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This Number Contains a Complete Report of the Recent Convention of the Maritime Electrical Association.

CANADIAN ELECTRICAL NEWS AND ENGINEERING JOURNAL

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VOL. IX. MAY, 1899 No. 5.

MARITIME ELECTRICAL ASSOCIATION

Proceedings of the Second Annual Convention

THE second annual convention of the Maritime Electrical Association was held, pursuant to announcement, at the New Victoria Hotel, Halifax, on Tuesday, April 18th. The Executive Committee met at 9 a.m. to transact business relative to the admittance of new members to the Association and its financial condition.

The opening session of the convention was held at 10 a.m., with the President, Mr. F. A. Bowman, in the chair. There were present the following members:

F. A. Bowman, superintendent New Glasgow Electric Co., New Glasgow; J. H. Winfield, eastern superintendent N.S. Telephone Co., New Glasgow; G. N. McDonald, electrician, Moncton, N. B.; S. G. Chambers, president Chambers Electric Light & Power Company, Truro; P. R. Colpitt, city electrician, Halifax; F. A. Huntress, manager Halifax Tramway Co.; J. W. Crosby, electrician Halifax Tramway Co.; I. H. Smith, representative Canadian General Electric Co., Halifax; G. C. Siebert, Maritime Electric Co., Halifax; R. T. MacKeen, representative Halifax Tramway Co.; F. A. Hamilton, electrical engineer, Halifax; W. Luke, Halifax Tramway Co.; P. A. Freeman, chief engineer Halifax Tramway Co.; James Graham, electrical contractor, Halifax; C. E. Harris, manager N.S. Telephone Co., Halifax; J. D. Briggs, superintendent N.S. Telephone Co., Halifax; A. Miller, electric light inspector, Halifax, E. Soubiss, Bedford Electric Co., Halifax; J. A. Anderson, electrician John Starr, Son & Co., Halifax; W. N. Pickles, electrical contractor, Halifax; J. L. MacDonald, Halifax Tramway Co.; W. A. Winfield, Windsor, N.S.; H. P. Archibald, B.A.Sc., Wolfville, N.S.; W. L. MacDonald, Moncton, N.B.

MR. F. A. HUNTRESS,
President Maritime Electrical Association.

After a few opening remarks, the President called upon the Secretary to read the minutes of the last meeting, held in Halifax September 27th, 1898. Upon motion the minutes were adopted.

The President then delivered his annual address, as follows:

PRESIDENT'S ADDRESS.

We have now passed through the first year of our existence, and have found out what are our powers and what our limitations. We held a convention during exhibition week last September, which was a fairly successful one, and would have been much more so had not the weather interfered with it, as it did with pretty much all arrangements of that week. In spite of this, one of the objects of the Association was distinctly advanced by the meeting. Several of the out of town members made the acquaintance of each other and the town members.

One feature of this meeting was most valuable, and will, I hope, be repeated this time. Several matters were brought up and discussed that were of direct interest to the members present, and personal experiences on these were freely exchanged. With a view to encouraging this, we issued a circular to the members, asking if there were any questions that they would like to bring forward. The response to this request was not as full as I would like to have seen, but we must not expect too much at first. We have a few questions that will be introduced for discussion as opportunity arises, and I hope that some of those who did not answer the circulars have brought questions with them, and will bring them up for discussion.

It is the discussion of the smaller and more local issues that I wish to encourage in this Association. As I think I have said before, we can depend on the larger associations and the technical journals to furnish us with valuable papers on the main principles of the industry. We should, therefore, devote our attention more to smaller details. The best way to do this is to get the members to feel that they can bring up any subject on which they want information and advice. As with our comparatively small numbers we shall very soon be all personally known to each other, our meetings should not take on a too stiff and formal aspect, but each one should feel at home and as free to say much or little as they would in a group gathered in the hotel smoking room. I will, therefore, ask you, one and all, to note any difficulties you may meet with or special methods you may use in your work, and either write them out in a few words and present them at a meeting, or, if you are really too diffident to do this, write a note to the Secretary and give him the idea, and it will be brought up at the meeting, with your name mentioned or not, as you may wish. I spoke at some length on this matter at the September meeting, and I must plead as my excuse for repeating it now its vital importance to the welfare, not to say the actual continued existence, of the Association.

The executive and the Halifax members have striven to make this meeting a thorough success, and it is hoped that it will result in awakening a thorough interest in the Association throughout the maritime provinces. I wish right here to thank the Halifax members for the lively interest they have taken, and the strenuous efforts they have made to make everything pleasant and attractive. Under the able leadership of our Vice-President, Mr. Colpitt, they have prepared a programme of papers and social entertainment that should cause this meeting to be long remembered.

Steady progress has been made in the electrical industries in these provinces during the past year. While we cannot expect to see the very large transmission schemes undertaken among us just at present, some smaller ones have been well worked out on modern lines, and some steps have been taken in connection with larger projects. All this going to show that our people have grasped the great possibilities of electrical power.

Among the many steps in advance that the industry has made during the past year, one that should be most seriously studied by the smaller stations is the question of forced draft in the

furnaces. While this matter has been coming steadily to the front for some years, it has lately been pushing itself into notice most markedly. Some remarks on this subject were made at our meeting last September that showed that our members were studying the subject and stand ready to adopt new ideas when it becomes apparent that they will pay. I hope that further information may be brought out at this meeting from those who have had practical experience in this matter or who have given it study.

F. A. BOWMAN, President.

Mr. Hamilton expressed his pleasure in listening to so able an address. In the course of his remarks he

MR. P. R. COLPITT,
Vice-President Maritime Electrical Association.

also stated that the suggestions made by the President were good. After some fitting remarks upon the zeal and untiring efforts displayed by the President during his term of office, Mr. Hamilton moved that a vote of thanks be tendered Mr. Bowman. This was seconded by Mr. Colpitt and heartily approved of by the members.

The President, replying, expressed his thanks to the meeting. He felt that he had done what he could, being hampered to a large extent in his duties on account of living at such a distance from the majority of the members. In the course of his remarks he again referred to the advisability of electing the members resident in Halifax to the offices of president, vice-president and secretary, also suggesting that a sufficient number of Halifax members be elected to the executive committee that a quorum could be formed at short notice, if necessary, without difficulty.

The Secretary then read his report, as follows:

REPORT OF SECRETARY-TREASURER.

At the meeting of organization held last April in Halifax, we had the names of fifty-six persons who were interested in the formation of this Association and had expressed their wish to become members. That meeting was a success, and the prospects seemed good for the formation of a very useful society. Since that time every effort has been put forth by the officers to further increase the membership list, though apparently with not any great degree of success. Circulars of information have been sent to all persons in the province (whose names we could obtain) that were eligible for membership. Only three new members have been added during the year, but we trust that our efforts have at any rate broken the ground, and that the fruits of our labors will appear later. Two meetings of the Executive Committee were held during the year, and various plans were discussed for rendering the Association of as much value as possible to its members. The following statement will show the financial condition of the Association at the close of the year, March 31st, 1899:

RECEIPTS.

40 membership fees at $2	$92.00

EXPENDITURE.

Rent of room for meeting, April, 1898.	$ 5.00
Books, etc., for Secretary.	4.35
Membership certificates.	6.20
Printing	34.50
Rent of room for meeting, September, 1898.	5.00
75 copies of report of meeting, September, 1898	3 75
Expressage and telephone	1.50
Postage	10.00
Cash in hand	21.70
	$92.00

The total membership list at the close of the year was 59. There were four new members elected at the executive meeting this morning, bringing the number up to 63. There are thirteen fees for last year still remaining unpaid.

J. H. WINFIELD,
Secretary-Treasurer.

Mr. Anderson moved, seconded by Mr. Chambers, that the report be adopted, which was carried.

A short time was then devoted to a general discussion as to the standing and financial condition of the Association, the general opinion being that, although the record of the Association during the past year had not been particularly bright, yet the present year promised better success.

The election of officers for the ensuing year was then proceeded with.

For the office of President, Mr. Chambers nominated Mr. P. R. Colpitt, of Halifax, the retiring vice-president.

Mr. Colpitt, however, feeling that it would be impossible for him to accept the position, nominated Mr. F. A. Huntress, of Halifax, for the office. This was seconded by Mr. Anderson, and met with the universal approval of the members.

