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Emerson.

Like some old Titan of majestic height,
His march has been with grand and solemn tread,
The brain profoundly working, while the head,
Circled by mists, was often hid from sight;
Yet from its cloud, when great thoughts flashed to light,
That mighty brain by the elect was read;
The many saw not, turned away, instead;
His brightness, veiled, to them was only night.
But, as he walked, anon at either side
Fell pregnant seeds of thought, which, taking root
In minds long barren, showed the tender shoot
That later blossomed. Clouds might genius hide,
Yet everywhere the great man planted foot
His mark remains, and shall through time abide.

ELIZABETH C. KINNEY.

What is "The Secret Telephone?"

For the last week or two the veracious scientist of the daily press has been serving up to his readers, well-seasoned accounts of a new telephone company recently formed, to carry on a general telephone business. The somewhat mysterious title of the new organization is stated to be "The Secret Telephone Company;" and the instrument by which the achievements of the new company are to be accomplished is denominated the "The Secret Telephone."

The scientific chronicler already mentioned, says: "It is called the secret telephone, because when two persons are talking, no one else, although he may be on the same line can hear what is said." After describing the secret telephone and its circuit arrangements the scientific chronicler goes on to enumerate its further advantages, as follows: "The secret telephone is about one-half the size of the Bell telephone. A carbon diaphragm is used in the transmitter instead of a metal one, as in the ordinary telephone, and in the receiver a common horseshoe magnet is used instead of the vibrating armature. The inventor claims great advantages for his instrument, (of course he does—was there ever an inventor who didn't, from Tubal Cain to Rogers?) Instead of being suspended, the electrodes float in mercury, which gives distinctness to the sound and enables the telephone to be operated at long distances. There are many other differences between the 'secret' and the common telephone, but the advantages urged are the secrecy and the superiority in transmission. In an experiment in Washington, conversation in a low tone at a distance of 25 feet from the transmitter was heard plainly two and a half miles away." It may be fairly presumed that about two-thirds of the daily and weekly newspapers of the United States, have printed within the last two weeks, some such statement as the above. We are persuaded that this estimate does not overshoot the mark; and judging from the number of samples we have received, with the words to the effect aforesaid, carefully marked in blue pencil on the second page, we should suppose that our estimate is considerably too small. By the way, why does the telephone man always mark such articles in blue pencil, when he wants to attract your attention? Is it indicative of the turn his feelings would take if he thought there was any adequate foundation for a new and opposition telephone company to be started upon, or is it merely a straw which denotes the growth of æsthetics among telephonists?

After reading some two thousand extracts of the same general character pertaining to The Secret Telephone, there came a pause, and we had time to breathe, and then we received duly the REVIEW of the TELEGRAPH and TELEPHONE, etc., etc., and we read with bated breath the details of the organization of "The National Secret Telephone Company," with the momentous fact that J. Harris Rogers, of New York, took 39,994 shares, leaving to the majority of his fellow stockholders but one share each, and trusting to the dear public to come boldly forward and take the remaining 10,000 shares. Since it appeared that more than ordinary public interest had been excited by the articles which we have generally described, we have thought that a few words explanatory of the real character of the secret telephone would be generally acceptable.

This secret telephone company, claims then, to be based upon the patents of James H. Rogers, at present some five in number.

The first and most characteristic patent was issued December, 1881, and is for the secrecy feature, and the method and apparatus whereby it is attained.

The second purports to be for a battery transmitter, consisting of a mouthpiece, a diaphragm, which may carry a suitable electrode, or which may itself be of carbon; a mercury bath in which floats one or more particles or broken fragments of carbon, which are supported by the mercury and caused to touch the under surface of the diaphragm or of the electrode carried thereon.

One of the circuit wires is connected with the diaphragm, and the other with the mercury bath, and a battery is placed in circuit.

This, according to the specification, may be used with or without an induction coil, and the resistance of the circuit is of course varied when the diaphragm is spoken to, causing electrical undulations which traverse the line and influence any electro magnetic receiving instrument which may be there in circuit.

Patent No. 3, is for a receiving telephone, although the patentee states that it will also transmit.

To understand it without a picture — imagine a sheet of metal, iron or steel for example, about six inches long and three inches wide, folded close round a cylinder or cone until it acquires the cylindrical or cone-like form, with the edges very near to each other but not touching; after the form is acquired the cone is withdrawn, one edge is then wound round lengthways with insulated wire and forms the core of the magnet, or if desired, the covered wire may be wound over the whole of the cylinder. The covered wire forms part of line circuit.

Patent No. 4, decribes and claims different methods of carrying out the secrecy feature patented in No. 1, and shows several ways of putting it into practical operation.

Patent No. 5, is for another variety of battery transmitter, in which the electrical undulations, to quote the specifications, are produced by varying the cross-section, quantity or bulk of a fluid conductor, and consequently its conductivity.

A word as to the relative value of patents may here be not out of place: Many persons are now fully acquainted with the general rules by which such relative values are governed. Many more, however, are not But the facts of the matter are something like the following:

Any person who first discovers or invents a new art, or process of manufacture, or machine, or any new article, may obtain a patent for it, in all its breadth, no matter how simple and easy his discovery or invention may have been. The very fact that until the date of his invention, it had remained undiscovered, presupposes a certain amount of inventive or discovering talent to have been necessary, and the protection for seventeen years from the date of issuance of the patent, is his reward for the use and benefit which the world will derive from the free and unrestricted employment of the invention after the seventeen years have expired.

Furthermore, any person who may invent or discover any new and useful *Improvement* upon any art, process or machine, may obtain a patent for his improvement, and he is entitled to his improvement just as fully as the first inventor was to *his* invention.

The improver may not use the first invention without the permission of the inventor, and the inventor, while having full right to the first invention, may not avail himself of the improvement unless he first agrees with the improver. For example: Mr. Brown may be the first inventor of a button, Mr. Jones subsequently discovers that buttons having four holes through them possess certain advantages, and patents a button having four holes.

Mr. Brown has a full right to buttons, but he may not use a four-holed button unless such a button was fully shown in his specification. Mr. Jones again, while controlling his four holes, may not make buttons at all unless he gets permission from Mr. Brown. Carrying the matter still further, let us imagine Mr. Cox to have subsequently found that, by making Mr. Jones's four holes square, he obtains certain additional advantages; this is Mr. Cox's invention and he patents it. At this point, to carry on our argument, Mr. Brown still retains his right to buttons *per se*.

Mr. Jones monopolizes four-holed buttons if he can get permission from Mr. Brown to use buttons at all, and Mr. Cox may enjoy exclusively the right to make buttons with four square holes — with the trifling

drawback that he must obtain buttons from Brown, and permission to drill four holes in them from Jones.

Thus Jones's patent is subordinate to Brown's, and Fox's to both.

So much for patents. We may now take another look at the patents of Rogers. His second, third and fifth patents are for varieties of receiving and transmitting telephones; hence, supposing that the above ideas are substantially correct, and supposing, as we have every reason to do, that some one, whoever that may be, has a basic patent for the speaking telephone, Mr. Rogers, coming somewhat late in the day, will have to arrange with that some one unquestionably, and, in all probability, with a score or two before he has the right to use his own improvement on the telephones that have gone before him.

This practically disposes of three patents, and reduces them to a question of infringement of existing patents, since they cannot be used unless the earlier patentees are first interviewed, and their permission gained. The other two patents cover the secrecy feature, and will be now described. The first patent is the one which embodies the idea.

A kind of roller must be imagined, which is longitudinally divided into halves, one of conducting and one of non-conducting material. A wire from the ground is led to a battery, and from the other pole of the battery to the electrodes of a contact transmitter; leaving the transmitter, the circuit is led to the metal part of the roller which may be continued into the axis, and there permanently attached. Here the secrecy comes in: the circuit upon one wire exists no longer, a pair of springs are arranged so as to press on the periphery of the roller, one over it, and one below; to each of these springs a line wire is connected, which is extended to the distant station.

There the two wires unite, and just after the point of union, the single conductor, resulting from the said union is connected through an ordinary magneto telephone or any-desired form of telephone to the ground.

The idea is that any one connecting a telephone in circuit, in one of the two wires between the two stations, can hear nothing but a confused and unintelligible series of signals; and this may readily be imagined to be true, since the roller must be in rapid rotation and acts as a commutator throwing the current conveying the message, alternately on each circuit or each branch wire in succession. But the proper receiver being in the circuit of both branch wires, receives the signals intact; one wire supplying what the other omits. It is obvious that the metallic part of the roller must be of somewhat larger surface than the non-conducting portion, in order that the main circuit is never completely broken.

A second plan provides two wires from end to end, yet both governed by the same transmitting mouthpiece, and rotating roller, and both connected with the same distant receiver.

Still a third plan shows two complete circuits, governed by one mouthpiece, but passing through two separate rollers, one of which closes its line as the other opens; each wire is provided with a separate receiver, and in this case one receiver is supposed to be placed at each ear. The patentee, referring to this modification, remarks that "when two receivers are used it will, of course, be impossible to receive intelligible signals over one of them; but when a receiver is placed to each ear the disjointed sounds are carried by the auditory nerve so as to unite in the sensorium and produce articulate speech. A third receiver might be employed on a third circuit, and applied to the teeth to act in conjunction with a receiver at each ear."

The subsequent patent upon this subject refers chiefly to specific methods of applying the principle involved, and shows that the two circuits required metallic circuit, so that each station on the line is entered by two wires coming from different directions. It also shows that an induction coil may be used. So far as the writer is aware, this arrangement of circuits is original with Mr. Rogers. It is perfectly evident, however, that the novelty is entirely in the use of the revolving circuit breaker, and the arrangement of circuits, and not in the telephone in any sense whatever.

Having now stated the matter as it stands, the writer ventures no comment thereon except the following:

When the Bell telephone was first brought into general use, many persons thought that absolute secrecy was essential to its success.

Hence the introduction of the secrecy switch which partially gave the privacy required, but as time wore on it was seen that very few people had either time or inclination to trouble themselves about other people's telephony, and the secrecy switch is rapidly becoming a thing of the past.

Besides this, it has become evident that the simpler telephone apparatus is, the better it will work, and that improvement must be in the direction of simplicity; and, as the Rogers' arrangement introduces a new element of complexity into each station, in the rolling commutator, it is, we think, an improvement in the wrong direction.

THOMAS D. LOCKWOOD.

A New Incandescent Light.

A GERMAN ELECTRICIAN'S INVENTION—DISCOVERIES IN THE FORMATION OF CARBON.

Henry Goebel, a German electrician, exhibited recently, at No. 468 Grand street, an incandescent electric light, embracing various new features, of which he is the inventor. Eight three-quarter lamps were placed on exhibition worked by a two-horse power. The lamps gave forth a clear white light, no vibration or flickering being perceptible. The most delicate shades of color were distinguishable under the light of the lamps. Mr. Goebel claims for his light that it has the highest resisting power of any electric light yet invented. The chief feature of his light is that it has a carbon of high resisting power which at the point of juncture with the wire is immersed in a fluid, of Mr. Goebel's invention, which is specially adapted to resist the action of heat. The carbons are formed from fibers of reeds, which have been reduced in a furnace of a high degree of heat. They are then bent into any shape desired and sunk into platinum, which is covered with the fluid adapted to resist heat which Mr. Goebel has invented. With these ingredients Mr. Goebel claims to have produced the best incandescent electric light yet invented. The electricity is generated in the usual way by means of a steam engine and dynamo machine. Mr. Goebel states that his light has twice the resisting power of any light yet produced, and that under the rule that the greater the resisting power the less the cost he can furnish the light at a lower cost than is involved by the use of gas. The light is capable of subdivision by disconnecting switches, on the same principle as turning the tap of a gas lamp. The cost of the lamps is a little less than twenty-five cents apiece. Several well-known electricians have seen the light and are very much impressed with it. Mr. Goebel has also invented, in connection with the light, an improved vacuum pump based on the Geissler system of vacuum pumps, but adapted to render the operation of the same mechanical, so that unskilled hands can operate the pump and evacuate electric lamps and other vessels in a rapid and reliable manner.

The invention consists of a Geissler pump provided with an air-discharge valve at its upper end, the whole structure being supported on a pivoted frame, throw a body of mercury into a trough-shaped horizontal portion of the vacuating tube and form therein a mercurial seal. The mercury receptacle connected with the pump is adapted to be raised to the proper height by a suitable hoisting mechanism, until the surplus mercury passes through a discharge valve at the top of the pump, and then back again by a connecting tube to the vertically-placed mercury receptacle. Upon the lowering of the mercury receptacle the pump is returned into its normal position and is ready for evacuation. Mr. Goebel states that the main advantage of this improved vacuum pump is that it contains no ground-glass stop-cock, which is always a source of leakage. Another advantage of this pump is that its operation is entirely mechanical, and it can be tended by inexperienced hands, which is an important feature when large numbers of electric vacuum lamps have to be evacuated.

