving himself of the wearisome task of answering the constant questions of visitors respecting the weather probabilities. He brings to his aid the phonograph. Every morning he "loads" his phonograph with the weather probabilities for the day, to which he refers all inquirers for their answer.

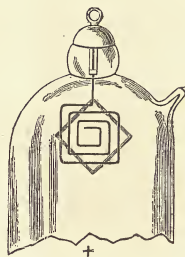
ELECTRICAL DRILLING.—Electricity is used to supply the power in drilling holes in the frame-work of the new cruiser *Maine*, now being built at the Brooklyn Navy Yard. Three-quarter inch plate can be perforated in less than one minute. The electric drill takes the place of the common pawl and ratchet hand drill.

An electrical thermograph has been placed in the New York office of the Signal Service Bureau.

No city can afford to own and operate an electric central station.—*A. R. Foote.*

CURIOS EFFECTS OF METALLIZATION IN A VACUUM.

In the *Revue Internationale de l'Electricité*, "G. M." writes as follows:—"We have received from M. Gaston Seguy, who is not only a very clever glass blower, but also an intelligent observer, two samples of tubes in which the volatilization of metals in a vacuum by the passing of the electric current has given rise to some curious phenomena, which we are unable to explain satisfactorily. We therefore confine ourselves to submitting to our readers the result of these experiments, hoping that perhaps one of them will be able to indicate on what theory we can base our facts.



"A glass tube 3 centimeters in diameter is closed at the two extremities, and to each end is soldered an electrode of platinum or copper of the form shown in the adjoining figure. Through a nipple on the side of the tube a vacuum equal to that of the Geissler tubes is produced by means of a mercury pump; then the current of a powerful induction coil (3 metres spark at least) is passed through. The metal is then volatilized at the negative pole and is deposited on the sides of the glass, producing a black discoloration for platinum and yellow for copper. The metallization of the sides of the tube is more rapid in proportion as the diameter is smaller. But in any case it produces this curious phenomenon to which we wish to call attention: it does not take place at all on either side on that part of the tube placed directly opposite the plane of the electrode, as we can easily see by placing the tube before a sheet of white paper. The reservation thus obtained exactly reproduces the external form of the electrode; but what is still more curious is, that the angles of this outline do not correspond to the angles of the electrode, but come opposite the straight lines as shown in the accompanying figure. These are phenomena similar to those observed by Crookes, Jamin, and Goltein, and we think that in order to facilitate an explanation of them, it is better not to pass them by in silence, but on the contrary, to note them with all their peculiarities every time we observe them."—*Electrical Review*, London.

Mr. William B. Wilson, of Philadelphia, Pa., one of the best known military telegraphers, has issued a pamphlet entitled "A Glimpse of the United States Military Telegraph Corps." It is an interesting story of the army telegraphers' position during the great conflict. Mr. Wilson very wisely devotes a chapter to the character of Abraham Lincoln, who was always a warm friend of the telegraphers. Being intimately associated with President Lincoln, during the first year of the war, no one among the army telegraphers is better qualified to speak of the kind deeds of the martyred president, who was really always on terms of easy familiarity with the operators at headquarters.

THE OLD-TIMERS AND MILITARY TELE- GRAPHERS.

The excursion from Louisville to the Mammoth Cave, in special cars provided for the occasion by the Louisville and Nashville Railroad, was most heartily enjoyed by sixty members of the party, nearly all of whom entered that immense cavern which has thus far been explored a distance of some one hundred and twenty five miles.

Just before reaching the Bridal Chamber Mr. George Dugan of Jackson, Tenn., suggested that a monument to the memory of all Old-Timers be erected in commemoration of the visit of the two organizations to this famous cave. The idea met with unanimous approval and in a short time a pile of stones was reared to a height of three or four feet, on the cap-stone of which Miss Kate Elliott, of Louisville, fastened this badge which she removed from her breast: "Reunion of the U. S. Military Telegraph Corps and the Old-Time Telegraphers' Association—Louisville and Mammoth Cave—Sept. 11th, 12th and 13th, 1889."

The trip through the cave was a most interesting one and was enjoyed by all. Fat Men's Misery and the Corkscrew both made it exceedingly uncomfortable for Mr. Richard J. Hutchinson, the largest and best natured man in the party, but with his characteristic display of pluck he succeeded in surmounting every obstacle in those tortuous passages and came through unharmed. His appearance in both instances provoked loud laughter and applause. Mr. R. G. Stephenson, after passing through the same ordeal, told your correspondent he would not repeat the experiment for forty cents. By next morning, his limbs having stiffened, the price was increased to twenty dollars. Messrs. Emerick, Pettit, Lounsbury, McCormick, Dugan and other heavy weights experienced little or no inconvenience in the undertaking.

After a walk of about sixteen miles the party returned to the hotel where, after supper, the meeting adjourned at Louisville the previous afternoon was called to order at nine o'clock, in the ball-room. On motion of Mr. Crittenden, President Plum appointed a committee of five, for the period of one year, on Congressional Action. The meeting, in common with the agreement reached by the Old-Time Telegraphers' Association, decided upon Kansas City as the place and the second week in September, 1890, as the time of the next annual meeting. Mr. Ives' motion that Mr. Bourlier's kind offer of tickets to any theatre in the city of Louisville, be received with a vote of thanks, was carried unanimously. Mr. Wilson, of Philadelphia, then moved that the reelection of President Wm. R. Plum be made unanimous, which was agreed to, Secretary Pettit being authorized to cast the vote of the organization. On Mr. Ives' motion the secretary was authorized to cast a vote for W. R. Wilson, of Philadelphia, as vice-president. It was then regularly moved and seconded that the positions of secretary and treasurer for the ensuing year be filled by one and the same person. In accordance therewith the president cast the vote of the organization for Mr. James E. Pettit of Chicago. The meeting then, at 9.45 p. m., adjourned.

At 8 o'clock the following morning, after three hearty cheers and a tiger, proposed by Mr. Wilson, had been given the proprietor of the Mammoth Cave Hotel for the hospitable manner in which he had entertained his guests, the return trip was begun. Mr. and Mrs. Plum, who were *en route* to Nashville, were accorded three rousing cheers and a tiger at the junction where they alighted to take the south bound train.

Reaching Louisville in time for dinner, good-byes were said and, separating in groups, the members, whose good fortune it had been to attend one of the best meetings ever held, departed for their various and respective homes in a most happy frame of mind. Prominent among the gentle-

men to whom your correspondent feels under obligation for the hospitable manner in which he was everywhere received, are Charles E. Taylor of Frankfort; Captain Irwin Dugan, Manager Charles H. Smith and Chief Operators Arnold and Frank Farrell of Louisville; President Plum, Michael J. Burke, W. B. Wilson, and last but not least, A. L. Eggleston, familiarly known as "Old Egg" of the J. M. and I. Road, Louisville, and W. J. Dealy, of New York.

President Taylor's address, which was crowded out of the last issue, was as follows:

Dear Brothers of the Military Telegraph and "Old-Timers." Another year has gone since our last reunion, to mingle like a drop in the shoreless ocean of eternity. Some of our beloved comrades have passed over the river, and are resting under the shades on the other side, while we remain to refurbish the golden links of fraternal regard which bind us together here, and unite us still to those who have gone before us in the mysterious realms of the great beyond.

To discharge that grateful duty we have left our widely separated homes, and for the ninth time assembled ourselves together; and it becomes my dutiful privilege, as your presiding officer, to extend to you the unfeigned welcome of a brother's love, not only to the pleasure of our present meeting, but with the pride of a genuine Kentuckian to this beautiful and prosperous metropolis of my native State.

Here let care be laid aside, and joy be unconfined, as we drink deep, delicious draughts from the brimming, sparkling cup of social happiness. Here we have no sordid purpose to subservise; here we meet for no selfish end, but to mingle with each other once more in the unrestrained freedom of heart-felt friendship, and for the mutual interchange of kindly courtesies and cordial congratulations. Our coming together is the spontaneous outgrowth of a sentiment as honorable to our nature as it is natural to our being—the result of that universal feeling of fraternity which exists among magnanimous men who are engaged in the same honorable vocations, and especially those who have dedicated their lives to the same grand and beneficent enterprise.

We see evidences of this fraternal sentiment everywhere. We see it in our trades unions, in the bankers' conventions, and in all the vast variety of assemblages which annually take place among those who have devoted themselves to the same calling in life; but nowhere does it exhibit itself more conspicuously than in the yearly meetings and permanent organizations of the surviving veterans of the two mighty armies which confronted each other in the grim array of battle during the tremendous but lamentable struggle between the States of this Union a quarter of a century ago.

Notwithstanding the long lapse of years since they were banded together in a common cause, and shared a common danger, there is not one of those old battle-scarred survivors of either army who does not still feel that there is a peculiar and sacred bond of brotherhood binding himself and his former comrades together, whether there is any other tie between them or not; they feel that they are co-partners in a common glory from which the balance of the world is excluded, and has no right to share, and who will say the feeling is not a just and natural one?

But "peace has her victories no less renowned than war," and if the honor of having participated in a great and important enterprise is to be estimated by its results upon the destinies of mankind, who will say that the "Old-Timer" has not far greater reason to congratulate himself and his early co-workers in the development of telegraphy than even the hero of a hundred stricken fields? It is but forty-five years since the genius and perseverance of its immortal inventor demonstrated to the

world, in spite of its incredulity and derision, that the electro-magnetic telegraph was a practical success, yet in that brief, fleeting moment in the history of our race it has done more for the advancement of human civilization than all the wars that ever stained the annals of mankind with fraternal blood since the morning dawn of time. I repeat that no other instrumentality contrived by the ingenuity of man has done more to promote the moral, intellectual or material progress of the human family in all time than this simple agency has done in less than a single half century. Could she, whose gentle hand penned the first trembling, tentative sentiment that shimmered along its solitary wire, behold to-day but a thousandth part of the stupendous results, well might she exclaim in a rapture of pious awe, "What hath God wrought?"

Then there was but a single line, but forty miles in length, regarded by the jeering and incredulous multitude as the costly experiment of an idle and infatuated dreamer; to-day they fret the face of the earth with a net-work of wires, which in a continuous strand would encircle the globe over two hundred times. Then they merely extended from the Federal capitol to the nearest city; to-day they reach nearly every village and hamlet inhabited by civilized man. They climb the mountain range, far above the whirling clouds, and stretch from continent to continent along the oozy bottom of the ocean. They reach to the far off islands of the sea and traverse the sands of the silent desert. They thread the eternal forests of the tropics and the icy plains of the frozen zone. They follow the lines of march which were trodden by the conquering hosts of Cæsar, and Cyrus, and Alexander, and cross the plains where Abraham watched his flocks beneath the silent stars. They are everywhere on their tireless mission of beneficence to man.

The key of the operator has, indeed, been the Archimedean lever that has moved the world. It has given an impetus to human energy in all its manifold phases, greater than that of all other agencies combined. It has enlarged the sphere of human intelligence, and multiplied the sources of individual comfort and happiness a thousand fold. It has brought nation in contact with nation and enabled the great powers of earth to talk with each other as friend to friend. It has assisted their diplomatic intercourse, abated their jealousies, strengthened their policy, and frequently averted the calamities of war. It has changed the art of war itself, and reduced to the sharp, decisive contest of a few months, what otherwise would have lengthened into years of carnage and plunder. It has furnished facilities to commerce, that have multiplied industries, stimulated the energy, sharpened the ingenuity, enlarged the intelligence, and elevated the tastes of mankind in all the departments of life, and thus increased the appliances of personal comfort and the means of individual enjoyment, beyond the power of computation. Every variety of manufacture, every product of agriculture, every creation of art, every discovery of science, every offspring of human genius or industry feels directly or indirectly the influence of its silent but all prevailing impulse. The world, in fact, is centuries on centuries in advance of what it would have been but for that mighty agency of civilization—the operator's key. In this grand but bloodless crusade of progress, this all-conquering march of enlightened energy, pressing on and ever on from one to another of the sublimest victories of peace, "The Old Timer" is the veteran, aye, the pioneer. But for his humble yet zealous and intelligent labors its triumphs could never have been achieved. Have we not then, my brothers, just cause to be proud of the calling to which we have dedicated our lives? Have we not good reason to congratulate ourselves upon the magnitude and beneficence of the great work in which we have so long been co-laborers? Should we not be proud and happy to clasp each other by the hand as brothers here to-day?