For the office of Vice-President, Mr. R. T. MacKeen moved, seconded by Mr. Chambers, that Mr. Colpitt retain his office as Vice-President. This motion also met with the approval of the members.

Mr. Chambers nominated Mr. Irving Smith, of Halifax, as Secretary-Treasurer.

Mr. Smith declining the nomination, Mr. Chambers

MR. R. T. MACKEEN,
Secretary-Treasurer Maritime Electrical Association.

nominated Mr. R. T. MacKeen, who was elected to the office.

The following members were then elected to the Executive Committee: Messrs. Hal Brown, St. John, N. B.; J. Eddington, Moncton, N.B.; J. A. Waddell, Charlottetown, P.E.I.; S. G. Chambers, Truro, N.S.; W. Pickles, Irving Smith, J. A. Anderson, and F. A. Hamilton, Halifax.

Mr. Miller moved that a vote of thanks be tendered

to Mr. J. H. Winfield, the retiring Secretary-Treasurer. This was seconded and carried unanimously.

Mr. Winfield expressed his gratitude to the members for their token of regard. In the course of his remarks he referred to the suggestion made by Mr. Bowman in regard to the difficulty experienced by the officers in fulfilling their respective duties, owing to their living at such a distance from the majority of the members. He thought that for the first few years the principal officers, at least, should be so located that they would be in touch with most of the members, thus increasing their opportunities for developing the Association.

It was then moved and carried that the selection of place and date of next meeting be left to the newly-elected Executive Committee.

Upon motion of Mr. Hamilton, seconded by Mr. Miller, the meeting adjourned until the afternoon.

AFTERNOON SESSION.

The afternoon session opened at 3 p.m., with the Vice-President in the chair. A few moments were devoted to completing the business of the morning. The President then invited Mr. P. R. Colpitt to read his paper on fire alarm telegraph systems, which was as follows:

THE EVOLUTION OF THE FIRE ALARM TELEGRAPH.

By P. R. Colpitt.

In submitting a paper on the above subject, I propose to briefly describe the system as it is to-day, and the various stages of improvement that led to its present stage of perfection.

Until 1850 (a period within the memory of some of the members of this Association) electric fire alarms were unknown. In the largest cities there was no means for arousing firemen and citizens except the primitive method of shouting and ringing bells or sounding steam whistles—which still prevails in most of our towns. In New York as early as 1845 the city was divided into districts, in each of which a watch tower was erected where a watchman was on duty at all hours. The districts were numbered, and when a watchman discovered a fire by seeing the smoke or flame, or a fire was reported to him, he would strike upon his bell the number of the district. This was heard by the watchman on the next tower and by him repeated, and in that way the alarm was gradually announced all over the city.

The first suggestion for the use of the telegraph for fire alarms was made by Dr. W. F. Channing, of Boston, directly after the earliest telegraph experiments of Prof. Morse in 1839. In 1845 Dr. Channing published an article in the "Boston Advertiser" describing a method for the application of the telegraph for giving alarms of fire. In 1851 he managed to interest the city council of Boston in his scheme to the extent that $10,000 was appropriated for an experiment. Dr. Channing's plan was to establish numerous box stations over the city connected by telegraph circuits with a central station from which signals received from boxes were sent out over other circuits to the bell towers—the signal was thus simultaneously struck on every fire-bell in the city by electric mechanism. At about this time Dr. Channing associated himself with Moses G. Farmer, who was a recognized expert electrical mechanic of that day, and Mr. Farmer worked out practically the machinery necessary to complete the inventions made either by Dr. Channing or by Channing and Farmer jointly. Mr. Farmer constructed the Boston system and had charge of it for several years. Messrs. Channing and Farmer took out many patents which were the foundation of the fire alarm system as it exists to-day.

In 1855 John M. Gamewell purchased the Channing and Farmer patents for the Southern States, and four years later acquired the patents for the rest of the country. This was the beginning of the well known Gamewell Fire Alarm Telegraph Company and of the several companies now manufacturing fire alarm and police signal apparatus. The Gamewell concern is probably the best known because of its greater age. All fire alarm telegraph systems, as far as the writer's knowledge goes, embody the fundamental principles of the early Channing patents, so that a description of one will serve for all as far as general principle goes. Any difference or improvement that one may have over the other is in arrangement of detail.

DESCRIPTION.

A fire alarm telegraph system consists of a central station provided with closed circuit batteries or other course of electrical energy, switch-board, automatic repeater and other instruments for regulating and controlling the system, wire circuits for connecting the central station with the street signal boxes, and alarm apparatus consisting of electro-mechanical bell checkers, electro-mechanical gong strikers, located in engine houses or residences of fire department officials, and visual indicators showing in plain figures the number of the signal box from which an alarm originates. The system is a closed circuit one, and any interruption of the circuit will release all the armatures of magnets, causing the bells to strike. To get any signal number, therefore, it is obviously only necessary to have mechanism to open and close the circuit a pre-determined number of times. This is accomplished in the signal boxes in the following manner:

A break wheel is provided with radial projections on its face to correspond with the number of signal required. Two German silver contact springs are so placed that they come in contact with the projections on the break wheel, thus opening and closing the circuit as the wheel revolves. In the first boxes this break wheel was operated by hand by turning a crank, one revolution of which would give the complete number. I am not in a position to tell how successful this style of box was, but am under the impression that the average man to-day under the excitement of having his property burning would turn that crank so fast that the armature would scarcely have time to release in a complete revolution. The modern boxes, however, are provided with clock work, the propelling power being a spring, so that simply releasing a dentin by pulling a hook is all that is necessary to set the clock work in motion.

A difficulty arose in the first boxes, in that there was nothing to prevent alarms from being pulled in from different boxes simultaneously, thus causing a mix up in signals given; this was first abated in the following manner: A small magnet was placed in each signal box, the armature of which when released operated to short circuit the break wheel, thus preventing the circuit from opening in the box. The above armature was further provided with a knife edge engaging a similar knife edge on the dentin, so that if the circuit was open when the box was pulled the armature would be forced against the short-circuiting contacts, and keeping it there while the box was in operation. On the other hand, should the circuit be closed when the box was pulled the opposite sides of the knife edge would engage, thereby forcing the armature against the magnet and keeping it there while the box was in operation. The weak point in this arrangment was that should a box be pulled just at the time the break wheel in any other box in its revolution engaged the contacts, interference would occur. This defect has been remedied in the more modern boxes so that should the armature of the non-interfering magnet be released at the time the door is opened for pulling in an alarm, or any time between opening the door and pulling the hook, the dentin cannot be engaged and the box remainsinoperative. This system, while a great improvement over those previously mentioned, was not perfect, in that a person pulling a box and getting no response would probably wait a short time and try again; but if he neglected to close the outside door the box would still remain inoperative though the circuit might be clear.

The latest improved boxes have the succession non-interfering principle. In this box the mechanism is so constructed that when a box is pulled after another has been started it will retain its signal until after the first box has finished, and will then transmit its signal without any possibility of interference or confusion.

On account of the common use of heavy currents for power and electric lighting, it has become necessary to provide each signa box with a cut-out that in some boxes operates to cut the entire box out of circuit when the door is closed. This not only serves to protect the box, but also greatly reduces the resistance of the system, thereby saving battery power. This cut-out is also arranged so that the box can be tested electrically and mechanically without disturbing the circuit. Lightning arresters are fitted to all boxes, strikers and gongs as a protection against disruptive discharges. The boxes are also provided with trap locks, so that when the box is unlocked the key cannot be removed except by a release key, these keys being carried by officials only.

The importance of transmitting alarms with the least possible delay has led to the introduction of various schemes for saving time in pulling in a box. In some cases a small auxiliary boxwith a glass front containing the key is fastened to the door of the

signal box; in order to get the key the glass must be broken. Another method is to have the hook or trigger protrude through the outer door, the end of it being encased in a small box as previously described. In this arrangement no key is required, but simply break the glass and pull the hook. Another arrangement, and probably the most popular one, consists of a trigger in the form of a handle attached to the door of the box, which being moved a half turn winds up clock work attached to the inside of the door, and this in turn operates to pull the trigger in the inside box, at the same time ringing a gong, indicating that the box is operating. The last named arrangement is the most convenient, but is open to the objection that false alarms can be pulled in boxes located in out-of-the-way places without much fear of detection; in fact, a box of this style has been removed from one of our principal streets to the police station for safe-keeping; nevertheless, this style of box is used exclusively in many cities and very little trouble is experienced with them.

