

# OPERATOR

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### Electric Lighting.—III

#### ELECTRO-MAGNETS (CONTINUED).

Magnets are not always made in the form of straight bars; there is another common form which is very useful practically. It is found that if the magnetic bar is bent like a horseshoe, so that its two poles are brought nearer to each other the attractive power is increased, and, other things being equal, such a magnet is much superior to a bar magnet of the same weight. The advantage is just as noticeable in electro-magnets as in permanent ones. A bent electro-magnet does not differ materially in action from a bent permanent magnet; both have the same magnetic field and consequently their behavior must be the same, just as was found to be the case with bar magnets.

Fig. 12 shows the magnetic spectrum obtained with iron filings from a magnet of this form.

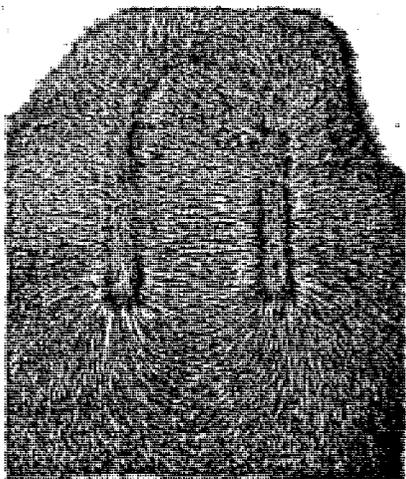


FIG. 12.

The increase of power obtained is not necessarily due to an increase in the number of the lines of force, but principally to the fact that they are brought closer together and are more concentrated around the poles. Some lines of force which, in a bar magnet, would have to make a long sweep around the outskirts of the magnetic field, now find a way to complete their circuit from one pole to the other by passing directly between them in a straight line, and in thus "shortening" they crowd each other more closely about each pole. These lines of force all form parts of complete circuits, as in all previous in-

stances. In this case, the substance of the magnet makes a path for the lines of force for the greater part of their circles. We notice, however, that the lines of force do not all cross over to the other side at the ends; and in fact it was the same with bar magnets. This is owing to Faraday's third law; these lines run parallel in the same direction and they repel each other as much as the concentrating power of the iron or steel will allow. Some of them are repelled so much that they never reach the poles, but start to go across at all points from the bend. Others are even compelled to start from the other side of one pole and thence make a long turn around the field to reach the other side. They all complete their circuits by the shortest route possible under the circumstances. What evinces the collecting power of iron in this, as in all magnetic fields, is that the portions of the lines which are further away from the poles succeed better in repelling each other, and the "field" is less dense in those regions. A piece of iron placed in such a portion of the magnetic field immediately draws these lines together and binds them in a "sheaf" in its mass, and then shortening takes place; that is why the piece of iron will be attracted toward the magnet, for the shortening of the lines of force passing through the piece of iron must of necessity bring it nearer if it is free to move, or else pull the magnet toward it. Shortening takes place from both poles, which together with the greater density of the field, just pointed out, explains the increase of attractive power obtained with the "bent magnets."

These magnets are sometimes called "horseshoe" magnets, but more generally they are known as U magnets, because their resemblance to that letter is greater, as they are at present made. To make an electro-magnet of the U

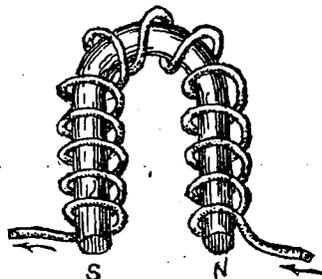


FIG. 13

variety, the wire should be wound around the iron in the same direction from one end to the other as if it were a straight coil bent in the middle. Fig. 13 shows this manner of winding. If the

current passes in the way shown by the arrows, the pole *N* will be north and *S* south, and vice versa. A convenient way to remember this polarity is the following: As we look at the pole of a magnet endwise, if the current circulates around it in the direction of the hands of a watch, this pole is the south pole; if the current goes around the other way, the pole is of north polarity.

In practice it is found very inconvenient to wind the wire at the bend, especially where it is desirable to put several thicknesses over each other. Consequently, the bend is left uncovered as in Fig. 14. The wire is wound on little spools which can be put on and taken off at pleasure. The connection from one spool to the other is made in such a manner that the current will still always go around in the same manner as in Fig. 13, namely, so that if we were to straighten the

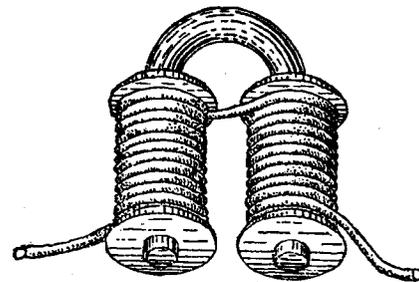


FIG. 14.

magnet and slip the spools to the middle until they met, they would be as one single helix on a bar electro-magnet. An electro-magnet made as in Fig. 14 gives the same results as if it were made like Fig. 13.

#### EFFECT OF CURRENT STRENGTH ON ELECTRO-MAGNETS.

We have seen that by increasing the number of turns or windings of the wire around a magnet the number of magnetic fields combined into one can be increased, and that consequently the magnetic power of an electro-magnet can be augmented to an almost unlimited extent; for by using a very fine wire it is possible to make a given helix contain a great many windings.

But there is another factor to be considered. If the current is strong, it is found to produce a much more intense magnetic field than if it be weak. For instance, a current may be so weak that its magnetic field would fail to arrange the iron filings, and make the magnetic figure, or spectrum. It may require two, three, or a dozen such currents united into one parallel bundle, to produce the concentric rings shown in Fig. 5. If it is already strong enough to make this field

itself, it will not require to be multiplied by passing through so many turns of wire, to produce a given effect. Accordingly when we are using weak currents to operate our electro-magnets, we use very fine wire on the spools, and when we are using powerful currents, as in dynamo-electric machines, we fill the spools with coarse wire. The larger the wire the less resistance it offers to the passage of the current; therefore it is an advantage to use a wire as large as the space will admit while giving the required number of turns.

ELECTRO-MAGNETIC INDUCTION.

We have all remarked many times that when a pebble is dropped on a smooth surface of water there arises a series of concentric rings around the point where the pebble struck. These little circular waves gradually expand outwards in all directions, still keeping their perfect circular form, and new ones, all coming from the same spot, keep following them at regular intervals. A very noticeable feature is that with a small stone these rings are very delicate and never spread out very far, while with a large stone they expand until they embrace quite an area; they become more and more delicate and finally die out.

This well-known phenomenon will serve as a good analogy in explaining certain motions which also take place in the concentric lines of force constituting the "field" around currents (Fig. 5).

We have seen, just above, that a weak cur-

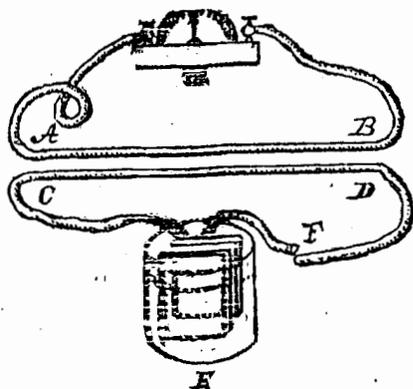


FIG. 15.

rent produces a weak magnetic field and a strong current a stronger one. We may investigate this variation in an easy manner. Starting with a weak current passing through a card, as in Fig. 5, let us gradually increase it. We will find that it will be soon strong enough to produce one single circle of iron filings around the wire; increasing again gradually, we will obtain two, three, four; and so the number of concentric lines of force will augment, and in consequence the area of the magnetic field will enlarge, with every increase of current, to infinity. If the weak current were made to multiply its own weak field by being made to pass through the same opening in the card several times, the result would be the same as increasing the current in the single conductor. We can understand this readily by referring to our analogy. Suppose that instead of one large stone, we "lump" several small ones together; the result is a mass of the same bulk as the one large stone and it would produce the same splash as the latter. We conceive, then, that the magnetic field of a current swells or increases outwards from the wire as a centre, when the current is strengthened. Now the reverse of this is also true; as the current diminishes in power the lines of force contract and fall back towards the wire, their centre. In doing this they are only obeying their tendency to shorten their circles. What prevented them from doing so before was the current which pushed or impelled them outwards. We might compare these lines of force to so many india-rubber bands which are stretched outward by the current, in opposition to a certain resistance of the air, or whatever medium is acted upon, and that while the current lasts they keep their tension, but they shorten all around and fall back to the centre as it disappears and collapse entirely as it dis-

appears. When we press on india-rubber it yields with every increase of the pressure, and recovers itself perfectly again as the pressure is removed, in a precisely analogous manner. Scientists suspect, therefore, that lines of force must be really a kind of strain (stress) produced in some very elastic medium supposed to pervade all space, and which is believed to transmit the rays of light. This medium is so little dense in structure, according to this theory, that it has no weight; it is thinner than the thinnest air; hence the name, "ether" has been given to it. It is believed that when a current (or a magnet) acts upon the ether it compresses it in certain ways and produces the peculiar strain in it which gives rise to "lines of force." Steel has the property of retaining this peculiar compression in its molecules after being subjected to the influence of a space where the ether is magnetic, and consequently itself acts like a current afterwards.

Magnetism, in a general sense, is now regarded as a special condition of "latent pressure" of the ether, just as light is due to a "motion" or vibration of this same medium.

Before going further, let us sum up the important facts derived from our experiments, for they will prove of the greatest utility in understanding what is to follow. There are four: 1st. When a current starts in a wire, the magnetic field expands outward. 2d. As long as the current remains constant no motion takes place in the magnetic field. 3d. When the current ceases the lines of force fall back toward the wire. 4th. Increasing the strength of a current expands the field, as in the first case, and weakening the current contracts it, as in the third case.

We pass on now to Fig. 15. There are two circuits; one includes an instrument for detecting and measuring electrical currents, G, called a galvanometer; the other includes a source of current, E. The portion A B, of the first circuit, is brought near to, and made parallel with, the portion C D, of the second circuit, though they do not touch or communicate with each other. We will now make another series of four observations, comparing them with the previous four.

Case 1. On closing the circuit at F and sending a current through C D, the needle of the galvanometer instantly swings to one side, showing that a current has been produced through some action of the magnetic field of wire C D on wire A B. The needle comes back again to zero immediately, however, so that the effect must have been only momentary. Case 2. The current is still passing through C D, but apparently without inductive effect on A B, as long as it remains constant. Case 3. We now break the current and instantly the needle turns in the op-

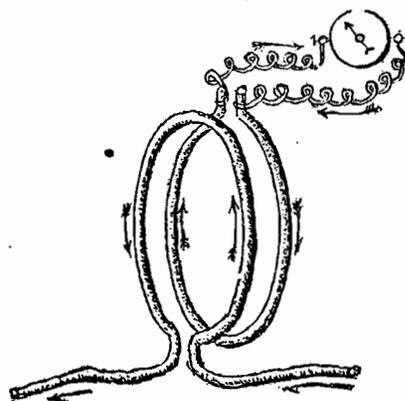


FIG. 16.

posite direction to that in which it pointed before, and immediately comes back to zero again. Case 4. If, while the current is on again, we increase it and then decrease it, gradually, in any suitable manner, we find that the increase of currents deflects the needle as in Case 1, and the decrease deflects it as in Case 3.

One cannot fail to observe the closest analogy between the two series of observations; and reasoning from a comparison of them, it strikes us at once that it is the "motion" or "displacement" of the lines of force as they expand or contract that induces the current in the neighboring circuit, for the moment the mag-

netic field ceases to move either way, and remains constant, or else has disappeared, there is no further induction; moreover it is quite evident from these observations that a motion in one direction produces results contrary to those due to a motion in the other direction.

Displacing either the wire AB or CD, while a constant current is passing through the latter will still afford a relative motion between the magnetic field of CD and the wire AB. Case 5. Therefore let us push AB nearer to CD; we find that the needle points as in Case 1 just as long as the movement of approach lasts; and it points as in Case 3 just as long as the movement of receding lasts.

We could explain these phenomena of electro-magnetic induction by supposing them due to a part of a circuit "cutting" across lines of force, or else lines of force moving so as to be "cut" by a conductor forming part of a circuit. This would be in accordance with our observations so far. Let us examine further, and see if this theory will explain other facts.

By turning our circuits into loops, as shown in Fig. 16, a greater portion of each can be conveniently brought under the influence of the other, and will still remain parallel to it. The arrows show the directions of the "direct" and "induced" currents in Case 1. Instead of a loop of the same size we could make a smaller one and put it inside the larger one, and the induction would still take place, no matter whether the direct current is passed into the inside or the outside one. Since increasing the amount of wire exposed in both circuits enhances the effect let us take two hollow coils or helices (Fig. 17).

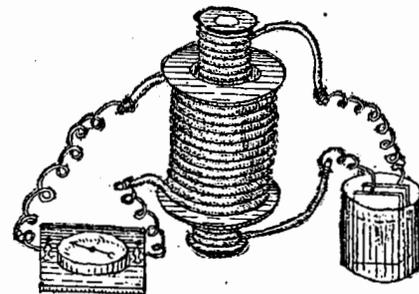


FIG. 17.

one of which is smaller than the other, and can be slipped into it. This apparatus will show all the results obtained with the contrivances in Figs. 15 and 16, but the results are multiplied so much as to become more striking. Moving either coil up and down while the current passes through also produces effects analogous to Case 5. Now, if we "concentrate" the magnetic field produced by the current in the inner coil, by placing an iron core in it, we find, as we would expect, that the effect is still further increased, and the needle shows a greater deflection.

C. O. M.

Mutual Union's Battle for Existence.

Mention was made in our last issue that Mr. Gould had obtained an injunction restraining the Mutual Union Company from tying up a majority of its stock in trust for five years in order to keep it out of Mr. Gould's hands. The complaint was made by the Western Union Telegraph Company and Jay Gould against John G. Moore (president of the Mutual Union), Thomas C. Purdy, James Stiles, William Niles, George F. Baker, George William Ballou, Asa P. Potter, Charles F. Peck, E. Schofield, George S. Scott, Harris C. Fahnestock, the Mutual Union Telegraph Company and the Central Trust Company of New York.

The complaint begins by saying that the Western Union Telegraph Company is a corporation and that Jay Gould is a citizen of the State of New York. The defendants, John G. Moore, Thomas C. Purdy and other persons unknown and in the complaint fictitiously styled James Stiles and William Niles, were, at the time specified later on in the document, copartners in the firm of John G. Moore & Co. The stock of the

Mutual Union consists of 100,000 shares, and George F. Baker contracted to buy of Moore & Co. 27,000 shares at \$5 a share. Gould acted for himself and the Western Union, and it was agreed that he should buy Baker's share, consisting of 13,500 shares, with Moore's consent. March 27 last Gould bought and paid for Baker's stock and received certificates for it. Gould, the complaint goes on, made a compact to buy of Moore & Co., who were acting for themselves and several persons, 8,500 shares more at \$5 each when a certain injunction should be removed and pending suits discontinued, and 10,000 shares at \$10 each. It was likewise agreed that all of the stock named and other stock belonging to the parties to the agreement, in all amounting to about 50,000 shares, should be placed in trust to be disposed of and controlled by Gould and Baker. It was stipulated that the persons interested in the trust should buy of the Mutual Union \$500,000 worth of its bonds at 80 per cent. of their par value. Each person was to contribute according to his interest in the trust. The agreement provided that the suits brought by either Pliny H. Babbit or William H. Cameron against the Mutual Union, which were pending at the time, should be stopped without costs to either party. The suit of the Western Union against the Mutual Union with reference to the Page patent was also to be suspended until the two companies should come to an agreement about it. The Western Union was, at the time the agreement was entered into, to be an associate of Gould therein. The complaint further states that the stock and bonds were purchased and the suits were discontinued according to the plan. At the time Baker, Ballou and Peck were directors of the Mutual Union and Baker was acting as its president. It was known, the complaint states, that the object was that the Western Union should become the owner of an interest in the Mutual Union, and with the knowledge and assent of the defendants purchased over three-tenths of the entire stock in the name of Jay Gould. The value of the stock and bonds depends on the performance of the terms of the agreement, and if the compact is not carried out the property will be of little or no value. The Western Union would not have bought the stock but for the existence of the contract, and but for the discontinuance of the suits the Mutual Union would not have received the benefits that have accrued, but would have been subjected to losses. No compensation can be made for the disadvantages which the plaintiffs have suffered. The plaintiffs have performed their obligations, and are willing to do anything that may be asked of them.

In the fifth specification it is said the plaintiffs have just become aware that secretly and in the absence of Jay Gould the defendants entered into a conspiracy with each other, in fraud of the rights of the plaintiffs, the sole purpose and effect of which is to defeat the accomplishment of the purposes of the arrangement. Under the terms of the conspiracy it has been agreed by the defendants that the stock of the Mutual Union, including the stock placed in trust, except the shares standing in the name of Gould, shall be turned over to Baker, Ballou, and Potter (the trustees in the last syndicate) for a period of five years, to be voted and managed and controlled by them with the distinct object of defeating the provisions of the previous agreement. It is charged that the plan is to hypothecate a majority of the capital stock and borrow money on it to expend in a manner that will not be to the advantage of the Western Union and Gould. The plaintiffs understand that the shares are to be turned over to the Central Trust Company, which is to issue certificates for them. The complaint speaks of Messrs. Baker, Ballou and Potter as fraudulent trustees. The plaintiffs ask that Baker be removed from his trust as a trustee with Jay Gould, and a successor appointed by the court to carry out the terms of the agreement; that in the meantime a receiver be ap-

pointed by the court to take charge of the interests and property in trust, and that the defendants be restrained from any attempt to do anything whatsoever in pursuance of the conspiracy. J. Gould, Thomas T. Eckert, vice-president of the Western Union; Norvin Green, president of the Western Union, and Burton N. Harrison, all swear to the truth of the complaint.