True, no braying trumpet nor roaring cannon heralded our triumphs to a grateful and admiring world; true, no storied urn nor sculptured hatchment will tell the tale of our humble labors to future generations; but there is no stain of our fellows' blood upon our hands, no widow's tears have dimmed our pure escutcheon, the wailing cry of no homeless orphan comes through the still, silent shades of the night to disturb the quiet of our grateful pillows. We are the soldiers of peace, the veteran vanguard of the grand army of an enlightened and glorious civilization.

It is true, also, that while our quiet and unobtrusive labors in the great enterprise in which we have so long been co-workers have rendered it possible, perhaps easy, for others to accumulate their millions, many of us here succeeded in gathering but little of this world's goods around us, yet we have cherished with more than miser's care the priceless jewel of self-respect—a gem richer than all "the wealth of Ormus or of Ind." Others have outstripped some of us in the busy, bustling race for earthly fortune, yet we are animated by the proud consciousness that throughout our long and laboring campaign of usefulness our rations have been the fairly-won bread of honest toil. No man can look us in the face and say that the little we have is the wages of wrong doing, or the price of our manhood. We meet, therefore, as men, as equals, as brothers, proud of each other, proud of our calling, and proud of what we have done for our fellowmen. As such, I hail and welcome you to this reunion. Let us strive by the exercise of those gentle amenities and the exchange of those fraternal courtesies, which alone make life worth living, to render it the most delightful in the history of our association, the happiest we shall ever have until, crowned with the imperishable chaplet of duty fully done, we shall meet on celestial shores of eternal rest.

I am aware, however, that there is no light without its corresponding shade, no joy without its correlative grief, no pleasure without its concomitant pain. I feel, therefore, that the abounding of our present meeting must, to a certain extent, be tinged by the mournful memory of our brothers who will never more mingle with us in our fraternal gatherings on this side of the dark waters through which we, too, must pass. It should be so, but let not the recollection of their absent faces mar the rational enjoyment of our joyous reunion; let us, rather, remember that

"Heaven gives us friends to bless the present scene;
Resumes them to prepare us for the next."

Let us cherish their memories and emulate their virtues with brotherly affection, with the unflinching hope that we shall meet them amid brighter scenes, in happy realms of eternal joy.

Of the many old timers who of late years have died at their posts, with the wounds and scars of long and honorable service upon them, this association has had much to say in perpetuation of their memory at other meetings, and if any veteran has gone beyond the circuit in silence and without recognition, some brother who survives shall yet miss and memorialize him here.

Since our last meeting one, at least, has passed conspicuously from this to the newer sphere.

With ample opportunity to have saved her own life, and to have escaped unscathed from an impending disaster, the veteran "Mother Ogle," who for twenty-seven years had been faithful to her key, preferred to stand by it as long as there was an instant left in which she could flash warning for the safety of the lives of others, and nobly met the martyrdom of which she died at Johnstown. With five feet of water on the floor of her office, and the monstrous wave from South Fork dam raging in the vale of Conemaugh, with death in her very front, she sat speeding her messages to the imperiled people below,

AMERICAN INSTITUTE OF ELECTRICAL
ENGINEERS.

The thirty-seventh meeting of the Institute was held at the house of the American Society of Civil Engineers, 127 East Twenty third street, New York, on Tuesday, September 10, 1889. The meeting was called to order at 8 p. m. by Vice-President Martin, who said:

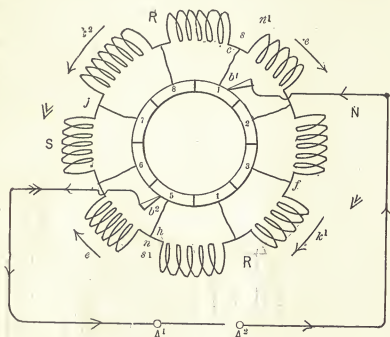


FIG. 1.

Gentlemen, this evening we have our thirty-seventh meeting, and the first of the present season. The paper which we shall have read to us is by Lieutenant F. Jarvis Patten, on "Alternating Motors—The Evolution of a New Type." Judging from the full attendance on so stormy an evening, the subject is one of great interest to us all, and I therefore have much pleasure in calling on the Lieutenant to read his paper.

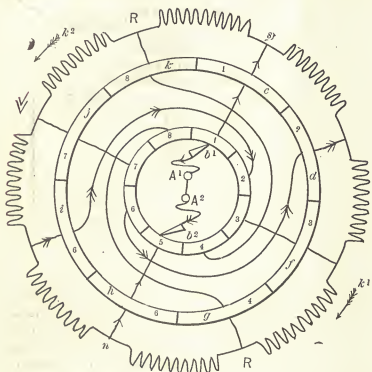


FIG. 3.

ALTERNATING CURRENT MOTORS—THE EVOLUTION OF A NEW
TYPE," BY LIEUT. F. JARVIS PATTEN.

On giving our secretary the title of this paper, it was my purpose to treat the subject in a broader light, and to show the progressive steps in a series of experiments which led eventually to the type of machine that I shall bring to your notice this evening. The recent and urgent claims of other work have rendered such a treatment impossible at the present, and I shall limit the paper to a description of a new alternating cur-

rent motor, one form of which is shown in the accompanying drawing.

The place that the alternating current electric motor is destined to fill in the industrial arts is familiar to you all, and the various ways known to the scientific world by which such machines may be rendered operative, have been ably considered and elaborately discussed in the Institute papers of the past two years by Professor Thomson, Dr. Duncan and Mr. Tesla.

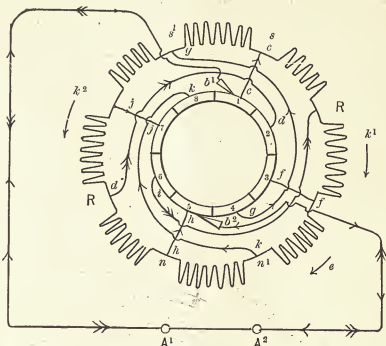


FIG. 2.

We are thus all more or less acquainted with the prominent difficulties of the problem.

My experience in common with that of my predecessors teaches that the alternating current motor has a strong and persistent disposition to stand still, and when persuaded to motion it is apt to be a sort of "go-as-you-please" machine, and asserts its inherent right to turn in either direction indiffer-

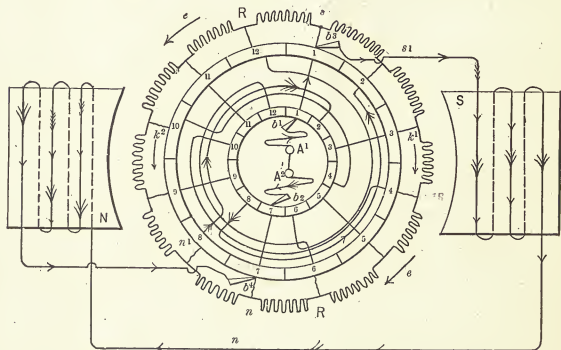


FIG. 4.

ently; direction of rotation in some cases being purely a matter of chance. I shall not have much to say about efficiency, as my experiments with large machines are not sufficiently advanced to furnish any reliable data; but I will endeavor to give a general solution of the problem designed to meet the following conditions of practice:

1st. A machine that will start itself independently of the speed of the generator or number of alternations of current per unit of time.

2d. A machine that has but one direction of rotation and cannot reverse under any conditions of current alternation.

3d. A machine that is not necessarily synchronous with the generator, revolution for revolution.

4th. A machine in which reversals of current direction do not produce corresponding reversals of magnetism in any iron part when the machine is in motion at its normal speed and maximum efficiency.

5th. A machine of simple form, having an ordinary continuous wound armature revolving in a single or two-pole field.

Referring now to the figures, which are simply diagrams of the circuits and operative parts, we have in Fig. 1 an ordinary closed circuit armature shown as a Gramme ring merely for convenience of illustration, the points of the winding intermediate between the eight coils being connected in the usual way to the eight segments or bars of an ordinary Gramme collector, and it may be well in passing to note here the functions of this collector. It is not a commutator in the strict sense of that term, as it does not rectify or re-direct reverse or opposed currents. If the brushes b^1 and b^2 were held upon the outside wire of the ring, the same results would follow, and the Gramme collector, properly so called, simply transfers the

change position, either mechanically or otherwise, then with an alternating current a constant polarity, s and n , would be maintained at the upper and lower points of the ring—for then a direct impulse, starting from A^2 to the right, would enter the ring through the brush b^1 , flowing down both sides in the direction of the arrows k^1 , k^2 , out through brush b^2 , and back to the source at A^1 . The reverse impulse, indicated by the double arrows, would start from A^1 to the left, going to brush b^2 , and, if we now suppose this to have changed places with the brush b^1 , the reverse current would then enter the ring at s , and, flowing down both sides in the direction of the arrows k^1 and k^2 , would leave through n and the brush b^1 , and so back to the source A^2 , maintaining the polarity of the ring the same as before. If the brushes could be thus changed at each alternation, the polarity of the ring would be maintained constant with an alternating current. While, however, it is quite impracticable to thus cause the brushes to change position

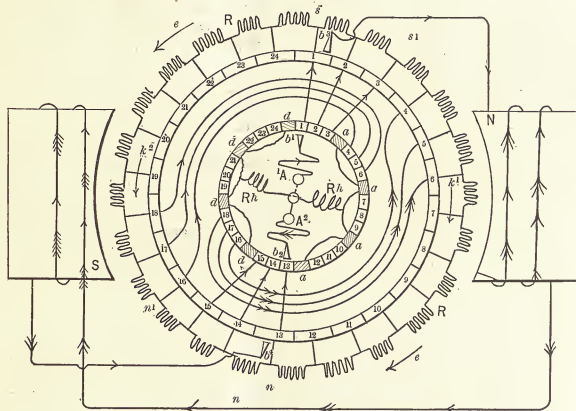


FIG. 5.

brush contact from point to point of the continuous ring winding. If a source of direct current be interposed between the terminals A^1 and A^2 , current will flow continuously from brush b^1 to b^2 downward through the right and left hand halves of the ring in the direction of the arrows k^1 and k^2 , making, say a south pole in the ring at the upper point S , and a north pole at the lower point n . With a continuous current these poles would be continuously maintained, and placed in the magnetic field indicated by N and S the armature would continuously revolve in the direction indicated by the arrows K^1 . If now a source of alternating current be inserted between the terminals A^1 and A^2 , the polarities of the ring would be reversed at each successive alternation of current, and if a direct impulse, indicated by the single arrows, in the external circuit produced the poles n and s in the ring, the reverse impulse, indicated by the double arrows, would produce the opposite polarities n^2 and s^2 at the same points, and the tendency to motion would be reversed if the fields remained the same, but, it will be noted, the motion would be in the same direction still if the fields were also reversed by the same reversal of current. If, however, the fields were maintained constant, as indicated by the large letters N and S , and some device could be contrived by which at each reversal of the alternating current the brushes b^1 and b^2 could be made to

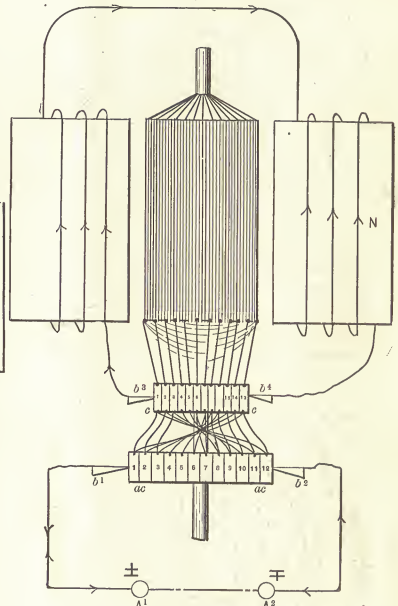


FIG. 6.

mechanically at each reversal of the current, it is perfectly feasible to produce the same effect without the mechanical change. The means of accomplishing this result are indicated in Fig. 2, which is identical with Fig. 1 with a single exception. There are eight coils, as before, and eight bars in the collector; the odd numbered bars, 1, 3, 5 and 7, are connected to the same points of the ring as before, c , f , h and j , but the even numbered bars, 2, 4, 6, 8, are connected respectively to points of the ring diametrically opposite them, bar 2 to the point d , bar 4 to the point g , and so on each even numbered bar to a correspondingly opposite point of the winding. If now a source of alternating current be interposed between the terminals A^1 and A^2 , and we make the single supposition that the ring shall turn through an arc of the circumference equal to that covered by one bar of the collector during each alternation of current, we shall still maintain a constant polarity at the

CONTINUED ON PAGE 8.