Mr. Goebel has been experimenting for the past thirty years in electricity. He states that he invented an electric light twenty-nine years ago, which he exhibited on the roof of his house, No. 271½ Monroe street, this city. On the first evening that he did so, he says, the fire alarm was sounded, and the engines came around to his house, and he was arrested and taken to the police station on a charge of disorderly conduct. He was, however, discharged an hour later by Justice Wood, to whom he explained the origin of the light, and that he had merely exposed it for the purpose of experimenting with it in the open air. Since that time he has frequently become impoverished by his electrical experiments, and has more than once given up his attempts in this direction in despair. He says that the electric light is by no means as new an invention as it is popularly supposed to be, and that forty-four years ago he knew of a professor in Hanover, Germany, who invented a good electric light, but who died while striving to overcome the difficulty of producing it upon a commercial basis. Mr. Goebel has a number of patents covering all the points necessary to the production of his light.

The Sellon Secondary Battery.

To the Editor of Engineering:

SIR.—I have read of the proceedings anent this battery on Tuesday the 4th inst., at the Crystal Palace, and I beg you will allow me space in your valuable paper to answer some of the statements made by two of the speakers. I will be as brief as possible and confine myself to absolute facts. I will first recall the two points which form the apparently solid basis of Mr. Sellon's theory as to the reality of the patent rights of the Electrical Power Storage Company.

These are, 1st, Mr. Swan's May and Mr. Sellon's September and subsequent patents purporting to cover forms of plates, or practically perforated plates; 2nd, the well-known fact that peroxide of lead has been known as a depolarizer as long ago as 1814.

This is my answer, viz.: I am able to prove that, being in my office, 446 Strand, in the middle of August last, I gave distinct orders, verbally and by letter, to the manufacturers of my batteries in France and in Belgium, that all plates ought to be without exception perforated.

My French patent is dated October 20, 1880. In December, 1880, I was in possession of a French patent, the principal claim of which is the application of perforated plates. According to the French law I might have embodied this as an addition to my first patent. On February 9, 1881, I again filed in France a patent specification, No. 141,057, in which I distinctly mention *suitable metallic wire gauze* as a substitute for felt, for holding the lead material against my plates. Thus you will see that a long time previous to any date mentioned by Mr. Sellon, I was in possession of all the elements of what he led his hearers t

In February of last year I was manufacturing elements for secondary batteries by retaining lead material or oxides in between two perforated coverings; this mode of manufacture I am carrying on, and all these facts were well known in England by men of standing.

Respecting the mention that peroxide of lead has been used as a depolarizer in primary batteries, it might as well have been mentioned that it has also been used as a paint.

Secondary batteries of the form in question consist of two electrodes around which is piled the peroxide of lead, or any lead material capable of answering the purpose, and these two plates form part of an electrical arrangement in which the current is alternatively in either direction.

Three more dates, and my sincere thanks to you, sir, for this mention, will terminate what I have to say for the present.

I first began the proceedings before the French courts against Mr. Volckmar on the 28th of March last, and the hearing of the case was fixed for the 1st of April. I was duly met at the court by Mr. Volckmar, in the person of Maitre Cortot, avoue, 88 Rue de la Victoire, duly constituted for this special purpose on March 31.

Is it not passing strange that Mr. Volckmar, on the Tuesday, April 4, should, by the mouth of Mr. Courtney, have emphatically denied having heard anything about these proceedings?

I remain, sir, your obedient servant,

C. A. FAURE.

The Sellon Secondary Battery.

To the Editor of Engineering, London:

SIR: In your issue of last week appears a letter signed by M. Faure, under the head of the "Sellon Secondary Battery."

In anticipation of pending judicial proceedings I deprecate correspondence of this nature, which enables either side to make statements which may prejudice the public mind, and I therefore do not propose to discuss the points referred to by M. Faure further than to suggest that he should at once prepare the proofs of his assertions, for they will most assuredly be required.

I leave it to the common sense of those who take an interest in this discussion, whether, had M. Faure been able, at the dates mentioned, to have so constructed his batteries as to avoid the difficulties and failures which up to the present moment have in the opinion of most scientific men been inherent to them, would he not have done so?

It seems to me that the points of general interest are as under, and that no further discussion can be of use until they are settled.

1. Are the batteries constructed by the Electrical Power Storage Company of the superiority over the "Faure" which is claimed for them?

2. If so, are the points which bring about this result protected by patents, and are these patents the property of the company?

3. Are they in any degree tributary to any valid claims of the Faure Company?

4. Are the "Faure" plates, as recently constructed, tributary to the Sellon-Volckmar claims?

Why any personal feeling is to be imported into the determination of these points is a mystery to me. For one inventor to be after another in his ideas is no disgrace, it is only his misfortune. The only ground for [illegible]ing which occurs to me would be on the part of any of the public, if they have, through misrepresentations, been induced to embark money in either undertaking.

I may mention that the Electrical Power Storage Company is now taking steps to have the above referred to four points determined scientifically and legally (we have already proposed to the English Faure Company a reciprocal examination of the respective batteries as shown at the Crystal Palace, but as yet without response), and I will only ask your readers to suspend all judgment until full and definite decisions have been arrived at.

Meanwhile, as soon as the manufacture on the large scale being prepared for, is sufficiently advanced, the new batteries will be offered to the public under guarantee of indemnity against any action on the part of the "Faure" Company.

I am, sir, your obedient servant,

JOHN S. SELLON.

The Motive Power for Dynamo-Electric Machines at the Crystal Palace.

I.

Engineers, both mechanical and electrical, may congratulate themselves on the success which has hitherto attended the introduction of the electric light. The ever-increasing use of this powerful source of illumination has created a demand for a special class of electricians, and the production of electricity from dynamo-electric machines driven by steam power has recently given quite an impetus to that part of the mechanical engineering profession devoted to the construction of steam engines. We believe it will not be uninteresting to many of our readers if we devote a portion of our columns from time to time to a series of articles bearing more particularly on the adaptibility of the various classes of engines, not omitting those worked by the combustion of gas, now employed at the Crystal Palace for the purpose of driving dynamo-electric machines. Without doubt the production of electricity by such means has been instrumental, not only in furthering the manufacture of numerous engines which would not otherwise have been required, but has actually driven engineers to design and carry out various improvements calculated to insure regularity of speed, which in all probability would never have been thought of or even considered requisite for any other purpose. The attention of many eminent engineering firms has been turned to the construction of the most economical and suitable engine for driving dynamo machines, and many successful applications have been the result. Prominent amongst those now regularly working in the Electrical Exhibition at Sydenham are the four types of engines shown by Messrs. J. & H. Gwynne, to whom we are indebted for portions of our description. They have attracted a considerable amount of attention not only from persons conversant with engineering subjects, but from the general body of the public. The following may be taken as a concise and brief description of these engines, and we hope shortly to be able to give illustrations of them as actually placed in position at the Crystal Palace.

No. 1. "Invincible" direct-acting high-speed vertical engine, coupled to spindle of and combined with one Siemens D_8 dynamo-electric machine and one Siemens S D_8 machine. Engine makes 700 revolutions per minute, provides 9 to 10 actual horse power. The dynamo machines worked by it maintain one Siemens arc lamp of 7,000 candle-power and four Siemens arc lamps of 1,000 candle-power each.

No. 2. "Invincible" direct-acting high-speed horizontal engine, combined and coupled directly with one of Siemens W_8 alternating current machines and one D_7 exciter for same. Engine makes 800 revolutions per minute, provides 10 to 12 actual horse-power. The dynamo machines worked by it maintain 6 Siemens differential arc lights and 75 incandescent lamps of the Swan system.

No. 3. "Invincible" horizontal engine, running at 280 revolutions per minute, provided with special bearing to carry properly heavy fly-wheel, and driving by straps one Siemens W_1 alternating current machine and one D_7 exciter for same. Engine makes 280 revolutions per minute, but will run at about double this speed. W_1 machine makes 700 and D_7 exciter 1,000 revolutions per minute. Actual horse-power provided at 280 revolutions, 20. The alternating current machine maintains 200 Swan incandescent lamps.

No. 4. "Invincible" high speed engine, similar in all respects to No. 3, but arranged vertically. Engine makes 300 revolutions per minute. Drives Siemen W_1 alternating current machine and D_7 exciter. Maintains 100 Swan incandescent lamps.

These engines present a remarkable example of their ready adaptability to electrical purposes, being really constructed for an entirely different kind of work. They are widely known under their original signification of the "Invincible" Pumping Engine, and it is for this purpose that they were originally built.

These pumping engines are guaranteed to be superior in every respect to any machine for raising water, and they are the result of a practical experience in the manufacture and working of hydraulic machinery extending over a quarter of a century. All parts of the engines are accurately balanced, so that they may be run at their highest speed without the *slightest* vibration or knocking.

Their cylinders and slides are of the very best mixture of cold-blast and Scotch iron; the connecting, eccentric, and slide rods are of the best hammered steel; the cross-head and piston are of one piece of steel; the valve spindles work in guides, and the crank shaft (double bearings) is worked out of a solid block of steel. Each engine is supplied with starting valves, a set of steel spanners, condensed water-cocks, impermeator, and an improved system of lubrication is attached to all the bearings.

As now shown at the Crystal Palace, the only alteration made is that the pump is removed and the dynamo-electric machine substituted. We believe these engines to have given every satisfaction; and from our own observation on several occasions, we can say that they are apparently well suited for driving dynamo-electric machines, and we see no reason why they should not attain to the same eminence for this purpose as they have long since gained as pumping engines.—*Electrical Review.*

Reward for Electrical Services.

From the *Malta and Mediterranean Review:* "We are delighted to hear that the Chevalier Edward Rosenbusch received, on Easter Eve, through the Italian Consul-General, the insignia of the Order of Saint Maurice and Saint Lazarus, which decoration was conferred upon our enterprising and energetic fellow-citizen by his his Majesty King Umberto I. . . . . During his long stay in Malta the Chevalier Rosenbusch has introduced amongst us electric clocks and bells, the electric light, telephones, the electric pen, and many other novelties which would grace the first cities of the civilized world." We may add that the Chevalier Rosenbusch is the representative of the "Brush" electric light in Malta.

ELECTRICAL ENGINEERING COLLEGE.—We understand that the Hammond (Brush) Company have started an Electrical Engineering College in order to provide the thorough scientific and practical training necessary to young men of good education who wish to become electrical engineers. In view of the great developments that lie before electricity in every branch, this college meets a decided want, and its connection with this successful commercial company will give an opportunity of securing a business training not obtainable at any of the ordinary scientific colleges.—*Engineering, London.*

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CONTENTS.

The following brief letter from our Paris correspondent, Professor Grignard, speaks well for the present able management of the Societe Generale des Telephones, covering the short period since which the telephone business of that country passed under their control, and considering the adverse circumstances under which they assumed charge. It shows quite conclusively that the measure of success in the business depends only upon its management, as the public need the service and anxiously await its development:

Telephonic Progress in France.

On the 31st of March last year the Societe Generale des Telephones of Paris had, in Paris, 1,210 subscribers, and only 822 working. In other cities 271 subscribers, and 145 in working order, making a total of 1,481 subscribers, 967 of which working, and making an average of 22,334 calls a week. On the 31st of March last the number of subscribers in Paris was 2,328, of which 1,556 connected to central offices, and in other cities 954 and 784 connected, a total of 3,282 subscribers, 2,340 connected, and averaging 122,568 calls a week. The gain in one year is therefore 1,118 subscribers in Paris, 683 subscribers in other cities, and an increase of over 100,000 calls weekly. The company has over 2,000 miles of cable under ground, and 96 miles of wire over housetops in Paris alone. There are ten central offices, the largest of them having 693 subscribers, and thirty young ladies to attend the commutator boards. We will describe in one of our next numbers this office, which has been visited by many prominent persons of Europe and America, connected with the telephone business, and pronounced by them one of the most perfect of its kind.

Edison in the Gramme Combination.