Gould, in a separate affidavit, says he in person conducted the negotiations with Moore & Co. which led to the contract. Negotiations with Baker took place. The discontinuance of the Cameron and Babbit suits enabled the Mutual Union stock to be issued. The stock was issued to Baker and Gould as trustees. Baker and Gould accepted the trust, and have ever since regarded the stock as trust property under the contract. For convenience, by agreement between Gould and Baker, 29,800 of the shares were transferred to Gould as trustee, and at Baker's request, and to carry out the agreement, 100 shares were transferred to George J. Gould and 100 shares to Russell Sage, in order to qualify them as directors of the Mutual Union. Baker has several times recognized the contract as being in force and had conferences with Gould relative to its sale. Moore & Co. received from the plaintiffs \$427,000 and other valuable consideration on the dismissal of the suits. Gould believes that the defendants have confederated together to violate the agreement and to place in trust a majority of the capital stock, including the 20,000 shares held by Baker, and that the object is to deprive Gould and the Western Union of the power to dispose of the control of the 50,000 shares as provided in the contract, to destroy the trust, to render the property purchased by Gould and the others almost, if not wholly, valueless, and the plot will work irreparable injury to the plaintiffs.

The defendants are ordered to show cause, before one of the Justices of the Supreme Court, on Nov. 9, why they should not be restrained from carrying out their plan. The defendants are also required to show why Baker, Ballou and Potter should not be enjoined from voting upon or disposing of the 50,000 and more shares of the Mutual Union, except as they may be directed by Jay Gould and George F. Baker, as trustees for the benefit of the respective owners of the shares, and why the Mutual Union should not be restrained from transferring the stock. The Central Trust Company is required to show why it should not be enjoined from accepting the stock and issuing certificates. In the meantime the defendants are restrained from taking action.

Alexander & Green, the Mutual Union's attorneys, were directed to prepare an answer denying the allegations, and saying that the proposed plan to form a syndicate was to protect the interests of the company. John G. Moore, the president, said that there was no written agreement made with Gould. The only compact made was that Gould was to have three directors in the board to represent the Western Union. Gould, his son, and Russell Sage were elected directors. They were not to have control and no promises were broken. President Moore thought the injunction would not hold, and he did not imagine that the syndicate would be interfered with at all by it. There were no overtures from Gould previous to the serving of the injunction. Mr. Fahnstock, who is prominent in Mutual Union affairs, said the injunction, or something like it, was not unexpected, and it was therefore no surprise. The fire-works, as he termed the proceedings, would continue a week or so and then go out. It would take a month to engrave the certificates, and by that time the proceedings would all be ended. Mr. Fahnstock denied the existence of a compact and was not all disturbed by the injunction.

A long and bitter struggle between the Western Union and the Mutual Union is anticipated. The case of the former against the latter is pronounced by all who are intimately conversant with the facts to be very weak, but they count on Mr. Gould's well known pertinacity and vindictiveness to exaggerate his pretensions in every way possible. Since the formation of the Baker-Ballou-Potter trust he has shown greater irritation than in any previous instance where his will has been thwarted, and he has uttered threats undisguisedly against the persons who are acting against him. All doubt as to the good faith and ultimate objects of the gentlemen

forming the "pool" has been removed from the minds of even the speculators in Wall street, who see in every stock or financial treaty a vehicle of trickery. It is certain, in the view of the best observers, that the interest of all the large holders of Mutual Union shares, with the single exception of Mr. Gould, is on the side of making the company entirely independent of its great rival.

"They all see," said a leading broker, "that any other course would be financial suicide, Mr. Gould is wounded more than he ever was before. When I say 'wounded' I do not mean especially in a financial sense, because he could sell his Western Union stock to-day without it going below the price that he paid for it. But his pride as the infallible genius of mischief is hurt. That's the reason why he will fight to the bitter end. He has an immense fund of ingenuity. He will exhaust every possible expedient and device before he will acknowledge himself to be beaten. But for once in his career he is over-matched. There's much more in this 'pool' than appears. The men composing it are strong, but there are others behind them who have ten times as much money, and who are preparing to spend as much as Gould's whole investment in telegraph companies to secure a fair share in the enormous telegraphic business of the country. They stand ready to furnish all the funds necessary for extending the lines of the Mutual Union to every point touched by the Western Union. If the Mutual Union desires to lay a cable they will place \$5,000,000 to its credit for that purpose. The public may be assured that at last the Western Union has found a rival which cannot be crushed."

At this writing the reply of the Mutual Union trustees has not been made, but its tenor is foreshadowed in the following conversation between President Moore and a reporter of the *Herald*:

Referring to the claim of Mr. Gould that the present action is a violation of the original agreement with him, Mr. Moore said: "If this trust was broken it was first broken by Mr. Gould himself, for he waited no longer than the time of the election of directors in last May before withdrawing his own shares from deposit and disposing of them to the Western Union Company. This was an act precisely similar to that which he now alleges as the cause of his present attack. Could he thus violate a trust without violating, and, in fact, destroying the contract which created it? The answer would be negative if the question were submitted to any impartial man. The agreement was made on our part upon his false representations that the stock which he received was to remain his personal property and was not to be used to the injury of this company. The fact that he transferred it to the Western Union proves that he acted in bad faith. But aside from these considerations, which would render the contract valueless if it ever had the original scope which he claims for it, there remains the fact that its apparent intent was fulfilled in the election of officers of the company last spring. Nothing could show this more conclusively than Mr. Gould withdrawing his shares from the trust immediately afterward."

"What was Mr. Gould's object in compromising with the Mutual Union when the suits to which you have alluded were pending against it?"

"It is well known that Mr. Gould had been worrying for some time under the heavy load of Western Union which he was carrying. His leading idea in obtaining our stock was to stimulate Western Union by creating the impression that we were under his control, and could, therefore, do nothing to hurt it. If the price had gone up he would undoubtedly have 'unloaded' Western Union. The 'street,' however, interpreted his maneuver in the contrary sense, and Western Union shares fell a good many points. It was taken for granted that Mr. Gould had already 'stood from under' as concerned Western Union, and was prepared to gobble up Mutual Union and force its rival to buy him out. This theory harmonizes perfectly with President Green's statement that the Western Union was placed in a 'false position.' So it was, and a decidedly awkward one, too. Finding that the gun went off backward, Mr. Gould changed his mind, and offered the stock to the Western Union, with the hope of thus restoring the confidence of speculators somewhat."

"What is your future course, Mr. Moore?"  
 "This company will present its answer in court, enforced by affidavits. There is not the lightest doubt but that the injunction will be swept aside. What we have done has been suggested by the best legal experience in this city. We have no fear but Mr. Gould will be discomfited in the end."  
 "What effect has this proceeding had upon your business?"  
 "A good one. It has already helped it immensely. The sympathy of the public is on our side."

### An Important Telephone Purchase.

From the *Lowell Times*, of Nov. 8, we learn that the purchase of New Jersey and Brooklyn telephone property by a New England syndicate, foreshadowed in our last issue, has been consummated.

"Yesterday afternoon," says the *Times*, "final action was taken in Boston, completing the pending bargain, by which the telephone business of the State of New Jersey and of Long Island changes ownership and falls into the hands of New England telephone men. The companies thus purchased are the Long Island Telephone Company, capital \$1,200,000, and including the city of Brooklyn; and the New Jersey Telephone Company, capital \$1,200,000. The latter includes virtually the entire State, excepting the cities of Newark and Camden. Contrary to the general impression on the street, the territory does include the important points, Jersey City, Paterson and other large towns in the suburbs of New York. Newark is the only important exception, and the new owners, by their contract, have the right to purchase that city Jan. 1, 1884, at a figure representing the actual cost of plant at that date.

The syndicate which acquires this large property includes W. A. Ingham, C. J. Glidden and L. N. Downs, representing the Lowell interests, who take \$250,000 of the stock; C. F. Cutler and J. C. Clark, of South Framingham, formerly president and manager of the old Bay State Company; H. W. Hyde and C. A. Nichols, of Springfield, representing Western Massachusetts telephone interests; W. W. Crapo, of New Bedford, representing the Southern Massachusetts Telephone Company; ex-Governor Jewell, General Manager H. P. Frost and Morris F. Tyler, representing the Connecticut Company; Piper, Sawyer & Co., of Newburyport, and former owners of the Suburban Company; General Manager T. N. Vail and Assistant General Manager O. E. Madden, of the American Bell Company, of Boston. The union is a strong one, all being experienced telephone men and several being classed as among the most successful of telephone handlers in the country. This fact alone will go far by way of indorsement in the eyes of investors and far-seeing men.

"It is proposed to take possession at once and to organize the two companies as one under the joint capital, \$2,400,000. The management programme as now laid out is as follows: C. F. Cutler, president; W. A. Ingham, vice-president; J. C. Clark, treasurer and general manager, with C. W. Clifford and H. P. Frost, members of executive board.

"The property is so purchased that there remains in the treasury of the new company funds to the amount of \$260,000 for construction purposes. Further than this, the Metropolitan Company of New York city (American Bell Company) will waive their right to dividend on \$800,000 of stock, which for perpetual contract they are entitled to hold. This latter proviso not accepted, the former owners will revert \$25,000 into the treasury of the new owners. The contract gives the new owners exclusive right for the use of the telephone (Bell and Golden stock patents), for the entire territory described above. In this territory on the 1st of September there were 16 exchanges, 2,600 subscribers, and 160 extra territorial lines. The books at the present time show an average income of 100 subscribers per month."

### The Electric Light at the "Theatre des Varietes."

[From *Le Genre Civil*.]

For a month past, the electric light from storage batteries has been glowing brightly at the Théâtre des Variétés, in Paris, without any interruption or failure. This is an artistic event that is of interest to all, and an industrial fact well worthy of the attention of engineers.

The plant comprises 260 Swan incandescent lamps, giving a light estimated at 660 carcel burners (5,000 candles). These 260 lamps make a theoretical expenditure of energy equal to 2,000 kilogrammetres per second, or 27 horse-powers.

In practice, it would require at least 85 horse-powers to operate these lights directly from the dynamo-electric machine. By the use of the Faure accumulators, however, the result is obtained with more safety and regularity, by means of a 12 horse-power engine, working 15 hours out of 24. These figures demonstrate in an eloquent manner the value of storage batteries, which allow a considerable diminution in the apparatus for producing the electricity. Let us add, moreover, that the ratio of 1 to 3 between the force employed and the force to be expended in the lights could be diminished still more if the daily working of the machine were increased to 22 hours.

In the theatres, that are lighted every night, the fraction of motive power would not be more than *one-fourth*; for the Opera, which is open four nights out of seven, it would fall down to *one-seventh*.

These results are in contradiction to the affirmations of some electricians; but the figures that we will give (and whose exactness everybody can easily verify) will allow every impartial engineer to judge for himself.

We have said that the lamps are 260 in number. They are disposed as follows: Auditorium, 60; footlights, 60; chandeliers, 60; flies, 4; green-room, 8; foyer, 18; vestibule, 20; passages, etc., 30; total, 260.

All these lamps are of the same power, except the footlights, which are weaker. Three of these little lamps coupled in series are equivalent in light and in expense to a normal lamp. The total lighting power therefore is equal to 220 ordinary Swan lamps. The Faure accumulators, each weighing 60 kilogrammes, are connected in six parallel series of 33 each; altogether 198 accumulators, weighing about 12 tons.

The motive power is furnished by an Otto gas engine of twelve horse-power, nominal. It runs at 114 revolutions and consumes 9 cubic metres of gas per hour, whence we can estimate its work at about 11 horse-powers.

As generators of electricity three Siemens dynamo-electric machines, style *D*<sup>2</sup>, excited *in derivation*, were taken.

The poles of these three machines are coupled for quantity, the positive pole of the battery of machines being coupled to the six positive poles of the six series of accumulators, and the negative poles being likewise connected in the same way. The conductors distributing the current to the lamps start from these two combined poles also.

Each machine can furnish a current of 32 amperes with an electro-motive force of 70 volts. This service represents a theoretical work of 9 horse-powers. If the power expended is 11 horse-powers, then the efficiency of the machines proper is  $\frac{9}{11}$ .

The electro-motive force of the battery of ac-

cumulators is 66 volts, or  $\frac{3}{4}$  of that of the source of current. To obtain its efficiency, it would be necessary to multiply this fraction by the *co-efficient of restitution* (which is the name we have given to the ratio between the quantity of electricity given out and that received by the accumulators).

Ordinarily this co-efficient must be but little less than 1, for the electro-motive force of charging is nearly the same as that of the battery.

The fall of potential which takes place in the conductors between the batteries and the lamps must not be ascribed to the accumulators. This quantity, moreover, has not been measured, though it may be deduced from the data that we possess. According to Mr. Maurice Simon, the Swan lamps burn normally with a current of 1.25 amperes and a fall of potential of 50 volts, while giving a light equal to 2.25 carcel burners. We find therefore:

$$\text{Resistance of the lamp, } R = \frac{E}{C} = 40 \text{ ohms.}$$

$$\text{Energy expended, } T = \frac{EC}{g} = 6.25 \text{ kilogrammetres* per second.}$$

$$\text{Light obtained per kilogrammetre, } K = \frac{2.25}{6.25} = 0.36 \text{ carcel-burner.}$$

On the other hand, in the installation of the Variétés, where the lamps are worked above their normal rate, we find a current of 1.5 ampère per light, and a lighting power of 8 carcels. This gives (admitting that the resistance of the lamp remains equal to 40 ohms):

$$\text{Fall of potential in the lamp, } E = CR = 60 \text{ volts.}$$

$$\text{Energy expended, } T = \frac{EC}{g} = 9 \text{ kilogrammetres.}$$

$$\text{Light obtained per kilogrammetre, } K = \frac{8}{9} = 0.88 \text{ carcel. (1)}$$

The fall of potential between the accumulators and the lamps is therefore equal to 6 volts, and the theoretical expenditure on the lights, when they are all working at once, is two thousand kilogrammetres per second, or 27 horse-powers. The light obtained is about equal to that of 660 gas jets of 140 litres.

To find the *final efficiency*, that is to say the ratio between the amount of energy developed in the engine and that utilized in the lamps, it would be necessary to ascertain the duration of the light by means of an exact record of the hours of opening and of closing all the partial circuits, for the working times of the several series of lights are very unequal. The entrance and the hallways are lighted from 7 to 12; the hall from 8.30 to 11.30; the footlights and stage during the acts, the foyer between the acts; a few lamps work night and day; finally the expense in certain circuits is sometimes diminished by the use of rheostats, to produce scenic effects.

Having no such record, we have made an approximate estimate, which would make the average time of working  $3\frac{1}{2}$  hours for the whole number of lights.

Thus, with an expenditure of motive power equivalent to 11 horse-powers during 15 hours, or 165 horse-power hours, we obtain, finally, an effective service of 27 horse-powers during  $3\frac{1}{2}$  hours, or 94 horse-power hours (2).

The *ultimate* effective service, therefore, would seem to be  $\frac{94}{165}$ , or fifty-six per cent.

Let us not forget that the final loss of 44 per cent comprises:

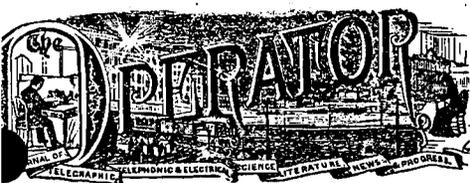
- (a) The friction of the dynamo-electric machines.
- (b) The energy spent in their inducing and induced circuits.
- (c) The loss incident to the use of accumulators.
- (d) The heat lost in the lamp circuits.
- (e) The losses through abnormal derivations.

\* NOTE.—Seventy-five kilogrammetres equal one horse power. The carcel burner is equal to rather more than seven standard candles.

(1) The photometric value of an electric light increases more rapidly than the expenditure of energy; therefore under the forced method of working employed with the Swan lamps, we ought to obtain a superior efficiency to that of normal operation. The estimate of 3 carcels is therefore evidently too low, but we adhere to it so as not to base our reasoning on an overestimation of efficiency obtained by a mode of procedure which will undoubtedly shorten the period of duration of the lamps.

(2) According to the recognized accumulative capacity of the Faure cells, a battery of seven tons ought to suffice to store up this amount of energy.





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### THE TELEGRAPHIC WAR.

The topic of the week in financial and telegraphic circles has been the bold defiance of the Autocrat of the Telegraphs by the Mutual Union Company. In the sensation created by this novel event even the nine days' wonder of the sale of the "Nickel-Plate" road has become obscured. The general impression appears to have been similar to that of Saul when he said to David: "Thou art not able to go against the Philistine to fight with him, for thou art but a youth, and he a man of war from his youth." Indeed, so preposterous has it seemed that the Mutual Union should, single-handed, throw down the gage of battle to Mr. Gould and its colossal rival that the belief has become general that there must be some power behind the former company in the fight, and rumor has freely used the names of Vanderbilt, Garrett and Bennett in connection with the matter.

No one seems to have been more surprised at the action of the Mutual Union than Mr. Gould himself. His organs have depicted the haste with which he was obliged to retrace his steps from his brief Western tour, and have dwelt upon the baseness of his wicked partners in taking advantage of his absence to bring forth their scheme.

That Mr. Gould is deeply concerned in the outcome of the affair is evinced by the fact that he has not been content to await the action of the court, but has sought to appeal to the public—that public to which his financial colleague, Mr. Vanderbilt, is alleged to have applied the term whose use is interdicted on telephone lines—by hastening to publish in the *World* copies of the individual agreements of the members of the "pool," and even a transcript of the check drawn by him to the order of Mr. Baker, in payment of the stock purchased by him.