CONTINUED FROM PAGE 3.

and when no other moment was left to her gave her brave farewell to the world and the fraternity in the simple utterance:

"This is my last message."

God blessed the world in giving life to this noble woman, and she, by her splendid example, has forever blessed our brotherhood.

For, in her life, she wrote her name
On labor's places high;
And when its final issue came,
She taught us how to die.

I feel, my brothers, that I should attempt some adequate acknowledgment to you for your unvarying courtesy to me at all times, and especially for the distinguished honor I have received at your hands. I would that I could do so, but for that talk I have no fitting words. It lies beyond the domain of human speech. It can only be expressed by the mute eloquence of silence. My poor tongue can only say from my full heart—I thank you.

It only remains for me to add that the ninth reunion of the "Old-Time Telegraphers' Association" is now formally opened for business.

KINDLY REMEMBERED.—One of the most pleasing features of the return trip of the Old Timers occurred at Richmond, Va., where Mr. J. H. Emerick, now general superintendent of the Postal, and one of the party, received from the manager of the Postal Telegraph-Cable Company the following letter which explains itself:

RICHMOND, VA., Sept. 16, 1889.

J. H. EMERICK, Esq.

Dear Sir:—Kindly permit me to present you with a walking stick made from a piece of the original flooring of Libby Prison. It is North Carolina pine and was placed in Libby Prison building in 1845.

I warrant this as genuine, as I personally got the piece of flooring at the prison and took it myself to Messrs. Savage and Holmes, furniture manufacturers, and had it turned and polished.

Yours very truly,

J. O. JEFFRIES.

Mr. Emerick, it will be remembered, was not only one of the ablest telegraphers in the military service but was the first chief operator located at Richmond after the surrender of Lee at Appomattox. For this reason the presentation of so valuable a souvenir was all the more thoughtful on the part of the donor and in view of the historical incidents connected therewith will be appreciated all the more by the recipient.

TESTING AN ELECTRIC MOTOR AT ASHEVILLE.

Quite an interesting test was made recently on one of the Sprague Improved Electric Railway Motors at Asheville, N. C., and an exhibition was made of the power of these motors as well as their high efficiency.

The Asheville Street Railway is now operating four cars of the Sprague electric system and have been running for about eight months. This company recently purchased two of the Sprague Improved Electric Motors for equipment of a new street car which they had decided to add to their system. Although it was intended to equip this car with two motors, as the grades on the road are quite severe, the question was raised as to what the results would be if only one motor was placed on the car and obliged to do the whole work. In order to test this question, on August 6th, the car, which was equipped with only one motor, started over the line, and frequent readings of an ampere meter were taken in order to determine the power used on different portions of the line. At the same time that the ampere meter readings were taken volt meter readings were also taken in order to make certain that the potential was obtained.

In all, three trips were made over about 4,000 feet on that part of the line where the grades were the heaviest. Two of these trips were made with nine passengers on each car in order to test the apparatus, and the third trip was made with forty-three passengers. On this trip the passengers were chosen from bystanders, and the heaviest were selected so that the weight of the car was certainly over 14,000 lbs.

The difference in elevation to a distance of 4,000 feet, was 185 feet. Upon the distance travelled were two reverse curves of short radius; one as low as 50 feet, and two other short radius curves. All curves and reverse curves were on grades of from two per cent. to five per cent.

The length of wheel base was nine feet, so that a large amount of power was required in going around the curve. The curves were all dry and dusty, and took a large amount of power for this reason. In addition to these and other difficulties all the journals of the car had not worn smooth, the car being entirely new so that it would not roll on one grade where the old cars habitually start by gravity, and the car pulled very hard on all the curves.

The time of the run was 6 min. and 31 sec., including a stop of 15 sec., and during the entire run a freedom from sparking was perfect, and when the amount of the capacity of the motor was exceeded, this point was truly remarkable.

The amount of H. P. required to raise the load against the gravity line for the distance attained was at least 12 H. P., and adding the friction in the journals, on the track and elsewhere, the ampere readings showed that the motor, although working at fifty per cent. above normal load, did the work at an extremely high efficiency. At the end of the three trips the motor, although hotter than one would like for every-day work, was by no means excessively hot, and showed no harmful results from the trip.

The Asheville Street Railway Company have expressed themselves as very much pleased with the results of this trial. The car is now being equipped with the second motor.

According to *Petit Parisien* "Linguagraph" is the name of a recent invention which is destined to revolutionize the system of signalling heretofore adopted on European railways. It is a small apparatus consisting of a number of pipes, copper wires and a keyboard. It contains a box in which are placed the phonograms in the order required by the engine driver. On the outside of the apparatus is fixed a sort of trumpet through which the steam passes while the engineer manipulates the keys. When, for instance, the train is about to enter a tunnel the engineer plays on the instrument and in a voice of thunder that can be heard three miles off the ingenious whistle howls the word "Tunnel." On entering a station the machine announces its name. It also calls out the names of such stations as are to be passed without stopping.

An apparatus very necessary in Germany and Holland for warning travellers of an approaching train at road crossings has been constructed by Messrs. Siemens and Halske. By an electric arrangement a bell begins to ring violently at the crossing when the train is 1500 yards therefrom and continues ringing till it has passed.

The Excelsior Electric Company of New York have brought suit against the Baxter Motor Company, of Baltimore, Md., for infringement on their patent of their automatic regulator. The suit is being pushed vigorously.

An Austrian railway official has invented a portable telephone for speaking from a railway train at any point stopping to the nearest station.

Mr. Edison is said to receive no less than 1,200 letters daily since his arrival in Paris,

THE McANEENY CONCERT.

The McAneeny Concert will be repeated at Chickering Hall, Thanksgiving night, November 28, and it is guaranteed to be fully up to the standard of the last one and in one or two particulars it may excel. Mr. Pearsall, as a matter of course, will take part; also Mrs. Johnson, the soprano; Miss Rosa E. Penner, contralto, who will make her first bow to a New York audience; Mr. S. Harry Holland, basso, and a chorus of twenty or thirty picked voices from the Brooklyn Apollo Club, under a competent director. Other strictly first-class talent is also being negotiated for. Tickets are now on sale and can be reserved upon application to Mr. McAneeny, 195 Broadway, New York.

OMAHA'S NEW TELEGRAPH OFFICE.

The magnificent building of the Bank of Omaha has been remodeled and another story added to accommodate the Western Union Telegraph main office. It is undoubtedly one of the finest edifices in the West. Entering the grand marble and granite entrance, elevators are in readiness to take one to the top floor, which is divided into two parts—the operating room and the offices of Superintendent Dickey. The operating room is lighted by 75 incandescent electric lights. At the further end of the room is erected one of Bunnell's latest improved switch boards, opposite which is a new self-winding clock. The cloak rooms are provided with individual boxes, each operator possessing a key. Behind the cloak rooms are the battery rooms, where another elevator runs to the rear entrance of the building, passing five other battery rooms in its descent. Another self-winding clock adorns the beautifully frescoed walls of the receiving department on the ground floor, which contains new and elegantly carved black walnut counters, with polished bronze trimmings, new desks, tables, and tile floor of the latest European design, which, together with French plate-glass windows, make pleasant quarters for the large force of clerks and book-keepers. Mr. J. J. Dickey is the superintendent; C. B. Horton, chief clerk; H. E. Jennison, superintendent of construction; J. Levin, manager; J. B. Twiford, chief operator; Geo. W. Lloyd, night chief; W. E. Wakefield, all night chief; W. J. Rusland and W. A. McElroy, traffic chiefs; Edward Rogan, assistant days; J. Pritchard, assistant nights. The personnel of the office will appear in the next issue. It may be well to add that now that Mr. A. M. Butler has accepted the agency of the Age, you may expect large returns from this locality in the shape of subscriptions.

Here's richness: just overheard St. Louis sending to Sun, N. Y., baseball gossip.

St. L.—(After sending a few words) "Min. pls. Can't read the copy."

Returns:

St. L.—"Do you know name of the manager of the Bostons?"

Sx.—"Manager Hart, I think."

St. L.—"This aint Hart. It looks like t-r-i-u-m-v-i-r-s. Is there such a man on the Bostons?"

Sx.—"Don't know him. The word is all right. G. A. triumvirs."

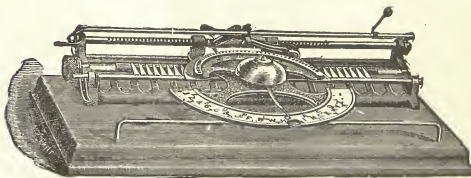
Mr. George W. Hickey, for many years with the G. N. W. Tel. Co., at Watertown, N. Y., has been appointed manager of the same company's office at Plattsburg, N. Y.

Mr. Frank Hennig is again supporting the tragedian Thos. W. Keene, as one of the leading men. Mr. Hennig is a well known operator.

NOTICE.

Dedication of the new Palace of Beauty, the Central Opera House, 205 to 217 East 67th street, by the New York Telegraph Operators, on Thursday evening, October 31, by an elaborate programme, including Robertson's society comedy "Caste," introducing the prominent amateur actress, Miss Ella Griffith Greene, supported by Messrs. Harry Du Souchet, J. M. Winders, J. C. Vancura and others. Extra attractions, Lillian Thorpe, recitations; Thomas Ballantyne, mimicisms; Arthur Hurd, tenor soloist, and M. J. Dixon, character songs. Tickets, admitting gentlemen and ladies, 50 cents; private boxes, holding seven persons, \$3.00; secured from Ed. Blakey, J. C. Vancura and M. J. Dixon, 195 Broadway.

THIS TYPEWRITER FOR TEN NEW YEARLY SUBSCRIBERS.



The World Typewriter will be given to any person who will secure ten new yearly subscribers to this journal. This is the greatest premium offer ever made by any paper and the offer no doubt will result in our friends everywhere putting forth their best efforts to earn a machine, which will prove of much assistance to them at all times. We guarantee that the commission on the ten new subscribers by securing this typewriter is \$10, or within one-third of the entire amount collected. In allowing this unusually large commission, of course, we expect new subscribers, and in fact this liberal offer is solely based upon this idea.