The Edison Electric Light Company has become a member of the Gramme Electrical Company of New York, a combination formed for the purpose of fixing prices and securing more harmony of action and greater effectiveness in litigation against electric light companies organized by irresponsible persons and using systems which may be infringements on the patents held by the Gramme Company. The other members of the last-named company, which joined at the inception of the combination in April, 1881, are the American Electric Company, of New Britain, Conn., the Brush Electric Light Company, of Cleveland, Ohio, the Fuller Electrical Company, of New York, the Jablochkoff Electric Light ing Company, and the United States Electric Lighting Company, of New York, and the Weston Electric Light Company, of Newark, N.J. The stockholders consisting mainly of the independent companies interested in the Gramme, have elected the following board of trustees: American, William Parker; Brush, George W. Stockley; Edison, Major S. B. Eaton; Fuller, William H. Appleton; Jablochkoff, William M. Ivins; Weston, Leonard E. Curtis; At large, Rowland R. Hazard and Henry I. Hoyt. The Board chose Colonel Hazard, as president, Henry I. Hoyt, the former president, as vice-president, and Robert W. Blackwell, as secretary and treasurer.

Mr. Hoyt said that the Gramme Company intended to protect the public by crushing out "wild-cat" stock companies, as the combination of sewing machine companies several years ago prevented the deluging of the country with low priced and worthless sewing machines. Companies like the Globe, which was exposed some time ago as being managed by Gray, and the American Electric Light Company of Boston, which collapsed last week.

Major Eaton said that the Edison Company had been invited to join the organization. Its sphere was widened, and it prosecuted infringements by "outside" electric light companies of the patents of all companies forming the Gramme, in whose l the patents were placed, and in other ways desti the "outside" organizations. Among these several companies using the incandescent light patents on which the Edison claims to have a opoly, instead of the arc light. Finding tha Gramme Company was benefiting the Edison pany by this work, the latter thought that it wa proper that it should bear its share of the co expenses of litigation.

The list of patents which the Gramme Com has just announced by circular to the "ou manufacturers of electric lighting apparatus t intends to protect by law from infringement co over ninety Edison patents, as well as those of l Maxim, Fuller, Houston & Thompson, Westo many other American and foreign. Friends Edison Company claim that its accession will p strengthen the Gramme union.

There will be an advisory board composed o chants and capitalists of great influence, and some of the most eminent scientific men of t other countries.

The arrangement as perfected is precisely t originally intended, and the delay in consumma so far as the Edison Company was concerned from the absence of one of the committee Edison Company and one of the committee Gramme Company in Paris during the electri position.

On their return, the arrangement originally p was consummated.

The company assume that no efficient sys arc, or incandescent lighting, or of the sto electricity in secondary batteries, can be wor any outside company without infringing funda patents held by the Gramme Association. applicants for admission are expected to dem the possession of some valuable fundamental to entitle them to admission.

The two classes that the public have to fear infringer and the swindler pure and simple, company will use every endeavor to protect th against both.

Underground Cable.

By many people who do not know anythin the matter it is asserted that it is just as easy ate telephones upon subterranean as upon ær

By others who know experimentally just much, it is held that it is by no means an ea to do.

It is obvious that only actual experiment c the dispute and place the matter on a practic To this end the American Bell Telephone C has laid the cable, which has already been n these columns

Four miles of the cable was ready for la Sunday, April 16th, and upon that day, at six in the morning, Road Master E. M. Merr Phillips and W. H. Sawyer, the manufacture cable, and H. B. Lytle, of the Telephone Company, were on the ground with a gang c laborers, and a locomotive to which was at box car open at the rear end and containing to be used.

The location chosen was the Boston and P railroad between the stations of Attleboro Mansfield, and only on Sundays is the road ly free from passing trains to admit of such a ive operation as the laying of four miles of der the surface of the ground between the t

It was decided to excavate a furrow or t the reception of the cable, and after conside that might be dug most expeditiously, som upon the happy thought of employing a pl men were accordingly sent out to procure implement of a farmer; but the first one

would not allow his plow to be used on Sunday at any price, and it was some time before one was obtained. Then a heavy beam was lashed to the rear of the car, the plow was chained to that, a man seized the plow handles, and the train started up, dragging the rusty shire through the closely packed gravel faster than any team which ever was driven a-field. And soon a single furrow five miles in length was opened ready for the reception of the pipe.

Inasmuch as the cable consisted of numerous sections, each 530 feet in length, conveniences were required for connecting together the conducting wires; for this purpose, boxes were prepared into which the opposite ends of each two adjoining sections were run, and when the wires were properly connected, the boxes were made water tight, and closed.

When all the cable thus far received had been properly laid into the trench, an impromptu appliance was contrived with which to cover it up by steam; a stout plank was thrown out from the car at such an angle that when the train moved forward it would draw the gravel back into the furrow like a scraper, so that the cable was buried in a very short space of time.

The remaining mile was laid on the subsequent Sunday with equal success, and the entire job reflects great credit on Mr. Lytle, who has had charge of the mechanical details of laying.

The cable itself, weighing nearly 30 tons, filled three freight cars and was constructed as follows:

Twenty-one conducting wires, ten of which were, besides being insulated perfectly with rubber, covered with tin foil, which being in permanent contact with the earth through the intermediation of the enveloping pipe, is intended to conduct away any induced currents.

Ten others were simply rubber-covered, and twisted together in pairs, while the twenty first was an ordinary paraffine office wire, No. 13 gauge. The whole of the conductors are enclosed in a leaden pipe, and makes a cable three-fourths of an inch in diameter.

The experiments with this cable, will be performed by the electricians of the American Bell Telephone Company, and it is hoped will set at rest many vexed questions.

Underground Telegraph Wires.

Among the most serious economical problems which the city has yet to solve, and which at present forces itself upon public consideration, is that of putting underground the countless suspended telegraph wires which disfigure our streets and avenues. The rapid growth of the various industries to which electricity has already become a necessity, and the probable early application of it to other uses, not yet contemplated because of its cost, render it imperative that an early solution be found. Fortunately the natural contour of the city favors the depression of wires under Broadway and one of the avenues, which together form a continuous route through the middle of the city from one end to the other. From wires placed in the main thoroughfare, branches through cross streets could be laid in any direction. That such lines can be operated without trouble when properly insulated has been clearly demonstrated The main thing to accomplish, therefore, is to secure the perfect insulation of a large number of wires in a small cable or group which can be laid and maintained at less cost than wires as now suspended. This would relieve us of the unsightliness, the annoyances, the destructiveness and the dangers of the present system. In a word, whoever furnishes a cheap system of insulation will settle the question of underground wires.

There are over 10,000 miles of suspended wire in the city, of which 1,500 miles belong to the city and are necessary to the efficient working of the Police and Fire Departments. The remaining belonging to the great telegraphic, telephonic, district-messenger and electric light companies, with none of which the city can dispense. The actual number in use a decade from now no person can foresee or calculate from the developments of twenty years past, but it is safe to assume that the defacement and danger of the city will be largely increased. The danger to life and property of the suspended wires has almost daily illustration; and since the introduction of the electric light wires the danger to property has been so augmented as to affect the rate of insurance on buildings which they cross or into which they are introduced. It is asserted that underground wires can be laid at a cost of $30 per mile in insulated cables containing numerous wires, and various companies have been formed to test the cost and efficiency of such plans of cheap insulation, with what result is not yet known; but it is apparent that if any projector can reduce the cost to such a figure it will be cheaper to depress than to suspend wires, for the cost of maintaining the latter is very great. A single storm has been known to interrupt the whole telegraphic system of the city for days; and the repairs hastily made have in a single instance aggregated more than a tenth of the original cost.

Of course the minor difficulties of laying wires underground, arising from the necessity of avoiding sewers and pipes already existing, and of repairing them when injured, still remain. These would be insignificant matters in cross streets, but serious ones in Broadway. But if a cable of a sufficient number of wires could be compressed into a very small space, it would be practicable to lay it under the sidewalk near or even under the curbing, so that business would be in no way obstructed by tearing up the street to lay or repair a cable. It might be possible, indeed, to utilize the curbing itself by substituting for the main cable through the heart of the city a curbstone of iron, with appliances for readily getting at the cable inclosed therein. But in one way or another these difficulties will yet be overcome.—*Ex.*

We regret to learn of the severe illness of our enterprising friend, Prof. Charles L. Gore, the General Manager of the Underground Wire Company. He has our heartfelt sympathy in the great bereavement he has recently sustained.

The West India and Panama Telegraph Company, Limited.

At a meeting of the board of this company, held on the 20th ultimo, it was resolved to recommend to the shareholders, at the approaching general meeting, the declaration of a dividend of 6s. per share, on account of arrears of dividend on the first preference shares to 31st December, 1881, carrying £3,294 13s. 1d. to the current half year.

Jay Gould's Cables.

The s.s. Faraday returned from her Atlantic trip on the 14th ult., and, after having been docked, moored alongside Messrs. Siemens' Brothers & Co.'s (London) works, at Charlton, on the 20th. We understand that she is now taking on board grappling ropes and buoys, and intends leaving the river shortly, on her fourth trip, to complete Jay Gould's cables.

We wish to thank Messrs. Eldred & Metcalf, of London, for the very interesting telephone article just at hand.

L'Electricité says that the telephone is now used by M. Dohrn in connection with his scientific explorations of the bed of the Bay of Naples. The divers and boatmen can quickly communicate with each other, thus saving the former fatiguing journeys to the surface.

The Conductivity of a Vacuum.

Professor Edlund has been making a number of experiments to show that a true vacuum is a conductor of electricity, not a non-conductor as is generally believed. The non-conducting theory is based on the high resistance of the Toricellian vacuum, but Professor Edlund holds this to be due to an obstacle of some kind at the surface of the electrodes preventing the discharge from taking place. Were this obstacle away or could electrodes be discarded, the discharge would take place. The obstacle in question he considers to be an electromotive force in the reverse direction to that of the main current, and this electromotive force goes on increasing after the rarefaction has attained a certain degree. The resistance of the air itself diminishes, but the "polarization" of the electrodes increases. By means of induction an electrical light can be produced in a highly exhausted tube, which shows that the vacuum is conductive. If, as recent experiments tend to demonstrate, electricity is an ethereal phenomenon, it is difficult to understand how a vacuum can be an insulator. The recent experiments of Mr. Spottiswoode, P.R.S., also agree with Mr. Edlund's theory. In these experiments, which were communicated to the Royal Society on March 31, the discharge from an induction coil in vacuum tubes was subjected to the influence of a magnetic field. The discharge was obtained by passing the alternating current from a De Meritens machine through the primary circuit and taking the spark from the secondary circuit. On placing the two poles of a magnet so as to inclose the discharge, the spark flattened out into two semicircular discs of light, one due to the discharge in one direction and the other to that in the other direction. Mr. Spottiswoode explains the discharge as follows: "In the first place, as soon as the tension is sufficient the electricity from the terminals breaks through the surrounding air, but with such rapidity that the fracture is like that of glass, or other rigid substance. This opens a path along which, if there is sufficient electricity or sufficient tension, the discharge will continue to flow. During such continuance the gas becomes heated and behaves like a conductor carrying a current, and upon this the magnet can act according to known laws (see Maxwell's 'Electricity and Magnetism,' vol. ii., p. 146). As long as the electricity continues to flow the heat will at each moment determine the easiest although not the shortest path for its subsequent passage. In this way the gas, which acts at one moment as the conductor of the discharge, and at the next as the path for it, will be carried farther and farther out until the whole discharge ceases. We are, in fact, led by these experiments to the conclusion that it is the gas in the act of carrying the current and not the current moving freely in the gaseous space upon which the magnet acts. . . . . Seeing now that the magnetic displacement of the luminous discharge means displacement of the matter in a luminous condition, and that a crowding of such luminous matter involves an increase of luminosity, may we not infer with a high degree of probability that the striæ are themselves aggregations of matter with dark and comparatively vacuous spaces between them? Such a view of the case would seem to imply that, in gaseous media, the better the vacuum the more easily can the electricity pass."

Electrical Exhibition at Munich.

We believe that experiments on a large and exhaustive scale are to be carried out in the Crystal Palace at Munich, on all matters connected with electric lighting, transmission of power, etc. The undertaking promises to be of great practical value, and is to last from the 16th of September to the 18th of October. The financial arrangements are to be guaranteed by the state and by private subscriptions.

The Telephone—from 1837 to 1882.

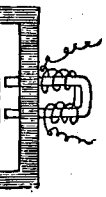
PAPER READ BEFORE THE SOCIETY OF TELEGRAPH ENGINEERS, LONDON.

By Amos Emerson Dolbear,
Professor of Physics, Tufts College, Boston.