The original memorandum of agreement is a vague and unsatisfactory document, neither the objects nor the duration of the "pool" being clearly set forth. Subsequently, however, it appears, each of the partners in interest, on delivering up his portion of the 51,000 shares composing the "pool," signed an agreement to abide by the action of the trustees (Messrs. Gould and Baker) for the term of one year from April 10, 1882. This agreement, it is claimed by the partners in the new "pool," was violated by Mr. Gould in transferring his Mutual Union stock to the Western Union Company, and was thus rendered void. Whether this view will be sustained by the court, or whether the proper course would have been to seek to restrain Mr.

Gould by legal measures from carrying out his action, remains to be seen.

However the case may terminate, the prospects for telegraphic competition look bright. Whether or not the Mutual Union is backed in its aggressive action by outside capital, there is little doubt that there is a large amount of capital ready to be invested in opposition telegraphs. It is well known that Mr. James Gordon Bennett is interested in the matter in connection with the Messrs. Garrett, and the return of the former from Europe just at this time is regarded as significant. Mr. Bennett has a deep interest in ocean cable telegraphy, being himself one of the most liberal users of the cables, and it is known that he has been for some time restless under the high charges of the present monopoly. In order to pay a new cable must have auxiliary land lines or "feeders," and for this purpose the Baltimore & Ohio lines, in their present extent, are insufficient. The company, however, is extending its facilities, and if the rumored coalition with the Mutual Union should be accomplished, it might prove to be a very formidable rival, both to the Western Union and the existing cable companies.

In a letter addressed to the telegraph operators of America some two years ago by ex-Gov. Rufus B. Bullock, himself an old operator, he took occasion to say: "Operators of to-day who sit in palatial offices and call for another wire if they are troubled even to change the adjustment of their receiving magnet, should think of the time when, for less pay, an operator was obliged to use his tongue for a galvanometer and to rearrange the adjustment of his armature twenty times in receiving one message. Think of this, I say, and be assured that the comfort and convenience of the operator has kept even pace with the success of the corporation." With all due respect for Governor Bullock, we are of the opinion that if he were to spend a few days in one of the "palatial offices" of to-day, subject to its prison-like discipline, chained for nine hours to one chair and to one spot, he would long for an opportunity to exercise his tongue as a galvanometer or in any other way. This strain is a favorite one with old-time telegraphists. Thus Mr. John Lenhart sets out to draw a comparison of a telegraphist's life in 195 Broadway and his early telegraphic experience among the alligators and mosquitoes of Alabama, greatly to the disadvantage of the latter, but we presently find him confessing that the days he spent in the South were among the most pleasant in his experience. Of course, with the great increase in the number of employes, a much stricter discipline has become necessary. There are, unfortunately, in the profession men who are ready to take undue advantage of every privilege allowed, and those who are honorable and trustworthy have to submit to iron-clad office regulations to prevent abuses by the thoughtless or dishonest. It is not the rigid discipline of the present day that chiefly distinguishes the service now from that of the past. There is something lacking that formerly existed—a feeling of cordiality, perhaps, between all the component members of the telegraphic system, from the highest down. We are led to this reflection by perusing a circular issued nearly seventeen years ago—on Jan. 1, 1866—by General Marshall Lefferts, to the employes of the American Telegraph Company, of which he was at that time Engineer. The occasion was the issuing of an order establishing

regulations to govern appointments and resignations, which General Lefferts prefaced by an address to the employes, from which we make the following extracts:

"At an early day I deemed it advisable, as a mark of merit, to create the position of assistant superintendents; increase the number of managers and chief operators; divide the masses of the operators into classes, in order that those who performed their duties with fidelity, energy and ability should be distinguished by a higher grade of rank and pay than those who were less competent and faithful.

"I have watched from day to day, with great interest, the success of these measures. Every day's experience but strengthens the belief, shared in by your representative men, that this policy is most excellent; but we must go farther. The man who is punctual at his post—who seldom or never makes errors—who is courteous and kind in his intercourse over the wires and with the public—and who is withal a competent operator—deserves the highest salary and the best position. To this I know you will respond 'O. K.' And when, on the other hand, I say that we must weed out from the corps all the sluggards, all the incompetent, and all the worthless because they are an injury to you not less than to the service, I am sure to this you will also assent.

"Let no operator say that promotion is slow; if so with some, it is their own fault. The company, at this moment, require men for positions of trust and management, but they find difficulty in making the selection. In other words, they are not competent; they have not taken any pains to make themselves so. Our profession has advanced. You can advance it much higher if you will. The limited knowledge which would have answered a few years since will not support a man in the same position now. To help you to attain to positions of trust and influence in the profession, I give you my personal pledge to see that all are fairly dealt with. For this I ask your earnest co-operation. The posts of honor in the great railroad system of the country are sought after by a worthy ambition, and worked by master minds, and do you not consider this, our telegraphic field, which combines and commands the nervous intellect of millions, which will soon join the Old and New Worlds in harmonious interchange of thought, and which, if it does not rank first, yet owes fealty to none—to be worthy of your ambition? That many of you so regard it I am happy to know, for the spirit is manifest in the address of your Telegraphic Union issued not long since.

"It is your duty, therefore, to assist as far as you can all reforms which have for their object the elevation of the fraternity."

It is difficult to conceive of such an address as this from the officer of a telegraph company at the present day. Much of the change of feeling in the profession is no doubt due to the introduction into telegraphy of the principle—or want of principle—represented by Mr. Jay Gould. After the experience which followed the merging of the American Union and Western Union Companies, it would be a rash official indeed who would say with Mr. Lefferts: "I give you my personal pledge to see that all are fairly dealt with."

WITHIN the last ten days two theatres in New York city and one in Baltimore have been destroyed by fire. Fortunately, in two of these instances the buildings were almost deserted at the time; nevertheless three lives were lost in the flames. It is frightful to reflect what the consequences might have been had the fires in the New York theatres originated at a time when the buildings were filled with people; yet they were just as likely to occur at such a time as at any other. In the cases of the New York theatres the origin of the fires will perhaps never be known; in that of the Baltimore theatre there is no doubt that the flames were communicated by a gas-jet. It is safe to say that most of the fires that occur

in theatres are due to the same cause. There is a way in which this risk can be obviated, and but one way. Incandescent electric lamps furnish as good a light as gas, or a better, and with them there is no risk. It must be remembered that the fires which have been occasionally reported as being caused by electric lamps or currents have been due to the arc and not to the incandescent system. The glowing filament in the incandescent lamp emits but an insignificant quantity of heat. It is protected by a sealed glass globe; should this be broken by accident, the instant the air touches the glowing filament it is extinguished. The currents supplied to the incandescent lamps cannot be compared in intensity with those of the arc lamps. They are doubtless intense enough in some cases to ignite inflammable material that might accidentally form a "short circuit" between two conductors from which the insulated covering had been removed; but no electrical problem is more simple than to so dispose the conductors that such "short-circuiting" shall be impossible. The incandescent electric lamp in theatres can be made absolutely safe. Its practicability has been demonstrated not only for general illuminating purposes, but for the lighting of theatres. It is no longer a question of experiment. In another part of this paper will be found an account of the successful lighting by electricity of one of the largest theatres in Paris. The question is now simply one of cost, and the difference in cost is not sufficient to be for a moment placed in the balance against human lives. With light and heat from electricity and steam, both produced outside the building, there need be no fire of any kind taken into theatres. The remedy for theatre fires is at hand; will the public wait for another Vienna horror to enforce it?

MR. JAMES GORDON BENNETT announces in the *Herald* that, the elections now being over, he proposes to devote considerable attention to telegraph and cable monopolies. In the course of an extended editorial on the subject, in which the statement is made that Mr. Bennett had been slyly approached by Mr. Gould with offers of special rates for the *Herald*, in consideration of support for Mr. Gould's telegraphic and press schemes, he says: "We desire to say, for the information of Mephisto and his co-partners in cable and telegraph monopoly, that the new cable is going to be laid, and that messages will be going through it next summer; that it is to be built, not on credit, but for cash, thereby saving its stockholders some one or two million dollars, which we do not remember that Mephisto took the trouble to save for the people who are interested in his monopoly. The people who build the new cable are to be paid in cash, not in shares, which will be a further saving to the stockholders. As to Mr. Pender being 'just the man to gobble up the new cable,' we don't regard him in that light at all, but rather as a man who has as much as he can do to keep from being 'gobbled up' himself. For the further information of Mephisto and his organs and the public at large we will add that, so far from its being difficult to get subscriptions, the trouble has rather been to keep out a number of people anxious to subscribe, including some persons who the organizers of the enterprise could not help thinking were the bosom friends of Mephisto and his cause. The money is now all subscribed. The cable will be laid at much less cost than any one of those now under the control of the monopoly, because it is to be constructed and laid on a solid cash basis, with

no watering of stock and no middlemen to pocket commissions. It is perfectly true that the proprietor of the *Herald* subscribed in 'exasperation,' but not in any greater exasperation than has long been experienced by the public, who are forced to pay the high rates extorted by the cable monopolists." In connection with the new cable we note an announcement in the English papers that the *Herald*, *Times*, *Baltimore Sun* and *Cincinnati Enquirer* have all subscribed for a part of the stock.

ONCE more the venerable skeleton that the Western Union Company keeps in its closet for the purpose of intimidating opposition telegraph companies, has been exposed to the public gaze. It appears that the Page patent formed part of the mess of pottage for which the Mutual Union Company sold its birthright to Mr. Gould—the proceeding which it now so deeply regrets and seeks to retract. Of all poor and flimsy devices to perpetuate monopoly and levy genteel blackmail, the Page patent stands at the head. It is an enduring monument of Congressional weakness and inefficiency. Let us be thankful that in a few years this absurd spectre will disappear from American telegraphy and be forever laid at rest. A company afraid to face it in the broad light of the courts is hardly worthy of sympathy. It is interesting to recall that when Mr. Gould was operating the American Union Company against the Western Union he made strenuous efforts to prove the complete invalidity of the Page patent as applied to telegraph instruments, even going so far as to combine some of his Western railroads with the American Union Company in the effort to break it down. It may also be recalled that Gen. Eckert and Mr. D. H. Bates made affidavits to the effect that the sustaining of the validity of the patent as regards telegraph instruments would work a great injustice and an irreparable injury to American telegraphy. Yet Mr. Gould did not hesitate, when he got the opportunity, to employ this weapon, whose threatened use against himself he had so loudly cried out against. So much difference does it make whose ox it is that is gored!

It has been a cold week for Mr. Gould. Before he had time to rally from the shock caused by the perfidy of his wicked partners in the Mutual Union pool, came a fresh blow, in the Superior Court decision, adverse to his interests, in the appeal of the Williams and Hatch suits, originally brought to test the legality of the consolidation of the Western Union and American Union Companies—suits which the public had almost forgotten. Briefly stated, the decision is that while the law authorizes the purchase by one company of the property, rights and franchises of another for the purpose of extending the connections of the purchasing company, there is no authority, and it is against public policy, for such a purchase to be made merely for the purpose of suppressing competition; and furthermore, the use which was made of the occasion by Mr. Gould to distribute gratuitously fifteen millions of the increased Western Union stock to the shareholders of the company—i.e., chiefly to himself—was entirely illegal. The result of the decision is simply to hand over the case for another trial, and as our system of justice is constituted it is possible for a powerful defendant, such as the Western Union Company, to obtain almost unlimited appeals and postponements; so that the prospect is that we shall have the Williams and Hatch suits on hand for some years. It is

something, however, to keep the memorable transaction that led to the suits before the mind of the public, and to show that the execution of schemes so subversive of public interest cannot be effected without at least a struggle.

THAT process which Mr. Herbert Spencer asserts to be a part of the history of every sensible existence, and which he defines as "the change from a diffused, imperceptible state, to a concentrated, perceptible state," is beginning to be very markedly apparent in American telephony. Having nearly accomplished its work in New England, it is gradually spreading to other parts of the country. It is a striking fact, and one that reflects credit upon the gentlemen who control the telephonic interests of the country, that these movements toward consolidation, which if they concerned railroads or telegraphs would be viewed with alarm, scarcely attract public notice. Although the general telephone monopoly is one of the most complete that this country has ever known, there has, perhaps, never been any monopoly less oppressive, as is proved by the unprecedented growth of the demand for the telephone, which now extends to the very confines of civilization. In seeking profitable returns rather in an extended field than in exorbitant tolls, the telephone owners have displayed a wisdom that cannot be said to be characteristic of monopolies, and it is to be hoped that a further extension of the same policy will mark the future of the telephone in America.

In the remarks upon the Morse code recently printed in these columns the needs of our domestic telegraphic service were chiefly had in view. On another page will be found a communication taking a somewhat wider view of the same subject. The article bears evidence of much thought. It is from a gentleman whom a large experience has given a right to speak on the subject, and whose views are worthy of attention. The writer has been in the telegraphic service since 1852, both in this country and abroad. There is certainly room for improvement in the present code, and we hope that some day an American congress of telegraphists will take the matter up and give us a permanent code that will meet all the needs of the service.

THE international conference to consider measures for the protection of submarine cables closed at Paris on Nov. 3. Addresses were made by MM. Cochery and Kern, who expressed much satisfaction with the results of the meeting. It is stated that the irritating questions of liability and jurisdiction have been settled for the best and in the general interest of the countries concerned. M. Cochery expressed the conviction that the proposals drafted by the conference would be adopted by the governments and would soon become law in the different states.

A STORY is floating about in the newspapers of the recent death, in Sydney, New South Wales, of a man who had walked 150,000 miles, and had visited during his lifetime Germany, France, Spain, Northern Africa, Turkey, Italy, Greece, England, the United States, New Zealand and Australia. To relieve the minds of our readers, we hasten to say that this man was a native of Germany, and it is not said that he was a telegraphist. Mr. Bogardus was still in Florida when we last heard from him.

### The Edison System.

#### HOW THE INVENTOR OVERCAME AN UNFORESEEN DIFFICULTY.

Although the Edison system of district lighting by incandescent electric lamps has now demonstrated its practicability for more than a month, the officers of the company have made no secret of the fact that they had met with some unexpected difficulties in regard to the working of the machinery—difficulties, however, merely of a mechanical nature, and the eventual solution of which was never a subject of doubt.

Mr. Edison has recently given a reporter of the *World* an account of what the difficulties were. As is well known, there are in the Pearl street station six dynamo machines, each run by a 200 horse-power engine. Each engine and dynamo are on one bed-plate and form one machine. The idea was to turn all the electricity generated by the six machines into one set of mains. When the experiment was tried, however, the result was not what had been expected.

"I found on trying the experiment," said Mr. Edison, "that the trouble was that when the electric current from two dynamos was united it was impossible to make them work smoothly, for the reason that if one engine ran faster than the other the fast engine would take all the load off the slow one, and the slow engine would be run merely as an electro-motor. The result of the first experiment was such as to astonish the engineers and every one who witnessed it and came near proving serious. When the current from the second dynamo was turned on, first one engine and then the other would go like lightning, and then one and then the other was converted into a motor. One of the engineers, witnessing the effect, shut off steam, and still his engine was running just as rapidly as before. He came running towards me as white as a sheet, exclaiming: 'My God, Mr. Edison, what is the matter? I have shut off the steam, and yet my engine is running at lightning speed and I can't stop it!' In addition to the 200 horse-power engines running at a high rate of speed, there were also attached to each a four-ton bobbin, which in effect increased the power equal to about 1,000 horse. The next thing that happened was the melting in a second of six or eight pounds of copper, which was thrown off in a sort of vapor, filling the room and nearly blinding every one present. Everybody groped their way to the windows, half frightened to death. If the whole six machines had been in operation at the time I don't know what would have happened. I suppose everybody would have jumped out of the windows. I tell you it was a pretty serious business, and I saw at once that I had a pretty difficult job before me to overcome it. But I saw what the trouble was and what would have to be done to remedy it.

"The problem to be solved was to invent some plan by which all the engines could be made to run at the same speed, so as to make them practically one engine. And that is just what has occasioned the delay. As many of our customers had dispensed entirely with gas and were relying upon us for light, it was necessary for us to furnish them, and hence we were forced to manufacture some electricity. I at once applied myself to the task of perfecting an apparatus whereby all the automatic regulators of the several engines could be connected, and this plan was soon perfected. But it has taken a month to construct and perfect the apparatus. It is now completed and in perfect order, and it works to perfection. We are turning on lights every day, and I can safely assert that all obstacles have been overcome, and that the success of the district system has been placed beyond doubt or question. The district in question will, when entire plant is completed, contain about nineteen miles of underground wires, of which about seven miles are already laid and connected.

"The entire feasibility of running electricity through wires laid underground has also been thoroughly demonstrated, and I have now no fears whatever of the perfect working success of

the scheme. I have also perfected a meter for measuring the amount of electricity used in a given time, which is absolutely perfect and certain, because not mechanical, and therefore not liable to get out of order. Furthermore, the production and sale of electricity for lighting purposes will in no way come in competition with gas, any more than gas does with kerosene, because it has an actual commercial value above gas, which will take it out of the line of competition and elevate it to a plane of its own. We measure electricity, for instance, on the basis of a ten-candle power of illumination, and we charge at the rate of one and one-sixteenth of a cent an hour for a ten-candle light. It makes no difference whether a customer burns ten candles' worth an hour or one hundred, he is charged accordingly. Electricity is worth, as a commercial product, one-third more than gas, and therefore people will use it and pay one-third more for it than they will for gas. Of course, the system is not yet by any means perfect, but I am constantly working at it, and in three months' time I will have it down pretty fine, as the saying is. I do not consider the lighting of the streets of any importance whatever, and have never had any desire to compete in that line of the business. I have been holding back until I had got my system perfect, and now I am prepared to go ahead. In the first place, people said that the wires could not be laid under ground. I have fully demonstrated that they can. The lighting of the streets does not represent one-fifth of the future possibilities of the business that I have been striving for, but it is the miles and miles of houses with the \$5, \$6 or \$8 per month from the thousands of customers that I am after. The result of the experiment in the district now being developed will tell the story. If it is such as to satisfy the capitalists that it is a success, which I have no doubt it will be, other districts will be worked as fast as the plants can be laid and the stations established. I fully expect in time to light the whole city of New York by means of electricity."