The World Typewriter was placed upon the market a little more than two years ago. Although then in a somewhat imperfect state compared with the World of to-day, its success from the start was remarkable, and it has steadily gained in favor. The World of to-day is the result of practical ideas, experiments, and improvements upon the original acceptable machine. The World is offered as the best machine for letter writing. It is practicable, durable, simple, and speedy, and will do as good work as any typewriter upon the market. It is intended as a legitimate companion to the telegraph and other office or professional desk, the stenographer's table, and for any other place where the pen or pencil is used. During the two years that the World has been before the public nearly fifty thousand have been sold. The compactness of the machine gives it advantages not possessed by large and weighty typewriters. It is but 12 inches long, 6 inches wide, and 2½ inches high, and weighs but 3½ pounds; consequently it can be easily placed in a convenient position on the desk or in the drawer, not necessitating an extra table and change of position whenever a letter has to be written.

Address, THE ELECTRIC AGE Publishing Co., 5 Dey street, New York.

Mr. Frank C. Mason, the well known Brooklyn electrician, has been promoted to rank as a captain of the Brooklyn police force. He is superintendent of the police telegraphs of the City of Churches.

CONTINUED FROM PAGE 5.

upper and lower points of the ring without causing the brushes to change position mechanically.

Thus a positive impulse starting from A^1 to the left and indicated by single arrows enters the ring at b^1 , flows down both sides to n , producing the ring polarities s and n out brush b^1 and back to source at A^1 . The reverse impulse being in the opposite direction will start from A^2 to the right, go to brush b^2 which we will now suppose bearing on segment 4 of the collector, whence it will go by the inverse connection to the opposite point S^1 of the ring, then down both sides in the same direction as before to the point n^1 , thence back to the opposite segment 8 out, brush b^1 now bearing on this segment and back to source at A^1 .

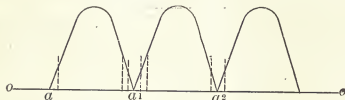


FIG. 7.

The reverse currents therefore, under the assumed conditions, are caused to maintain a constant polarity in the ring, so that in a constant field its tendency to motion would always be in the same direction with an alternating current in the armature. It will be further noted that the alternating current is not re-directed or commuted in the strict sense of the word, and we may enunciate the fundamental principle which underlies the construction of this type of machine as follows:

"The poles of any closed circuit may be maintained constant with an alternating current by causing opposite impulses to traverse the circuit in opposite directions." The direct and inverse connections, shown in Fig. 2, have precisely this effect, when, as supposed, a single bar of the collector passes under the brushes at each reversal of current. The connections, c, c, d, d, f, f , etc., in Fig. 2 may have any form, and other bars may be interposed between their extremities without affecting in any way their functions as connectors. This step is shown in Fig. 3, where another collector bar $1c, 2d, 3f$, etc., is inserted in each of the connections c, c, d, d , etc., of Fig. 3, thus making another collector shown outside the first to avoid confusion of the drawing, while for the same reason the source of alternating current A^1, A^2 is placed inside the inner ring. As the polarities s and n of the ring are maintained constant, as previously described, with an alternating current, and current is constant in direction from s downward through the right and left halves of the ring to n , so must necessarily any current be constant in direction which is led from brushes through any shunt circuit connected to the segments $1c$ and n of the outer collector; a field circuit of constant direction may therefore be shunted from this outside collector. This is shown in Fig. 4, in which 12 coils are shown in the ring and 12 bars in each collector connected alternately direct and inverse as before. Tracing now two opposite impulses of current, we have the first indicated by the single arrows from source A^1 to segment 1 of the inner collector, thence to segment 1 of the outer collector, where the current divides, part going down the right and left hand halves of the ring to n and part out brush b^1 through the field circuit making the poles N and S , back to brush b^1 segment 7 of outer and segment 7 of inner collector to the terminal A^2 of source. If the armature be supposed now to turn through the space covered by one collector bar, the reverse impulse can be traced as follows: Starting at A^2 in the opposite direction to brush b^2 now bearing on segment 8 of the inner collector thence through the reverse connection to segment 2 of the outer collector, now under brush b^1 where the current divides going part as before down the right and left halves of the ring making a south pole at s^1 and a north pole at n^1 as before, and the other part out of brush b^2 through the field circuit in the same direction as before back to brush b^1 now on

segment 8 of the outer ring thence to the reverse connection back to segment 2 of the inner ring, now in bearing with brush b^1 and so returning to the source at A^1 . Thus the two impulses of opposite direction have been made to traverse both armature and field circuits in the same direction, we have, therefore, with an alternating current constant armature polarity and constant field polarity, and therefore a constant tendency to motion in the same direction.

Not only this but the further condition is fulfilled that there are no reversals of magnetism in any iron part so long as one bar in the machine, as shown in Fig. 4, passes under the brushes at each alternation of current. It remains to show how this is brought about. Referring again to Fig. 4, let it be supposed that the first impulse of current did not cause the armature to turn through the arc of the circumference subtended by one segment, but all the brushes still bore on the same segments, as shown in the figure, and the reversals of current continued. By tracing the circuits it will be seen that each reversal of current reverses the polarity of both field and armature, and with either direction of current or rapid reversals there will be a constant tendency to motion always exerted in the same direction.

The machine under these conditions becomes therefore simply a direct current machine on an alternating current circuit with a constant tendency to start in one direction. Assuming the machine, therefore, self-starting, it will continually gain in speed until the condition is fulfilled of one segment passing the brushes at each alternation, for it then becomes in the broad sense a synchronous alternating motor. The current then produces no reversals of magnetism and there is a true alternating current in the armature circuit, producing however no reversal of armature polarity; and a current of constant direction in the field. Under these conditions the motor is self-regulating, moving at a constant speed and with a maximum rotary effort.

It is not, however, essential that one bar should pass the brush at each alternation, as any number may be caused to do this depending upon the speed required and the number of

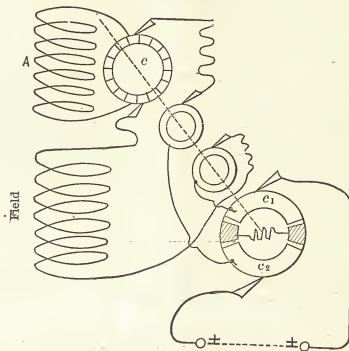


FIG. 8.

coils upon the armature. This is illustrated in Fig. 5, where the complete machine is shown. There are 24 coils in the armature, 24 bars in the outside collector and 32 bars in the inside one, this latter being composed of 24 connecting and eight insulating bars. The connecting bars of the inner ring are numbered to correspond with those of the outer ring around to the right from one to 24; the insulating bars, drawn shaded, separate the others into groups of three. In this machine three segments, 1, 2, 3, in the outer ring are connected direct to the corresponding segments 1, 2, 3 of the inner ring, likewise the opposite three 13, 14, 15 of one ring are connected,

direct to 13, 14, 15 of the other. The next group of three is connected inversely 4, 5, 6 of the outer ring to the diametrically opposite bars 16, 17 and 18 of the inner, and the corresponding opposite group, 16, 17, 18 of the outer ring are likewise connected inversely to the diametrically opposite group, 4, 5 and 6 of the inner ring. The remaining segments are connected in the same manner, but the connections are omitted to avoid confusion of the drawing. The operation of the machine is evidently the same as that shown in Fig. 4, except that the required conditions are fulfilled in this instance when three bars of the collector pass under the ring at each alternation of current, and as there are 24 segments arranged in groups of three, the machine, at its normal speed, would make one revolution for every eight alternations of current, and connected in a circuit supplied with 16,000 reversals per minute its nominal speed would be $\frac{16000}{8} = 2,000$ per minute, and with 48 segments arranged in groups of three, its speed would be 1,000 per minute. The blank segments insulating the groups of the inner ring are connected to the extremities of a rheostat Rh. Rh., which is enclosed inside the commutator and is designed to offer a path for the alternating current such as there may be, and prevent its absolute rupture at a period of change from one group of segments to the next; they also serve an important purpose in preventing a dangerous short circuit which would be occasioned by the inner brush bridging two groups of segments oppositely connected.

It follows, as a matter of course, as the machine starts as a direct current motor connected in an alternating circuit, rapid reversals of magnetism will at first be produced in all the iron cores, and these should be made of laminated iron to prevent undue loss by heating at the period of starting. The machine, in fact, starts as a direct current motor, and automatically changes to a sort of synchronously alternating motor. When it gains its normal speed at this point it is self-regulating, and its capacity of doing work is a maximum.

Fig. 6 shows a plan of the machine as constructed. It consists simply of an ordinary closed circuit armature in a single field; *c c* is the ordinary collector, really a part of the armature circuit, from which the brushes *b b'* take a current of constant direction to the field shunt; *a c* is the reversely connected commutator, and the brushes *b' b''* bearing upon this commutator are connected to the terminals of the alternating current circuit.

I might add to the paper the fact that the inner commutator, the one which is the ordinary commutator of the Gramme ring winding, does not perform the ordinary functions, as the brushes bearing on this collector require no adjustment, it being merely a rubbing contact from which the shunt field circuit is taken as a derivation to the main circuit of the machine. With that exception, I think the machine is fully explained in the paper.

ELECTRICAL LEXICON.

TECHNICAL TERMS IN COMMON USE AMONG PROFESSIONAL ELECTRICIANS.

AMPERE (from Ampere, a Frenchman). One of a series of British Association units of electrical measurement, adopted by an international congress at Paris, 1881. The unit of the strength of an electrical current. It may be compared to the volume of steam in a boiler.

CURRENTS. The flow of electric force. A continuous current is "like a body of water running uninterruptedly through a pipe." An alternating current is "like the same body of water running through a pipe for a given time, when it reverses and runs in the opposite direction for a given time—the reversal taking place about 150 times in a second in a Westinghouse dynamo."—Edison.

DYNAMO. [from Gr. *dunamis*, power]. A machine for generating electric currents.

ELECTRODE. [from Gr. *electron*, amber, and *hodos*, a way.]

Either of the two poles of the voltaic circle; a metal plate, to which is often attached a wet sponge for the conveyance of the current to persons under treatment.

OHM [from G. S. Ohm, German electrician]. The unit of electrical resistance; i. e., the resistance offered a current of electricity. The average resistance of persons is 1,000 ohms, the extremes being 1,800 and 660 ohms.—Edison.

VOLT [from Volta, an Italian, who devised the first chemical apparatus for generating electricity.] The unit of electro motive force. It may be compared to the pounds pressure of steam.

WATT [from James Watt, an English inventor]. The unit of power, 746 being equal to one electrical horsepower, which is almost equal to one mechanical horsepower. Also called a Volt-Ampere.

WHEATSTONE BRIDGE [from Wheatstone, an early English electrician]. An instrument used in connection with a galvanometer for measuring the resistance of bodies to the electric current.

ELECTRIC LIGHT DEALS IN ST. LOUIS.

A new syndicate, headed by H. B. Hollins & Co., of New York, who are at the head of the syndicate owning the Laclede Gas Light Company, has closed negotiations by which it acquired a controlling interest in the stock of the United Electric Light Company, the owner of the Thomson-Houston electric lighting plants in St. Louis. The purchase is no doubt made by the Hollins people to strengthen their position in the lighting business in St. Louis, though it is already strong. This purchase will not interfere with the electric light plant at Mound and the Levee now in course of construction by the Laclede Gas Light Company.

The Laclede's contract with the city is for the incandescent lighting of the parks and public buildings in the northern portion of the city. These lights will be furnished from the plant it is now erecting, as has been intended from the first. The purchase of the United Company was made by the Hollins independent of the Laclede Company, though it will undoubtedly be turned over to the latter in due time, or at least operated in its interest.