We publish the following report of a most remarkable lecture recently delivered by Professor Dolbear. The new facts for the first time submitted to the notice of electricians and scientists in this country will command the attention they justly merit:

The Professor said that in the attempt he was about to show them something concerning the development of a new system of telephonic communication, he had thought it best, at the outset, to go hastily over the history of electric telephony. Of course, he knew that the main points in these matters were familiar, more or less, to them all; but he thought, if he devoted a little time to it, it would be refreshing the memory of some of them. Amongst the earliest attempts which had been made to transmit sound through the agency of electricity, the first that he knew of was that made by Dr. Page, of Salem, Massachusetts, somewhere about the year 1837. Those present would remember his device: It consisted of a bar of iron, around which was wound a coil of wire. When a current was passed through this, it gave out a sound; indeed, it gave out a sound every time it was magnetized or demagnetized. The bars were of considerable magnitude, some of them two or three feet in length. The cause of that sound was understood to be molecular disturbance whereby the bar was lengthened. When these sounds or clicks followed each other with a sufficient rapidity per second, of course we have a continuous sound. The break-piece he employed was an automatic one—an electro-magnet and contact breaker. The sound he got was sufficiently loud to be heard at a considerable distance. He was not aware that Dr. Page made any attempt to transmit articulate speech. Of course, nothing but a certain definite pitch could be transmitted in that way.

The next attempt was by one they had probably not heard about—it was made by a Mr. Farrar, of southern New Hampshire. He first proposed to make a kind of electric telephone in which sounds of different pitch should be transmitted. He, for his device, employed an electro magnet with a vibrating armature, something like this diagram. For his transmitter he employed a device consisting of vibrating reeds which could be manipulated by the ordinary keys of a melodeon or piano, opening and closing the circuit like Helmholtz's tuning forks, or like some of the devices employed in quadruplex telegraphy. With this apparatus he was enabled to transmit tunes. After that it occurred to him that it might be possible to transmit speech. He spent some time in experimenting, but did not succeed in making a transmitter. Soon after this, Helmholtz employed vibrating tuning forks with electro-magnets.

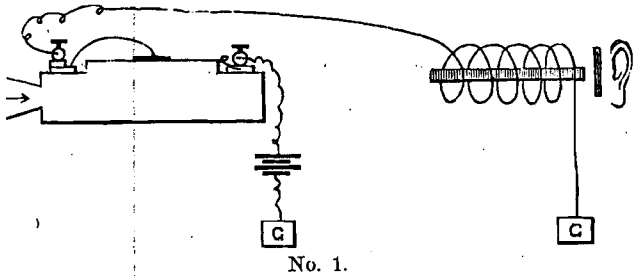


About the year 1860, Philip Reis, of Germany, of whom they had heard so much, undertook, by himself, and with extremely meager resources, to solve the problem of transmitting articulate speech. Let us suppose that this problem was to come to them for the first time, they having possession solely of such knowledge of electricity and of the conservation of energy as existed in those days. It was known that a sound of a definite pitch could be reproduced at a distant place. The problem was how to make the vibrations of the human voice bring about the varying conditions in a current of electricity which should reproduce, at a distant place, corresponding sound vibration. Reis knew that a drum-head or diaphragm, when vibrating, must constantly vary the pressure upon it of any body in contact with it, and he employed that device to vary a current of electricity.

It has been denied that it was then a matter of common knowledge that differences of contact pressure made a difference in an electric current, and such knowledge has been proclaimed as a discovery of later days; but since batteries were invented it has been known that proper contact is one of the elements of efficiency for an electric current, and every student in electricity learns this among his first lessons.

The material which Reis employed for his varying contact was platinum. One of the specific devices which he used, and there were several of them, was a cubical box having a membrane diaphragm at the top and a mouthpiece in connection with the inner part. On this membrane was fastened a strip of platinum, and a small piece of platinum wire rested upon this strip, completing the electric circuit. This is the typical transmitter which is usually shown in the market, and which is pointed to when Reis's work is mentioned (a transmitter of this form was exhibited, it being one made by Albert in 1863, Albert being instrument maker for Reis).

Reis, however, did not confine himself to this form, but made several forms, one of which had a shallow chamber, and is represented in diagram No. 1.



No. 1.

So much for Reis's transmitter. For a receiver he adopted, at first, the same receiver which was invented by Page—a straight rod of iron, surrounded by a coil of wire in electric circuit with the transmitter.

This receiving magnet he had mounted on a box for resonant effects. The question was, Would this receiver receive? There is no dispute about that, so far as the principle is concerned. What results did Reis get from that? Evidently very meager—and why? The whole thing was set on a box on a table with the evident expectation that it would make as loud a sound as ordinary telegraph instruments made. But it would not do it, neither will any receiver that has yet been made. In order to utilize the best receivers we have to-day, it is necessry to box them up. But Reis did not stop with that receiver. He made another, which embodied still a different principle.

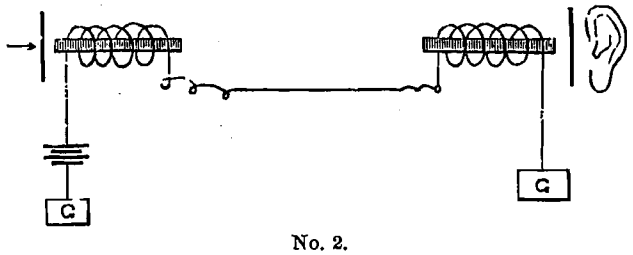
It seems a remarkable thing that people, when speaking about Reis's transmitters and receivers, refer only to his first instruments, quite ignoring his later ones.

He invented a receiver in which an armature was placed in front of an electro-magnet in order to utilize the magnetic induction to produce the vibratory motion of the armature. (See Diagram 1.) This was used in 1863.

Then let us see what it was that Reis did.

He invented a transmitter which would vary the strength of a current of electricity by the varying degree of pressure which was brought about between the contact surfaces, and, as was before stated, whether or not there was entire break of contact under such conditions as these depended solely on the amplitude of the vibrations of the diaphragm. It was not necessarily broken at any time when in use. The speaker could testify that the instrument would talk and would talk well. The identical instruments employed by Reis would do that, so that Reis's transmitters would transmit.

Secondly. His receiver would receive, and Reis did transmit and receive articulate speech with such



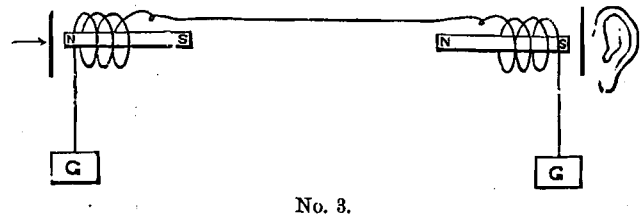
No. 2.

instruments. There is no doubt about it all. This system, the speaker said, he should call *Reis's system.*

In 1876 Prof. A. G. Bell brought forward another system, quite distinct from this. He proposed (and the lecturer thought he was the first in the world to propose) to speak to the armature of an electro-magnet with the expectation that somebody else listening to the armature of another electro-magnet in the same circuit might be able to hear the spoken words. His device they were all acquainted with. He had made a diagram of this (Diagram No. 2).

Prof. Bell proposed to have in one circuit two similar instruments, each provided with an armature in front of its proper pole, and he expected that words spoken to one armature would be heard by a listener at the other end. But the principle involved in this was different from that of Reis. In this case the two magnets were included in the same circuit with a battery, and any motion of the armature in the one would vary the current on the line. This, he said, was a new system.

An improvement on that system was soon made, in which permanent magnets were substituted for the electro-magnets and the battery was dispensed with, as illustrated in diagram No. 3.



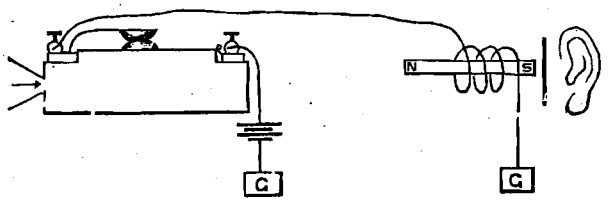
No. 3.

This was an invention of his own, in 1876. But the instrument, as it was at that time, was very limited in its applications. Under certain conditions it could be used for a distance of twenty miles, but it was not efficient, and it became necessary to find some means to increase its usefulness, and men began to turn back towards the original Reis system, some seeking to improve his transmitter, while others sought a substitute for it, in order to make the telephone of more practical use.

Among the latter, Mr. Edison proposed to employ such relatively poor conductors as plumbago and lampblack, the conductivity of which varied with the degree of compactness to which they were subject, as illustrated in the well-known Clerac's tube,

and he thus developed what is commonly known as the Edison transmitter.

Prof. Hughes discovered that gas carbon, when in an unconstrained state, was as efficient or more efficient than any other substance appropriated to that use, and now when the gas carbon is made to take the place of the platinum in the Reis instrument, we have one of the most efficient transmitters that has yet been invented. He had now, in diagram No 4,



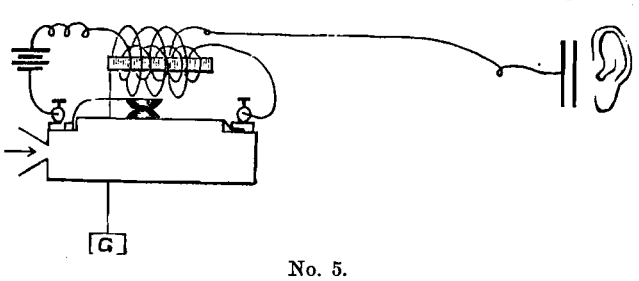
No. 4.

what represented the identical instrument—invented by Dr. Reis—in all its features except that carbon was used in the place of platinum, and he (the Professor) would say that this instrument was as efficient a transmitter as had ever been invented, and furthermore, it was coupled up with the magneto apparatus, and was what is known as the present Bell system. They would see it was the original Reis system, plus a permanent magnet.

There was another device, which to some would seem the same as the foregoing, but it was worked upon another principle altogether, which might interest them to know more about. (The Professor here had recourse to the blackboard to illustrate the instrument he was alluding to. He here described the Rotaphone, and also described a sounder and a relay, which were adapted to telephonic work, all invented by himself. The instruments were exhibited.)

Having described these, he would now come to the particular one he had there to exhibit, and in order to lead up to that, he wanted to remind those who had experimented with so-called static electricity, that any one who has charged a Leyden jar must have noticed that it always emitted a sound. They could always hear it cracking and snapping, and it so continued until it was discharged. This had been known for a long time, The first experiments that he knew of, in which the sonorous effects of condensers in any other form than those of the Leyden jars were observed, were those of Sir William Thomson, about 1863, in which he had an air condenser in connection with some sub-marine cable; and he observed that as often as the condenser was charged or discharged it produced a sound, and the sound appeared, as he thought, to come from the air between the two parts of the condenser. Afterwards Dr. Wright coupled up two pieces of silvered paper, back to back, and connected them with terminals on a secondary coil, and that with a Reis transmitter—and he found that, by charging and discharging, he could make sounds loud enough to be heard in a hall of considerable size. I have never heard that articulate speech was rendered by Dr. Wright. Mr. Varley then employed condensers of considerable capacity for producing sound. The speaker was not well acquainted with these devices, but he did not understand that Mr. Varley got articulate speech from his arrangement, or that he attempted it. But although his (the Professor's) apparatus was in some respects similar, it was not true that he worked up to it from that direction. It occurred to him that if he should pass a varying current of electricity through a substance that electricity would decompose, and the decomposition of that substance should result in the liberation of gaseous material which would increase in volume, he would have the means of setting up vibrations. (The Professor then described his apparatus, illustrating it on the blackboard.) This instrument consisted of a plate opposite another one, the space between the two being practically water tight. He supposed that the material he placed between the two would be decomposed. He put on an ear piece, and listened, and heard. He found one time, when he was at work at this, that for some reason the liquid had leaked out, and that he was still able to hear when there was nothing but air between the plates. He took the hint and worked out on that line, and developed from such conditions as those the present instrument. This instrument consisted of substantially the same parts as the previous one, excepting that the decomposable material was left out. He wanted to say something about the electrical condition present in this instrument. It had been known for a very long time perhaps from the earliest days, that an electrified body would attract another body in its neighborhood. (The lecturer illustrated this on the blackboard.) Let them suppose then that here was a wire which came from some source of electricity—here was a body, say a pith-ball. That body would be electrified This is a case of action at a distance, a physical condition which was extremely interesting for many reasons. There was a great deal involved in that kind of action which they, as physicists, had to look after. If, instead of putting the pith-ball there, he should put a plate, separating the two by means of a non-conductor, the electric pulsations in the one would result in attraction upon the other. In describing this it was said that one was inductively electrified; but the effect was to make the plate move. The strength of this attraction would vary with the kind of material that was employed, with the electro-motive force which was acting upon this plate, and also with the shape and physical conditions of it. Suppose they looked for a minute or so at the necessary conditions for getting a maximum amount of sonorous work out of a device of this kind, i. e., a condenser. It must be that the plate was free to move, free to vibrate. Suppose, then, they were using an ordinary condenser, made in the way he would show on the blackboard, in which they had the plates like those in the diagram. Now the electrical condition here would spend itself on them, and they would have, not maximum condition, but the very minimum. These plates must not touch each other if they were to get the best results from them. The vibrations occurred with such great rapidity in articulate speech that it was an essential condition for the maximum amount of work that the plates should not be capable of absorbing to any appreciable extent the electrical conditions. He had worked with plates of all sizes, from those not larger than the end of one's finger to those, perhaps, 2 ft. in diameter.