Great improvements have been made in gongs and tower strikers, but time will not admit of a detailed description of them; but a very valuable feature has in recent years been added to the signalling system that is worthy of notice, viz., the visual indicator. This instrument not only strikes the number of the box, but in addition indicates it in plain figures, thus removing all doubt or occasion for difference of opinion as to what box was pulled.

The central station, a very important part of the system, has also been greatly improved in recent years. At the inception and for many succeeding years, the gravity battery held full sway as the source of electrical energy; but since the introduction and common use of the dynamo and the perfecting of the secondary battery, the old reliable gravity battery has become to a large extent a back number, and wisely so, for it is at best a very expensive system and requires considerable attention, while with the secondary battery, though the first cost is greater, the saving is so great that there is no room for comparison—in fact, the cost for charging batteries is so small that in many places it is furnished free by the local companies. In large cities current is used from the commercial circuits after being transformed to the required pressure.

REPEATER.

Another very important part of the central station is the automatic signal repeater. In a fire alarm system the circuits are run to all sections of the city, and if they were all connected together in series the combined grounds on them all in bad weather would make it very uncomfortable for the superintendent. The office of the repeater is, as its name indicates, to automatically repeat any signal coming in over one circuit, on all the other circuits in the system. This is a very fine-working instrument and probably deserves the praise bestowed on it by Sir William Thompson, now Lord Kelvin, at the Centennial Exposition, when he said it was the most ingenious and finest piece of telegraphic mechanism ever exhibited. It not only repeats the signal instantly, but in case a circuit breaks the repeater, after sounding one blow on the other circuits, throws the disabled one out of service, leaving the others intact. As soon as the broken circuit is repaired it is automatically taken into service again. In a large city where the circuits amount to more than ten in number, a manual central office is necessary. In such an office operators are constantly on duty to receive alarms from the box circuits and to send them out over the alarm circuits, also to watch and test the circuits by means of a far more complicated and expensive apparatus than is necessary to use in smaller localities. In a system embodying a manual central office, the instant that a street box is pulled the following notifications are simultaneously appearing where the skilful operators are on watch for them. The box number is being sounded on a tapping or small gong, the same number is being recorded visibly by the multiple pen-register, and a cylinder, which is one of a series representing every circuit in the system, revolves and brings into view on its reverse side the numbers of the boxes on the circuit from which the alarm has come. Upon the completion of the first round of any of these signals the operator, by a single movement of a lever on the switchboard, connects the box circuits with the combination alarm circuits and instantly the box number is being tapped in the engine houses and recorded on the tape register direcly from the street box. The next operation is to set the dial transmitter to the number of the box required, which send out over the alarm circuits as many rounds of the box number as the rules may require. All alarms are, therefore, received simultaneously at the engine houses over two district circuits and registered and announced on two sets of instruments.

All of this is, of course, done within less time than it takes to read this description of the process, and usually before the alarm box stops running, after it has been pulled for an alarm, the signal has been received at the central office, has been sent out over two independent circuits, the firemen have responded, horses have been harnessed, and the apparatus on its way to the fire.

Other important parts of the equipment of a large central office are the pin register, line tester and annunciator board. The first of these automatically registers upon a paper roll the record of all the signals received into or transmitted from the office. The line tester automatically tests all the circuits and every twenty minutes reports any grounds or open circuits that may occur. The annunciator board is for the purpose of showing the numbers of the companies which have left their houses to attend alarms, and as fast as these companies are released from duty the operator restores the corresponding drop. Thus, at a glance, the operators can tell at all times what apparatus is available. The line construction of a fire alarm system should be of the best description. A line down or rendered inoperative by crosses or grounds might cost many thousands of dollars more than the first cost of the whole system. The writer is of the opinion that when fire alarm wires are on poles used for carrying other wires they should be on top of all others and as far as possible removed from them. This is by no means the universal custom, however, as many prefer to have them strung on the lower arms.

It is scarcely necessary to add that a fire alarm system requires constant care and attention—the nature of the service and the grade of apparatus employed will suggest this. The agent will probably tell you confidentially that any fireman can keep it in order, likewise the dynamo agent—and we have a few, though not enough, in our Association—who will tell you that the particular generator that he is selling is absolutely self-oiling, self-regulating and self-righteous; but it does not always follow that this is so, as some of us can testify to.

I have tried briefly in this paper to give the evolution of the fire alarm telegraph, and if in so doing I have succeeded in showing its importance in connection with any fire department regardless of size, I shall feel amply repaid for the time spent in writing it. Surely the recent disastrous fires in some of the fairest of Nova Scotia's towns are object lessons not to be put lightly aside.

DISCUSSION.

Mr. Hamilton, after expressing his pleasure at listening to so valuable and interesting a paper, questioned Mr. Colpitt regarding the use of storage batteries in operating the system, in lieu of primary batteries, also regarding the satisfactory results of charging storage batteries from alternating current circuits through the medium of the rotary transformer.

Mr. Colpitt, replying, stated that secondary batteries had almost superseded primary batteries in the larger cities, and that rotary transformers had been used successfully in charging same. He stated that it required but little energy to operate the fire alarm system, the current rarely exceeding one-tenth of an ampere at a potential, depending upon the length and number of circuits.

Mr. Bowman followed, and after congratulating Mr. Colpitt on the concise manner in which he had presented so interesting a subject, expressed the opinion that it would prove of great benefit to laymen in general if the paper could be distributed among them. It would have a tendency to make town authorities purchase reliable apparatus.

Mr. Chambers interrogated Mr. Colpitt more closely regarding the charging of accumulators from street mains, and concluded his remarks by moving that a vote of thanks be tendered Mr. Colpitt for his paper.

The President then introduced Mr. Hamilton, who presented the following paper entitled "Reminiscences."

REMINISCENCES.

By F. A. Hamilton, M.I E.E., M. Can. Soc. C.E.

The telephone, like many other adaptations arising from discoveries of nature's secrets, is the outcome of evolution, but it is a plant which, when once matured soon burst into blossom and bore fruit. The marvellous instrument is in more general use

than any other signalling apparatus under the sun, and yet it is the one concerning which those who use it the most are the very people who know the least about it. I, of course, allude to the general public.

It is simply astonishing to what an extent familiarity breeds indifference—particularly as regards some of the most prominent apparatus of applied science. The locomotive is an old tried and trusty contributor to our comforts and necessities, but how many of the thousands of people who are now being rapidly transported by this picturesque and snorting iron horse have the remotest idea as to its internal structure, or of the manner in which the steam power is applied?

Reverting to the telephone, it may not be an inappropriate observation to say that this most delicate and sensitive instrument is subject to more indignities than any other public servant one can call to mind at the present moment. The telegraph has doubtless occasionally conveyed sulphurous odors sufficiently strong to be a source of discomfort at remote distances, but the telephone leaves it far behind in respect to the conveying of "cursory" remarks and vituperative utterances. Never was an innocent victim more sinned against in this respect than the gentle telephone.

It would be interesting to study the nomenclature which has been introduced since the advent of the telephone, but this is neither the time nor the place for such enquiry; I would merely remark that "telephone beef" is a significant term as applied to meat ordered through the medium, instead of being selected by the housekeeper, and that "aught" instead of "naught" is a less justifiable innovation which by a strange perversity is in general use among telephone operators, especially in the United States.

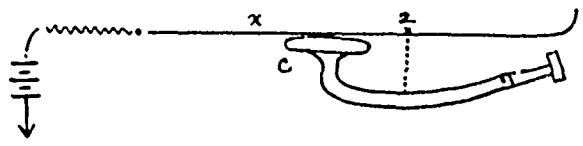
It was my habit at one time to regard the submarine telegraph cable as analagous to the steamship line, the land lines to the great trunk lines of railway, and the telephone lines as the interurban and suburban roads, but there is more than a doubt in my mind as to whether the analogy holds good at the present day, for the telephone is now carrying a considerable portion of the heavy traffic.