#### New Decisions in the Williams and Hatch Suits.

The General Term of the Superior Court reversed on Nov. 6 Judge Truax's decision dismissing the complaint in the suit of W. S. Williams against the Western Union Telegraph Company and others, to have set aside the agreement of Jan. 19, 1881, consolidating the Western Union, the American Union, and the Atlantic and Pacific Telegraph companies. The General Term opinion is written by Judge Freedman, and is concurred in by Judges Russell and Arnoux.

Judge Freedman does not find in the telegraph laws providing for the extension of telegraph companies and the increase of their capital stock any prohibition of any of the provisions of the consolidation agreement, but he does hold that the Western Union Company violated a statute by issue of the stock dividend of \$15,526,590 to the shareholders of that company at the time of the consolidation. He says in substance:

Even if the assumption be continued that the property representing the investments of past earnings was really worth \$15,526,590, and in view of that fact no valid objection to the agreement will lie under chapter 508 of the Laws of 1870, and that in other respects the agreement, as a whole, is not in essential particulars in excess of the authority conferred by said chapter, yet the statute forbidding the declarations of dividends from surplus profits, and prohibiting the division, etc., of capital without the consent of the Legislature, and no such consent having been found to exist, the plaintiff has demonstrated that the proposed gratuitous division of \$15,526,590 of stock among the shareholders of the Western Union Company is wholly illegal. No action on the part of the directors or the shareholders, or both combined, could overcome this difficulty, and as the illegality complained of entered into and permeated the agreement of Jan. 19, 1881, in as much as by its terms the capital stock of the Western Union Company was to be first diluted to the extent of the proposed gratuitous issue, and payment for the property, rights, and franchises of the vendor companies to be made in the stock thus depreciated, the agreement itself cannot be sustained.

The action was properly brought by the plaintiff, and though he may represent only a comparatively insignificant minority, he has nevertheless a sufficient interest and standing to make it the duty of the court, for reasons affecting public interests, to entertain his complaint and upon the proofs given in support thereof to grant appropriate relief. The dismissal of the complaint therefore constituted error. As the case stood the plaintiff was at least entitled to an adjudication declaring the illegality of the agreement of Jan. 19, 1881, and enjoining the distribution of the \$15,526,590 of stock. How much further relief should have been granted, if any, especially in view of the far-reaching provisions of the statute that has been violated, it is not necessary to express an opinion upon. That is a question which may be best left to be determined on a new trial. Of course the fact that, at the time of the commencement of the action, the agreement had been partially executed, and that since the erroneous dismissal of the complaint it may have been wholly executed, so far as lay in the power of the directors and the majority of the shareholders of the Western Union Company, cannot affect the legal question involved, though it may have an important bearing upon the nature of the relief to be granted. The judgment should be reversed and a new trial ordered, with cost to the appellant to abide the event.

The same disposition is made in the like suit of Rufus Hatch against the Western Union Telegraph Company and others. In that case there was no charge of fraud, but it was claimed that the consolidation was against the laws of Ohio and Pennsylvania and of the United States. These points, however, are not considered, as the grounds passed upon on the other appeal are decisive.

President Green, of the Western Union Telegraph Company, said that the company might appeal from these decisions to the Court of Appeals, which, if it reversed them, would settle the matter. In case they were affirmed, the company would have recourse, as at present, to a new trial, from which there would be, in all probability, successive appeals to the Court of Appeals. There are only 300 shares of Western Union stock that have not assented to all the terms of the consolidation. Mr. Williams said an appeal would have followed if his suit had been decided against him. Mr. Rufus Hatch was delighted.

#### A New Suit Against the Mutual Union.

William H. Cameron, through his attorney, Edward Russel, began in the Superior Court, New York, on Nov. 6, a suit against John G. Moore & Co., the contractors who built the lines of the Mutual Union Telegraph Company, against that company and certain of its officers, both as such and as alleged secret partners of the contracting firm, and against Carrie B. Evans, the administratrix of the late John O. Evans, who was President of the company. Mr. Cameron claims to be a holder of seventy-five shares of the original \$600,000 capital stock of the company, and alleges that when the capital was increased to \$10,000,000 to extend the company's lines, a contract was made between the company and John G. Moore & Co. and their secret partner, by which the latter were to receive from the former about \$9,000,000 of its stock and \$4,000,000 of bonds (par value) for building telegraph lines which, it is alleged, did not cost over \$3,000,000. A provision of the contract was that John G. Moore & Co. should pay the interest on the company's bonds for three years, and furnish it, if necessary, with funds for its operating expenses for three years from the date of its opening for business, these advances to be repaid with 6 per cent. interest. This part of the contract has, it is alleged, since been modified to the disadvantage of the company. Mr. Cameron also claims that the first takers of the stock did not give the company the full par value of their shares, as required by law. He sues, therefore, to have the firm of John G. Moore & Co. and its secret partner refund to the Mutual Union Company the excessive profit from their contract; to have the modification of the contract mentioned declared void, and to have the original receivers of Mutual Union stock pay to the company the full par value of the shares they received. As the company is controlled by the persons who were interested in the transactions mentioned, the plaintiff avers that it would be useless to ask the company to bring this action, but he prays that it be compelled to take such proceedings as may be necessary to protect his interests in the premises.

**A Sensation in a Telegraph Office.**

Great excitement was created in the ladies' department of the Northwestern telegraph office in Toronto one day recently by a mouse, which one of the operators had conveyed into the office in her hat. On her way to the office she became aware of an extraordinary sensation inside her hat, but being in an awful hurry she did not linger to investigate, or ascertain what the intruder was. Arrived at the office she removed her head gear when—horror—out leaped a mouse, and scampered along the floor. The other female operators gathered their skirts about them and jumped upon chairs and tables, in fact any place where they could escape being eaten alive by the monster. It is even said that one more timid than the others threw open a window and screamed "murder" at the fullest extent of her voice. The interloper, after making a number of circles around the room, discovered a way of escape into which it crawled, and the "nasty thing" having made itself scarce, work was resumed. The scene is thus described by a rhymer in a local paper:

One damsel jumped upon a chair; she looked with anxious eye,  
And when the mouse ran 'way from there said, "how is that for 'Hi?"

Another, braver than the rest, just giggled he! he! he!  
No foolish fears perturbed her breast, and she, of course, was "E."

Alas! that it must here be told, one nervous 'gan to cry  
Out "murder, murder, manifold," and she is known as "Ki."

And still another gasped for breath, and covered up her head,  
She could but wish poor mouse's death; her "sine?"—well, it is "Ed."

A pretty damsel, too, there stood, who of the "quad" soon knew;  
Twas thought that faint she shortly would; sweet reader, that was "U!"

Then when the mouse had found a hole, and vanished quite away,  
One made with pen a handsome scroll and shouted hip—hip—"Ra!"

"Mo." slid down from off her desk, "M. H." heaved such a sigh,  
"N. W." was glad the pesky thing no more was nigh.

What of "A. F.?" care she did not for wild beast such as this;  
The flying mouse her sweet smile got and waved her back a kiss.

**Mexican Enterprise.**

*El Correo de las Doce*—the *Noonday Courier*—published in the city of Mexico, boasts of being "the only english and spanish daily in Mexico." The following items, of interest to our readers, are taken from the "english" page of its issues of Oct. 6 and 8, and are given just as we find them:

"At last we have been joined by the cable with all South American Republics. Glory, glory, hallelujah!"

"With regret we have to announce that the shrewd and active friend of ours Mr. Hanis, the Representative of the Metropolitan Telephone Co. of New York and General Manager of the Mexican Telephone Co. here, has been much ill for the past few days. We make votes for his recovery."

"Always the printers! always! In a recent cablegram published by the 'N. Y. Sun' we read: 'The English attacked the Egyptians and saved a great many of-em.' The original was: 'and sabred a great many.' Oh, my!"

"The New York Telephone Co. were fortunate at a glance to send a representative near this republic that could carry out the full purpose of the Co., and which is, to extended the telephone wire all through this republic—without leaving margin for any other company to come in opposition to it."

"All parties, foreigners especially, give vent to nummers deep and frequent, on account of

the slow imperfect working of the telegraphic companies. They cannot, neither can we, nor nobody ever will be able to account for the fact that telegrams from, or to the States, go just about at the same rate that common letters do. Wherein lieth the fault? Remedy it."

As the above extracts hardly do justice to the *Courier's* literary style, we are tempted to add one or two anecdotes from its column of "Sunday Chat":

"A man being told to take several dozen of crabs for a birthday present to a justice of the peace—on his way all the crabs got out of their in-hold and approaching his man, delivered the letter of consignment; the judge after reading the letter asked him for the crabs and the old devil answered him saying yes sir, the crabs may be on that letter because the once I was bringing got away."

"A skilful physician trying to cure a certain affection of the tongue, asked his patient, which was a young woman, to take it out, to see it, the woman did it, and the Doctor said, more, and she did it, once more again answered the Doctor, the woman much troubled, turned round to the Doctor and said to him, do you think women's tongues have no end?"

**A Proposed Universal Telegraphic Alphabet.**

*To the Editor of the Operator:*

SIR: After thirty years' experience in American Morse Telegraphy, the last twelve spent in foreign lands, where I was obliged to note the defects of our telegraphic alphabet when applied to foreign languages, perhaps more particularly the Spanish, I would indulge the hope that my fellow-telegraphers in America will permit me to express the opinion that the time appears to have arrived when a radical change in the original Morse alphabet should be made. I attribute this necessity especially to the fact that the multiplication of submarine cables between the Americas and Europe, and increased cable facilities between European countries, Asia and Africa, add to the number of messages arriving at and departing from the United States and Canada written in languages in which our alphabet makes sad havoc, even when handled by the most expert operators, provided they do not understand the language employed. The recent completion of the Central and South American Telegraph Company's cables (Oct. 2) opens telegraphic communication of the most direct kind with the five Central American States—Salvador, Honduras, Guatemala, Nicaragua and Costa Rica; and with the South American republics—Colombia, Ecuador, Peru and Chili (Bolivia has no telegraphs, otherwise she would be included via Peru), and by land lines across Chili with the Argentine Republic, Brazil, etc., thereby making it certain that the number of messages to and from the Americas in Spanish will soon demand attention, and to these must be added the messages in all European languages which will necessarily proceed from those countries, en route to Europe and vice versa. Has not every operator of a few years' experience in large cities had demonstrated to him the "bulls" which creep into messages written in a foreign language, all the offspring of the peculiarities of our alphabet combined with the unfortunate development of the "rushing" mania? Such, at least, has been my experience.

I have given considerable thought to this question and have studied the International alphabet carefully, for the purpose of satisfying myself whether it ought to rule or another take the place of our beloved Morse. I think the International is susceptible of improvement. It makes of the letter C our J, and of O our figure 5, two characters which seem to me out of all proportion, considering the frequency with which these letters appear in the majority of languages which are daily telegraphed; besides, the numerals of the International are almost interminable, being an increase in dots and dashes upon the Bain, which I always thought had attained the maximum. The numerals of the International, if applied to the daily market reports transmitted throughout the United States and Canada, would entail the expense upon the State of an extralunatic asylum or two, specially prepared for operators who had collapsed under the infliction. I take the liberty of handing you with this what

I consider—vainly, perhaps—an improvement on the International and our old Morse. I ask for it all the criticism possible, and particularly solicit improvements. But whoever pretends to do either ought to possess a fair knowledge, at least, of one other language besides English; and if he has a general idea of the peculiarities of French, German, and Italian, so much the better.

	Morse.	International.	Universal.
A	.....	.....	.....
Á	.....	.....	.....
B	.....	.....	.....
C	.....	.....	.....
D	.....	.....	.....
E	.....	.....	.....
É	.....	.....	.....
F	.....	.....	.....
G	.....	.....	.....
H	.....	.....	.....
I	.....	.....	.....
J	.....	.....	.....
K	.....	.....	.....
L	.....	.....	.....
M	.....	.....	.....
N	.....	.....	.....
Ñ	.....	.....	.....
O	.....	.....	.....
Ó	.....	.....	.....
P	.....	.....	.....
Q	.....	.....	.....
R	.....	.....	.....
S	.....	.....	.....
T	.....	.....	.....
U	.....	.....	.....
Ü	.....	.....	.....
V	.....	.....	.....
W	.....	.....	.....
X	.....	.....	.....
Y	.....	.....	.....
Z	.....	.....	.....
&	.....	.....	.....
1	.....	.....	.....
2	.....	.....	.....
3	.....	.....	.....
4	.....	.....	.....
5	.....	.....	.....
6	.....	.....	.....
7	.....	.....	.....
8	.....	.....	.....
9	.....	.....	.....
0	.....	.....	.....
Period	.....	.....	.....
Comma	.....	.....	.....
Interrogation	.....	.....	.....
Exclamation	.....	.....	.....
Apos'ph.	.....	.....	.....
Hypphen	.....	.....	.....
Fresh ¶	.....	.....	.....
Inverted Comma	.....	.....	.....
Par'thesis	.....	.....	.....
Underline	.....	.....	.....
Accent (very important in Span. mess'ges)	.....	.....	.....

To demonstrate the advantages to be derived from a change in the Morse, I will enumerate a class of errors which are being made daily in the United States with Spanish messages, and which are rendered impossible by either the International or my proposed alphabet, which I would call the "Universal."

The termination "se" is almost invariably copied as "z," thereby at least changing the orthography unnecessarily. These terminations are frequent in Spanish, and the chances are ten to one that words like *dieziseis* (16) and *veintiseis* (26), will be copied *dezizis* and *vrntizis*, which ought to puzzle any ordinary Spanish merchant. I could enumerate hundreds of examples, but let your readers simply think of the possible jumbling to be done with our C, R, Y, I, O and E getting into proximity even in many English words, and they will have an idea of the errors threatened to every Spanish message. The same rule applies to messages in English, etc., passing through the hands of Spanish operators unacquainted with the languages employed.

I hold that the Universal reduces to the minimum the probabilities of error in receiving, even when the operator is utterly ignorant of the languages transmitted. While discussing this subject with some fellow telegraphers to-day and

declaiming against the too common practice of transmitting in a hurried, careless manner foreign names composed of the letters which, when brought together, give the careful American Morse operator occasion to doubt their association. I was handed a cablegram, just received from a Central American town, addressed to one such in Italy, as if in confirmation of my observations. Now that is a name which, I consider, demands of the American Morse operator extra care in transmission, in order to avoid the possibility of doubt in the mind of the receiver as to its correctness. The American Morse would therefore necessarily occupy extra time in transmission, thus ----- while the

Universal would write ----- and not afford occasion for the slightest doubt in the mind of the receiving operator, or, in fact, of anybody else through whose hands the message might have to pass. I claim for the Universal all that is gained by the International—freedom from errors contingent upon the employment of the American Morse characters C, E, I, O, R, Y, Z and &, when brought together, without, however, departing as far from the American Morse as the International has done. The alterations I have made in the American Morse are ten in the alphabet, none in the numerals or in the punctuation marks in common use.

The International made eleven in the alphabet and a complete change in the punctuation marks and numerals, excepting only the figure 4. I might have, perhaps, improved the Universal alphabet by introducing into it a few of the old Morse numerals, but it occurred to me that any change in the latter might not be recompensed by the transposition, for I consider that the original Morse numerals are of the greatest value in the innumerable daily market reports transmitted throughout America, and as for their employment in railroad traffic, I venture to assume that their importance is almost incalculable. I have, therefore, preserved our original numerals intact, as well as signs of punctuation. Of the latter I have even increased the International by two—complete as it may have been—without, I think, taxing the memory unnecessarily. Perhaps your readers will admit the more readily the advantages I claim for the Universal by perusing this abstract of the component parts of the International and Universal:

The International contains:	Dots.	Dashes.	No. of characters.
Alphabet and numerals.....	79	75	41
Punctuation marks.....	31	23	9
Totals.....	110	98	50
The Universal contains:			
Alphabet and numerals.....	101	60	42
Punctuation marks, etc.....	34	27	11
Totals.....	135	87	53

Making a total (counting each dash as two dots) of 306 and 308 dots, respectively (allowing the zero in the Universal to count double); but the Universal possesses 3 characters more than the International, consequently the average length of a letter of the latter is  $6\frac{1}{10}\%$  dots, while the Universal is  $5\frac{1}{10}\%$ , making a difference of  $5\frac{1}{4}\%$  per cent. possible speed of transmission in favor of my alphabet, taking it as a whole, without, I think, reducing the grade of safety obtained by the International.

The new character for the letter O, which I have proposed, does not, please me; the Bain character for the letter—our T—I should prefer, but it is a question which of the two letters is oftener employed in the run of a week's business. I am inclined to favor the T, so that if the O were shortened it would be necessary to lengthen the T, or else change the whole alphabet. My study has been to preserve the original American Morse character, as far as possible, so that we old hands may not find it necessary to learn a new song entirely. Besides, I should be sorry to rob Prof. Morse of any of the glory which his alphabet gave him (or Vail?). Whoever will take the trouble to study the frequency with which certain letters appear in telegrams will, I think, find that I have neglected the subject in forming the Universal. Many of your readers who may be accustomed to using the abbreviation "fr" very often during each day's work may, perhaps, think that the F and R which I have introduced are too utterly too long. But why employ "fr" at all? The letter F ranks very low in the frequency of its appearance, and consequently I

consider it may well be a little longer than one more frequently used. J, K, Q, X and Z are in the scale with F. It will be observed that the International has no character for &, which I think is of great service in transmitting firm names. I have supplied one in the Universal, tolerably long drawn out, but what can one do and avoid entirely all spaced letters?  
OCTOBER 17, 1882.

SA.