Now he would say a few words about the different conditions at the transmitting ends. In the four diagrams he had shown, only the essential features had been drawn. In No. 4, he was quite aware that an



No. 5.

induction coil was used, but it was not an essential thing. In No. 5, which was his system, it was essential that he should have the electro-motive force. If he connected up an instrument of this sort with No. 4, no appreciable result would be got from it, because the electro-motive force there is not sufficient. There were two or three ways in which they could use a transmitter. One of them was by means of electric machines. Let them suppose that instead of a battery being the source, it was an electrical machine which would give a jumping spark. He could get a current of electricity in this way which would pass a certain distance in air.

If, however, he took an ordinary induction coil having a sufficient number of turns, he would then have the means of getting the high electro-motive force essential for working this instrument. In that case he would have the device shown on the board, in which was a Reis transmitter connected with an induction coil, connected with his receiver. In this case the undulatory current in the primary circuit set up varying electro-motive force in the secondary coil to work the instrument. External resistance was a very small factor, indeed. The length of wire through which it would work was almost unlimited.

He would now exhibit the working of these instruments. He had set up several instruments there in working order, which he would show.

Arranged on stands in different parts of the hall were twelve receivers, all connected with a single transmitter, in which was employed a single small bi-chromate cell. Counting, whistling, and a cornet solo were distinctly heard in all parts of the hall.

He then showed that it was not necessary to have a return circuit, for a receiver was shown which had but a single terminal, and the sounds from this instrument were not inferior in loudness to the two-terminal receiver.

He next said that it was not necessary that there should be even two plates, and he showed an instrument having but a single plate and terminal, to which the President was invited to listen, and he reported that he heard perfectly with it.

And lastly, the Professor said he had discovered that even connection with the line was unnecessary, and he therefore quite disconnected a receiver from the line wire, and handed the instrument to the President, who, at a distance of several feet, reported that he heard perfectly, although the sound was much weakened.

The speaker thought it might be well for him to say a few concluding words (regarding this system which he had just shown them) concerning its advantages, and why he described it as a new system. The Reis system was one in which the electricity was transformed into magnetism, and this into the vibratory motions of the plate. In this system the electric transformation was but a single one, the electricity being transformed immediately into the vibratory motion without the intermediation of magnetism. On account of the electro-motive force, the matter of resistance does not enter it as a factor, as in electro-magnetism. There, of course, Ohm's law was applicable, but in this case it was not—at any rate within the limits of figures which they were capable of manipulating.

The cost of the apparatus was nothing very great. It was about the same as the other system. As to what it would do, he would simply tell them what he had done with it. He had had a line between his lecture room and his residence—a line of about half a mile in length—which, for two years, had been worked on this system, and it was going as well then as when he put it up two years ago, and the single cell of battery which had been used had received no attention except to add a little water. He had also used it on tolerably long lines, one of 40 miles, and one, the telegraph line of the Rapid Telegraph Company

veen Boston and New York, 256 miles in length. s last one he talked over during a storm, expect- a loss from leakage, but he was able to bear very inctly. As to what it was capable of doing beyond , he had not had opportunities of trying.

t the conclusion of Professor Dolbear's address, ch was received by the audience with marked ex- ions of approval, the chairman expressed his fication and appreciation and called upon W. H. Preece. The latter gentleman warmly mended the address, and declared his interest in invention of Professor Dolbear, because of its ctical importance to the world, as well as its ntific novelty. It should be the policy of the Gov- ment to foster and encourage all such advance in ience so important as telephony, and if the Patent ws of Great Britain are not such as to secure that ult, Mr. Preece remarked that it was time they e altered. He moved the thanks of the society to fessor Dolbear for his valuable paper. Professor ey Foster seconded the motion in a few well- sen remarks, and the chairman declared the mo- unanimously carried.

e Development of a New Telephonic System.

the Editor of The Electrical Review.

IR,—In your last report on the general meeting of Society of Telegraph Engineers and of Electric- s, I found a report of a paper read by Prof. A. E. lbear, before the said Society, on "The Develop- nt of a new Telephonic System," which paper re- ds me of an "improvisato," but interesting, ex- iment made last year at the Paris Electrical Ex- ition.

Before entering on the subject, I wish to say that writing this letter after Prof. Dolbear's paper, I am moved to claim priority (so conspicuous amongst tors), nor that of throwing any doubt in re- g him as the first who brought the subject be- e the public.

Whilst visiting the various exhibits on the upper leries, I came to that of M. L. Maiche et Cie ciete de l'Electrophone. I found in this show a ltiphone transmitter, which could transmit on the ne wire the articulate speech of a person, the melo- s of a musical box, of a piano, and also that of a ss instrument. But the one which attracted my ention was that of two inductoriums, disposed izontally on a bench one meter apart one from the er. The primary of No. 2 coil was worked by a r Bunsens', also having a suitable condenser, as in ordinary induction coils.

The secondary was connected through a telephone high resistance to one terminal of the coil No. 1. . 1 coil had only one coil, as the primary in this e would have been obviously detractory rather than elp to the secondary, unless it was an open cir- t.

Both ends of the coils were connected with a cop- plate, 12 centimeters square, placed parallel to another, and having a wooden cube interposed. working No. 2, an induced current was set up ernatively in No. 1 coil in the same direction as t of the secondary of No. 2 coil, therefore produc- a sound into the telephone, which sound varied in ensity with the number of makes and breaks in a en time of the primary or battery circuit. The a of this experiment, I believe, was simply for owing that his telephone was so sensitive as to rk through a high resistance. By permission, I ved to make an alteration in the connections. ter having done so we worked No. 2 coil as before, d still sound, though rather feeble, could be dis- ctly heard. By observing this latter experiment it ll be seen the effect or action is purely statical, as effect of magnetic induction is totally neutralized by placing No. 1 coil and the telephone in an equipo- tential position relative to the inductor No. 2, where- as in the first experiment the effects were more mag- netical than statical.

I must confess that we were both pleased at the unexpected success of this latter experiment. Now, it is not difficult to see that it is quite possible to pro- duce sound in a telephone by merely reversing the electrical condition at its ends through induction by a neighbouring electrified body, and improving the effect by substituting a suitable condenser at each end of the telephonic circuit. Further, we dispensed with No. 1 coil and also plate P_1, and separated the plates, P_3, P_4, and sound, though still feebler, was not totally extinct. By this experiment it shows that by mere electrical disqualibration of the neutral state of the plates attached at the ends of the telephonic line or circuit is enough to produce a slight electrical wave along the wire, therefore disturbing also the magnetical state of the telephone, which result is a tick. As it is well known the pitch of the sound is proportional to the number of vibrations in a given time, it follows that if a series of alternates are made by induction on the plates, P_3, P_3, in a given time, the result is a series of ticks or sounds, therefore con- firming Prof. Dolbear's statement.

Hoping you will find a space for the insertion of this letter in your valuable periodical, I thank you beforehand.

I am, Sir, your obedient servant,

London. H. CONTI.

A Telephonic Speed Indicator.

An ingenious plan for telling the rotary speed of an axle and its torsion, and consequently the work of a motor, has been presented to the French Academy of Sciences by M. C. Resio. The apparatus con-ists of two parts, connected together by an electric cir- cuit; one which is applied to the moving axle and forms the transmitter; the other, which can be placed in any convenient position, is the receiver. The principle on which the apparatus is based is as fol lows: If in a circuit containing a battery and a cur- cuit interrupter capable of giving a sound there are two identical bobbins, A and A^1, connected in series, but wound in opposite directions, the induced cur- rents in two other equal bobbins, B B^1, placed near, will destroy each other, and if a telephone be con- nected in their circuit no sound will be heard so long as these bobbins are equidistant from their primaries. If, however, this distance is unequal, a sound will be audible in the telephone, and the louder the greater the disparity of distance. To carry out this idea M. Resio attaches a rigid stem from four feet to six feet long to the axle and parallel with its axis, one end being fixed, the other free. On the latter he mounts a primary coil A, and opposite it on the axle itself a secondary, B, both coils having their axes in a line. Now the torsion of the axle moves this secondary to or from the primary according to the direction of rotation. The receiver is composed of two like bob- bins, A^1 B^1, placed similarly but at a distance, and one of them, A^1, can slide along a graduated scale so as to increase or diminish the distance between the two bobbins and restore the balance in the telephone. The distance shifted through is found by experiment to correspond to a given torsion or effort. This is simply an application of Professor Hughes's induc- tion balance and will be readily understood. An insulated toothed wheel is mounted on the axle so as to make and break the current in the primaries. The number of turns of the axle is in unit time deter- mined by having a diapason or tuning-fork with adjustable masses on its branches so as to regulate its note. Then by ear the observer moves these masses until the fork sounds the note given out by the tel- ephone:

Action of Telephonic Currents upon the Galvano- meter.

BY M. DE CHARDONNET.

If in a telephonic circuit, we substitute for the receiv- er a very sensitive galvanometer, and if we act upon the transmitter by means of a tuning-fork, an organ-pipe, or the voice, we observe no deviation as long as the sound preserves the same intensity, but as soon as it increases or diminishes the needle deviates. This movement changes its direction according as the am- plitude of the vibrations of the sounding body in- creases or decreases. The effect is most marked when the transmitter is affected by a sound of short dura- tion, such as a detonation or by a body struck slight- ly upon the vibrating plate. In the latter case, the needle of the galvanometer leaps like the second hand of a clock. The experiment succeeds well if the sounding body is approached to or withdrawn from the transmitter. These deviations appear much more distinctly when a michrophone-transmitter is used, such as that of Ader, but they are visible with every kind of telephone.

The explanation appears simple. As long as the oscillations of the vibrating plate retain the same am- plitude, and consequently the same speed, the induced currents at each complete vibration compensate their action upon the galvanometer alternately in both di- rections, whether they proceed from an electro-mag- net or from a microphone. But if the oscillations tend e. g., towards zero, each odd semi-oscillation has a greater amplitude than the even semi-oscillation fol- lowing, and the induced currents, direct and inverse, no longer set in motion, two and two, the same quan- tity of electricity. The residues of the same direction in each complete oscillation accumulate so as to de- flect the needle, and the deflection is the greater as the decrease is the more rapid.

Experimenting with electro-magnets on various minerals, Prof. Doelter has made the interesting ob- servation that the absolute amount of iron present does not determine the degree to which the minerals are attracted, for sulphides and sulphates containing much iron are very little attracted, while the attrac- tion of oxides, carbonates, and silicates is strong. This varying amount of attraction (it is pointed out) may be of service in mechanical separation of natural mixtures of ores, purifying ores, isolation of rock matter, and approximate estimation of quantitative mineralogical composition.

Uniting Telegraph Lines in Canada.

The act recently passed by the Dominion Parlia- ment of Canada permitting the amalgamation of tele- graph lines was suggested by the Western Union Company. It is a general and not a special law, and it is said that there is no doubt that it will have the approval of the Governor-General, because the bill was a Government measure.

The Western Union owns one-half of the stock of the Great Northwestern Telegraph Company, of which Erastus Wiman, a director of the Western Union, is president. It promoted the building of the company's lines, and when it absorbed the American Union it turned over to the Great Northwestern the lease of the Dominion Company, which the American Union had previously made. There was some question whether the charter of the Montreal Tele- graph Company permitted it to lease its lines, and to avoid difficulty the Western Union asked that a gen- eral law be passed permitting the leasing or the amal- gamation of telegraph companies throughout the Dominion. The Great Northwestern had already leased the Montreal Company, and, by the recent action of the Dominion Parliament, the control of all

the telegraph lines in Canada passes practically into the hands of the Western Union Company. It is understood that a closer union of the companies is not contemplated at present.

Telegraphic and Telephonic Notes.

The Jay Gould Cables.

The *Standard* of the 10th inst. says:—"The effect of the Jay Gould duplicate cable, constructed and laid between Europe and America, was expected to have materially cheapened the international cable communication between the eastern and western hemisphere, but it has had the contrary effect. The various English, French and American cable companies have conferred together, resulting in an arrangement being arrived at to increase the present tariff of 1s. to 2s. per word, and arrangements are in progress to shortly give this effect.