The Laclede Gas Light Company has recently purchased of The United Gas Improvement Company, of Philadelphia, the owner of the Heisler patents, the right to use that patent in fitting up its incandescent plant, which is to supply the lights called for in the Laclede's city contract.

MACHINERY EXHIBITS AT ST. LOUIS EXPOSITION.

The Western arc lights are kept going by a Russell and a Phoenix center crank, the former running at 225 and the latter at 275 revolutions. Altogether the machinery department contains 1600 actual horse power, 700-horse power of which is in operation.

A compact engine of 150-horse power, made by the Buckeye Manufacturing Company, of Salem, O., is running independently at present in the north nave, but will be connected with appropriate machinery in a few days.

Another pretty piece of power distributing machinery is the Russell engine, made at Massillon, O. Two of these are at work behind Heisler light dynamos, to operate which they were especially constructed.

Armington & Sims, Providence, R. I., show two high-speed engines, each of $14\frac{1}{2} \times 13$ cylinder dimension, 125-horse power, and 260 revolutions.

A Rice automatic high-speed engine, running ordinarily at 300 revolutions, is driving a Loomis dynamo.

TELEGRAPH LITIGATION IN CANADA.—The case of the Great Northwestern Telegraph Company against the Montreal Telegraph Company is being tried before Justice Davidson at Montreal. It is understood that the counsel for the plaintiff have given another notice that in consequence of the nature of the evidence elicited in the case so far they will make an application to the court for permission to put in an additional demand, asking that the reduction in the amount of rental payable to the Montreal Telegraph Company be increased by an additional two per cent, making the amount to be paid four instead of eight per cent.

THE TELEPHONE IN THE FRENCH NAVY.—Some interesting experiments are about to be carried out at Cherbourg, with the view of testing the possibility of establishing telephonic communication between vessels of the same fleet at sea. It is stated that a preliminary trial, which took place recently, demonstrated the fact that a torpedo boat can be kept in communication with the command afloat, and receive direct orders as to where to steer and how to act in general operation.

MUNICIPAL LIGHTING, by Fred H. Whipple, of Detroit, Mich, is before us. It is the second edition of this interesting volume, which has already made a field peculiarly its own, and is much sought after by those interested in municipal lighting. Its aim is to honestly inform its readers upon the subject for which it stands—the illumination of cities and towns by whomsoever it may chance to be.

WASHINGTON, D. C., Sept. 16.—John W. Lane, of Portland, Me., a millionaire who was interested in the telegraph business before the formation of the Western Union Telegraph Company, died here last evening, aged 71.

America has 200,000 telephones more than the rest of the world combined.

Mr. Edison is arranging a scheme, in company with Herr Siemens, for lighting Berlin with his electric lamps.

Mr. Thomas A. Edison, before his departure from Paris for Berlin, gave 10,000 francs for the benefit of the poor of Paris.

"I'm just doing a little light work," said the man who changes the carbons of the electric lamps on Chestnut street.

New York has an electrical execution about every day, but is still waiting to see the first murderer executed by electricity.

The first electric tramway in Italy is soon to be opened between Florence and Fiesole. Its total length will be 7,300 metres.

A Moscow foundry fuses metals by electricity. The glare is greater than the sun, and employees work two hours per day.

London has fixed the cost of its electric light at 16 cents for one ten-candle lamp thirty hours, or twenty sixteen-candle lamps ten hours.

Mr. Edison is filled with gratitude and dyspepsia by the cordiality of his reception in Paris. He says a few more banquets would finish him.

A crank at Altoona wanted a telegraph operator to send his love to every operator in the world and to collect the costs on the delivery of the messages.

The Philadelphia electricity exhibit at the Centennial Exposition in 1876 was very small. To-day \$30,000,000 is invested in the 3,000,000 lamps and 109 railways.

Princeton College has organized an electrical course of study.

The Lehigh Valley railroad has adopted the Delany Line Adjusting system, which keeps their relays at all stations in adjustment in bad weather.

Thomas A. Edison has gone to Heidelberg. He will return to Berlin to exhibit the phonograph to Emperor William, Prince Bismarck and Count Von Moltke.

The Postal Telegraph-Cable Co. has opened offices as far south as Columbia, S. C. Some half-a-dozen offices have been opened in North Carolina within the past fortnight.

During the recent Telephone convention at Minneapolis, Minn, freedom of the wires was granted the delegates and visitors by Superintendent McMichael and Tuttle of the Western Union and the North American telegraph companies respectively.

Dynamos are being substituted in the Postal office, Pittsburgh, Pa., to take the place of the battery heretofore in use. The saving to the company by the substitution is about fifty per cent.

The Delany Line Adjusting System, a description of which appeared in a recent issue of this paper, is being tried with great success on the Erie, Lehigh Valley, Baltimore & Ohio, Chesapeake & Ohio, Old Colony, Fitchburgh, and New York & New England railroads. Some of these roads have adopted this system and others are about to do so. The system keeps the relays at all stations in adjustment in all sorts of weather.

Edison has given over his original plan of returning from Paris to New York without visiting London, and will arrive in the latter city in a day or two, accompanied by Senator Wm. Maxwell Evarts. Mr. Edison, it is stated, has had a reception in Paris such as no American or any other foreigner has ever received during the three weeks that he has been in the gay capital. Crowds have followed him in the streets, and his appearance at the Exposition has been the invariable signal for a blockade which on the police could move. As his picture has been published in all the illustrated papers and his photographs are on sale in the shop windows, his face became well-known, and he has been unable to appear anywhere in public without being recognized. Newspapers have published his goings and comings with greater attention even than they devoted to the Shah.

BUSINESS NOTICE.

The following letter tells its own story.

BUFFALO INTERNATIONAL FAIR, Buffalo, N. Y.
Mr. Geo. F. Shaver, New York.

Dear Sir:—The Shaver mechanical telephone exchange bought of you has been in constant use since the opening of the Fair, ten days, and has given good service although rain and wind storms prevailed part of the time. We have ten stations, and switch direct one station with another, the time required for making a connection being about five seconds. The longest line is about one-half mile, and the longest circuit when connected through the central office is about seven-eighths of a mile. We can recommend it as being fully equal to the Electric Telephone in articulation, besides working much louder.

Wishing you success, which this remarkable invention merits, we remain, respectfully, (signed.)

C. J. Hamlin, president; C. W. Robinson, secretary and general manager; J. F. Hause, assistant secretary; H. B. Stimson, treasurer; B. F. Taylor, general superintendent.

STANDARDIZING ELECTRICAL APPARATUS FOR
STREET RAILWAYS.

At the semi-annual meeting of the National Electric Light Association, held at Niagara Falls, on August 6th, the following resolution was offered and adopted:

Whereas, it is the belief of the members of this association that the electric motor service upon street railways will require a service of electric current for the motor that will be reliable and constant, and that the various electric light stations are capable of generating and distributing such current;

Resolved, that a committee of three be appointed by the president, who shall endeavor to make such arrangements with the manufacturing companies that they should adopt some standard potential to be used upon the various railways; and the committee also to collect such data regarding the supply of current to railways as may be deemed of interest to the association.

The president appointed Messrs. Eugene T. Lynch, Jr., of New York; T. Carpenter Smith, of Philadelphia, and Marsden J. Perry, of Providence, as members of that committee.

It has been thought advisable to collect and compile the opinions and experience of such street railways that have adopted electricity as a motor power. It is requested, therefore, that those interested fill out and answer such of the following questions as possible:

1. What system do you use?
2. What proportion of your cars are equipped with motors?
3. Do you generate your own electrical power, or are you supplied by an electric light station?
4. What proportion does your greatest average H. P. in use bear to the total H. P. of engines and boilers which you have installed?
5. What is the voltage or pressure of your generators?
6. Is there any other railroad in your town using an electric system? If so, what system do they use, and do you know the pressure at which they run?

BURNED OUT.—The building in which the Western Union Telegraph office in Bangor, Me., was situated, was gutted by fire Sept. 19. It was mostly occupied by offices, and the loss will be heavy.

BENTLEY-KNIGHT COMPANY SOLD OUT.—The Bentley-Knight Electric Motor Company has disposed of its property to the Thomson-Houston Co. of Boston. The latter company will carry out the contracts of the former.

AN IDEAL STATION.—The Edison Incandescent system in Brooklyn is, without doubt, the most perfect in the United States. The station is an ideal one in every sense of the term. A description in detail will soon appear in these columns.

REPAIRING CABLES.—The Anglo-American Telegraph Company's cable between Brest, France, and St. Pierre, Miquelon, laid in 1869 and broken in deep water on the 17th July last, was successfully repaired on the 5th inst, by the company's steamship *Minia*, Captain Trotter, commander.

ELECTRICAL CENSUS.—We have received the following from General Porter, Superintendent of Census: "In view of the representation made to this office by firms and corporations interested in electricity as to the extent and importance of this industry, it has been decided to make it the subject of a special investigation. Your endorsement of Mr. A. R. Foote, of Cincinnati, as a suitable person to have charge of the investigation has been duly considered and Mr. Foote's appointment will be issued in due season."

YOUR TELEPHONE EAR.

IT IS A MATTER OF RECORD THAT VERY FEW PEOPLE USE THEIR
RIGHT EAR AT A 'PHONE.

You have a telephone ear. You may not know it, but you have all the same, says the *Albany Express*. It is the left ear, for it is on record that only a very small percentage of men or woman use the right ear at the telephone.

As a matter of fact the telephone has suddenly come into prominence as a medical proposition, and unless the scientists are mistaken the bulk of men and women who use the telephone within a few years may expect to find themselves rather hard of hearing in the left ear.

This is because when using the telephone every muscle and nerve of the ear is strained to catch the faintest sound from the person speaking at the other end.

Dr. Oliver W. Moore, the eminent eye and ear specialist, was asked the other day if he had heard of any cases of deafness from the telephone.

"It is rather difficult to state exactly," he replied. "I have seen where the repeated sounds of an instrument or the repetition of any sound has caused deafness. Telegraph operators are in danger of injuring their sense of hearing. Boilermakers often suffer from deafness. In the construction of boilers it is necessary for one man to be inside of the boiler and the other outside, and the incessant noise caused by the riveting of the boilers always causes either deafness or an affection of the ear.

"As to the telephone, it no doubt has the same effect. It is natural and reasonable to suppose that a person listening for a sound, and not knowing the moment when it will come, may injure the membrane of the ear, and in time that might affect the hearing power."

President Weeks, of the Electric Light Association, reports that twelve very important papers have already been submitted to be read at the Kansas City meeting of the association and a dozen others are expected. Those who imagine that the association is going to pieces will now change their minds. The association never was in a more healthy condition.

Hills school at Pottstown, Pa., has adopted electricity for lighting purposes. The United States Electric Light Co.'s system is used. Since the adoption of electric lights there has been a decrease of 80 per cent. in complaints of affection of the eyesight. This institution has also ordered a storage battery plant. Mr. Eugene T. Lynch, Jr., of N. Y., has taken the contract for this. The Julien system will be used.

What Edison says of electricity of the future:—"It is the coming motive power. It will be used on all the railroads some day, but the point is to get an economical engine. My theory is to have immense dynamos located all along the line of the road and have the electricity conveyed from these stationary engines to the locomotives by wire through the rails. For example I would put two big engines between New York and Philadelphia and enough power could be furnished to whisk the limited at the rate of a hundred miles per hour. But this is the point I have been working on for years—to convert heat directly into electricity without the intervention of a boiler, steam and all that. What an enormous amount of expense could be saved if this could be done. Think of putting something into the heat of that natural gas fire and making electricity out of it. It can be done. I feel it in my bones and just now have a suspicion that I am on the right track, but it is a pesky problem, one that can be worked out only in time."