Speaking of the strong language to which the introduction of the telephone has given rise, or rather has been the means of radiating, one is naturally led to reflect that the age in which we live is an extremely exacting one. When we contrast the condition of things as they existed say, fifty, forty, thirty, nay twenty years ago, and even nearer to the present time as far as some places are concerned, when we compare the means of transportation, the methods of lighting, the facilities for communication, not only between cities and provinces, but between countries and continents, we cannot but recognize the centuries of difference between the crude methods of the past and those of to-day, and yet there are those who in their early days read by the flickering flame of the farthing rushlight or the tallow candle, and who travelled at a snail's pace in a springless cart, whose knowledge of the world outside of the prescribed limits of their own village was extremely meagre—owing to the sluggish means of inter-communication—who would have laughed to scorn the idea of electric telegraphs, and declared that the semaphore was sufficient for all such needs; who would have pronounced a man mad had he claimed to be able to speak viva voce along a wire, and derided as a fool the dreamer who ventured to predict that the ordinary horse-drawn carriage would be succeeded by such a conveyance as that described by the Celestial as "no pushee, no pullee, all samee hellee," which now rushes clanging through our streets.

But let there be an instant's delay in connection with the telephone, or the street car, or an interruption in telegraphic communication, or even a flicker in the electric light, let such things happen, why then the air becomes of an unnatural tint and perturbation reigns supreme. Verily, this an exacting age. I am not complaining, but simply stating what I believe to be a fact.

I am not sufficiently conversant with the details of the telephone business as it exists to-day to discuss the manifold appliances connected therewith, but with regard to some of the multifarious uses to which this instrument can be applied, I can speak from experience. As an aid in the detection and localization of faults in subterranean and sub-aqueous electric cables, and in electric circuits generally, the telephone can be used with great advantage, as the following instances will sufficiently illustrate:

Let A——x——2——B be an insulated conductor in which a leak exists at 2, the approximate position of which has, in the case of a subterranean cable, for example, been determined. By applying an intermittent current to the line and using a coil of insulated wire in circuit with the telephone, the exact position of the fault can be found without cutting the cable. With the end free at station B, and an intermittent current applied at A, the length x + 2 becomes the primary circuit, and the coil c with the telephone the secondary circuit. By moving the coil along the line and applying the ear to the telephone the position of the fault can be determined with the greatest accuracy, for immediately on passing 2 the inductive effects will be reduced and



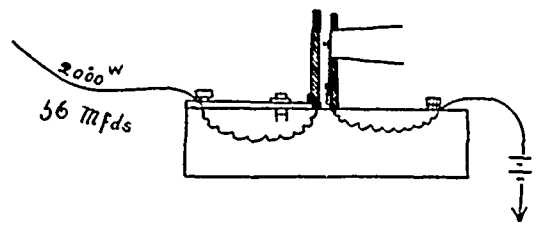
the vibrations of the diaphragm of the telephone correspondingly enfeebled.

In repairing the street cables here in Halifax some years ago for the Direct United States Cable Co., the application of this method enabled me to save no inconsiderable expense, the labor in opening up the trench in which the four cables were laid being in consequence but a small item.

I have also found the telephone useful in detecting the exact moment when a change occurs at the "fault" consequent on the reversal of the battery current. According to the amount of conductor exposed at the break, or leak, will depend the length of time between the application of the current and the evolution of hydrogen gas at the fault, after the positive pole of the battery has had the effect of depositing chloride of copper on the exposed surface of the conductor. The telephone, being connected through a condenser on the line end of the Wheatstone bridge, will enable the operator to immediately detect the moment when the change of condition takes place.

Another very interesting and extremely useful application of the telephone in submarine cable repairs, after a splice has been made, is to ascertain if the line is working. It has sometimes happened that in making what is known as a "final splice" to a cable at sea—that is to say, joining up the two ends which connect with the shore on either hand that a rupture has occurred, unknown to those on board the vessel. By means of a prearranged system of signals from each station, and the application of the telephone in the manner already described, the rupture of the cable would be known on board by the absence of the signal from the station cut-off.

It would be interesting to know what is the greatest length of submarine or subterranean cable through which telephone speech has been exchanged. As long ago as the year 1878, when the construction of various forms of microphones was one of my hobbies, I tried an experiment, the mention of which may perhaps be of interest. It was during the repair of a cable between Sydney, C.B., and the Island of St. Pierre-Miquelon. We were about 20 miles from Sydney. I requested St. Pierre to put on a telephone. The reply was, "It is no use; we tried to speak to Placentia, but did not succeed." The length of cable between St. Pierre and Placentia being 112 nautical miles, and that through which we were signalling 188 miles, including 20 miles on board the ship, rendered the conditions anything but promising. However, I persisted, and St. Pierre joined up his telephone. The transmitter—or, as I then called it, the microphone—I had in circuit was fearfully and wonderfully made. The base was a cigar box, on which were mounted a piece of battery carbon, a frame carrying a parchment diaphragm, against which a spring with a pencil point—graphite—lightly pressed, and a mouthpiece. The circuit was completed through the graphite point, the stick of



carbon and the cable. The resistance of the line was about 2,000 ohms, and its electrostatic capacity about 56 microfarads. Into the mouthpiece of the microphone I sang a snatch from a light opera then popular, scarcely daring to hope that the sounds would be heard at St. Pierre, but on joining up to the Morse instrument and enquiring if they had heard anything,? the reply was "Yes, heard someone singing."

What tune? We asked.

"Fille de Madame Ahgot" was the correct answer.

An encore being called for, several other tunes were warbled into the monster. But we did not succeed in imparting audible articulations.

There is another application of the telephone to which I may here allude. In April, 1885, whilst crossing the Atlantic after a heavy gale, we came upon a dismasted vessel, the barque "Hudson." This vessel, bound from Java to London, 131 days out, was a pitiful, but withal picturesque object. Jib-boom, fore-top mast, main-mast, all gone, the foreyard and fore-topsail yards hanging a-peak, bulwarks washed away, and a labyrinth of rigging snaking alongside. On the stump of her mizzenmast was lashed a stun-sail boom, rigged for a signal staff, and on it floated jauntily the gay bunting "K R L" of the Commercial Code, signifying "will you take me in tow?"

We did take her in tow, and along one of the hawsers I had a length of insulated conductor secured, by means of which telephonic communication was established between the two vessels.

Whether towing vessels are now provided with such means I know not, but there is no reason why frantic gestures, fearful yellings and demoniacal howls should be the sole means of conveying "intelligence" between the towing vessel and the towed.

I trust that you will excuse me for indulging in these reminiscences; such recollections are apt to crowd upon one in reviewing events in connection with such operations as those to which allusion has been made. I began my remarks with the intention of eulogising the telephone, and it may not be too much for me to say that I have made out a fairly good case in favor of this much used, much abused and withal unique application of scientific discovery.

There is one point of interest to be mentioned, but the discussion of it does not come within the scope of this paper. I allude to the manner in which telephone wires are run within buildings. When one considers the multiplicity of elaborate rules issued from various sources relating to the installation of electric light and power circuits, one marvels at the absence of any adequate provision against the ingress of foreign currents into a building via the telephone wires. I could point to an instance in this city of a narrow escape from a serious fire, resulting from an outside contact between the telephone wire and a conductor carrying a heavy current. The fact is, all wiring should be run in conduits wherever practicable. Of course it would be impolitic to condemn all the old wiring, but all new buildings should be provided with conduits. I beg to thank you for your kind and patient attention.

DISCUSSION.

Mr. Anderson opened the discussion by commenting upon the valuable suggestions embodied in the paper, and in referring to the careless method usually adopted of running telephone wires, expressed the opinion that more stringent rules should be adopted by the National Board of Fire Underwriters in regard to the installation of telephones, etc.

Mr. Chambers cited an instance of serious damage resulting from fire caused by the telephone wire coming in contact with live circuits outside of building. Had the same care been exercised in installing the telephone wires that is taken when installing electric light wires, the trouble would not have occurred.

A vote of thanks was tendered Mr. Hamilton for his valuable paper.

The President then introduced Mr. J. A. Anderson, who read a paper on iron-armored conduit installations.

THE IRON ARMOURED CONDUIT INSTALLATION AT ST. MARY'S CATHEDRAL, HALIFAX.