Mexican Cables Extension.

The steamship G. E. Wood, chartered by the India-rubber, Gutta-percha and Telegraph Works Co. to assist their steamship International in extending the Tampico-Brownsville section of the Mexican Telegraph Co.'s cables to Galveston, U. S., arrived off the Silvertown works on Saturday, the 8th inst. The G. E. Wood is a steamer of 1,084 tons gross and 98 horse-power nom. She will be fitted with an iron cable-tank and the necessary gear and machinery for laying the cable she has to carry out to Mexico. Mr. H. Benest goes out in charge of the G. E. Wood, and will probably leave the river by the 25th inst. The steamship International, with the greater part of the cable on board, will leave before the end of the month. Capt. W. F. Wardroper takes charge until arrival at Kingston, Jamaica, where Messrs. Theophilus Smith and J. Rymer Jones join the International. Mr. Theo. Smith then takes charge of the expedition.

Bravery in the the Telegraph Service.

Mr. Alexander Dowling, now employed in the Eastern Telegraph Company at Marseilles, has been presented, through the Foreign Office, with a medal and diploma from the French Government, accompanied by a complimentary letter from the chairman of the company, Mr. John Pender, M. P., in recognition of his bravery in rescuing, during a gale, the crew of a Chinese junk off Cape Stiyacque, Saigon, Cochin China. The vessel at the time was in a sinking state many miles out at sea, and the crew, consisting of fifteen Annamites (French subjects), were completely exhausted from exposure and privations. Mr. Dowling was occupied ten hours in the perilous duty, and on landing the Annamites, he received the thanks of the Governor of Saigon for his courage and perseverance in the cause of humanity.

Telephones in Germany.

The present state of the telephones in the Imperial Post Service of Germany was reviewed by Mr. Unger before the Electro-Technical Society at Berlin in December last. Already in November, 1877, when the greater multitude saw in the telephones hardly more than scientific toys, the German post began to introduce the "Fernsprecher" (far speaker) as Dr. Stephan, the Postmaster-General, in his zeal for a pure German language, christened the novelty from abroad, into the regular service; and now, after an elapse of four years, 1,280 telephone offices are in action. They have always been found reliable, and the officials in general prefer to be attached to this branch than to the more exerting telegraph department. The encouragement from private circles, Mr. Unger, himself one of the higher officials in the post service, assures was weak enough, and one might with more justification speak of the indifference of the public than of the laxity of the leading men that was complained of in some newspapers. Telephone connection exists at present in Berlin between the different ministers, the chief municipal buildings, all the railway offices and their goods stations, and a great many of the principal bankers, manufacturers, printing works, newspaper offices, lawyers, etc., are connected by telephone with the Exchange, their branch offices, etc. In the list of the more important towns that have adopted the telephone service, Strasburg, Bremen, and Dresden are still missing; its installation has, however, already been decided upon. Some of the smaller towns have proved more eager than the their greater rivals. The telephone wires of all Germany have at present a length of a little less than 2,000 miles, of which Berlin claims more than one-third. The arrangement for the nine telephone boxes at the Berlin Exchange deserves being mentioned. The point was to protect the people inside the boxes fron the noise in the Exchange, and this has perfectly been obtained by surrounding the boxes with double walls, the hollow space between which are filled with ashes, saw-dust, and clay, and which are, moreover, covered successively with pasteboard, wooden laths, felt, and finally the real wall paper. Quite new are the public telephone offices, which permit every one, on payment of sixpence, to enjoy a five minutes' conversation with any person whose abode is connected with the central office. Of these, Berlin has two and Hamburg one.

Consolidation of Telephone Interests—Facilities for Summer Resorts.

The Boston and Northern Telephone Company has sold its property and franchise to a company of Boston, Lowell and Worcester men, who will conduct and develop the enterprise for which it was formed. Its field of operation is a large one, including the entire State of Vermont, with the exception of two points, all of the State of New Hampshire, except Concord, Keene and Manchester, and the American Bell Company's perpetual franchise for the County of Essex in Massachusetts, including the right of way into Boston. The network of cities in Essex thus connected by the telephone wire are Lawrence, Lynn, Salem, Newburyport, Gloucester, Rockport, Peabody, Danvers, Amesbury, Merrimac, Nashua, Portsmouth, Dover, Great Falls and Exeter. The company has 1,700 subscribers, 11 Exchanges with suburban branches, 356 miles of pole line, 617 miles of wire between points, and in cities and towns an estimated length of 6,000 miles of wire for district purposes.

This change in ownership and management, as those who have assumed the company's control were already heavily interested in the telephone business, seems to indicate that, with the exception of Boston and a few adjacent points, the entire telephoning business of Eastern Massachusetts, Maine, New Hampshire and Vermont, is likely to be consolidated. Such a union of interests would be the most important of its kind, excepting the American Bell Company, whose business is of a different nature, and possibly one of the New York companies. The union would bring together a capital of nearly $2,000,000, owning 1,200 miles of trunk lines connecting cities and towns, and between 12,000 and 15,000 miles of wire in use for district purposes. It would bring under one management the business of 6,000 subscribers, using 12,000 telephones.

An important feature of the summer's work will be the connecting of all the summer hotels on the coast between Boston and New Brunswick. Similar connections are to be made with the principal mountain houses.

The Baltimore Telephone Company, as now organized, has a capital of $200,000. Augustus C. Davis, Esq., is the president and John H. Watts, Esq., treasurer, for the ensuing year.

M. Montigny published, a short time ago, some interesting observations on the effects of lightning on trees placed near a telegraph wire. A more extended examination of the road from Rochefort to Dinant has enabled him to mature his conclusions, and he now affirms (*Bull. Belg. Akad.*, 1) that "in the section of road beyond Rochefort, nine kilometers in extent, where one notices poplars that have been struck by lightning near a telegraph wire, the fulminant fluid has scarcely produced its effects, except in places where the provocative action of the wire is favored by the influence exerted on it by a considerable group of lofty trees; this action is especially favored in places where the roads traverses woods on an elevation, but the differences of height seem to have less powerful influence than the surrounding and neighborhood of wood." This conclusion agrees with what Arago observed as to the objects and places which lightning strikes by preference.

The Secretary of the American Society of Mechanical Engineers, in accordance with the instructions given him at the last meeting, is sending out for signatures, copies of a memorial to Congress, asking the appointment of another Commission to test iron and other structural materials. It embodies the points presented in the address of Prof. Egleston Copies may be had by applying to the Secretary, T. W. Rae, 239 Broadway, New York.

The Alaska's arrival at Fastnet from New York in 6 days, 21 hours, 46 minutes, sets another advance mark in the never-ending rivalry for short ocean passages. It seems only the other day when the minimum was ten days and odd hours; and next when nine days became the subject of wonder; and then when eight days and its fractions were astonishing; while now the hours have been taken one by one from seven days anp odd, until only six full days with less than twenty-two additional hours, has become the measure of the swiftest passage. There is a subsidy bill before Congress, proposing that a new line of steamers shall be rewarded by a very large gift of money from the Treasury, each time it crosses the ocean in a specified time. Yet this specified time is longer than the Alaska has now taken, though on a course of fewer miles, and by steamers giving no freight accommodations, being wholly for passengers and their baggage and the mails.

Female Operators.

Superintendent Duxbury, of the Telephone Company, expresses his preference for female operators to do the work of attending to telephone calls, and one of his reasons is—to put it in plainer language than he does—that impatient subscribers treat the young ladies politely, while they are very apt to waste time and electricity in swearing at the male operators. The reason is certainly a novel one, but very good for all that. It reminds us of the landlord in the White Mountains, who employed girls as waiters, because of the great saving in the board of his young gentlemen guests, whose appetites were appallingly delicate while the eyes of the pretty young waiters were upon them, although they usually strolled off in the direction of a pork and bean restaurant very soon after dinner. We don't mean, of course, to insinuate that the subscribers who are so polite to the lady operators take out their impatience in kicking their office boys. —*Providence Telegram.*

Still Single.

I stood by the "Blake transmitter,"
For the telephone bell had rung,
And over the wire a sound came,
As though a maiden sung.

A musical tone, quite familiar—
Her voice I had often heard—
For, in answering daily telephone calls,
We had interchanged many a word.

Have you never received a letter
And paused ere breaking the seal,
As you thought concerning the tidings
That the contents might reveal?

Did not a longing possess you
To know what was really within,
And yet to avail of that knowledge
You seemed in no haste to begin?

In some such manner I tarried
At our end of the telephone wire,
Then, at last, mustering courage sufficient,
Began at once to inquire:

"Well, hellos! Well, what is wanted?"
It seemed at least all I could do,
When, in quick return, came the message,
"Hellos! Well, hellos! Who are you?

"Why, I'm Forty-eight," I responded.
"You called only a moment or two,
"'Forty-eight!'" she repeated in answer.
"Well, surely, I don't wish for you."

I was giving my telephone number,
As found on the company's page,
But I fear, from her hasty answer,
She thought I was giving my age.

Alas! that the blow came so sudden—
I received it bewildered alone—
As the consciousness dawned there upon me,
Rejected by telephone!

—*Rochester Democrat.*

The very excellent showing of the progress made by the Providence (R. I.) Telephone Company during the past year, a brief synopsis of which we publish herewith (and for which we are indebted to Superintendent Duxbury), speaks well for its management and must have been very satisfactory to the stockholders.

ANNUAL MEETING OF THE STOCKHOLDERS.

The annual meeting of the stockholders of the Providence Telephone Company was held at the offices of the company, in the Butler Exchange, on the 3d inst.

The President, ex-Gov. Howard, read the following

REPORT OF THE SUPERINTENDENT.

Hon. Henry Howard, President:

I have the honor to present the following report for the year ending May 3, 1882:

The last report of my predecessor was made May 4, 1881, at which time there were 1,252 subscribers to the Company's Exchanges, with 38 applications not connected. The switches in the Providence Exchange were not adapted to the requirements, and new switches were ordered from Messrs. Post & Co., of Cincinnati, which it was hoped would prove ample to meet all demands for a year or two. Our growth has been so rapid, however, that there are now only eight vacant wires in these switches, and a new switch, manufactured here, has been added. This switch is different from any yet invented, and with the system of making connections which we have adopted, and which evidently satisfies our subscribers, I see nothing to prevent continued increase in the number of our patrons, and equal good service as at present to any extent required.

CONSTRUCTION AND OFFICE CHANGES.

During the past year 250 miles of wire have been strung, embracing subscribers' lines in Providence, Pawtucket, Woonsocket, Attleboro, North Attleboro, Bristol and East Greenwich, the lines for new exchanges at Warren, Pascoag and Westerly. Also trunk lines as follows: Two from Providence to Pawtucket, one from Providence to Woonsocket, one to North Attleboro, one to Warren, one to Fall River, one to Pascoag, two to Warwick Neck, one to Narragansett Pier, one to Greenville and from Westerly to Watch Hill, and a number of important trunk, house-top and pole lines in Providence. The switch room in Providence has been completely refitted in more spacious rooms and with new machinery. This change was effected without interruption of business, and reflects great credit upon the skill of our workmen who took part in it. The offices at Pawtucket, Woonsocket, North Attleboro and Olneyville have been refitted with new switches taken from the old operating room in Providence; as also were the switches for the exchanges in Warren, Pascoag and Westerly, which have been opened during the year. The instrument men have connected over six hundred new instruments, and removed or changed locations of nearly one hundred.

The following

COMPARATIVE STATEMENT

will show the growth of the Exchange and business.

NUMBER OF SUBSCRIBERS.

	1881. *May* 4.	1881. *July* 8.	1881. *Oct.* 8.	1882. *Jan.* 8.	1882. *Mar.* 25.	1882. *May* 3.
Providence and Olneyville....	903	978	1016	1063	1149	1202
Pawtucket.....	142	161	170	175	212	230
Woonsocket....	76	77	83	102	112	119
Bristol.....	33	44	44	44	46	46
East Greenwich	20	22	21	20	17	18
No. Attleboro'..	50	52	53	56	72	72
Attleboro'.....	28	31	32	33	35	37
Warren, (opened Sept. 1881).....	...	...	22	23	25	26
Pascoag, (opened Nov. 1881)..	. .	....	....	24	27	27
Westerly, (opened April, 1882 .	..	....	....	....	....	30
Total.....	1252	1365	1441	1541	1697	1805

Some fifty instruments have been taken out during the year in consequence of fires, removals, deaths, closing of business and summer resorts, etc.

We have 90 unfilled applications on file, which are disposed of as rapidly as rights-of-way can be obtained, and new applicants continue to come in fully as fast as the previous applicants are connected.