THE ST. LOUIS ELECTRICAL EXHIBIT.

While the Electrical Department did not show up as beautifully as intended on the first night, the exhibit was still a magnificent one. The display is the finest, largest and most complete ever shown in this or any other country. It is doubtful if there is an electrical appliance of any kind that is missing.

The dynamo exhibit could not possibly be finer. Every patentee of any note is represented. There are nine arc light and eleven incandescent light dynamos. The Edison Company, of New York, have six 400 incandescent lighters. The Western Electric Company, of Chicago, show four low-tension and one high tension arc light dynamos of thirty-five lights each, and one incandescent 150-lighter. The Heisler Company, of St. Louis, have two 300 incandescent lighters. The Westinghouse Electric Company, of Pittsburg, are exhibiting one 750-light alternating current incandescent and one 400-light continuous current incandescent and one fifty arc-light machine. The Excelsior Company, of New York, has a novelty in dynamos. It is a thirty-five arc light which drives an arc motor. This runs an incandescent dynamo, which furnishes the current for an incandescent motor. This company also shows several light and power machines. The Seaforth Company, of Chicago, has one fifty-arc-light machine. The Ball Company, of New York, shows a twenty-five arc machine which only weighs 530 pounds.

In the centre of the department is the phonograph and graphophone exhibit. This display was one of the features of the department. A small corrugated iron house contains several instruments for conversational purposes. In an enclosure are the foot and electric battery machines. Here any individual can talk to a friend he chooses, and the message will be repeated in any part of the Exposition where a phonograph is located. The type-writing machine is located in this department and is a new feature of the phonograph. The pleasing novelty of this exhibit is the concert given every night in the small hall of the Exposition. Four musical selections and an address were given one night. With the aid of the large horn, which is used, every tone and each word is as pure and distinct as though given by the instrument or spoken in person.

A beautiful booth festooned in blue and white with pink trimmings stands near the phonograph exhibit. This contains a part of the exhibit of the Solar Carbon and Manufacturing Company of Pittsburg. Everything of an electrical nature is seen there. Near this booth is the carbon display of the company mentioned. The Solar Company show all kinds of carbon, which is made of coke, while the Fidelity have a beautiful exhibit of battery cups and carbon points. The back of the exhibit is draped in red, white and blue, with a terrace of carbon points beautifully arranged. In front, on each side of a carbon fence, are two pyramids, one of battery cups and the other of carbon points. Near this is the display of the Parker & Russell Mining and Manufacturing Company. On a black background is the trade-mark of the company represented by a large sun, surrounded by the words "Sunlight Carbons" in large brass letters. When lighted the effect is grand. Strewn around the inclosures are firebrick, tiling, retorts and different articles of this kind of ware, making the whole display one of the most beautiful on the floor.

The Microphone Carbon Battery Company, of New York, have a unique exhibit. Artistically arranged on several tables are bells, batteries, etc., and in the centre is a beautiful pyramid of electric batteries. The apparatus showing the different applications of the batteries is one of the features of the display.

The feature which perhaps was the greatest novelty and which attracted the most people was the writing telegraph. Five machines were in operation, showing the practical application of the instrument. An operator writes at one machine and a fac-simile of the handwriting is shown on four other machines stationed at different parts of the enclosure. There is also a key-board similar to the one in use at the telephone central office. This is to be used when the writer is in one part of the city and the receiver in the other.

The Central Electric Construction Company of St. Louis have an elegantly trimmed booth. The rear, on a black background, contains all kinds of electric lamps, in different colored globes. The firm's name is artistically arranged with these lamps. The canopy which covers the booth also contains electric lamps. When lighted this will make a magnificent picture.

Geo W. Lewis, St. Louis, has a novelty in an electric shoe. The sole contains an electric plate, which has a ground connection in the shape of a copper and zinc button. Dawson, Lize, Bros. & Co., of St. Louis, are on hand with their electric matting burglar alarm carpet. The Shultz Belting Company are manufacturing endless dynamo leathern belts. Wm. Powell & Co. have a beautiful display of lubricators arranged in the form of a pyramid. All kinds of asbestos material for covering steam pipes are shown by Thomas J. Connors, of St. Louis.

The most beautiful display in the whole department is that of the Phoenix Glass Company of Pittsburg. On a large board, 20 x 20 feet, with a dark background, are 150 electric globes of the most beautiful designs in artistically arranged groups. Some of these globes are hand-painted, and when the whole 150 lights are turned on the result will be wonderful, reminding one of the fabled glories of Aladdin's palace.

Eureka Electric Company (The Loomis system) has a fine exhibit of low potential lighting. From this system there is no danger to life whatever, and the wires may be handled with impunity. They show one of their own dynamos, running the incandescent lamps for the illuminated waterfall and fountain, and they also have a large number of lamps, artistically arranged in the space reserved for them. The display of switches, "cut outs" and many other appliances is large and is under the charge of Mr. Huntington Lee. The American Leather Link Belt Company, of New York, have on exhibition a very fine display of their link belting; and the perforated belting, which has gained a well-earned reputation among the electric light people, commands a great deal of attention from those interested in this class of goods.

William Koedding makes a very fine showing of electric motors and small dynamos. He has a model of a street car propelled by electricity that will prove interesting.

The Fidelity Carbon Co. have carbons in various forms and shapes. Two pyramids, one of arc light and the other of cup carbons, are shown, with dozen of boxes of arc light carbons, the whole surrounded by a fence made entirely of carbon.

The Parish Bros. & Peck Electrical Co. of Detroit, Chicago and St. Louis, show working models of electrical signals for passenger and freight trains and steamboat burglar alarms and other contrivances, all in operation.

The Burton Electric Co. of Richmond, through their founder, Dr. W. L. Burton, have electric heaters and cooking apparatus. With this system cars on an electric road can be splendidly heated and that, too, without danger from fire and at small cost. They can be applied with success to railroad cars. The John Scott legacy medal was awarded Dr. Burton, by the Franklin Institute in Philadelphia, on this invention.

The aquarium will be an attractive feature of the basement, the display lighted throughout, as it will be, by electricity.

A very handsome and attractive illuminated waterfall, tropical garden and fountain are shown, the water sparkling as it falls over hundreds of vari-colored incandescent lamps, like so many rubies, emeralds and diamonds. This will be one of the features of the electrical exhibit.

The Deane Pump Co., of Holyoke, Mass., have 10 pumps ranging from 100 to 1,000,000 gallons capacity, pumping from and into a large tank for the instruction of visitors.

The St. Louis Iron and Machine Works exhibits a magnificent Corliss engine of 150-horse power. It stands in the center of the north nave, and drives the north and west lines of shafting.

CHICAGO TELEGRAPHERS' ECCENTRICITIES.

The intricacies of the fearful and wonderful split trick kept me at my desk until after midnight not long ago, and as I came down into the hall my attention was attracted by the sound of several animated voices in the dining-room.

I stepped inside and discovered that these voices proceeded from a little group, consisting of a fat operator, two slim operators, a new man from the country and a check boy, who were evidently engaged in exchanging reminiscences. Seating myself quietly at one side and pretending to be absorbed in a newspaper, I overheard the following conversation:

"Speaking of ghosts,"—began one of the slim operators.

"Who was speaking of ghosts?" interrupted the check boy.

The slim man deigned no other reply than a withering look and resumed.

"Speaking of ghosts, I will never forget a terrible fright I had when I was working nights at B—."

In response to a chorused "tell us about it," the speaker continued:

"B— was a little out-of-the-way town on the Mo. Pac. Railway. I was sent there to work nights, and I can tell you it was the loneliest spot I ever struck. The depot was about a mile from town, in a sort of a hollow, and I would sit there all night long without seeing a human face. The dismal, creepy feeling that used to come over me I shall never forget. This feeling was not lessened by the fact that a few years previous a night operator had been killed in the same office by a large stone thrown through the window by some drunken strikers. Well, one evening we were sitting in the office, the agent, the day operator and myself, when the day man remarked, 'why it was just three years ago to-night that poor Jones was killed.' (Jones was the night operator referred to.) 'So it is,' replied the agent, and then turning to me said jestingly, 'ain't you afraid he'll come back and haunt you, Tom?'"

"Of course I laughed with them, but you bet I felt mighty queer, for I was only a boy; after they left I determined to steal a little rest, so I laid down on a table and was soon fast asleep."

"How long you slept you do not know," etc., etc., said the fat man, "skip all that stereotype and go ahead with the story."

The slim man condescended no reply but continued:

"When I awoke I was attracted by a peculiar sound from the instrument. It seemed familiar, but I could not tell just what it was. I arose, walked over to the desk and sat down." A moment later I was rooted to the spot with horror at the sight before me. The circuit-breaker was open and the key was moving, sending a message. In an instant I realized that it must be the invisible spirit of the dead operator to whose sending I was listening."

"What did he sign?" inquired the new man.

"Then the thought flashed over me," pursued the slim man taking no heed of the interruption, "that the chair in which I sat must be occupied by the ghost. I sprang to my feet—"

"Thought you was rooted to the spot," said the check boy.

"Sprang to my feet and started to the door only to find that it had been bolted from the outside. Then I fell to the floor in a dead swoon. When I recovered, the day operator and agent were leaning over me pretty badly scared, fearing they had killed me."

"Fearing they had killed you?"

"Yes; it all came out then. They had attached a fine wire to the key-lever, passed it through the holes in the table and floor and into the room below, opened the key,

knowing I would have nothing to do for several hours, and went below to lay for me. By pulling on the wire they had operated the key, and the key and sounder going in unison had caused the peculiar sound which attracted my attention."

Everybody heaved a sigh of relief and the other slim man said: "Well, I must go home and take some rest; business is getting awfully heavy on my wire lately."

"You fellows don't know what heavy business is," said the fat man contemptuously; "why, after the floods in '82 I sat down one night on first New York with a stack of business two feet seven and one half inches high before me. Had to reach way up above my head, so, to time them."

"But how could you read them?" asked the new man.

"Fixed that easy enough. Had a mirror suspended over them and, by looking up into it, I read them all right. During that night I sent seven hundred and twenty-two messages."

"Bill," said the first slim man impressively, "you are the biggest liar I ever saw."

"Think so?" returned the fat man complacently as he drifted towards the stairs; "you ought to meet my brother."

DETROIT NOTES.—Among recent departures we note Mr. E. B. Vosburgh to join the "McGibbeny Family" concert troupe; Mr. E. E. Beebe to Beaman, Mo., for the M. K. & T. Ry. Co.; Mr. Paul Dorman to the D. L. & N. Ry. Co., and Mr. Larry O'Brien to try his luck in other pursuits; Mr. J. H. Hancock to Cleveland. Arrivals: Mr. George Boos from St. Clair, Mich.; Mr. C. H. Kent from Winnipeg, and Miss Rowland from Lansing. Miss Carrie Fox, and Mr. W. A. Kennedy, who have been doing relief duty through the district have been recalled to the Detroit main office. Mr. Frank Riley, who was detailed to help out at Lansing during the State Fair, has returned, Plank's Hotel office at Mackinac Island having been closed for the season. Miss Ella Shannon, after a two weeks' vacation will return to the Detroit main office. Mr. M. S. Corbett, chief operator, and Ed. Corbett, traffic chief, have returned from a short vacation and trip to Mackinac. Messrs. Fred Dolson and Tom Kennedy have also returned from ten days' vacation. In the Canadian division: Manager Dwight has just returned from a fortnight's vacation looking much benefited thereby. During his absence chief operator Powers officiated, assisted by Messrs. Fred Damon, George Lockhardt and George Fair; Mr. Damon taking a week off upon Manager Dwight's return. Mr. George Fair, who was subbing in this division, is a student at the Kalamazoo Theological College, and is filling in his summer vacation by working at the key. The International Fair and Exposition has opened here for ten days, and business is booming. Mr. Joe Richardson has charge of the company's interests at the Exposition Grounds. A new arrival handling a grain market, let it get away from him "Ress," and he hasn't tumbled yet, but may when this item strikes him.