By J. A. Anderson.

The first iron or steel conduit system in Halifax was installed some 16 months ago by Messrs. John Starr, Son & Co., in St. Mary's Cathedral, under plans and specifications drawn up by Mr. F. A. Hamilton. The conduit used is uninsulated mild drawn steel, made by the Boston Electroduct Co., and is coated with a special compound which prevents oxidation or rusting of the surface. The makers claim that coated samples of this conduit have been immersed in acids and alkalies and buried in the ground for over a year, and has also been soaked in sea water and subjected to steam and oil, and in every case the coating remained intact and the lustre as bright as when first applied.

The wire used is double rubber covered and double braided. The several circuits are controlled from a slate switchboard which is located in the vestry of the church, in a large cabinet handsomely finished and having plate glass doors, giving full view to the whole interior; on this board is mounted one 50 ampere and eight 35 ampere switches of the knife pattern, also one pilot lamp and bracket and the Tramway Co's watt meter. The main and branch circuits are separately protected with fuses of the Link type connected to brass terminal screws which pass through the board and having brass lugs attached thereto, the wiring all being done on the back of the board, the wires being "sweated" into the lugs from where the pipes pass through the floor into the basement of the church, passing through the necessary junction boxes, some of which are located at the base of the large columns, on which are mounted the different fixtures in the body of the church. Smaller pipes are used from the junction boxes to the outlet and placed in the recesses of the column, and are marbleized to match the church finish. The piping was all completed first, then the wires were drawn in by means of a No. 10 galvanized wire.

The circuits are laid out so that there will be no unnecessary waste of light, and at the same time that sufficient light may be had for the different devotions, and are divided as follows: (1) two centre columns and east porch; (2) east altar and pulpit; (3) west altar and sanctuary; (4) west columns; (5) east columns; (6) organ, under gallery and porch. The brackets and fixtures were made from special drawings prepared by the Rev. Dr. Murphy; they are combination gas and electric and are finished in rich gilt. The advantage of having lights properly switched has been exemplified in this instance in effecting a saving in cost with the use of electricity with a 50% greater number of lights than there was originally with gas.

DISCUSSION.

Mr. Hamilton opened the discussion. He questioned the apparently needless statement found in the rules of the Fire Underwriters Association, i.e., that wires used in iron-armored conduit work should be provided with a double braided cotton covering. He considered that the one essential of wire used in this method was that it should be flexible. The double braiding was not necessary as far as insulating qualities were concerned, and certainly did not add to the flexibility of the wire.

Mr. Huntress, while partly endorsing the views of Mr. Hamilton, expressed the opinion that the better insulated the wire was, without reducing its flexibility materially, the less danger there would be from careless wiremen, who neglected to form a bell mouth at the ends of the conduit, which reduces the danger of abrasion to a minimum.

Mr. Hamilton supported his previous contention by stating that the wire would be made needlessly large by adding the double braiding, and thus require larger sizes of conduit. He also raised the question why flexible cable was not used to a larger extent than it is for this class of work.

Mr. Siebert stated that the reason for such a rule was to protect the customer from poor work.

Mr. Bowman said the rules were a combination of all interests, being compiled by representatives of all those concerned.

Mr. Anderson cited some cases where weatherproof wire had been used for circuits, and a short piece of rubber-covered wire soldered on where the wires emerged from the conduit, in this way taking advantage of the customer.

Mr. MacKeen referred to a case which occurred in Boston in connection with pulling in wires through conduit. Considerable difficulty had occurred in pulling the wire through a long conduit owing to the crushed condition of the pipe, caused while forming offsets.

The passage had been so reduced that considerable force was necessary to pull the wire through, so much, in fact, that the wire stretched to such an extent that the diameter was materially reduced, thus reducing its carrying capacity, and consequently it had to be withdrawn

Mr. Siebert expressed the opinion that more stringent rules should be adopted by those qualified to compile them, and steps taken to enforce them, thus overcoming the rascality of some wiremen.

Mr. Anderson thought that if wiremen were required to qualify before being allowed to practice the profession, less trouble would result from careless workmen.

Mr. Archibald, while partially endorsing the views of Mr. Siebert, thought that a limit was necessary. If too stringent rules were adopted and enforced, there would be a great temptation on the part of wiremen to violate them. In concluding his remarks, he moved a vote of thanks to Mr. Anderson for his valuable paper.

The following paper on "Steam Engineering," by Mr. P. A. Freeman, was read by the Secretary:

STEAM ENGINEERING.

By P. A. Freeman.

The subject of this paper, Steam Engineering, covers such a broad field that I finally decided to confine my paper to certain limits, avoiding all intricate formula and deductions, although both are necessary for the competent engineer.

At times it is somewhat difficult for an engineer to decide upon the type of boiler to use, and in every case the choice should depend upon the nature of the work demanded, whether it is better to use water tube, externally or internally fired, etc. Many plants are able to use with good economy a return tubular boiler, and the selection of a water tube boiler would be of no advantage in comparison with the increased first cost.

For railroad work and for any kind where the demand for steam is liable to increase rapidly during certain hours of the day, the water tube boiler is by far the best. With a first-class water tube boiler a fireman can carry for a certain length of time from 50% to 100% above the rating of the boiler.

In our plant at the tramway station we have four 250 h.p. Babcock & Wilcox boilers, and it has been a common occurrence during the winter months for us to carry 50 to 75% above the rating of the boilers for several hours. For such service a quick steaming boiler is necessary, and is only to be found in the water tube boiler.

In these days of keen competition it is absolutely necessary to take every precaution for reducing operating expenses, of which the coal pile represents a large percentage. The best of boilers will not take care of themselves and will generate steam according to the manner in which they are treated. Shovelling coal into the furnace and keeping a sufficient supply of water in a boiler do not constitute the entire duties of a fireman. He must shovel coal and feed water to the boiler intelligently and study the peculiarities of the steaming properties of his boilers and coal. I might add that no two boilers of the same make with exactly the same handling will give the same results.

The proper maintenance of boilers demands that they should be shut down and examined inside and outside thoroughly at least every nine weeks. The boiler should be thoroughly blown out and cleaned even if solvents are to be used for the prevention of scale. In our plant we use the following method for preventing scale and for cleaning boilers: The feed water is supplied to the boiler from a tank capable of holding 3500 cubic feet; suspended in this tank is a bag containing about 50 lbs. of lime, which is renewed twice each month. We find that this method of treating our feed water has a considerable tendency to prevent scale formation. When the boiler is taken off the line for cleaning and general overhauling we pump it full of water, in which about 10 lbs. of sal soda have been dissolved while it is still under full pressure. It is then allowed to remain 48 hours, when by this time the steam pressure has fallen. The blow-off is opened and the boiler emptied. It would seem at first that this would be sufficient to thoroughly cleanse the boiler, but it is not so. If the feed valve is slightly opened and the water allowed to flow slowly through the boiler it will then be thoroughly cleaned, as this slow filtration through the boiler seems to bring with it all the dirt, scale, etc., which was not carried away by blowing down. Also, particular care should be taken that the feed valves of the other boilers are closed during the time we are filling the boiler with the sal soda solution, otherwise the brass fittings, etc., will be seriously affected.

Safety valves are the most delicate part of a boiler and demand constant care and watching if we wish them to work fairly accurately. My experience with spring safety valves has led me to adopt the rule that all our safety valves shall be lifted from off their seats once every 24 hours. If this is not done I find that a so-called skin forms on spring and seat, and if the valve is not lifted oftener than once a week it will take considerable more pressure to lift it than for which it was originally set. Another very serious trouble with safety valves which often occurs is the loosening of the check nut, and if this is not attended to immediately upon the indication of such trouble the steam pressure will drop and all steam escape into atmosphere, shutting down the plant. Although it at first appears difficult to the engineer or fireman to tighten the nut and set the valve properly, nevertheless if he understands his type of valve thoroughly he can accomplish it with his monkey wrench, hammer and chisel in very short space of time with perfect safety to himself and plant. If the valve should commence to blow off and steam pressure drop more than 5 lbs., or if the steam pressure should at any time drop more than proper on account of the safety valve blowing off, the engineer or fireman should at once assume that the valve is out of order and must be attended to immediately. If check nut is loose it can be remedied by turning the valve spindle to the right until the steam stops escaping, then the cap may be removed and the check nut tightened without further difficulty. The boiler pressure should be increased to the same point at which the valve blew off, and beyond, in order to make certain that the valve will blow off at the proper pressure. This point can be easily obtained by slightly turning the valve in the proper direction.