### THE ELECTRIC LIGHT.

The Olmstead Electric Light and Power Company of New York was incorporated at Albany on Nov. 6, with a capital of \$1,000,000.

An enterprising photographer on Broadway has placed in his window a small dynamo in operation, with the announcement: "Photographs taken on the ground floor from morning till night by the electric light."

An electric light tower (Fuller system) has been erected in Bridge Square, St. Paul, Minn., overlooking the Mississippi river. It contains six lamps, each of 2,000 candle-power. If the light is found to be insufficient the mayor promises to increase it to twelve lamps. Some objection has been raised to the height of the lamps, the objectors claiming that better service would be obtained if the lights were about half as high. The tower stands 200 feet from the ground.

The Portland Electric Light Company has lately undergone a change in its ownership, the N. E. Weston Company subscribing for a large amount of stock, and therefore holding the controlling interest. The company has leased for five years the boiler house in rear of Lancaster building, and will raise it up fourteen feet. The building is 40x40 and will contain, in addition to their forty horse-power engine a new one of one hundred horse-power, and two boilers of eighty horse-power each. There will also be accommodations for two other boilers should there be a necessity for them. When the new power is in place the company will be able to run one hundred and forty lights. Mr. Jared Crane, a thorough electrician, is superintendent of the company.

The Reading, Pa., *Eagle* says that several electricians and capitalists, among them Mr. H. W. Spang, of that city, have been interested for some time past in the electric light inventions of Chas. E. Ball, of Philadelphia, who has made a number of important improvements during the past year. His system is now covered by eight patents, one of which covers broadly the combination of one or more armatures with one pole (north or south) of one or more electro or permanent magnets, by which a strong current of electricity of but one polarity or direction is generated, which is as continuous and steady as from a galvanic battery. The other patents cover improved arc lights and revolving armatures, also a novel commutator by which excessive sparking and the short circuiting of the wire coils or bobbins of the armature are prevented. It is claimed that Ball's employment of one or more armatures with but one pole of a magnet or magnets, requires much less power than is required by the other machines, which use both poles of a magnet.

The Edison lamps have just been installed, for the first time, in Paris, for public illumination, in the St. Lazare depot. The effect is favorably commented upon by the attachés of the depot and by the public. The establishment of the Edison system in this depot, at the same time that the Swan system is installed in the Théâtre des Variétés, affords Parisians a favorable opportunity for comparisons, as well of the two lamps as of the methods of supplying the electricity. At the St. Lazare depot the current is conveyed directly from the dynamos to the lamps, while at the Variétés it first charges the Faure accumulators. At first glance the method of direct supply would seem to be preferable, for economical reasons; but there are other considerations favorable to the storage method. Thus at the Variétés there was not room to place a motor large enough to supply all the lamps directly; but the great advantage of the accumulators was shown by the fact that on several occasions when the machinery stopped there was no interruption of the supply from the accumulators to the lamps, which would otherwise have been extinguished.

### TELEPHONE DEPARTMENT.

Mr. W. E. Huntington writes encouraging letters from Puebla, Mexico. Mr. Huntington is a hard worker, and usually carries out what he undertakes.

Mr. D. L. Haines, general manager of the Mexican Telephone Company, has been ill, but is now about again. Mr. J. D. Haines, secretary of the same company, is still in Mexico, but is expected home soon.

Mr. George L. Wiley, at last accounts, was riding on mule-back all over the territory of the Central Telephone Company of Mexico, of which he has charge. It is said that he does not feel ready for his day's work until he has made at least forty miles in this manner. Messrs. Wiley and Hobart are making a great success of the Central.

Mr. Preston C. Nason, formerly prominently identified with the telephone business at Franklin, Mass., has sailed for the West Indies, in the capacity of general manager and chief electrician of the West India T. & T. Co., to develop that territory. He is accompanied by Mr. O. R. Arbuckle, well-known throughout the West as an energetic telephone worker.

Reports received by the Mexican Telephone Company from its territory continue to be of a flattering nature. It is expected that the number of subscribers in the City of Mexico will reach 1,000 within ninety days. The rental charged, since Nov. 1 is \$5 per month. The company has acquired some valuable government contracts, and is now self-supporting. It is expected that it will ere long be in condition to consider the declaring of dividends.

A shocking accident occurred in the cashier's office of the Telephone Company at Lowell, Mass., on Nov. 3. Thomas F. McGuire, a messenger of the company, playfully pointed a gun, which he believed to be unloaded, at Mr. Joseph F. McDonald, the cashier of the company, at the same time exclaiming: "Look out, Joe!" To the horror of those present the gun was discharged, the shot and powder entering Mr. McDonald's left cheek. It is feared he will lose an eye.

The Washburn & Moen Manufacturing Company, of Worcester, Mass., has issued a neat little pamphlet giving a description of the telephone, with an account of the development of telephony in this country and abroad, and much other information of interest to telephonists and the general public, including a discussion of telephone wire, one of the specialties of the company. It is stated that the idea which formerly prevailed that a light and cheap wire answered all the requirements of telephony is being abandoned, and that wires as heavy as No. 4 and No. 6 are coming into use for telephone lines.

Messrs. Charles L. Knapp & Co., of Lowell, Mass., who make a specialty of telephone stocks, have issued several circulars illustrating the growth of the telephone business in New England. It is stated that the title "Eastern Company," as used, is likely to mislead. The various companies, i. e., National Bell of Maine, Boston & Northern, Bay State, Suburban, Union, and Granite State, make up what for convenience is called the Eastern Company, but no actual consolidation exists. Each is now independent of the other, though governed by the same executive officers, whose headquarters are at Lowell, excepting only the Granite State Co., whose headquarters are at Manchester, N. H.

As an example of Yankee enterprise the Augusta, Me., *Journal* relates that Mr. Frederick L. Gower, of that State, who is only thirty years old, has made \$1,500,000 in the formation of telephone companies in Europe. He recently sold his English interests for \$500,000. He is now a large owner in French companies. His father died when he was two years old. He and his brother were educated by Mr. A. H. Abbott, of Farmington. Since his good fortune Mr. Gower has made a handsome return to Mr. Abbott. He visited this country last year and purchased a \$25,000 house for his mother in Brookline, Mass. He is about to crown his achievements by marrying Miss Lillian Norton, also a native of Maine, who is under a three years' engagement to sing in Paris at \$12,000 per year.

Of the many forms of electric transmitters and receivers brought out in the past few years, none show more novelty and exhibit such a marked difference in form and construction from all the others as one recently perfected by Mr. Preston C. Nason, an electrician of Franklin, Mass. The new instrument is only two inches in its largest dimensions, and so small otherwise that eighteen of them could be placed inside of a Blake transmitter and, unlike the latter, the Nason has no door, lock or hinge, no opening to speak into, no binding screws to work loose, and nothing in common with other transmitters except the induction coil. Externally, with its hard rubber or metallic case, it resembles a small pocket match-safe. After once adjusting to line it can be removed or replaced instantly by touching a small spring at the top of the case. Although so small it will transmit words spoken in any part of an ordinary sized room without directing the voice towards the instrument.—*Woonsocket, R. I., Patriot.*

**DASHES HERE AND THERE.**

Telegraph business in the oil regions is unusually heavy, the cause being the recent remarkable advance in the price of oil.

The Academie Nationale, Ag. Mfr. et Com., of Paris, has awarded a premium of the first class—a gold medal—to Messrs. Cumming & Brinkerhoff, of New York, for their periphery contact disc electrodes.

Postmaster General Howe stated in conversation on Tuesday, that he should probably include government telegraphy among the recommendations of his annual report, although he had little hope of a disposition of the matter at the next session of Congress.

Assessment 158, of the Telegraphers' Mutual Benefit Association, has been issued, calling for one dollar each from members holding certificates up to and including No. 4,293, to meet the death of Mr. Henry C. Maynard, of Chicago. The claim arising from the death of Mr. Charles B. Noyes, of New York, will be paid from the surplus. The number of members of the association is 2,324 in the first division and 139 in the second division.

Cleveland operators tell a good story of an electrician of the Western Union office in that city who, on his way homeward on Halloween night, espied a gate hanging high up on a lamp-post, and as thoughts of his boyhood days passed through his brain he was filled with merriment, and not only stopped and laughed, but every few steps he took he turned around and renewed his merriment; but when he arrived at his own house and found his gate missing he suddenly relapsed into the ordinary sober mood of a telegraphist.

Closing quotations for telegraph, telephone and electric-light stocks, Wednesday, Nov. 8:

Western Union Telegraph.....	80
Mutual Union Telegraph.....	24
American Cable.....	69
American Bell Telephone.....	183
Edison Electric Light.....	500
Brush Electrical.....	150
U. S. Electric.....	106
Fuller Electrical.....	25

Under the influence of adverse litigation Western Union has been lower during the week than for any time within two years.

An esteemed correspondent of THE OPERATOR, writes from Chicago, under date of November 2, as follows: "Passing through Canada recently, on one of my erratic peregrinations, I discovered an order from the general manager of the Grand Trunk Railway, to the following effect: 'Operators will receive for instruction any suitable person wishing to learn the business of telegraphy. By order of the General Manager.' The Grand Trunk has probably as poor a set of operators as any road in America, and evidently is not anxious to increase its efficiency.—OCTOBER."

An Oil City, Pa., correspondent says: "In a recent issue of THE OPERATOR I read an article in regard to some fast work done by Mr. Gross, of the Western Union office here, and Mr. Harvey, of Bradford. The correctness of the statement was doubted, probably from want of information in regard to oil country messages. They consist of but from two to ten words. The

usual form is as follows: 'No. 308. Fe. 7 pd. To. B. D. F. — Sell one, dollar twenty-one, net me. — F. E. B.' On Nov. 4, Mr. O. C. Morgan, of the American Rapid office in this place, sent to Mr. Johnston, at Pittsburgh, 300 messages in 57 minutes, and 920 messages in four hours and ten minutes, eclipsing anything of the kind ever done in the oil regions. Seven operators in the Rapid office attest the truth of this statement."

**NEW YORK CITY ITEMS.**

**Echoes from 195.**

Mr. Chas. Noble, formerly of 195, is now working in Montreal.

Mr. Farden, the paying cashier, is the most popular man in 195—on pay-days.

Mr. Hugh Wallace is now acting as traffic chief of the Southwestern division at 195.

Mr. Wm. O'Hearu has resumed work, after a three weeks' siege of inflammatory rheumatism.

Mr. Percy Jones, after a prolonged vacation on his father's farm in Western New York, is again with us, much improved in health.

Another race is arranged between the rival oarsmen of 195, Messrs T. Marrin and John Mahoney, to take place on the Passaic River on the 16th.

Mr. F. M. Huntington, who works No. 16 Erie, is also editor and proprietor of a temperance paper called the *Sunbeam*, published in Jersey City.

Messrs. Earnest and Crawford have left for New Orleans and Galveston respectively. Several more of the operators will leave for the South shortly.

The unsightly scaffolding still encumbers the operating-room, as it has done for over a month. The operators will hardly know the office when the carpenters, painters and plasterers get through with it.

In consequence of the steam having been cut off on Sunday, the 5th inst., to allow of a connection with the Steam Heating Company's pipes, the operating-room was so cold as to make it very difficult to write.

Election day in 195, like the calm that precedes the storm, is generally very quiet, but the scene changes about 7 P. M., when a large delegation from the day force arrives, and the "returns" begin to come in. All is then bustle and activity, and there is a rushing to and fro of messengers with manifold bulletins. As, however, every one is assigned to a certain work there is little or no confusion.

One of the printing operators in Philadelphia being ill, his place is filled by New York printers, who are taking turns of two weeks each in Philadelphia. Mr. Joe Knittle has just returned, and Mr. Theo. Fullon is there at present. To fill the vacancy in the New York office caused by this arrangement, Mr. Wm. Blanchard is now working days, while the remaining printers here take turns in working Mr. Blanchard's night "trick."

Mr. Luther R. Hallock, Western chief operator in 195, has taken a position on the night force, to enable him to pursue the study of medicine, which profession he has decided to follow. Mr. Hallock has been very popular with all his associates, and every one wishes him complete success in his new vocation. Mr. George Stainton takes Mr. Hallock's place at the switchboard, Mr. Con. Myers relieving the former gentleman on the Southern switch.

For some years past a certain few of the old employes of 195 have taken a day off annually, for a pleasant walk in the country, and this year was not an exception. On the morning of October 19, Messrs. F. Weedsport Baldwin, J. Walker McLaren, J. A. Wright, Jr., D. Barrie Mitchell, A. Ridgewood Coleman, E. Freehold Welsh, J. A. Ashurst, Billy Taylor and George Read, met at the Grand Central Depot and rode to White Plains, where they disembarked with the intention of walking to Mount Vernon. Mr. Welsh was appointed pace-maker and Messrs. Baldwin and Coleman whippers-in. After walking for two hours and a half, at the rate of a mile an hour, Mr. Welsh being in the lead at that time, rain unfortunately began to fall and the party was compelled to seek shelter in the only avail-

able hotel at Hartsdale, where, however, a very convivial time was spent, awaiting the 5 P. M. train for New York. It was voted to have the next annual walk over the Ramapo Mountain road, N. J.

**Other City Items.**

William C. B. Rawson, the telegraph operator who was indicted for manslaughter in the fourth degree in connection with the recent collision in the Fourth avenue tunnel, was called in the General Sessions on Nov. 6. He pleaded not guilty, and his bail was continued.

The operators of the Western Union and Mutual Union offices who reside in Brooklyn are arranging for a reception to be held at Grand Central Hall, in that city, on Tuesday evening, Dec. 5. A committee of arrangements consisting of Messrs. Stimpson, Cusack and Tierney, of the Western Union, Flood, of the Mutual Union, and Nolan, of the Produce Exchange, is prepared to furnish a limited number of tickets to members of the fraternity, the price of which has been fixed at one dollar. From present indications there will be about 200 couples present, and a pleasant time is expected.

On Nov. 15 the Telegraphers' Mutual Benefit Association will hold its annual meeting in this city, and the movement set on foot at the last annual meeting, to give the delegates from distant cities a proper reception upon their arrival, is making progress. A circular is about to be issued to all the New York members, urging their co-operation, and it is earnestly hoped that they will respond. The committee propose to give a dinner and, if possible, to have Dr. Green preside and deliver an address of welcome. Tickets for the dinner, at two dollars, can be obtained from Mr. H. C. Lockwood or any of the committee.

Thomas G. Sheridan, who for the last 15 years has been the private telegraph operator of Mr. Jay Gould, died on Nov. 1, of quick consumption. He was brought up in the office of the Erie Railway Company, where he became an expert telegraph operator. In that capacity he attracted Mr. Gould's attention when the latter went into the Erie. His superior ability as an operator, and his trustworthiness retained him in Mr. Gould's employ in a confidential capacity up to the time of his death. He and G. P. Morosini, formerly general auditor of the Erie Company and since then Mr. Gould's private secretary, were the only employes who stuck to Mr. Gould during the Erie difficulties.

About fifteen of the messenger boys employed at the W. U. Office, at No. 8 Broad street, quit work on Nov. 2, on the ground that they were dissatisfied with their wages. New boys were soon employed to supply their places and no delay was caused in the delivery of messages or in the work of the office. Manager M. H. Redding said that he had no intimation of any dissatisfaction on the part of the boys and was surprised when he was notified of the step taken. He said that the boys received two cents for each message delivered, but that owing to the dull market in Wall street they had not been employed for the past few weeks as constantly as they generally are. He was waited upon by a committee of the strikers, but refused to see them, sending word to them that he would talk to each boy individually, but would recognize no committee. He was then requested, in writing, to increase the rate to 2½ cents per message and subsequently to reduce the force employed, both of which demands he refused. Some disposition was shown at first to intimidate the boys who refused to join the movement and the new boys, but this was quickly stopped by the police and no evidence of excitement around the office was to be seen after noon.

**MUTUAL UNION OFFICE, 185 BROADWAY.**—Mr. F. A. Cloudman has resigned his position as night manager to accept a more lucrative place on a new railroad in Mexico.

Business in the office is very brisk. Assistant Chief Flood is a favorite with the operators.

Mr. Colebeck smiles and grows stout on the Syracuse wire.

Mr. Thomas Geary is said to be a candidate for the night managership. Mr. Geary has many friends.

It is reported that Messrs. Marrin and Macau-

ley are practicing the racquet for the coming ball in Brooklyn.

Mr. John Martin rejoices in a new daughter. Mr. Martin is quite a dramatic critic. His "copy" attracts attention by its fine business style.

Manager Seymour understands how to maintain discipline, while at the same time he has won the esteem of the operators by his quiet and courteous demeanor.

Mr. W. F. Holbrook is the artist of the office. His schedule of the city office districts, which occupies a prominent place at the distributor's desk, attracts much attention by its artistic workmanship.

The Manhattan District Telegraph Company, of New York, was incorporated on Nov. 2, with a capital of \$100,000. The line is to run from a main office in the vicinity of the Stock Exchange to other points in the city where branch offices may be established, and from such offices along, across, through, and in the streets, over buildings and into buildings, so as to connect such buildings with the offices of the company, and to connect such offices with each other. The company expects to begin operations within two weeks and to open messenger offices at Thirty-first street and Broadway, and at Church and Vesey streets. By Dec. 1 it is proposed to open an office in Wall street and one in Twenty-third street, near Broadway. The board of directors of the new company is composed as follows: W. H. Wolverton, president of the New York Transfer Company; H. W. Pope, Postmaster H. G. Pearson, A. S. Dodd, of Dodd's Express, and H. W. Gwinner, of the Pennsylvania Railroad. The officers are: President, W. H. Wolverton; vice-president, H. W. Pope; and secretary and treasurer, H. W. Chipman. Mr. Pope was general superintendent of the American District Telegraph Company from 1873 to 1879, and held the same position in the Mutual District Company from Jan. 1, 1880, up to within a short time. A disagreement with other officials of the latter company induced Mr. Pope to sever his connection with it and to work to organize the new Manhattan. Mr. Pope says that the new opposition will not cut rates when it is ready for business. He thinks that the field of messenger service in this city is ample enough for the new company without resorting to warfare against the existing corporations.