NEW YORK POSTAL NOTES.—Arrivals: C. Zimmerman, T. Alcan, L. Straup, W. J. McGarr, J. O'Connor, J. E. Brick, R. H. Brooks, J. P. Regan, H. G. Funk, W. W. Wilson, Walter Holbrook and F. C. Frace. Harry Peters and R. A. Lynch have been transferred from the waiting list to the regular force. Departures: C. H. Ennis, E. J. Davin, E. J. Fullum, E. A. Hawley, J. J. Keating, G. McKenzie, C. L. McGerty, F. P. Newman, J. O. Wilson, F. N. Withey, W. C. Murray and J. M. Foley. The Misses Conway and Willis have left to take situations with brokers.

PENNSYLVANIA R. R. NOTES.—Mr. S. H. Hubbard, of 8 Broadway, New York, is on a well-earned vacation. E. C. Cuddy, of the same office, has just returned from a short trip through the western part of Pennsylvania.

THE BUTLER HARD RUBBER CO.,

33 Mercer Street, New York.

—MANUFACTURERS OF—

Hard Rubber Goods of Every Description,

INCLUDING THE CELEBRATED HARD RUBBER BATTERY CELLS Manufactured under Kiel's Patents.

FOR PRIMARY AND STORAGE BATTERIES.

THE CHEAPEST AND BEST CELLS IN THE MARKET.

Also, SHEET, ROD AND TUBING (Kiel's Patent) for Electrical Purposes, at Reduced Prices.

Standard Quality Sheet, Rod, Tubing, Insulator Hooks, Key Knobs, Switch Handles, Telephone Receivers and Battery Syringes constantly on hand. Hard Rubber specialties of all kinds made to order.

SEND FOR PRICES AND ESTIMATES. FOR SALE BY

CENTRAL ELECTRIC CO., Chicago, Ill.

SAWYER-MAN ELECTRIC CO.,

510 to 534 West 23d Street, New York.

SEND FOR NEW CATALOGUE OF

Incandescent Lamps and Supplies.

ELECTRIC AND COMBINATION FIXTURES.

SERIES LAMPS AND SOCKETS.

CORRESPONDENCE SOLICITED.

J. S. TOWNSEND,

1554 Wabash Ave., Chicago, Ills.

Will ship you any article in the way of Diamonds, Watches, Jewelry, Emblems, etc., etc., C. O. D. approval, and guarantees all goods as first-class, and prices spot cash, wholesale rates. We sell immense quantities of goods and can afford to give our customers the benefit of very great inducements. Write for Catalogue and our Co-operative Watch Club system. Manufacturing and Repairing. Designs furnished free of charge.

References: Editor of this journal and First National Bank, Chicago, Ills.

J. S. TOWNSEND,

1554 WABASH AVENUE, CHICAGO, ILLS.

PATENT BUREAU.

ROOM 47.—181 BROADWAY.

For the purpose of soliciting and prosecuting applications for patents in the United States and foreign countries. Re-issues, Caveats, Trade-Marks, Copyrights, Designs and Labels promptly and carefully attended to.

Expert opinions, diagrams and general information in electrical matters furnished at reasonable rates. Correspondence solicited.

We will furnish copies of United States patents on receipt of 25 cents each.

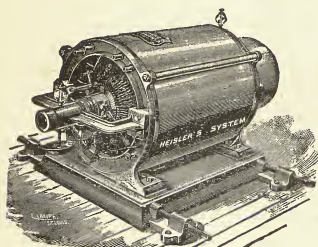
Suits in patent cases prosecuted and defended in United States Courts.

L. A. McCARTHY, *Manager.*

J. B. SABINE,

Attorney at Law.

**THE HEISLER PATENT LONG DISTANCE
INCANDESCENT ELECTRIC LIGHT SYSTEM.**



SEND FOR CIRCULARS.

Unequaled for Distribution over wide Areas.

SPECIALLY ADAPTED FOR
STREET, COMMERCIAL AND DOMESTIC ILLUMINATION FROM CENTRAL STATIONS.

SAFETY, RELIABILITY AND FINANCIAL SUCCESS FULLY DEMONSTRATED.

Plan of Wiring the Simplest, Cheapest and Most Efficient.

— STRICTLY SERIES. —

Noted for the Brilliance and Beauty of the Light Lamps, 16 to 100 Candle Power. Long Life without Blackening.

Greatest Production of Candle Power per Horse Power. Dynamo Self-Contained and Perfectly Automatic.

Plant may be located where Power can be secured Cheapest, even if Miles Distant from the Lighting.

CORRESPONDENCE SOLICITED.

HEISLER ELECTRIC LIGHT CO., 809-817 South 7th St., ST. LOUIS, MO.

THE TELEGRAPHERS' MUTUAL BENEFIT ASSOCIATION.
A FRATERNAL LIFE INSURANCE SOCIETY.

Twenty-second Year.

For Particulars, Address T. E. FLEMING, Secretary,
Box 3175, New York.

GOLD AND STOCK LIFE INSURANCE ASSOCIATION.

TWELFTH YEAR.

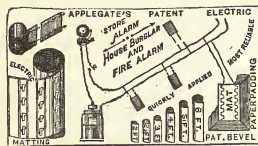
For Telegraphers and Others in Electrical Service.

INITIATION FEE, \$1.00. DUES, 50c per Month. INSURANCE, \$600.00.
In Payments of \$50.00 per Month for One Year.

WM. J. DEALY, Secretary,

(Room 58.)

195 Broadway, New York.



Applegate's Electric, Floor Mat Manufacturing Co.

OFFICE AND FACTORY:

No. 37 Market Street, Camden, N. J.

THE GREATEST HOME PROTECTION YET INVENTED.

SIMPLE! DURABLE! CHEAP! VALUABLE!

For sale by all Electrical Supply houses.

J. W. COLBURN & CO.
130 MAIN ST. FITCHBURG MASS.

MACHINES FOR
ARC AND INCANDESCENT ELECTRIC LIGHTING, ELECTRO-PLATING, AND FOR EXPERIMENTAL USE. ALSO MOTORS.

CHEAPEST WORK **LOWEST PRICE**

The Standard Time Advertising Co.,

8 DEY STREET, NEW YORK.

Electric Self-winding Clocks on Western Union Time Circuits leased for business advertisements.

Commissions paid to managers for securing advertisers. For terms address as above.

EDWARD BLAKENEY,

431 Broadway, Brooklyn, E. D.
DEALER IN

New & Second-hand Electrical & Physical Apparatus.

LARGE LOT OF SECOND-HAND INSTRUMENTS AND MATERIAL AT LOW FIGURES.

—CORRESPONDENCE INVITED.—

W. H. COLE,

Electrical Engineer

— AND —

Consulting Electrician,

321 East 14th St., New York.

Tests, Measurements and Estimates of all kinds. Sole Agent of the Phoenix Incandescent Lamp Co. Lamps for any System and Candle Power.

LEONARD PAGET. CHARLES J. KINTNER.

PAGET & KINTNER,

Chemical & Electrical Experts & Electrical Engineers,

DOMESTIC AND FOREIGN PATENTS.

No. 45 Broadway, New York.

PHOTO-TYPE COMPANY



76 BEEKMAN STREET,
New York.



Printing Plates

On Brass, direct from Photograph, Painting, drawing, etc., by Oesterreicher's New Process.

Telegraphers' Mutual Aid and Literary Association of Boston,

Initiation Fee, \$2.00.

Dues, 25 cents per Month; Sick Benefit, \$7.00 per week Death Benefit, \$50.00.

Qualifications for Membership:—Good Health, employment in Electrical Pursuits, 18 years of age, residence in vicinity of Boston.

ROBERT E. TORIN, President,
GEO. H. WINSTON, Secretary,
177 Devonshire Street, Boston.

NEW YORK TELEGRAPHERS' AID SOCIETY.—

G. Irving, Pres., J. M. Moffatt, Sec., address 105 Broadway. Dues 50 cents per month; pays \$8 per week, and \$100 at death. Qualifications: Good health, employment in electrical pursuits, and residence in vicinity of New York. Applications solicited.

Headquarters for Type Writer Supplies.

RIBBONS, CARBON AND MANIFOLD PAPERS.

Full line of papers specially selected for use on all writing machines. Pads for Yost writing machine. Sample books and price lists furnished on application

THE S. T. SMITH CO., 14 Park Place, N. Y.

O. R. T. DATING OUTFITS!

Put up especially for Operators, contains

- 1 Self-Inking Stamp, (your name)
- 1 Self-Inking Stamp, (town and state)
- 1 Self-Inking Date Holder
- 1 Set Solid Rubber Dates, (good 8 years)
- 2 Bottles Ink, (any color).

Sent postpaid, only \$1.85.

SOLID RUBBER MOVABLE TYPE

Is needed by all; 4 sizes, 50 cts. to \$2.00.

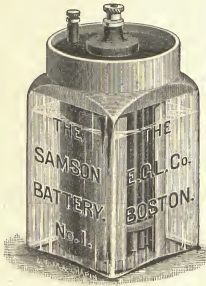
Name, and all small one line Stamps, - - - 20 cts
Pen and Pencil Stamps and Ink, - - - 25 "

Little Gem, Self-Inking, (one line) - - - 45 "

Everything Else in Proportion. Agents Wanted.

—Circulars Free; 16 page Catalogue 2 ct. Stamp.—
B. B. WELDY, Cpr. C.E. & N. Ry., Deef Slough, Wis.

THE
"SAMSON"



LETTERS PATENT PENDING.

PROVES A MOST DECIDED ADVANCE IN OPEN-CIRCUIT
BATTERIES IN THIS COUNTRY.

IT IS REALLY A "SAMSON" IN STRENGTH. ITS MARVELLOUS WORKING POWER CREATES
GENERAL SURPRISE; BUT ITS SIMPLICITY IS MOST ASTONISHING!

In France, where the Leclanché Battery originated and flourished, the "SAMSON" now takes the lead. America too, demands the best; and as she adopted the Leclanché, so she is now receiving the "SAMSON," the latest improvement and highest advance in Open-Circuit Batteries, into her highest favor. Its rapid introduction and sale in the United States indicates the existence of a great demand for a better battery, and marks a new era for those who have been annoyed by the uncertainty, and burdened with the consequent high cost of battery power.

WHAT MERIT HAS THE "SAMSON" BATTERY to account for its sustained popularity abroad and its growing favor here? Its remarkable endurance and long life render it especially valuable. **FIRST.**—There is no prism or porous cup to wear out. **SECOND.**—Its *Corrugated Carbon Porous Vase* is practically inexhaustible. **THIRD.**—Its *Cylindrical Zinc* weighs $3\frac{1}{2}$ times more and has a surface fifteen times greater than the Leclanché Zinc. **FOURTH.**—Its *very porous* and large surfaced Carbon reduces the internal resistance to almost nothing, thus greatly increasing its available current strength.

Practical Electricians Enthusiastically adopt The "SAMSON."

No higher praise could be accorded it than the *continued and constantly increasing orders* received from those who early ventured to try it. Indeed, it is getting to be the conservative thing to use the "SAMSON" Battery. After all it is simply a matter of *dollars and cents*. As for instance, if the "Disque" Leclanché costs 50 cents and the "Samson" 65 cents, but lasts *three times as long*, you don't need higher mathematics to help you determine which it will pay you best to use! Experience here and abroad, as well as scientific opinion and common sense, teach that the "Samson" will on an average outwear two cells of the best "Disque" Leclanché! At any rate, *it will cost nothing to verify these statements*, and it is exceptionally important to users of Open-Circuit Batteries to know the real merits of this King of Cells.