The above method of handling the safety valve is that commonly used in ordinary practice, but for close regulation the cushion seat should also be raised or lowered according to the range within which it is desired to have the safety valve act. Under no conditions should the safety valve spindle, or any of its parts be struck or hammered in order to make it close, as this is a very dangerous practice and is liable to cause more or less serious explosions. This latter precaution of mine may seem to be hardly necessary, yet in my own experience I have seen an engineer strike down on the spindle with a piece of wood 6x6 with the idea of causing the valve to close. Although at this time of which I speak no serious results occurred, it might cause great danger the very next time it was tried.

Water tube boilers have the following very essential qualifications not met with in other types of boilers:

They have the property of steaming quickly on account of the rapid circulation and good combustion. The liability of dangerous explosions is reduced to a minimum on account of the tubes, which are the weakest point of the boilers, splitting and thus allowing extra vent for the steam. On the other hand, these tubes are easily and quickly replaced if burned out or injured in any manner. For fear some of you might obtain the impression that the tubes are a weak point in the ordinary running, I might state the case of one set of boilers which we have in our station. These boilers have been in constant use for seven years, and the only repair necessary beyond that of replacing grates and brick was the inserting of one tube which had been injured through carelessness in allowing water to flow over the outside of the tube from a leak in the feed water piping. This caused a blister on the tube, and although it did not weaken it seriously, it was considered advisable to replace it before any damage should occur.

My experience has led me to believe that boiler explosions are caused by careless and unintelligent attention to the supply of water, and not at all times through any inherent defects in the boiler. The gauge cocks should be tried regularly in order to detect any false indications of water in the glass. False indication of water is not by any means an uncommon occurrence. The sudden breaking of a gauge glass causes the valves of the column to be closed, and on replacing the glass the bottom valve is opened and the upper one forgotten. The glass under such conditions will show false water, as the water will remain in the glass until the boiler is emptied, held in position by the vacuum in the top of the glass. This very case has occurred in our own plant, but any dangerous results were averted by prompt action.

In connection with this I recall an answer given by my chief in the west end power house to the Board of Examiners. He was asked what he would do if on entering a boiler room he discovered

(Continued on Page 86.)

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Correspondence is invited upon all topics legitimately coming within the scope of this journal.

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Acetylene Gas.

THE Boston Manufacturers' Mutual Fire Insurance Company, in response to many inquiries from its members, has had the subject of acetylene lighting, including its advantages and dangers, and the proper appliances to use for the purpose, carefully examined, and, as a result of its examination, advises its members not to try the experiment of using it at present, until better methods and appliances are available than any yet put on the market.

Inspection of Steam Boilers.

THE government of British Columbia has passed a law providing for the compulsory inspection of steam boilers before being put in operation, and periodically while in use. It is learned that the government of Nova Scotia will, at the next session, introduce a bill along the same lines. The day is apparently near at hand when all steam plants in the Dominion will not only be placed under the supervision of government inspectors, but when additional protection will be afforded the public by making it compulsory upon engineers to show that they are properly qualified to assume charge of a steam plant. Surely Ontario, the banner province of the Dominion, will now follow the example set by British Columbia, and thus assist in raising the standard of steam engineering in Canada. Unfortunately, one or two attempts in the past to secure a law for the licensing of engineers have not met with success.

The Maritime Electrical Association.

IN the building up of an association, much depends upon the character of the foundation established in the early days of its existence. Conscious of this fact, the promoters of the Maritime Electrical Association, formed one year ago, have labored earnestly to reach that point from which there would be likely to grow a useful and progressive association. How far they have succeeded can be judged in a measure from the report of the second convention, which appears elsewhere in this number. Notwithstanding drawbacks, which need not here be enumerated, the standard reached within the short space of twelve months since organization should be encouraging to the executive officers and those

members who have contributed to its support. If the present interest can be maintained, there need be little fear of the future welfare of the association. Its membership is now over sixty, and it is believed that this can be considerably increased, particularly by interesting a greater number of cable and telegraph men. The several excellent papers and the discussions thereupon, which formed one of the most important features of the recent convention, is a most hopeful indication of a successful association. It is encouraging to observe the practical character of the papers and their wide scope, being designed to interest the lighting, railway, telegraph, telephone and fire alarm departments of the electrical industry. To the author of each paper equal credit is due, but the subject of electric meters, taken up by Mr. Mackeen, is one which has a particularly wide interest. While much has been written regarding the meter, we seldom find the subject treated in such a practical and simple manner as in this paper. As a means of inducing discussion upon questions brought out, it would be an advantage to have copies of the papers placed in the hands of the members prior to the day of the convention. They would then be able to read them carefully and discuss them more intelligently at the meeting. This as a suggestion to the officers-elect, who will be equally interested with their predecessors in strengthening the association.

The Electric Light Bill and the Canadian Electrical Association

THE passing of the Conmee Bill should be, and doubtless is, the subject of congratulation and thankfulness on the part of private electric lighting companies in Ontario. It gives a fair measure of security to their investments, which could at any time previously have been wiped out by the decision of the municipality to engage in electric lighting. The clause which provides that the price to be charged by the company for light shall be determined by arbitration in the event of dispute, is of distinct advantage to the municipality, and must tend to lessen the desire for municipal control. Notwithstanding the manifest wish and attempt of the promoters to make the provisions of the Bill fair both to the companies and the municipalities, its course through the Legislature was attended by many uncertainties and difficulties, of which those not intimately associated with the movement can have little appreciation. Well known members of the House who were depended on to take charge of the measure, after expressing their willingness to do so, afterwards declined, thereby causing delay and anxiety. Finally, however, the task was accepted by Mr. Conmee, and the result showed that it could not have fallen to better hands. The strongest possible opposition was offered to the measure by certain newspapers who saw an opportunity to make a bid for public favor, and of following the example of the Irishman of whom the story is told that he always made a point of voting with the majority. The statements of these papers were rightly discounted by the members of good judgment in the House, to whom it must have been apparent that the time had arrived when some consideration should be given, not only to the rights of the masses of the people, but of those who had freely invested their capital for the development of an important industry, from which large convenience and benefit had accrued to the public. The policy of the companies should now be "What we have we'll hold." The rights secured by the Conmee Bill must be carefully guarded. Assaults may and probably will be made on the new legislation at future sessions. Steps should therefore be taken whereby an organized effort can at any time be made to resist the passing of amendments calculated to weaken or destroy the protection afforded by the Bill. The usefulness and value of the Canadian Electrical Association have been clearly demonstrated in connection with this movement, which has ended so satisfactorily, and which was conducted through the medium of that organization. Without such an organization the work could not have been so expeditiously and effectively done, and the result might not have been so satisfactory. Credit is also due to the following gentlemen composing the Legislation Committee, who, in conjunction with the President and Secretary of the Association, and the solicitors, Messrs. Donald Guthrie, Q.C., and W. D. McPherson, successfully conducted the campaign: John Yule, manager of the Guelph Light & Power Company, Guelph, chairman; W. H. Comstock, president of the Gas & Electric Light Company, Brockville; B. F. Reesor, manager of the Light, Heat & Power Company, Lindsay; J. J. Wright, manager of the Toronto Electric Light Company, Toronto; C. B. Hunt, manager of the London Electric Co., London; A. L. Breithaupt, manager of the Berlin Electric Light & Street Railway Company, Berlin; R. O. McCulloch, of the Goldie & McCulloch Company, Galt; David Speirs, president of the Electric Light Company, Galt; John Farley, Q.C., president of the Gas & Electric Light Company, St. Thomas; S. J. Parker, president of the Electric Light & Gas Company, Owen Sound; Thomas Sadler, president of the Light, Heat & Power Company, Lindsay. Many of the companies by their co-operation gave valuable assistance to the committee. These companies, and all others, should now become members of the Canadian Electrical Association, and give what support they can to an organization that has already done much and may in the future do more for the development and welfare of the electrical industry of Canada. We hope to see at the annual convention of the Association at Hamilton in June a larger representation than ever before from the electric lighting companies.