The total number of lines leading from each exchange, and the estimated total length are given below. This does not include the seven Boston wires, which are owned wholly by the Inter-State Telephone Company.

	Wires.	Miles Est.
Providence.....	525	1050
Olneyville.....	28	37
Pawtucket.....	90	60
Woonsocket.....	38	18
Bristol.....	13	11
East Greenwich.....	11	15
North Attleboro'.....	21	22
Attleboro'.....	12	7
Warren.....	8	9
Pascoag.....	8	15
Westerly.....	7	12
Total.....	761	1256

This statement shows that we have now about twelve hundred and fifty miles of wire in use, comprising housetop and pole lines, in the different cities and towns embraced in our territory, and trunk lines as follows: Seven to Pawtucket, two to Woonsocket, one to Franklin via Woonsocket, two to North Attleboro', one to Attleboro', two to Fall River, one to Bristol, one to Warren, two to Nayatt, three to Warwick Neck and Rocky Point, two to Pawtuxet, one to East Greenwich, one to Narragansett Pier, one to Hill's Grove, two to Harrisville, one to Pascoag, one to Greenville, three to Olneyville, and numerous long lines extending from the various exchanges to adjacent villages. They are all first-class lines for telephone work. The only exception is the Rocky Point line which was purchased early in the summer season of 1881. It proved a valuable acquisition in view of the demands for connection at Rocky Point, but will require rebuilding this year or next.

UNDERGROUND SYSTEMS

For electric wires are being agitated in all directions. Nothing has yet been devised which is accepted by telephone men as practical. The American Bell Company are now experimenting on five miles of underground cable at Attleboro, and hope to arrive at something definite on the utility of wires grouped in cables for telephone uses. The question how to support the wires is becoming a serious one, and will be the only obstacle, in my opinion, that will be presented to the growth of large telephone exchanges.

* * * * * *

The president stated that, financially, the company was in a perfectly healthy and satisfactory condition.

The amendment of charter granted by the General Assembly at its recent January session, authorizing an increase of capital stock to a sum not exceeding $200,000 was accepted, and the Board of Directors was authorized to increase the stock at such times and on such terms as they may prescribe.

The Directors were re-elected, viz: Henry Howard, H. C. Carnston, H. G. Russell, Charles Bradley, R. G. Hazard, 2d, J. H. Chace, R. M. Larned, C. R Greene, W. H. Pope, F. W. Carpenter.

The meeting then adjourned.

At a subsequent meeting of the Directors the old board of officers was re-elected, and it was voted to re-engage Mr. Duxbury as Superintendent.

Electric Light Currents and the Insulation of Conductors.

The various installations of electric lighting in town and country have, up to the present, been made with the conducting wires arranged either overhead or underground. When wires are freely suspended in air from lamp post to lamp post, it is not actually necessary that they should be insulated, except at the points of support, as it is usually only in these points that the current could escape; but as they might swing against obstacles in connection with the ground, or those persons connected with the operations of electric lighting might accidentally come in contact with them, it is advisable that they should have an insulating protection throughout their length, especially when the currents produced by the Dynamo electric machine employed are of high tension. As however, the future and permanent use of the electric light will be so arranged that the wires conveying the electric current will be placed underground, this method will form our chief consideration. Our object in dealing with this subject is to impress, not so much upon our general readers, as upon the active representatives and engineers of electric lighting companies, who have probably had little or no experience in electrical science, the absolute necessity of securing a good and durable insulating material to protect their conductors. Many of the partial failures in the already existing installations of electric light can, as is now well known, be directly attributed to the bad insulation of the wires used; and the employment of such wires can only be due to the want of the requisite knowledge of what is necessary on the part of those superintending such operations. Any electrician specifying for a submarine cable would be sure to calculate the insulation suitable for his purpose to a nicety, and electric-light engineers ought to be equally certain as to their own requirements.

When a conductor has to be carried underground through pipes, from which water can never be entirely kept out, the insulation must necessarily be continuous, and the conductor is usually covered with gutta percha or india rubber. Economy of material must of course be studied, but in this department it has been to a certain extent overdone. We know of many instances where conductors have been put down for carrying high tension currents, and merely covered (we cannot say insulated) with yarn and tape, the result of course being a failure. It must be quite understood that for such purposes as underground communication the conductors must be as nearly perfectly insulated as is possible, for a minute defect will in course of time develop into a fault of sufficient importance to interrupt the working of the circuit. Considering the cost of material, it is of course advisable that the covering of gutta percha or india rubber should be as thin as possible consistent with safety, but this must depend a great deal upon the tension of the current to be used. Both these materials have certain advantages, and regarding them from the point of insulation alone, india rubber is the superior of the two. It is also better able to bear extremes of heat and cold, Hooper's or Henley's india rubber cores being capable of standing in boiling water without detriment. Gutta percha, on the contrary, becomes soft and loses its insulating capacities when heated above 100° Fah., but under water at the ordinary temperature it is practically indestructible. It is, however, not improbable that some other material much cheaper than either of the foregoing will be shortly introduced, and which will be found equally efficacious for the insulation of electric light leads. An absolutely perfect insulated conductor would be one whose insulation is the same throughout its length, but the manufacture of such a core as this is of course an impossibility.

Suppose, for example, we tested a ten-mile length of *core* (this being the technical name for an insulated wire), and it gives us a result at a certain temperature of 200 megohms (200,000,000 ohms). In the ordinary way of reduction to megohms per knot, this particular core would have an insulation resistance of 2,000 megohms per knot; but if we cut this core up into lengths of one mile each, and test them separately at the same temperature as before, we shall not find every piece to give us just 2,000 megohms, as might be expected, but each length will give us a different figure—some higher, others lower. It will, therefore, be seen that the insulation resistance per mile of a definite length of covered wire is an average resistance of its component miles. It follows that one part of an insulated conductor may have an enormous insulation resistance, whilst a neighboring portion may have a very low insulation, and it is these local places of low insulation which are apt to develop into faults. The best core is not always that which apparently gives the highest insulation; and, in fact, if the insulation of a gutta percha covered core is abnormally high, it is always regarded with suspicion, it being very probable that a too great percentage of some foreign material is mixed up in it during manufacture.

Electric-light engineers dealing with high-tension currents must order the insulation of their conducting wires according to circumstances, remembering that a fault which may not be noticed when using 100 volts will break out if the electromotive force be increased to 200 or 250 volts, and so on in proportion. The manufacturers of submarine telegraph cables, or engineers connected with cable operations, can offer the best advice on the subject of insulation. We know of one eminent cable manufacturing company turning its attention recently to the production of conducting wires for electric lighting, the insulation of these wires being as good as can be obtained; but success of a marked character has not yet attended their efforts in this direction, as the representatives of some of our electric light companies have not only considered them too expensive, but have observed at the same time that such insulation as that proposed was quite unnecessary; in fact, "We have now more current than we know what to do with, and if there is any little leak in the cables it will not matter." It will be found, however, that good insulation is as necessary for making successful installations of the electric light as it is to the proper and effective working of underground or submarine telegraphs. Electric light companies must also eventually possess what is now almost ignored—viz., the usual instruments for making electrical tests of their circuits, and competent electricians to manipulate them. It is not alone sufficient to know that a fault exists in a line, but it is absolutely essential to localize such faults, so that the minimum of time and expense shall be employed in repairing operations.—*Electrical Review.*

Electric Railways.

In anticipation of the Universal Exhibition to be held in Tunis in 1884, steps have been taken to build an electric railway from the Place Carlo Felix to the grounds of the Exhibition. The railway will traverse the Course Victor Emmanuel and the Course Massinio d'Azeglio del Valentine, and is to be opened to the public at least four months before the opening of the Exhibition. There will be four cars, each fitted with an electric motor and capable of carrying forty persons. They will be driven by four dynamo-electric machines and lighted by the electric current, as well as controlled by electric brakes capable of arresting them almost instantaneously, though going at a speed of twenty miles an hour. While upon this subject we may also mention that recent experiments by Dr. Werner Siemens on the electric tramway of Lichterfeld, at Berlin, have shown that two or more cars may be driven in either direction along the same line with as much ease as a single vehicle, the fixed generator, of course, doing double work.

ELECTRIC EXHIBITION IN MUNICH.—South Germany is preparing an electric exhibition, and the capital of Bavaria, Munich, has been chosen for the reason that, being a center of industry and intelligence, a place in which during the autumn a large number of visitors assemble, and it is moreover expected that for the introduction of electrical appliances Munich offers special advantages, since it possesses ample water power, which is at present but scantily used. A committee has been formed under the presidency of Professor Dr. W. Von Beetz, a high authority on electrical science; sufficient capital has been subscribed to insure the exhibition financially, and a large number of good firms have expressed their willingness to contribute liberally. The exhibition is to be held from September 16 to October 8, and is to comprise all articles included in electro technical science. The chief feature of the exhibition is to consist in trials on a large scale of all kinds of electrical appliances, with a view of establishing their practical utility, no doubt a very praiseworthy object; we cannot, however, quite see, judging from experience of previous exhibitions, how in the short time of three weeks a large series of trials can be conducted. We hope shortly to hear further particulars, and we meanwhile wish success to the undertaking.—*Ex.*

According to the *Memorial Diplomatique*, the Congress of Electricians for determining the length of the column of mercury equivalent to the theoretical ohm, the advisability of establishing a system of telemeteorology, and a system of observations for the electricity of the air, will meet on May 1 at Paris. Almost all the foreign governments, including the British, have appointed their delegates. The names of two only are wanting.

The telephone line recently built between Bay City and Alpena, Michigan, one hundred and thirty miles in length, is said to be working effectively.

A new telephone line has been completed between Natchez and Washington, Mississippi.

It is stated that the streets and public places of Paris are lighted with 45,815 gas burners, 63 electric lamps, 65 vegetable oil lamps, and 293 mineral oil lamps.

THE TELEPHONE IN FRANCE.—The authorities of the French post-office intend, it is announced, to buy up the patent rights of the telephone in France. It is proposed to open stations in connection with the present telegraph offices, at which the public without becoming subscribers may communicate with subscribers at a charge of half a franc for every five minutes.

Edison's Electric Light.

Holborn, from Newgate street to Holborn Circus, has been lighted by the Edison incandescent lights. Two are placed in each lamp, with the gas kept burning between them. There are about 160 of the ordinary small bulbs, and four large ones at the entrances to the London, Chatham, and Dover Railway station, of about fifty candle illuminating power, which give a very brilliant light.

Eighty-one Miles in Eighty-three Minutes.

The fastest time ever made in this country by a train of three passenger cars, was made on Saturday afternoon last, when a party of journalists from Philadelphia, Baltimore, and other places were whirled to Cape May over the West Jersey Railroad. The trip of 81½ miles was accomplished in 83½ minutes. The run to Milville of 41 miles, was made in 42 minutes. Many of the miles, especially after Milville had been passed, were covered in less than fifty seconds. The engine accomplishing this work was No. 22, in charge of Harry Reinhart. This trip formally opened the season at the Cape.

We have just published an excellent work by Mr. T. D. Lockwood, entitled "Practical Information for Telephonists." Mr. Lockwood's plain statements of so intricate a subject as electrical science have been too frequently commented upon to render it necessary to call attention to the excellence of this latest work of his, as a hand-book for even the advanced student in electricity who desires plain facts in a thoroughly plain manner. Mr. Lockwood has treated the subject of telephony in an exhaustive manner, both practically and historically; and, while thus conferring a boon upon his fellow men, he has fixed his own reputation as an electrician and a careful writer. —*The Operator.*

Mr. Jared R. Woodfill, of Aurora, Mo., has patented certain improvements upon that form of repeating instrument in which the instrument for each line has a magnet with independent helices about the same core, one of which helices in each instrument is charged by their respective main line circuits, and the other of which helices is charged by a local battery current, and in which each instrument is provided with two sets of contacts controlled by the armature lever of that instrument, one of which set of contacts in the first instrument controls the second main circuit in the other instrument, and the other of which set of contacts in the first instrument controls the local battery in the second instrument, and in which the two sets of contacts of the second instrument act reciprocally to the first in the same way to produce the same result.

NEW PATENTS—1882.

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING APRIL 18TH, 1882.

256,701. Combined Gas and Electric Lamp Fixture. Edward H. Johnson, New York, N. Y. Filed Nov. 28, 1881. (No model.)

256,786. Dynamo-Electric Machine. Leonidas G. Woolley, Mendon, Mich. Filed Nov. 10, 1881. (No model.)

256,618. Dynamo-Electric Machine. George H. Bangs, New York, N. Y. Filed July 29, 1881. (No model.)