SEND FOR CIRCULARS, PRICE LISTS, ETC.

THE ELECTRIC GAS LIGHTING CO.,
35 Arch Street, Boston, Mass.

LOUIS W. BURNHAM, Vice-Prest. and Manager. SOLE MANUFACTURING AGENTS FOR THE UNITED STATES.

The
Westinghouse Electric Co.,
PITTSBURGH, PA.

Electric Light and Power for all Purposes.

190 Central Station Alternating Current Plants, *Aggregating the Capacity of 330,000*
16 c. p. Lamps, sold since the first Commercial Plant was started, November, 1886.

LESSEE OF

THE
UNITED STATES ELECTRIC LIGHTING CO.
SALES DEPARTMENT, 120 BROADWAY,
NEW YORK CITY.

THE
SAWYER-MAN ELECTRIC COMPANY,
510 WEST TWENTY-THIRD STREET,
NEW YORK CITY.

COMPLETE ISOLATED PLANTS, : :
Arc or Incandescent.
: : BEST DESIGN AND CONSTRUCTION.
HIGHEST EFFICIENCY.

INCANDESCENT ELECTRIC LAMPS, : :
—AND—
SUPPLIES FOR ELECTRIC WORK,
: : : ELECTRIC AND COMBINATION FIXTURES.

ESTIMATES FURNISHED.

CORRESPONDENCE WITH DEALERS INVITED.

The Westinghouse Electric Co., - Pittsburgh, Pa.

THE "ELECTRIC AGE."

○ ○ ○ ○ ESTABLISHED 1831. ○ ○ ○ ○

John Stephenson Company, LIMITED. TRAM CAR BUILDERS,

47 East 27th St., New York.

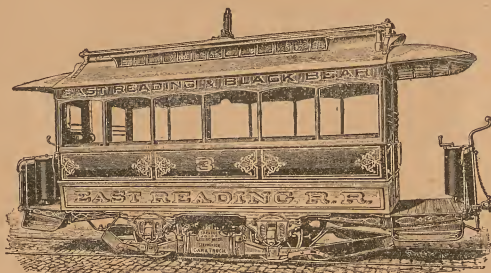
INVITE THE ATTENTION OF

Promoters of Electric

Railway Enterprises

TO THEIR

SUPERIOR FACILITIES



FOR THE CONSTRUCTION OF

TRAMWAY CARS

—AND FOR THEIR ADAPTATION—
TO THE

Various Schemes

OF

ELECTRIC PROPULSION

SPRAGUE ELECTRIC RAILWAY AND MOTOR COMPANY.

Out of six thousand, four hundred and sixty-four trips made by the SPRAGUE ELECTRIC CARS at Atlantic City, N. J., since that road was started, NOT A SINGLE TRIP HAS BEEN LOST FROM ANY CAUSE WHATSOEVER, although there have been no reserve cars.

This Road Uses the Sprague Improved Motors.

16 & 18 BROAD ST., NEW YORK.

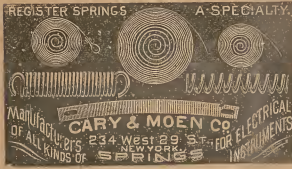
**AERIAL, SUBMARINE
and Underground
WIRES & CABLES**



TRADE MARK.

For Telegraph, Telephone and
Electric Uses.

THE OKONITE CO.,
No. 13 Park Row, NEW YORK.



W. D. SARGENT, Pres.

JNO. A. BARRETT, Vice-Pres. & Cons. Elec.

E. H. CUTLER, Treas. & Man.

FRANK A. PERRET, Electrician.

The United Press.

International in scope, representing leading Journals throughout the United States, Canada, and Europe, and operating a complete system of leased wires to the principal American cities.

BOARD OF DIRECTORS.

JAMES W. SCOTT,	Chicago Herald,	ROBERT S. DAVIS,	Philadelphia Call,
CHAS. H. TAYLOR,	Detroit Globe,	JAMES E. STRIPPES,	Detroit Evening News,
WILLIAM M. LAFFAN,	N. Y. Evening Sun,	SAMUEL D. LEE,	Rochester Herald,
WILLIAM L. BROWN,	New York Daily News,	E. H. BUTLER,	Buffalo Evening News,
ARTHUR JERLINS,	Syracuse Herald,	C. R. BALDWIN,	Waterbury American,
JOHN H. FARRELL,	Albany Press,	W. C. BYRANE,	Brooklyn Times,
	and Knickerbocker,	WALTER P. PHILLIPS,	New York.

EXECUTIVE OFFICERS.

JAMES W. SCOTT, President.
A. L. SURAMAN, General Western Manager, Chicago.
C. R. BALDWIN, Treasurer.
WALTER P. PHILLIPS, General Manager, New York.

ANSONIA BRASS & COPPER CO.

SOLE MANUFACTURERS OF

Cowles' Patented Fire-Proof and Weather-Proof Line Wire.



SAMPLES FURNISHED UPON APPLICATION.

Pure Electric Copper Wire, bare and covered, of every description.
Waterrooms: 19 and 21 Cliff Street, New York; 133 & 135 Wabash Ave., Chicago, Ill. Factories: Ansonia, Conn.

THE ELEKTRON M'FG CO., Cor. JAY & PLYMOUTH STS.,
BROOKLYN, N. Y.

MANUFACTURERS OF THE

PERRET ELECTRIC MOTORS and DYNAMOS.

Automatically Regulated, Unexcelled in Simplicity and Durability.

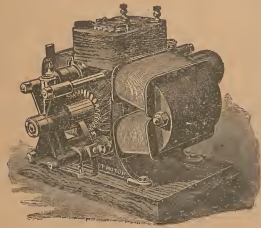
THE ONLY MACHINES HAVING

Laminated Field Magnets of Softest Charcoal Iron,

BY MEANS OF WHICH

Higher Efficiency, Closer Regulation and Slower Speed are obtained than
— is possible otherwise. —

CAREFUL INVESTIGATION INVITED.



Standard Underground Cable Co.

**ELECTRIC CABLES,
LINE and HOUSE WIRE.**

General Office: 708 Penn. Ave., Pittsburgh, Pa.
Branch Offices:
N. Y., 18 Cortlandt St. Chicago, 139 E. Madison St.

DAY'S

KERITE WIRES AND CABLES,

For Aerial, Underground and Submarine use.

EDWARD B. McCLEES,
General Agent.

16 DEY ST.,

NEW YORK

When consulting with advertisers or sending for catalogues, mention that you saw the advertisement in this paper.

JOHN A. ROEBLING'S SONS CO.,

MANUFACTURERS OF

Galvanized Iron & Hard Drawn Copper Telegraph Wire.

MAGNET, OFFICE AND ANNUNCIATOR WIRE, UNDERWRITERS' AND WEATHERPROOF LINE WIRE.

H. L. SHIPPY, Secretary.

117 & 119 LIBERTY ST., N. Y.



Engravings for Books, Newspapers and Circulars
SEND GREEN STAMP for CIRCULAR—SEND PHOTOGRAPH, DRAWING or PRINT for ESTIMATE.

PATENTS!

WRITE AT ONCE FOR ILLUSTRATED CIRCULAR and INSTRUCTIONS.

ADVICE FREE.

J. B. CRALLE & CO.,
WASHINGTON, D. C.

THE EDISON MACHINE WORKS

WIRE INSULATING DEPARTMENT.

JAS. F. KELLY,

GENERAL SALES AGENT,
New York.

19 Dey Street.

THE ELECTRIC AGE.

THE
EDISON MACHINE WORKS,
SCHENECTADY, N. Y.

MANUFACTURERS OF

Weather-Proof Wire. Magnet Wire. Insulated Iron Wire.
Annunciator Wire. Office Wire. Gas Fixture Wire.
Rubber-Covered House Wire. German Silver Wire.
Flexible Cords. Arc Lamp Cords. Tinsel Cords.
Telephone, Telegraph and Electric Light Cables. Paragon Tape.
Flexible Brush Holder Cable.

JAMES F. KELLY,

General Sales Agent,

19 DEY STREET,

NEW YORK.

BERGMANN & CO.,

All Appliances for the Edison Electric Light,

AND

ELECTRIC LIGHT, COMBINATION ^{and} GAS FIXTURES.

Fixtures Adapted to any System of Incandescent Lighting.

CATALOGUES, SPECIAL DESIGNS AND ESTIMATES FURNISHED ON APPLICATION.

ARCHITECTS' DESIGNS FAITHFULLY CARRIED OUT.

CORRESPONDENCE SOLICITED.

Office and Works:
292-298 Ave. B. }

NEW YORK.

{ *Show Rooms:*
65 Fifth Avenue.

T. W. Wilmarth & Co., 225 State Street, Chicago, Ills.

AGENTS FOR OUR FIXTURES IN THE NORTHWEST.

FRANKLIN S. CARTER, CHARLES M. WILKINS. E. WARD WILKINS,

TRADING AS

PARTRICK & CARTER,
Manufacturers and Dealers
ELECTRICAL SUPPLIES

Sole Proprietors of the Patent Needle Annunciator.

114 SOUTH SECOND ST.,
PHILADELPHIA.

ESTABLISHED 1867.

Patent Needle Annunciators, Burglar Alarms, Electric Bells, Bronze, Nickel and Wood Pushes, Door and Window Springs, Electric Matting, Automatic, Ratchet, and Hand Light Burners, Spark Coils, Keys (Wood and Nickel), Compound Pushes, etc., Door Pulls and Attachments, Automatic Drops, Magneto Bells, Buzzers, Batteries (all Kinds), Foot Pushes, Pear Pushes, Desk Pushes, and all Supplies for Electric Bell Work, Telegraph Instruments, Registers, Relays, Keys, Sounders, Learners' Outfits, Medical Batteries and Appliances, Induction Coils, Motors, Storage Batteries, Hydrometers, Bluestone, Salammonic, Zinc, Copper, Climbers, Pliers, Screw Drivers, Bits, Augers, Vices, Tool Belts, Tool Bags, Splicing Irons, Clamps, Electro-Plating Outfits, Electric Light Supplies, Wires of all kinds, Tape Insulators, Cross Arms, Brackets, Pole Steps, etc., etc.

SEND FOR OUR NEW 1889 CATALOGUE,

And if in the trade, inclose business card for Discount Sheet.

EDISON LAMPS.



FROM $\frac{1}{2}$ TO 36 CANDLE POWER.

FROM $2\frac{1}{2}$ TO 40 VOLTS.

—FOR—

BATTERY OR DYNAMOS.

CATALOGUE ON APPLICATION.

EDISON LAMP CO.,

Harrison, N. J.

THE



“PARAGON”
ELECTRIC BELL

—: IS DUST PROOF. —:

PLATINUM CONTACTS. THOROUGHLY RELIABLE.

THE

“PARAGON”
ELECTRIC ANNUNCIATOR

Is constructed on an entirely new principle.

ZIMDARS & HUNT,

MANUFACTURERS,

237 MERCER STREET,

NEW YORK.



“THE PUBLIC is respectfully informed, for its own protection, that we have sued the Leclanché Battery Co., in the U. S. Circuit Court, for making and selling batteries which infringe our Patent No. 405,246, and that corporations or persons having in use or vending such batteries, are incurring liability therefor.

“In the event of a favorable judgment, which we confidently expect, we shall exact full damages for every cell.”

LAW TELEPHONE CO.

112 LIBERTY ST. WM. A. CHILDS, PRES.

NEW YORK, Sept. 17, 1889.