THE CANADIAN ELECTRICAL ASSOCIATION.

At a meeting held recently of the Committee appointed to make the local arrangements for the approaching annual convention of the Canadian Electrical Association at Hamilton, a draft programme was considered and adopted. The dates selected for the convention, subject to the approval of the Executive, are the 28th, 29th, and 30th of June. The business sessions, as well as the annual banquet, will probably be held in the new Royal Hotel. A sufficient number of papers on a variety of subjects of interest to those engaged in the various departments of electrical work, have been promised, and are in course of preparation. Among the features of entertainment will probably be a trip to the Beach over the Hamilton Radial Railway and an evening excursion on the lake, a trip to Grimsby Park over the Hamilton, Grimsby & Beamsville Electric Railway, and a visit of inspection to the stations of the Cataract Power Company at St. Catharines and Hamilton. The Hamilton Street Railway Company have very kindly offered free transportation to members of the Association during the convention. Everything points to a successful and enjoyable meeting.

MARITIME ELECTRICAL ASSOCIATION.

(Continued from page 83.)

no indication water in his boiler. He said he would make sure his water was shut off, close all drafts and open his fire-box door. On being asked what he would do next, he replied that he would leave the building and watch it from a safe distance.

Pumps are usually given the least care, worked the hardest of the equipment, and at the same time play the most important part in a station. They should be given the same careful attention as the steam engine. We make it a practice to completely overhaul our pumps once a week in order to detect any faults that may exist, or are liable to occur. Special care should be paid to the water plunger and valves; valves should be used which are made to withstand the temperature of the water which passes through them. Disregard to this may cause serious trouble.

All modern plants should be equipped with heaters and condensers, either jet or surface. In our station the heaters raise the temperature of the feed water during the winter months to 120° and during the summer months to 140°. This difference in temperature is accounted for by the difference in temperature of the city water at the above seasons. We use a jet condenser, which gives an increased economy of 20%. Surface condensers should not be used if possible on account of the deteriorating effect of the oil upon the tubes of the boilers, and if the water is not to be used again in the boilers, then there is no gain, but a loss, in installing surface condensers on account of increased first cost and increased cost in running. Heaters and condensers demand the same careful attention as pumps.

The selection of an engine demands the same careful consideration as boilers, whether high or low pressure, single or compound, high or low speed, steam jacketed, etc. For heavy and variable loads the compound engine is generally accepted. Large low speed compound engines with wide expansion are generally accepted as more efficient than the single cylinder engine. This is clearly shown by the result of test on the compound engine in the U. S. gunboat "Boche." When this engine was run as a single engine it used 24 lbs. of steam per 1 h.p., and when run as a compound engine with the same load, steam pressure, and under the same general conditions, it only used 20 lbs. of steam per h.p., thus demonstrating that the compound engine was 20% more efficient than the single engine. Especially are compound engines more efficient with high steam pressure.

Engines for street railroad work, and other work imposing sudden changes of load and unusually heavy strains, should be built with heavy forged cranks, and wheels of about double the usual weight, and with all the parts in such proportions as will give perfect work under the most trying conditions. Governors for this work must be especially good and must respond to sudden changes of load and continue to regulate closely under all circumstances. The variable cut-off on low pressure cylinders is also a strong point in such engines for this work, as it ensures quick work, quick regulation and high economy. Under variable loads the regulation of our Robb engine is within 2%, giving the greatest satisfaction, and up to the present time two of this type of engine have been in constant use on our railroad load since February, 1896, on an average of 18 hours per day, from no load to full load and at times 50% overload. We set our values for our average load, as the maximum pull does not last longer than 10 seconds duration.

An engine should be indicated every three months, on account of the wear and tear of the parts and variation in the valve rod. Our engines were first set by hand and then by the use of the indicator, and a saving of 19% was shown. On taking charge of our present plant the boilers were carrying nearly their capacity. By indicating the engines and setting valves properly we were able to increase our engine load 50% and only increased our boiler load 10%.

All this simply goes to show that the indicator should be used freely and intelligently in order to effect the greatest economy.

The profitable use of steam jackets is a much discussed question, and many engineers disagree. My experience with 9-100 h.p. steam jacketed engine has led me to doubt the advisability of using the steam jacket. In my opinion the extra cost of maintaining the extra steam piping and traps, and the liability of damage to the cylinders, more than counterbalances the saving obtained by steam jackets. If an engine has cooled down the greatest care must be taken in re-heating the cylinder through the use of the steam jacket, or else a cracked cylinder will result on account of the unequal expansion. Such an accident has occurred under my own observation, and it has not made me very enthusiastic over steam jackets.

If I did not consider that I have already occupied my share of your time I would like to take up the subject of engineering in a more technical manner, giving figures to back up my statements; also the proper handling of coal, draft, etc., but the latter subjects demand a paper on themselves and can hardly be treated sufficiently in a paper of this kind.

I wish to thank the members for their attention, and if the paper has suggested any questions which might be asked, I shall be only too glad to try to answer them.

The conclusion of the reading of the paper was greeted with applause, the subject proving an exceedingly interesting one.

DISCUSSION.

Mr. MacKeen, in opening the discussion, referred to the use of lime as a solvent in neutralizing the effect of acids present in the city water, also stating that some information regarding the different solvents used for this purpose might be of general interest.

The President, Mr. Bowman, referring to the use of a tank, asked Mr. Freeman if the tank was of sufficient size to permit matter in suspension in the water to settle. He also referred to the unreliability of gauge glasses, expressing the opinion that gauge or try cocks were more reliable and satisfactory. He recommended the placing of two sets on each boiler, one set being used to check the other.

Mr. Chambers requested information regarding low and high water alarms. This was furnished by Mr. Huntress and Mr. Freeman, who referred to systems used at the West End Street Railway, Boston.

Mr. Hamilton spoke of the steam jacket. The principal objections to its use, he said, were not generally known.

Mr. Freeman supplemented his paper by a few remarks regarding the different forces of draft used with different coals, his opinion being that different coals required different drafts, dependent to a large extent upon the methods of firing, conditions of weather, and direction of wind. In concluding his remarks, he said that he had not devoted the time to the preparation of his subject that it deserved.

A hearty vote of thanks was tendered Mr. Freeman for his interesting paper.

The President then introduced Mr. MacKeen, who submitted the following paper on "Electric Meters":

ELECTRIC METERS.

By R. T. MacKeen.

In selecting the electric meter as the subject matter of my paper, it was with a view to treat upon a subject that is probably of considerable interest to many of those present, and one which usually furnishes material for a large amount of discussion upon occasions of this nature, and with this fact in view I respectfully submit it. The history of the electric meter from its inception would certainly constitute very interesting reading, and a collection of the various types used in "ye olden days," as it were, would occupy a very prominent place in an electrical museum, even at this early date.

Many of us, no doubt, are familiar with the Edison chemical meter, the first successful apparatus, I believe, used for metering current supplied to customers. The principles upon which it is constructed constituted it an exceedingly accurate piece of apparatus. The trouble involved in determining its reading, however, has caused it to give way to the more easily handled Watt hour meter. Another disadvantage of the chemical meter which appeared prominently with the adoption of alternating current machinery, is that it registers upon direct currents only. In order to overcome this difficulty the ampere hour meter was devised, metering, as its name implies, the current only, giving a final result practically independent of the variation in voltage. An improvement in this regard, however, was the adoption of the Watt hour meter, which measures the total energy in watts, thus combining the relative instantaneous value of both current and E.M.F. As

the Watt hour meter is now used almost exclusively, my remarks will refer particularly to it.

The majority of our electric light and power companies in the maritime provinces are at present selling power under what is termed the flat rate system, i.e., a fixed charge per light per year, a method which will surely be superseded by the more correct method of measuring the power supplied each individual customer and charging so much per kilowatt. The advantages to the company of a meter system over the flat rate system are manifold. I feel, however, that it would be impossible to do justice to the subject in the short time at my disposal. In passing I might state, however, one result of the adoption of a meter system which appears very prominent, i. e., the increased capacity of a station due to a system of selling current by meters, or in other words, customers demand less capacity at the station to supply the average load in proportion to their maximum load.