156,778. Dynamo-Electric Machine. Edward Weston, Newark, N. J. Filed Feb. 21, 1882. (No model.)

256,686. Electric Light. Carl Paul Hoenack, New York, N. Y. Filed May 17, 1881. (No model).

256,803. Electric Light Carbon. John B. King, Brooklyn, N. Y., assigner of one-half to Alphonse Frederick, same place. Filed May 26, 1881. (No model.)

256,605. Electric Lamp. Elihu Thomas, New Britain, Conn., assigner to the American Electric Company, same place. Filed June 20, 1881. (No model.)

256,685. Electric Lamp. Carl Paul Hoenack, New York, N. Y. Filed May 17, 1881. (No model.)

256,690. Electric Lamp. Charles T. Holloway, Baltimore, Md. Filed Feb. 25, 1882. (No model).

256,746. Electric Lamp. Louis Sexauer, Brooklyn, N. Y. Filed Jan. 19, 1882. (No model.)

256,785. Electric Lamp. Leonidas G. Woolley, Mendon, Mich. Filed Oct. 28, 1881. (No model.)

256,486. Electric Signal Transmitter. John King, Ansonia, Conn. Filed June 29, 1881. (No model.)

256,516. Electric Alarm for Hydrants and Water Mains. Uldric Thompson, Cutchogue, assignor of one-half to A. Sidney Doane and Thomas E. Rhodes, both of Brooklyn, N. Y. Filed Nov. 4, 1881. (No model.)

256,706. Electric Motor. John Du Bois Kiely, Toronto, Ontario, Canada. Filed Oct. 12, 1881. (No model.) Patented in Canada, Nov. 25, 1881.

256,784. Electro-Magnetic Motor. Leonidas G. Woolley, Mendon, Mich. Filed Oct. 24, 1881. (No model.)

256,581. Guard for Electric Lights. William Mc. Devitt, Philadelphia, Pa. Filed March 3, 1882. (No model.)

256,691 Galvanic Battery. George M. Hopkins, Brooklyn, N. Y. Filed Feb. 9, 1882. (No model.)

256,639. Magnetic Ore Separator. Samuel E St. O. Chapleau, Ottawa, Ontario, Canada. Filed Jan. 26, 1882. (No model.)

256,458. Rheostat for Multiple Telegraphy. Madison Buell, Buffalo, N. Y. Filed Jan. 23, 1882. (No model.)

256,709. Striking Device for Electric and Other Clocks. Alphonse Lemoine, Paris, France. Filed Dec. 9, 1881. (No model.) Patented in France Oct. 24, 1881.

256,797. Switch and signal locking apparatus. Oscar Gassett, Boston, Mass., assignor to the Union Switch and Signal Company, Pittsburg, Pa. Filed Feb. 18, 1882. (No model.)

256,645. Telegraph key. George Cumming, New York, N. Y. Filed May 10, 1881. (Model.)

256,646. Telegraphic electrode. George Cumming and Clara M. Brinkerhoff, New York, N. Y. Filed Aug. 12, 1881. (Model.)

256,753. Telephone repeater. James G. Smith, Hackensack, N. J., assignor of two-thirds to George W. Coy, Milford, Conn., and Charles E. Buell, Washington, D. C. Filed Feb. 23, 1882. (No model.)

256,795. Telephonic receiver. Charles Cuttriss, Duxbury, and George F. Milliken, Boston, Mass., assignors to James Wentworth Brown and Henry D. Hyde, both of Boston, Mass. Filed Aug. 22, 1881. (No model.)

ISSUE OF APRIL 18, 1882.

Patents	362—No.	256,451 to No. 256,812, inclusive.
Designs	14—No.	12,887 to No. 12,900, inclusive.
Trade Marks	12—No.	9,294 to No. 9,305, inclusive.
Labels	5—No.	2,665 to No. 2,669, inclusive.
Reissues of patents	1—No.	10,068
Total issue	394	

FOR THE WEEK ENDING APRIL 25TH, 1882.

256,819. Apparatus for Sustaining Telegraph Wires. Henry A. Chase, Lynn, Mass. Filed June 17, 1801. (No model.)

256, 866. Device for Underground Electric Communication. B. Frank Teal, Philadelphia, Pa., assignor of two-thirds to Jno. E. Gowan, same place. Filed Jan. 27, 1882. (No model.)

257,007. Dynamo Electric Machine. William Hochhausen, New York, N. Y. Filed Feb. 17, 1882. (No model.)

256.965. Electric Meter. Charles V. Boys, Wing, near Oakham, County of Rutland, England. Filed Feb. 2, 1882. (No model.) Patented in England Oct. 13, 1881.

256,994. Electro Magnetic Escapement Mechanism. James M. Gardiner, Hackensack, N. J., assignor to the Gamewell Fire Alarm Telegraph Company, New York, N. Y. Filed June 27, 1881. (No model.)

257,070. Electrical Gas Lighting Apparatus. Thos. H. Rhodes, Brooklyn, N. Y. Filed Mar. 12, 1882. (No model.)

257,075. Magnetic Receiver. James Harris Rogers, Washington, D. C., assignor of one-half to Frank Hume and L. G. Hine, both of same place. Filed Mar. 6, 1882. (No model.)

256,906. Receiver for Telephone. Robert M. Lockwood, New York, N. Y., assignor to the Molecular Telephone Company, same place. Filed Sept. 10, 1881. (No model.)

256,907. Receiver for Telephones. Robert M. Lockwood, New York, N. Y., assignor to the Molecular Telephone Company, same place. Filed Sept. 10, 1881. (No model.)

256,910. System of Electrical Generation and Distribution. Hiram S. Maxim, Brooklyn, N. Y., assignor to the United States Electric Lighting Company, New York, N. Y. Filed April 21, 1881. (No model.)

257,019. Telephone Alarm. James F. Kettell, Worcester, Mass. Filed Sept. 3, 1881. (No model.)

257,133. Telephone. A. Howard Hiteaman, Baltimore, Md., assignor of one-fourth to A. E. Dolbear, College Hill, Mass. Filed April 4, 1881. (Model.)

256,881. Underground Cable Way. Henry Casebolt, San Francisco, Cal. Filed Jan. 17, 1882. (No model.)

ISSUE OF APRIL 25, 1882.

Patents	330—No.	256,813 to No. 257,142 inclusive
Designs	8—No.	12,901 to No. 12,908 inclusive
Trade Marks	24—No.	9,306 to No. 9,329 inclusive
Labels	3—No.	2,670 to No. 2,672 inclusive
Reissues of patents	9—No.	10,089 to No. 10,097 inclustve
Total issue	374	

A printed copy of the specification and drawing of any patent to the annexed list, also of any patent issued since 1865, will be furnished by any of the patent solicitors whose advertisement appear in this journal. In ordering please state the number and date of the patent desired.

New Patents—Great Britain—April, 1882.

1626. "Electric light and power apparatus." J. Munro. Dated April 4.

1640. "An improved dynamo-electric machine." R. Kennedy. Dated April 4.

1642. "Incandescent electric lamps." W. H. Akester. Dated April 5.

1647. "Manufacture of incandescent electric lamps." St. G. L. Fox. Dated April 5.

1649. "Improvements in underground conduits for electric wires, and in the method of laying the wires therein." A. J. Boult. (Communicated by J. D. Thomas.) Dated April 5.

1663. "Improvements in the arrangements of circuits, and in apparatus to facilitate communication by telephone." F. D. A. Goold. Dated April 6.

1670. "Incandescent electric lamps." J. Jameson. Dated April 6.

1684. "Telephonic instruments." A. E. Dolbear. Dated April 6.

1689. "Electric lamps." G. S. Young and R. J. Hatton. Dated April 6.

1692. "Dynamo-electric or magneto-electric machines" D. T. Piot. Dated April 6.

1698. "Manufacture of incandescent electric lamps." Hon. R. Brougham and F. A. Ormiston. Dated April 8

1713. "Electric lamps." J. Brockie. Dated April 11.

1726. "Electrical apparatus for signaling on railways. E. Tyer. Dated April 12.

1727. "An automatic current director for electric machines. W. Fisher. Dated April 12.

1747. "Dynamo-electric machines. D. A. Chertemps and L. Dandeu. Dated April 12.

1755 "An improved method of, and apparatus for, ascertaining the gradient of any internal or external surface, together with the magnetic bearing of such gradient." P. Jensen. (Communicated by E. F. MacGeorge.) Dated April 13 (Complete.)

1760. "Construction and arrangement of dynamo or electric current producing machines." J. B. Rogers. Dated April 13.

1769. "Secondary batteries." J. H. Johnson. (Communicated by C. A. Faure.) Dated April 13.

1774. "Improvements relating to electrical circuits, and apparatus for use with such electrical circuits." A. Muirhead. (Communicated by J. A. Briggs and F. Kinsmon.) Dated April 14.

1787. "Dynamo-electric and electro-dynamic machines. B. H. Antill. Dated April 14.

1794 "Means or apparatus for generating currents of electricity." E. L. Voice. Dated April 14.

1803. "Improvements in the method or process of manufacturing incandescent lamps, and in tools or apparatus therefor." A. R. Leask. Dated April 15.

1821. "Manufacture of silicious copper and silicious bronze, particularly suited for making electric conducting wires." J. E. Mewburn. (Communicated by L. Weiller.) Dated April 17.

1822. "Electric lamps." A. S. Church. (Communicated by J. B. King.) Dated April 17.

1830. "Mechanism used for transporting goods and passengers by the aid of electricity." F. Jenkin Dated April 17.

1850. "Improvements in negativing or destroying the effects of induced currents in telephone lines, and in the means employed therefor." R. D. Smillie Dated April 18.

1851. "Insulated supports for the communicating wires of telephones." C. Curtoys. Dated April 18.

1853. "Transmitting and receiving apparatus for printing telegraphs." W. J. Burnside. Dated April 18.

1862. "Electrical railways or tramways and carriages, cars, or vehicles therefor." T. J. Handford (Communicated by T. A. Edison.) Dated April 18.

College of Electrical Engineering.

It is stated that the Hammond Electric Light Company, London, have started an Electrical Engineering College, in order to provide the thorough scientific and practical training necessary to young men of good education who wish to become electrical engineers.

Amendment of Rules 85 and 86.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
Washington, D. C., April 1, 1882.

Rule 85 (Rules of Practice, revised September 1, 1880) is hereby amended by striking out the last sentence, viz.: the words "If the reissue shall be granted, the cost of the abstract of title will be refunded."

Rule 86 is hereby amended so as to read:

"Applicants will be required to file with their petitions for reissue—

"1st. A statement setting forth particularly the defects or insufficiencies in the specification which render the patent inoperative or invalid, and in cases where more was claimed and allowed than the applicant was entitled to claim as new such part or parts must be distinctly pointed out.

"2d. In such statement the applicant must explain how such errors arose, in order that the question of inadvertence, accident, or mistake may be determined.

"3d. The statement must be accompanied with the oath of the applicant that said errors arose without any fraudulent or deceptive intention.

"From the decision of the examiner, holding that the statement or oath is insufficient, an appeal may be taken to the Commissioner in person."

E. M. MARBLE,
Commissioner of Patents.

Approved to take effect April 15, 1882.

S. J. KIRKWOOD,
Secretary of the Interior.

Engineer's and Mechanic's Pocket Handbook, containing Weights and Measures, Rules of Arithmetic, Weights of Material, Latitude and Longitude, Cables and Anchors, &c. Forty-first edition. Revised and enlarged. By Charles H. Haswell. New York: Harper & Brothers. 1882.—Certainly no book in the guise of a *vade mecum* has arrived at such popularity in the United States as "Haswell." You will find it in the lumber-cutter's cabin in Maine, in the miner's shanty in Nevada, and on the work-bench of the American mechanic in all parts of the country. It may be consulted for almost anything having to do with the science of numbers or the strength of material, whether it be of wood, metal, or stone, squares, cubes, roots, sines and cosines, motions of bodies, equivalents of heat, properties of light, evaporating powers, differences of fuel, varnishes, alloys, the efficacy of steam engines; all find their appropriate place in "Haswell." The laws it presents are not empirical, but are the positive solutions derived from the most reliable sources. To the already extensive index has been added an additional one, which covers an infinity of subjects. Now that electricity is exerting its influence, we are to suppose that in forthcoming editions all the rules regulating the action of this the most powerful of the imponderable agents will be fully presented. As to the value of "Haswell" as it is presented to-day, it is sufficient to state that just as a dictionary is necessary in any library, so without your "Haswell" a source of the best possible information is wanting.

Entered according to Act of Congress, in the year 1882, by George Worthington, proprietor and publisher, New York, in the office of the Librarian of Congress, at Washington, D. C.