The failure to receive a signal at the fire-alarm headquarters from the special signal-box in the Park Theatre, on the occasion of the recent fire at that theatre, has done much to destroy confidence in the efficacy of the signal-boxes. There were two boxes in the Park Theatre, in each of which was a printed card which read as follows: "In case of fire, break the glass and push the button hard." The effect of this action is to start the transmitter by which the signal is communicated to headquarters. The workman who undertook to give the signal broke the glass with his hand, and cut himself severely in so doing. It is claimed by the Fire Department that in the excitement of the moment he failed to press the button. Superintendent of Telegraph J. Elliott Smith, of the Fire Department, announces that small mallets are now being provided for the signal-boxes in the theatres, and a new card of instructions is being printed, reading as follows: "This mallet must not be removed from its fastenings, except in the observance of the following

#### DIRECTIONS IN CASE OF FIRE.

"Break the glass front of this box, and turn the handle around to the right as far as possible and let go.

#### TESTING.

"The test signal for this station is—, which will be given upon the key before the commencement of each performance by the officer of the Fire Department detailed hereat for duty."

The result of each test will not only be known at the central office, but also by the officer sending it.

#### PERSONAL.

Mr. Walter P. Phillips is now connected with the Western Associated Press in Washington.

Mr. Bell, the inventor of the Bell telephone, has become a permanent resident of Washington.

Mr. Charles Childs telegraph operator and

ticket agent at Arcade, N. Y., died suddenly of heart disease at that place on Sunday, Oct. 29.

Superintendent Telegraph C. W. Hammond, of Marshall, Tex., desires that Mr. Charles Newton, who in September, 1881, was operator at Grape-land, Tex., will communicate with him.

Mr. Hiram Sibley, of Rochester, formerly prominently connected with the Western Union Telegraph Company, is said to be the largest owner of cultivated land in America. He is soon to erect a seed warehouse in Chicago, which will be the largest in the world.

SEDALIA, Mo.—Mr. George T. Witten, formerly night chief at Little Rock, Ark., takes the managership vacated by the transfer of Mr. G. M. Baker to Dallas, Texas. Mr. Daniel Hausam is esteemed by the printers for the handsome "copy" he gives them in the press reports. Messrs. Ed. Hausam and Kelles Easley keep the St. Louis and Kansas City wires clear. The rest of the staff is the same as two years ago.

Mr. J. C. Mattoon, of the Baltimore W. U. office, gave a social entertainment to a few friends on Wednesday evening, Nov. 1, at his residence in that city. Dancing was a chief feature of the occasion. Mr. Mattoon and Miss Frames also sang for the entertainment of the guests. After refreshments, the merry party adjourned at a late hour. Among the telegraphers present were Messrs. Hull, Hagarman, Gorsuch, R. Johnston and N. A. Johnston.

Mr. Wm. V. Miller, of the Oil City Rapid Telegraph office, has resigned to accept a position with the United Pipe Line Company. On Oct. 14 his friends in the profession proceeded in a body to his rooms and presented him with a handsome silver ice pitcher bearing an appropriate inscription as a souvenir of their pleasant relations. Messrs. Charles Matthias and M. A. Noss made addresses, which were responded to by Mr. Miller and were followed by an oyster supper.

ATLANTA, Ga.—Business is still increasing. Mr. J. M. Stephens is manager; Mr. Holcomb, chief operator; Messrs. Alston, Stevens, Tebeau and Williams complete the day staff; Mr. T. Sullivan, of Mobile, and Mr. C. Hamilton, of Augusta, have the "split tricks"; Mr. P. E. Murray is night chief, with Mr. P. J. Soaden, of Pittsburgh on press reports, and Messrs. C. F. Dunn and Harry Crist as night operators. The opening of the Southern Telegraph Company here is talked of, but nothing has yet been done.

Dallas, Texas, newspapers speak in terms of high praise of Mr. J. S. Burton, manager of the Western Union office at that place, who has resigned to accept the position of chief clerk in the office of Col. L. C. Baker, Western Union superintendent at St. Louis, in place of the late Mr. W. W. Cummings. Mr. Burton is very popular with the operators of the Dallas office, who presented him with a watch chain and charm prior to his departure. Mr. G. M. Baker succeeds Mr. Burton as manager of the Dallas office. Mr. Baker has been for two years manager of the Sedalia, Mo., office, where he is succeeded by Mr. T. M. Witten. Nine years ago, when Mr. Burton took charge of the Dallas office, but one operator was employed there; there are now fifteen. Galveston has twenty-three operators, Houston thirteen, San Antonio four, Austin four and Waco two.

ST. PAUL SCRAPS.—Mrs. H. C. Hopo, wife of the superintendent of telegraph of the C., St. P., M. & O. R. R., died on Oct. 15, after a long and painful illness. Some very beautiful floral offerings from the operators of the C., St. P., M. & O. R. R. and Western Union and Mutual Union companies, with appropriate messages of condolence, were conveyed to the residence on the morning of the funeral. Mr. John Goodfellow, a well-known train dispatcher in Lower Canada, passed through St. Paul recently on his way to Regina, the new capital of the Northwest territory, where he will take charge of a section of the Canada Pacific Railway. We are glad to see that Mr. Peter McGill has recovered from his late illness and rejoined the night staff of the Western Union office. Mr. John Root has also recovered from an attack of typhoid fever, and takes a position in the Western Union office. Mr. Wm. Hendy, for many years W. U. cashier, has resigned. The Brotherhood talks of a State ball.

A committee is considering the matter. Our delegate to the Cincinnati Convention has returned, and speaks highly of the hospitality of the fraternity in that city. The new Western Union management is making some improvement in the service. OBSERVER.

#### BORN.

BOYER.—Sept. 29, to Mr. George A. Boyer, W. U. Tel. Co., Baltimore, Md., a son.

DORAN.—Oct. 31, 1882, to Mr. G. W. Doran, operator and leverman, junction of N. Y. and Phila. Divisions, Pennsylvania R. R., Philadelphia, a daughter.

#### ELECTRICAL PATENTS ISSUED.

Week ending Oct. 31, 1882.

Apparatus for treating carbon conductors; J. E. Lockwood, Paris, France.....266,703  
Commutator-brush for dynamo-electric machines; W. B. Mason, Boston, Mass.....266,855  
Conduit for electrical conductors; G. S. Eaton, Brooklyn; N. Y.....266,681  
Conduit for electric lines; R. H. Corbett, New York, N. Y.....266,877  
Connecting device for operators' telephones; L. Mann, Detroit, Mich.....266,853  
Containing vessel for galvanic batteries; C. A. Faure, Paris, France.....266,798  
Electric distribution system; T. A. Edison, Menlo Park, N. J.....266,798  
Electric railway signaling apparatus; C. A. Scott, Boston, Mass.....266,904  
Implement for closing and testing electric circuits; L. Mann, Detroit, Mich.....266,854  
Incandescent electric lamp; E. Weston, Newark, N. J.....266,741  
Magneto or dynamo-electric machine; E. Weston, Newark, N. J.....266,740  
Making electrodes for secondary batteries; C. F. Brush, Cleveland, O.....266,762  
Railway-train electric signaling apparatus; E. T. Gilliland, Indianapolis, Ind.....266,806  
Rheostat; E. T. Starr, Philadelphia, Pa. (two patents).....266,910-11  
Safety or cut-off switch; E. T. Greenfield, New York, N. Y.....266,808  
Shunting device for electric lamps; E. Weston, Newark, N. J.....266,739  
Telephone switch, S. Bergmann, New York, N. Y.....266,750  
Telephone transmitter; D. Drawbaugh, Eberly's Mill, Pa.....266,615  
Telephonic receiver; S. E. Beedy, Farmington, Me.....266,748  
Telephonic transmitter; S. E. Beedy, Farmington, Me.....266,747

#### BUSINESS NOTICES.

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\$4.00 Fairy Sewing Machines, practical, cheap, durable; greatest bargains; every one warranted. Secure one ere it is too late, or the supply is exhausted. Read carefully the announcement of Messrs. E. G. Rideout & Co., in this issue.

Knowing that telegraphists have keen ears for music and that there exists a great deal of musical talent, both latent and developed, in the profession, the World Manufacturing Company advertises in this issue a number of musical instruments, to which the attention of readers inclined that way is called.

The value of the Holcomb mechanical telephones is attested by the length of time they have been before the public and the continued growth of the demand for them. Important improvements in the instruments, suggested by experience, have been made and patented. A special galvanized steel wire, made for the purpose, is employed, and an effective and durable insulator, also patented. Those who desire telephones for ordinary distances will find the Holcomb to answer the purpose, at but a fraction of the cost and trouble of electrical telephones.

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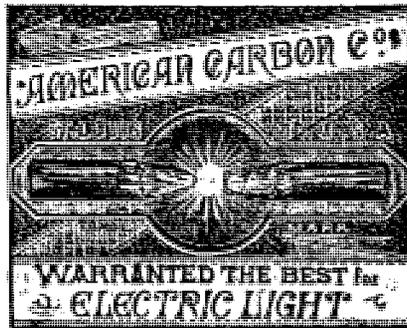
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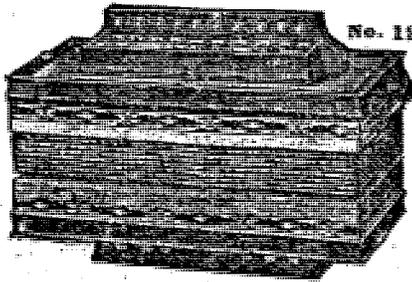
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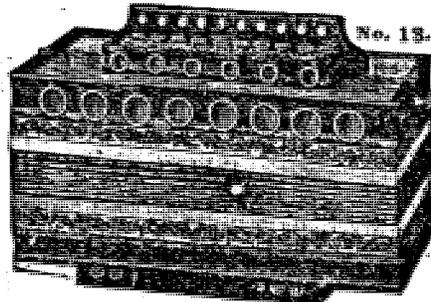
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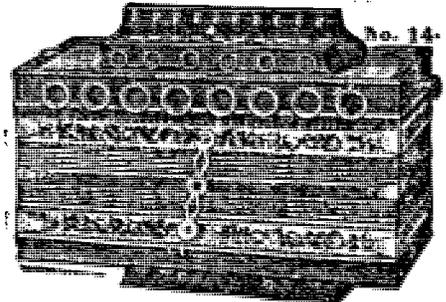
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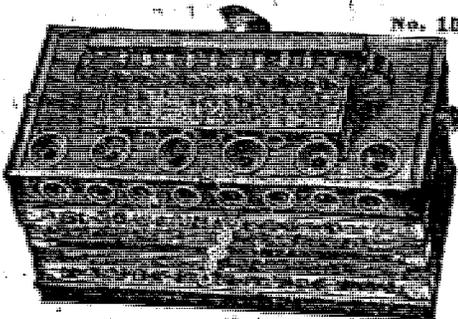
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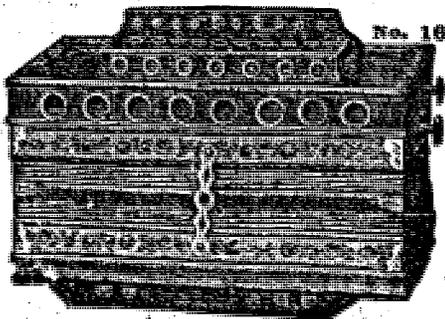
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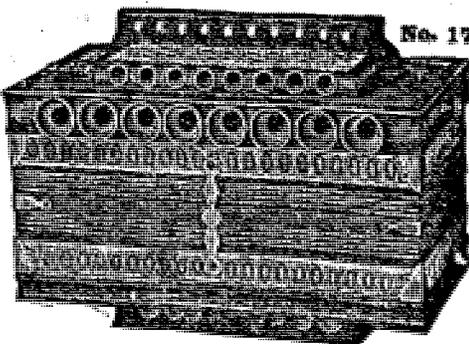
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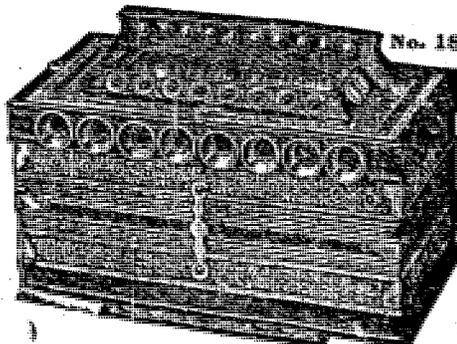
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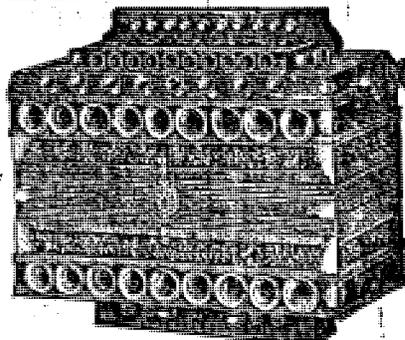
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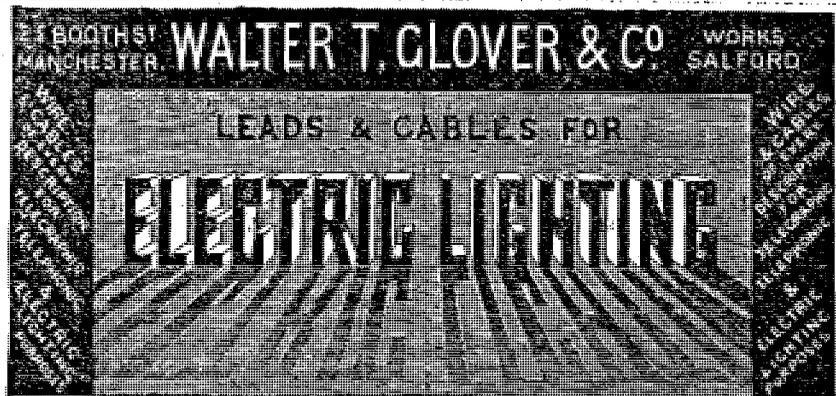
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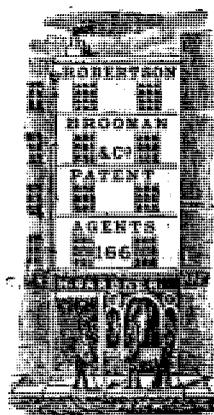
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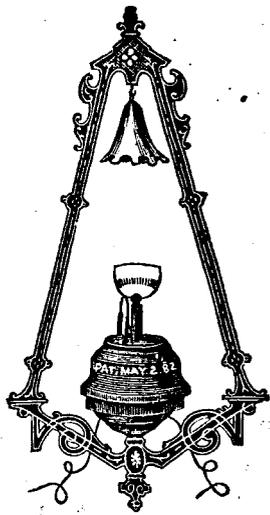
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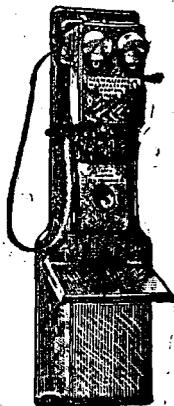
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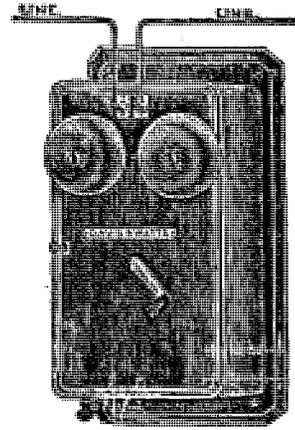
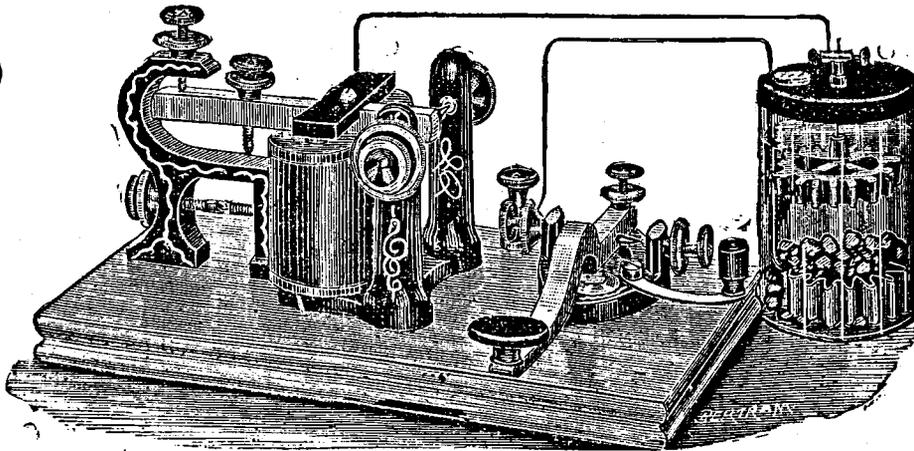
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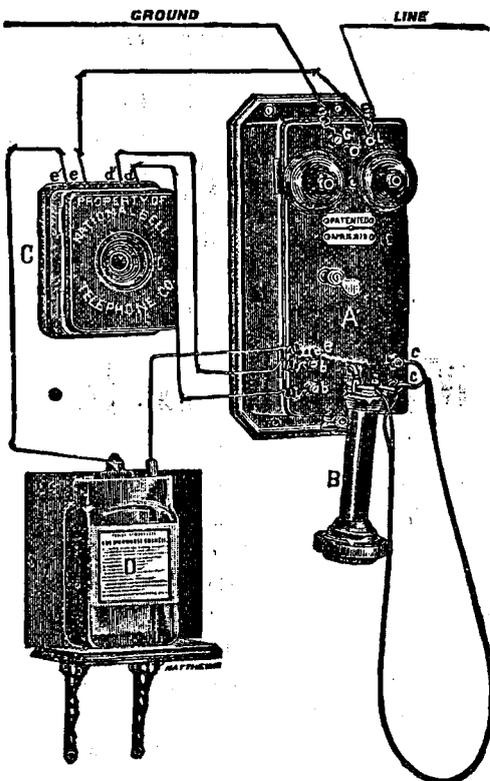
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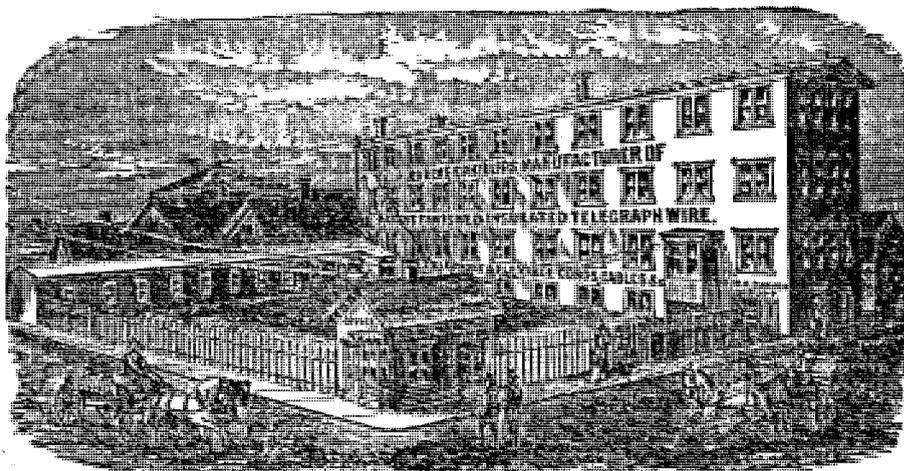
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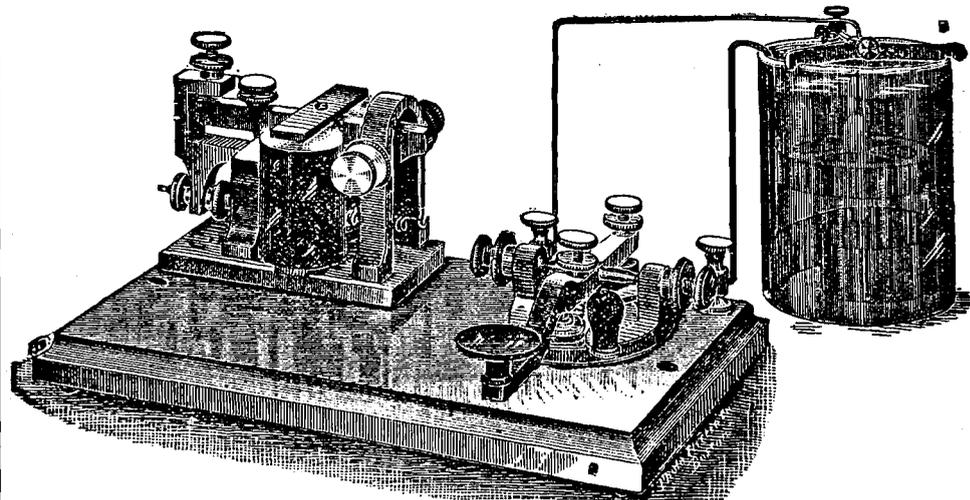
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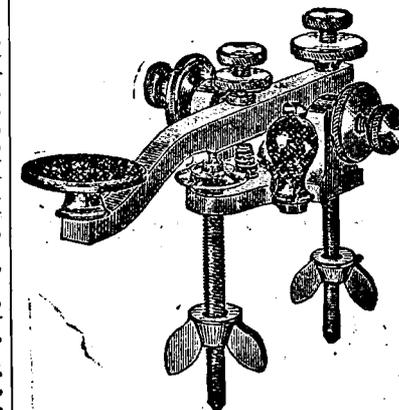
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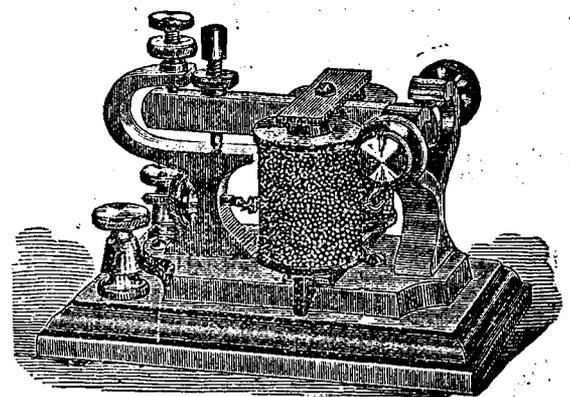
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The above Sounder and Key (either on one base or separate, as ordered), one full-sized Callaud battery, 1 lb. vitriol, 15 ft. office wire, book of instructions, all nicely packed and sent C. O. D., \$1.50, with privilege to examine before paying for them.

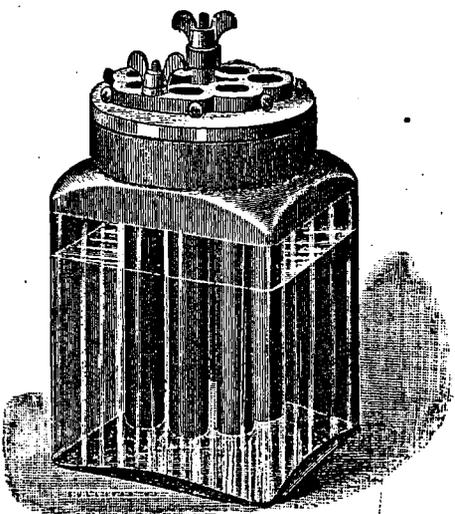
These instruments are neat in appearance, strong and durable. The bases of the key and sounder are iron, japanned, and nicely ornamented with gold leaf. The levers are iron, bronzed, and look as well as brass. All the screws, check-nuts, binding-posts, etc., are of brass, nicely finished. The contact points in the key are pure platinum. The sounder magnets are full size, and wound to work on a line from a few feet to 10 miles without relay.

If you want cheaper instruments, send for my reduced catalogue and instruction book, free of charge. will fill all orders the same day I receive them. Address, mentioning THE OPERATOR,

A. B. LYMAN,

36 SOUTH WATER STREET, - - - CLEVELAND O

THE "Diamond" Carbon Telephone BATTERY.



[PATENT APPLIED FOR.]

Jar, 6. in. high, 4 in. square; fits any Telephone box.

Has More Than DOUBLE THE CARBON SURFACE Of Any Other Battery.

Excels for Constancy, Simplicity and Price ELEMENTS.

7 Sticks Round Carbon, 3/8 inch diameter, 5 1/2 inches long.

Amalgamated Zinc, 3/8 diam.

Sal ammoniac.

Price Complete, \$1.25 per Cell.

SUBJECT TO

Liberal Discount in Quantities.



THE "DIAMOND" CARBON BATTERY

INSTRUCTIONS.

Place the jar in a wooden box... fill with water to the shoulders of the jar... See that the covers fit so nearly as to prevent air from entering...

NOTICE

As they are the only battery... The Battery has more than double the carbon surface of any other battery...

MANUFACTURED BY THE ELECTRICAL SUPPLY CO.

Washington 109 Liberty Street, New York

[FAC SIMILE OF LABEL, REDUCED IN SIZE.]



ONLY \$4.00

THE GREATEST INVENTION of the AGE. THE FAIRY SEWING MACHINE.

HANDSOME, STRONG, PRACTICAL, CHEAP, DURABLE. Endorsed by the Public Press and all the leading Physicians of the United States.

This Sewing Machine is constructed upon a new, novel, and scientific principle, requiring only about one-fifth the strength necessary to run an ordinary Sewing Machine.

THE FAIRY is recommended by Physicians as the only Machine that can be run by Ladies without injury to the health.

It will do just as good work as a \$20.00 Machine, and sew any kind of cloth from fine cambric to the heaviest made, either single or double thickness, and for fine embroidery on heavy cloth it cannot be excelled.

Having secured exclusive control of this Machine by taking the entire production of the factory, we will, upon receipt of only FOUR DOLLARS, send one of these Machines pre-paid to any part of the United States upon the following

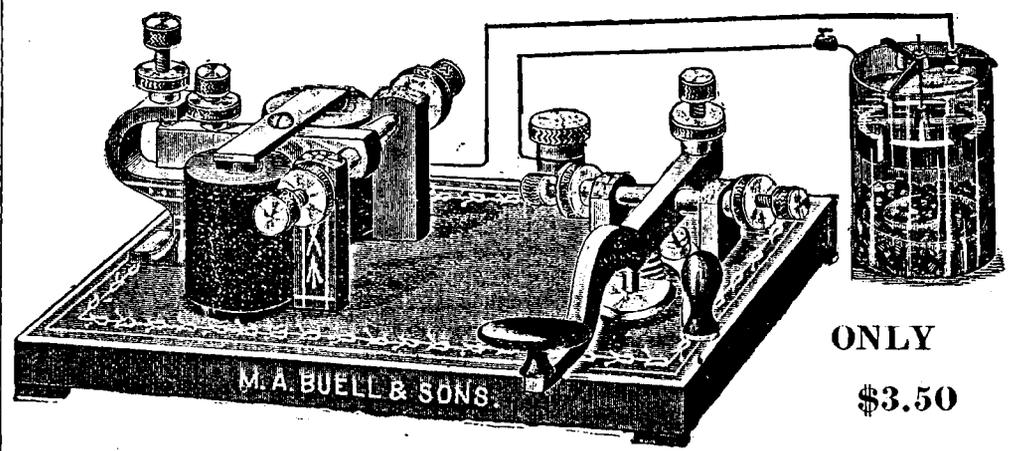
TERMS AND CONDITIONS. - Each order for a Machine must be accompanied by the attached Certificate, with the statement that you saw the advertisement in this publication, and that you will accept the Agency for your town if the Machine is satisfactory.

CERTIFICATE THIS CERTIFICATE IS VALUABLE THIS CERTIFICATE accompanied by FOUR DOLLARS entitles the holder to ONE FAIRY SEWING MACHINE, delivered, charges pre-paid to any part of the United States, but is GOOD ONLY TILL FEB. 1st, 1893, and must be accompanied by the Name, Post Office, and Express Address of the Sender. E. C. RIDEOUT & CO., 10 Barclay St., N. Y. CUT THIS CERTIFICATE OUT

Only a limited number of these Machines will be sold at this price, and no order will be filled for less than \$20.00 after Feb. 1st, 1893. Address all orders to E. C. RIDEOUT & CO., 10 Barclay St., New York.

JOHN A. ROEBLING SONS CO. MANUFACTURERS OF TELEPHONE AND TELEGRAPH WIRE WORKS AT TRENTON, N.J. ALL KINDS WITH THE HIGHEST ELECTRICAL CONDUCTIVITY OFFICE & WAREHOUSE 117 & 119 LIBERTY ST. NEW YORK.

The Works of the JNO. A. ROEBLING'S SONS CO., at Trenton, N. J., have facilities for producing large quantities of Telegraph Wire on short notice. The Belgian system of rolling long lengths of wire rods, and improved methods of galvanizing, were first introduced in the United States at these works.



ONLY \$3.50

THE STAR INSTRUMENT, guaranteed to be Perfect and Good for five miles or less. Outfit, including wire, vitriol, book, etc., cash with order \$3.50 without battery, cash with order 8.00 sent by mail for 3.50

M. A. BUELL & SONS, 144 Superior St., Cleveland, Ohio.

**BOSTON**  
**Electric Company,**

550 Washington Street,  
BOSTON, MASS.

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**ELECTRIC SUPPLIES,**

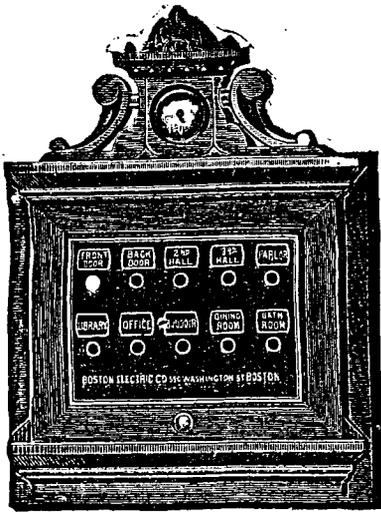
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ELECTRIC BELLS,

**BURGLAR ALARMS**

Electric Light Supplies, Telegraph  
Supplies,

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Elegant in Design, Style and Finish.

**LINE SUPPLIES**

AT BOTTOM PRICES.

Galvanized Iron Wire,

Galvanized Steel Wire,

Screw Glass Insulators,

Porcelain Insulators,

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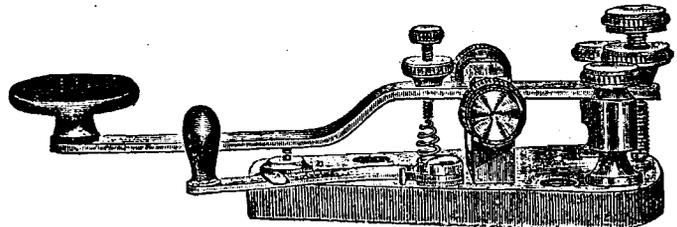
and Chemicals.

SEND FOR CATALOGUE.

**PARTRICK & CARTER'S**  
**TELEGRAPHIC SPECIALTIES.**

PERFECTION AT LAST!

**The Acme Steel Lever Key.**



PRICE, BY MAIL, TO ALL PARTS OF THE UNITED STATES AND CANADA, \$3.

For beauty of design, lightness, easy working, durability, and for fast sending, surpasses all other keys ever made. This key has hard rubber base, with top connections, and is entirely nickel-plated, and has received the indorsement of hundreds of operators throughout the country as being the "perfection of all keys." Since the introduction of the "Acme" key every mail brings fresh evidence that the "Acme" is destined to be the most popular key ever placed before the telegraphic profession.

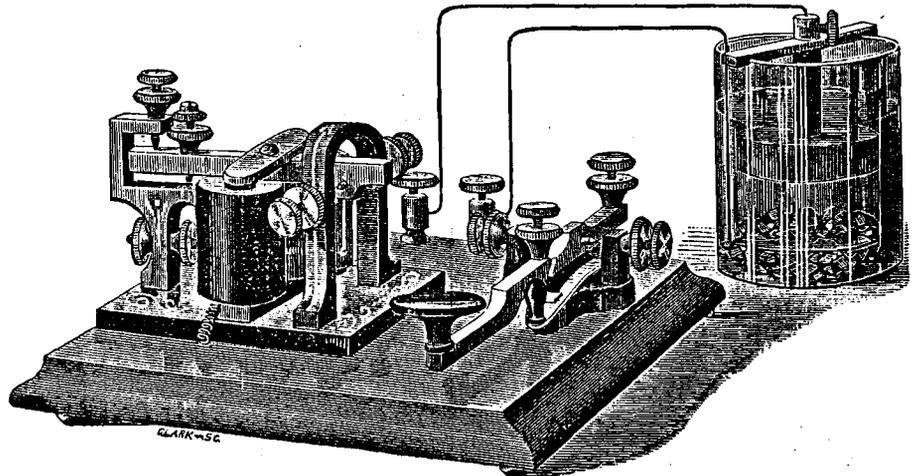
**THE NEW GIANT SOUNDER PERFECTED.** PRICE, \$5 BY MAIL. Patented Feb. 10, 1875, and the only patent ever granted embodying the principle contained in the Giant Sounder, and which is absolutely owned and controlled by us. Buy from us and you will get the original.

**THE CHAMPION LIGHTNING ARRESTER AND CUT-OUT.** PRICE, \$1.25 BY MAIL. The Lightning Arrester, Cut-Out and Ground Switch combined, of which we are the originators, has been extensively copied and imitated, BUT NEVER EQUALED.

**PREMIUM LEARNERS' APPARATUS.**

ONLY \$5.

NOT THE CHEAPEST, BUT GUARANTEED THE BEST



The PREMIUM LEARNERS' APPARATUS AND OUTFIT comprises the famous "NEW GIANT SOUNDER PERFECTED," and the "NEW CURVED KEY," placed upon a splendidly polished base, with a cell of Callaud Battery, Chemicals, Office Wire, and an excellent Book of Instruction, for \$5, when the money accompanies the order.

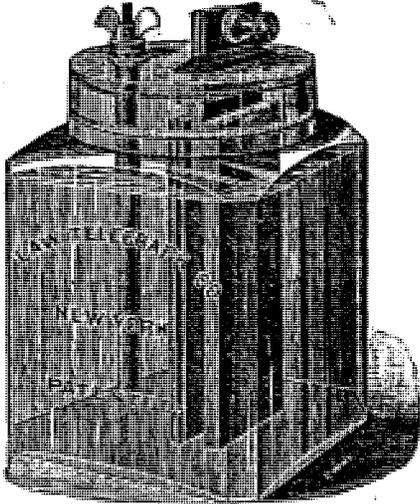
These instruments are the exact size and form of those upon which we received the highest award at the late Centennial Exhibition over all competitors. Everything reliable, and so guaranteed, or money refunded. Our book of instruction contains full and explicit information as to setting up the battery, running of wires, &c.

Price, Complete Outfit.....	Money in advance \$5.00
" Instrument without Battery.....	" " 4.20
" " wound with finer wires for lines of one to 15 miles.....	" " 5.00
" Cell of Battery, Complete.....	" " 80
" Premium Sounder, Separate Base.....	" " 2.50
" " Key.....	" " 1.75
" Premium Learners' Instrument Key and Sounder entirely Nickel-plated, without battery.....	" " 5.20
" Complete Nickel-plated Instrument, with battery and outfit..	" " 6.00
" " Sounder, separate base.....	" " 3.25
" " " Key.....	" " 2.00

Instruments without battery, sent by mail, 55 cents extra. Battery jars cannot be sent by mail. All orders will receive our prompt and careful attention. To prevent delay in shipment, full shipping instructions with town, county and State, should be given. Remittances should be made by P. O. money order, registered letter, draft, or express, which will insure safe delivery. Send for catalogues and circulars before purchasing elsewhere.

**PARTRICK & CARTER,**  
MANUFACTURERS OF TELEGRAPH INSTRUMENTS AND SUPPLIES,  
No. 114 South Second Street, Philadelphia, Pa.

THE  
**LAW BATTERY.**  
THE GREATEST  
**TELEPHONE BATTERY.**



SIZE OVER ALL,  $7\frac{1}{2} \times 4\frac{1}{4}$  INCHES.  
**PATENTED.**

As a Telephone Battery, the "LAW" unquestionably excels all others, for the following reasons, viz.:

- 1st. The cost of renewing is about ten cents per year, as against more than one dollar per year for others.
- 2d. The cells are all exactly alike.
- 3d. They continue exactly alike.
- 4th. They never get out of order.
- 5th. The first cost is less than any other.
- 6th. The connections NEVER corrode.
- 7th. Every part of the battery is exposed to view, and if a fault exists it is instantly seen.
- 8th. The water cannot evaporate.
- 9th. The sal ammoniac cannot escape.
- 10th. The parts are not liable to break.

With the introduction of the "LAW," the objection to the use of a battery in connection with the telephone sinks into insignificance, for the care is nothing, of injury or interruption to the service there is none, and the cost of maintenance is less than one cent per month.

The battery is not an experiment; but an established fact.

It has been in use by the Law Telegraph Company for two years.

The materials used in its construction are the very best. No acids. No odors. Great recuperative power. Nothing to renew except the zinc and sal ammoniac—no porous cup, plaques or prism. Fits the standard size battery-box.

The Bell Telephone Co. of Missouri writes: "We have been testing the 'Law Battery' for several months in our telephone circuits, in competition with the various styles of Leclanché and Callaud batteries. For transmitter work the 'Law' excels all others in uniformity of action. As a result of the test referred to, we have concluded to adopt the 'Law.' We have upward of 250 cells now in use."

**DIRECTIONS FOR USE.**—Put in one-half pound of sal ammoniac and fill with water to the shoulder.

**PRICE, \$1.25 PER CELL.**

Manufactured and for sale by the  
**LAW TELEGRAPH COMPANY,**

140 FULTON STREET, NEW YORK.

WILLIAM A. CHILDS, Manager.

FRANK SHAW, Engineer.

THE BISHOP  
**GUTTA PERCHA WORKS**  
OF NEW YORK CITY.

SAMUEL BOARDMAN, Agent.

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ESTABLISHED IN 1847.

ORIGINAL AND ONLY MANUFACTURERS IN THE U. S. OF

**GUTTA PERCHA INSULATED**  
ELECTRICAL WIRES AND CABLES

OF EVERY DESCRIPTION, FOR

**Telegraphic, Telephonic and Electrical Purposes.**

**Gutta Percha Insulated**

**SUBMARINE CABLES, 50 Regular Sizes**—One to ten conductors.

**SUBTERRANEAN CABLES.**—Any number of wires, hempen-armored covered.

**AERIAL CABLES.**—Any number of conductors; any desired insulation; lead or hempen covered.

**LEAD-COVERED CABLE.**—Any desired insulation; any length covered continuously without a break.

**ANTI-INDUCTION TELEPHONE (Lead-Covered) CABLES.**—As used by the Metropolitan Telephone & Telegraph Co.

**TORPEDO CABLES.**—One to four conductors. Recommended and in use by the United States, European and South American Governments.

**MARKS' COMPOUND INSULATED WIRES.**—For office, outdoor, underground and battery use.

**G. P. OFFICE WIRES.**—For all electrical purposes; cotton or tape covered and saturated if desired.

**FUSE, LEADING AND CONNECTING WIRES.**—For submarine and subterranean blasting.

ALWAYS HAVE ON HAND:

Wires of Every Variety of Insulation,

Burglar Alarm and Annunciator Wires,

TELEGRAPH, TELEPHONE AND ELECTRIC LIGHTING WIRES, CORDAGE AND CABLES OF EVERY DESCRIPTION.

COPPER MAGNET WIRES, { Perfect Insulation,  
Highest Conductivity,

GERMAN SILVER RESISTANCE WIRE,

TELEPHONE FLEXIBLE CORDS, MEDICAL CORDS,

FLEXIBLE ELEVATOR CABLES, { Any number of  
Conductors.

B. B. Galvanized Iron Wire, Double Braided.

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420, 422, 424, 426 East 25th Street,

**NEW YORK CITY.**

OFFICE AT THE WORKS.

**A. G. DAY,**  
 MANUFACTURER OF  
**Kerite Insulated Telegraph  
 Wire and Cables.**

OFFICE: 120 BROADWAY, NEW YORK.  
 Factory: Seymour, Conn.

The discovery of the insulating compound, known as Kerite, is the result of more than ten years of uninterrupted experiment and application, as well as twenty years' previous experiment and experience in the manufacture of India-rubber. About ten years of this time was spent in assisting Mr. Charles Goodyear in the experimental department, while perfecting his improvement in vulcanized India-rubber and its varied applications.

The necessities of the telegraph business requiring an indestructible insulation, stimulated me to the discovery and perfecting of my compound known as Kerite, which combines the great advantage of durability with perfect insulation.

Kerite insulation is proof against the action of the corrosive elements in the earth, air and water; and, where it has been practically tested, has proved its superiority to all other insulation.

**DURABLE QUALITIES OF KERITE.**

It is not injuriously affected by the extremes of heat and cold, experienced in our climate, nor by length of exposure in the atmosphere.

It will endure long-continued heat below two hundred degs. Fahrenheit, while for short intervals it may be subjected to from two hundred and fifty to three hundred degs.; and it may be safely immersed in boiling water.

The action of water, salt or fresh, not only protects all its qualities, but very much improves its insulation.

It is also unchanged by being placed in the ground. Any corrosive elements in the earth do not act upon it; nor is it injured by the roots of plants, which soon destroy gutta-percha.

There are thousands of miles in use throughout the country, by Fire Alarm and other Telegraph Companies of all our principal cities.

It has been used largely in the city of New York, under all conditions and exposures for the last nine years.

Constant exposure to the sun and atmospheric changes are the severest tests that can be given it in practical use.

**Eminent Electricians and Practical  
 Telegraphists**

commend and recognize the Kerite insulation as superior to all others.

At the Centennial Exhibition at Philadelphia, Sir WILLIAM THOMSON, the eminent electrician and scientist, awarded to the

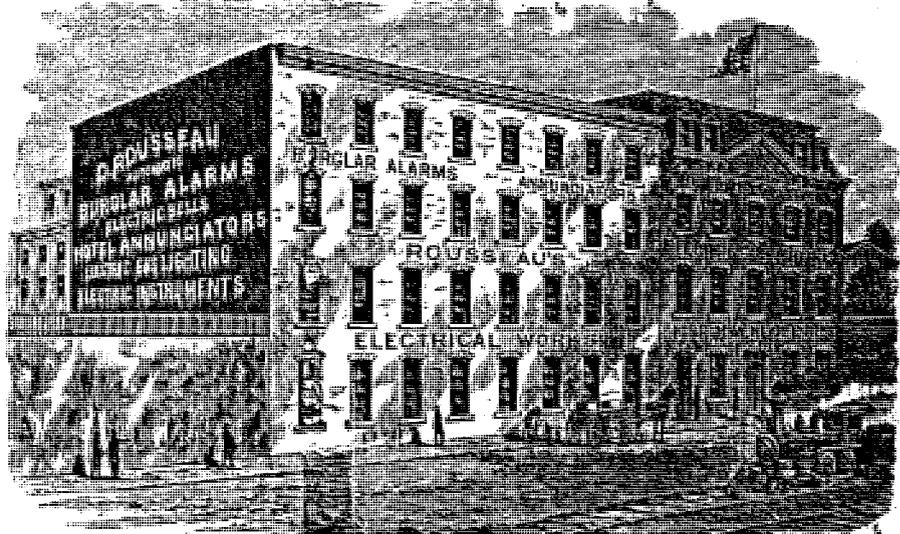
**Kerite Insulated Wire and Cables**  
**A DIPLOMA FOR**  
**"Excellence of the Insulation and Durability  
 of the Insulator."**

For sale by all dealers in Telegraphic Materials.

For further particulars, address

**A. G. DAY,**  
**120 Broadway, New York**

**ROUSSEAU'S ELECTRICAL WORKS,**  
 FOURTH AVE., NEAR 138th ST.



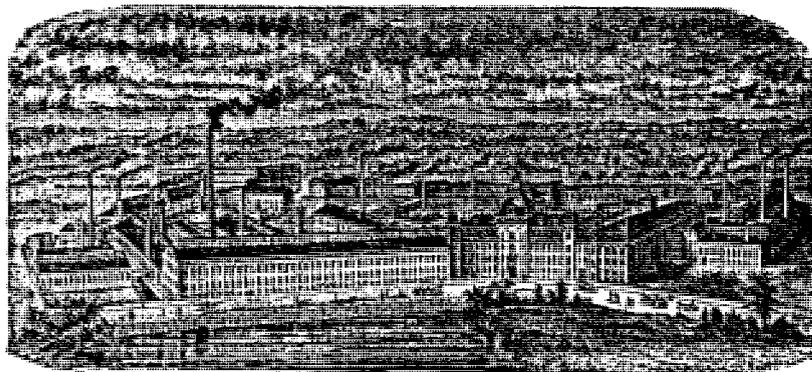
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 PATENT IMPROVED BURGLAR ALARMS, HOUSE ANNUNCIATORS, HOTEL ANNUNCIATORS, ELECTRIC CALL BELLS, ELECTRIC BURNERS AND ELECTRIC GAS LIGHTING APPARATUS.  
 SPECIAL RATES TO THE TRADE.

TELEGRAPH WIRE.

TELEPHONE WIRE

**WASHBURN & MOEN MANUFACTURING COMPANY.**

ESTABLISHED 1831. CAPITAL \$1,500,000.



**WORCESTER, MASS.**

21 Cliff Street, New York.

215 Lake Street, Chicago.

This Company having given careful attention to Telegraph Wire from the introduction of the Art of Telegraphy, and especially with reference to the conditions necessary to highest electric conductivity, does not hesitate to recommend this class of its products as unequalled in that particular.

Being the first to

**MAKE A SPECIALTY OF TELEGRAPH WIRE.**

and anticipating at an early day the great demand that would exist for that article, they have adopted and fully proved certain methods and appliances for the production of Telegraph as well as of Telephone Wire which are peculiar to themselves. Among them may be mentioned the

Patent Continuous Rolling Mill,

Patent Continuous Galvanizing Bath,

And the Belgian Rolling Mill

(In connection with the DOUBLE SIEMENS FURNACE).

All Wire made by this Company for Telegraph or Telephone purposes is thoroughly tested before shipping, with regard to Conductivity, Tensile and Torsion strength, as well as Elongation.

Prices and terms for Telegraph or Telephone Wire—Plain, Oiled or Galvanized—given upon application. Best Best (B. B.) kept constantly in stock.

JUST THE PEN FOR OPERATORS.



**Esterbrook's Mammoth Falcon No. 349**  
 LARGE ALL-WOOD PENHOLDERS TO SUIT.  
 Sample dozen Pens and Holder 40 cents.  
**THE ESTERBROOK STEEL PEN CO.**  
 Works, Camden, N. J. 26 John Street, New York

**PINS AND BRACKETS.**

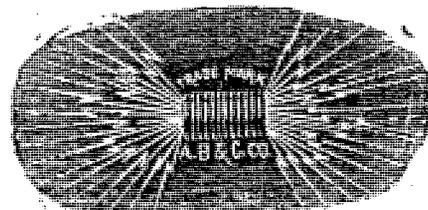
We are now prepared to furnish  
**Pins, Plain, at \$10 per thousand.**  
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**Brackets, Plain, \$13 per thousand.**  
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**BEST QUALITY OF OAK.**  
 SPECIAL REDUCTION ON LARGE ORDERS  
**L. B. HARRIS,**  
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**WATER MOTOR AND ELECTRIC LIGHT**  
 machinery for sale. Our four-horse power Lewiston  
 Water Motor, one Steam Gauge, one Engine Speed  
 Register, three Dynamo machines:—one ten-light  
 American, one three-light Weston, one three-light  
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 stat; a large assortment of gutta-percha and other  
 insulated wires, and other Electrical Apparatus and  
 supplies; all in good condition, some of them never  
 having been used. Apply for list to  
**JEROME REDDING & CO.,**  
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LIGHT POLES FOR TELEPHONE LINES AND LONG  
 POLES FOR CITY USE CONSTANTLY  
 ON HAND.  
 50,000 Split Cedar Posts on Hand Ready for  
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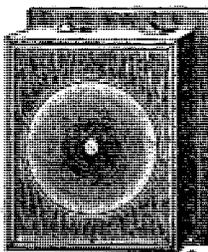
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**Pure Electric Copper Wire,**  
 For Magnets, Telephones, Electric Lights, &c.,  
 With H. Splittorf's Patented Liquid Insulation,  
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**LINE WIRE.**  
 FIRE PROOF HOUSE AND OFFICE WIRE FOR IN  
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 Wrought Metal Gongs, for Annunciators, Telephones, &c.  
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**HOLCOMB'S IMPROVED MECHANICAL TELEPHONES.**

FULLY PROTECTED BY FOUR VALID PATENTS.

(Patented in U. S. and Can.)

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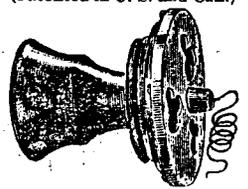


**Amplifying Telephones.**  
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*The latest and best.* These new instruments embody recent and important improvements. They excel in clearness and volume of tone. The only durable and reliable substitute for the Electric Telephones. Highly commended by business men. Work 2 miles. Price, by express, \$10 per set. **TREBLE STEEL WIRE** (the only durable wire for long lines) 5 cents per rod.

IMPROVED AUTOMATIC (Patented in U. S. and Can.)

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Excellent for short lines. They work finely and are the best instrument for the price now made. Elegant Ebony Enamel. Beautiful Metallic Base. Intended for practical business purposes; durable and efficient. None better for short lines. They are constructed on correct scientific principles. Do not confound them with amateur imitations. Price per set, by express, \$5. Galvanic Wire, 3 cents per rod.

These new instruments are unquestionably the best of their class. Thousands of them are in successful operation. Beware of imitations and infringements. Illustrated Circulars and numerous Testimonials from our patrons sent FREE on application. Address  
**THE HOLCOMB TELEPHONE CO.,** Atwater Block, Cleveland, O.

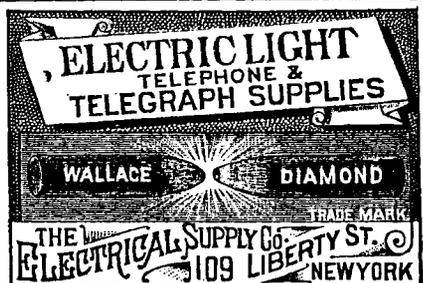
**30 DAYS TRIAL. LITTLE GIANT FRENCH BATTERY.**  
 Endorsed by the most eminent Physicians for the cure of Rheumatism, Neuralgia, and all Nervous Diseases and Weakness. Every Family should have one. A. B. Cameron, of Piedmont, Wyo., says: "I have successfully managed to remove Rheumatism from my left knee to my left shoulder, and from my shoulder it is now gone to parts unknown to me, with the use of your 'Little Giant' Battery." Sent by express subject to inspection. Price complete, \$6.00. Send for Circular.  
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**SHORT-HAND WRITING THOROUGHLY** taught by mail. Terms low; satisfaction guaranteed. Send stamp for circular and specimen of writing.  
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**CEDAR TELEGRAPH POLES.**

50,000 25s to 70s, No. 1 quality, deliverable on Mack. Div. M. C. R. R., F. & P. M. R. R. and C. S. & C. R. R.

**HENRY C. RIPLEY,**  
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I HAVE ON HAND A  
**LARGE QUANTITY**  
 Of new and first-class

**Kerite Insulated Wire,**

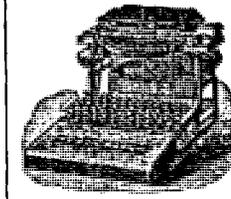
For which I have now no use, and will sell  
**IN SUCH LENGTHS AS MAY BE DESIRED**  
 AT PRICES

Lower than it has ever been Sold for Before  
 Send three-cent stamp for sample.  
**J. H. LONGSTREET,**

HALBERT E. PAINE, late Comm'r of Patents. STORY B. LADD

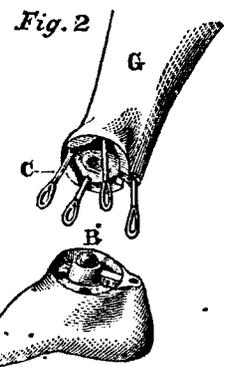
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 Descriptive Catalogue of Books relating to practical science—90 pages—and Catalogue of Electrical Books—12 pages—sent free by mail on application.  
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**E. CRAWFORD'S SONS,**  
**FIRE INSURANCE,**  
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 Representing eight Fire Insurance Companies, and the "Travelers," of Hartford, Conn.



The celebrated Bly **ARTIFICIAL LIMBS**, with or without universal ankle motion. Remodeled, improved and warranted for five years. Prices reduced. Send for free pamphlet. **GEO. R. FULLER,** auc.