The fact that cost of power to a consumer is based upon the actual consumption as recorded by the meter causes the customer to be less extravagant with light particularly than when using it under the flat rate system. The result is that the company can possibly carry 20% more load with the same machines under the meter system than when operating under the flat rate system. The gross receipts may possibly be less at first if the meter system is adopted, but the net revenue will bear a higher ratio to the operating expenses, the coal pile being materially reduced. It is therefore possible that there are some present who are considering the adoption of the meter system, as well as some who are already familiar with it, to whom a few remarks regarding the selection, testing, installation and inspection of meters may be of interest.

The adoption of any one make of meter is necessarily based upon one's experience with it. In lieu of this, however, I might say that there is little chance for mistake in obtaining meters from any of the well known electrical supply houses, as manufacturers are bound as a result of competition, to a certain extent, to place a good article upon the market. The advantages, however, that any one meter may possess over another can only be determined by actual experience with it, and for the preliminary steps in this direction we must have recourse to the testing department.

Every station, whether large or small, should be provided with apparatus for testing meters. The entire revenue depends upon them and they should be treated accordingly. The apparatus necessary for testing is not extensive, nor does it form an item of much expense. In direct current stations, the necessary instruments are usually at hand, namely, an accurate ammeter and voltmeter; a portable direct reading wattmeter, however, is necessary for alternating currents. A reliable stop watch is also necessary to complete the outfit. A bank of lamps, or a water rheostat for testing power meters, forms a load which can be varied easily over a wide range. The connections for testing are as follows: The ammeter or series coil of the portable wattmeter is placed in series with the meter under test, care being taken in case of the portable wattmeter to insert it on the service side of the meter. The v. m. or shunt coil of the portable wattmeter is then connected in multiple with the shunt coil of the meter. The load is then adjusted to the capacity of the meter under test, and the accuracy of the meter can be calculated by noting the load and seconds for any definite number of revolutions, as follows: $\frac{3600 \times \text{constant} \times \text{rev.}}{\text{seconds}} = \text{watts}$. The percentage of error either way is determined by the difference between the true watts as shown by the instrument and the value registered by the meter. Another method is to put a known load upon the meter and allow it to run for an hour or so, the error being deduced from the difference between the known load and that shown by the meter; this method, however, involves time and necessitates great care in reading the dial, and is therefore objectionable.

Meters should be tested on ⅓ ½, full and 10% over load, the results being tabulated for future reference. Any error found upon testing can usually be remedied by moving the magnets toward the centre of the disc if meter is slow, or vice versa if fast, or in the case of some alternating current meters the drum or armature can be raised or lowered to accomplish the same result. A meter upon which testing and after adjusting does not record accurately to within 2% either way, both on full load and ½ load, should not be placed upon the line. It is rare, however, that new meters exhibit such a record after adjusting. Particular attention should be paid to the light load accuracy, as this usually forms the greater part of its load in actual service, and any inaccuracy on it affects the revenue on account of its longer duration more directly than the same inaccuracy on a variable load.

The meter begins its career upon being installed, and for satisfactory results depends to a large extent upon the care exercised in this regard. As a general rule, meters are placed just where the wireman elects to leave his meter loops, irrespective of the delicate nature of the instrument as well as the convenience of the meter reader and inspector. Vibration is a deadly enemy to the life of a lighting meter, having not only a tendency to render the meter fast, but by the reciprocating movement of the armature, scratches and ultimately chips the jewel. It, of course, requires time to effect the damage, but the meter is rendered inaccurate long before the jewel becomes useless. In connection with this, a good method of detecting vibration is to place a pencil between the teeth and touch the point to the wall, the slightest vibration being easily detected. It would be well if all the meters were installed as near the ground floor as possible. Any vibration would then be reduced to a minimum and the meter would also be subjected to a less variable temperature than if placed near the top of a building, the extreme of both heat and cold impairing its accuracy to a certain extent.

In connection with alternating current meters, some of those containing iron in their fields should not be placed upon inductive loads, such as motors or arc lamps having a low power factor, the tendency being to run slow. A method of overcoming this difficulty is to install two meters in series with each other, one being calibrated for a load of this nature or affected by it, the other being an ordinary meter. The difference in their readings at the end of the month will show the amount to be added to compensate for the error caused by the inductive load. Care should be taken in the case of meters installed on motor circuits that they are placed upon the service side of the switch, otherwise the field discharge of the motor is liable to injure the fine shunt windings by the alternate expansion and contraction of the wire, which chafes the insulation and ultimately ends in a short-circuit.

A mistake is often made in installing too large a meter for the number of lights without considering its light load accuracy. The meter of to-day will stand an overload of 20% for a brief period and will usually be found to register quite correctly upon it. Thus, in the case of house lights particularly, where the usual load is but from ½ to ⅔ of the maximum, a meter of such a capacity that this would be its full rated load could be installed, thus obviating the inaccuracy caused by running upon a light load were a meter of capacity equal to the maximum load installed. As stated before, light loads for long periods constitute the revenue producer, and particular attention should be given to the fact when installing the meter.

The mistake is frequently made of thinking that once a meter is calibrated and installed, it will go on recording accurately for an indefinite period without receiving the least attention. Such, however, is not the case, which is apparent upon a moment's thought. Dust and an accumulation of dirt upon the commutator in the case of meters with brushes, and particles upon the disc which come in contact with the pole pieces of the magnets, are conditions under which any delicate mechanism would fail to operate. It is almost impossible to prevent the ingress of dust, and sometimes insects, which make the meter their home without regard to potential present.

An annual inspection, at least while on the line, is therefore necessary. The meter should be thoroughly cleaned and overhauled and at the same tested under its normal running conditions and its reliability determined, future purchases being regulated thereby.

The meter merits our warmest sympathy. It is frequently the most abused piece of apparatus in existence. I refer to its character being so rudely mutilated by many customers whose anger have been aroused by some mistake usually effected by themselves. My experience has been that 9 out of 10 complaints are based upon some mistake which can be traced to the customer, who, however, loses no time in denouncing the meter as inaccurate without considering the matter in order to arrive at the truth.

A meter usually bears an unenviable reputation in the mind of the general public, the reason of which is probably due to the principal complainants, old flat rate customers, who having acquired the habit of burning light needlessly under the old system, find it hard to curtail when placed upon a meter. Their bills naturally in the winter months run up to an alarming height. A good plan when dealing with an intelligent customer is to make him familiar to a certain extent with the mechanism of the meter, explaining the method of reading the dials so that he may check

his own meter if he so desires. It takes but little time, and the result of enjoying the confidence of your customer fully justifies the time so expended.

In conclusion, I may say that my experience has been that a meter treated in a proper manner constitutes a most satisfactory and honest servant to the consumer and company in whose service it is employed.

DISCUSSION.

Mr. Chambers remarked that he had listened to the paper with much pleasure. He referred to the difficulty under which they labored regarding government inspection of meters. It not only formed a large item of expense, but was a drawback as regards testing meters while on the line, as the seals had to be broken, unless the meters were provided with windows. He said that he had recently received a pamphlet from the Canadian General Electric Company advocating the inspection and testing of meters four times a year. He thought that if meters required the amount of attention, as advocated by the pamphlet, they had better be abolished, as the inspector's fees and expense of removing meters from line would offset any advantages of a meter system over the flat rate system.

Mr. Huntress, while agreeing in a measure with Mr. Chambers, favored the government inspection of meters. The fact that a meter had been inspected, and its accuracy certified to by a representative of the government, relieved the company from the usual charges of fraud. The seal of the inspector settled at once any difficulty arising between customers and company. The quality of meters was improving, and consumers were becoming more cognizant of their value. Mr. Huntress also considered it good practice to make the consumer as familiar with the mechanism, etc., of the meter as possible.

Mr. Miller stated that he had tried for years to familiarize people with both gas and electric meters, and had failed to accomplish the desired results.

Mr. Chambers, referring to his previous remarks, said that he offered no positive objection to the inspection of meters when necessary, but questioned the necessity of so doing four times a year.

Mr. Miller, in supporting Mr. Chambers, said it was impossible to inspect them so frequently; it was not necessary, his experience having been that in the majority of cases meters, after two or three years' use, recorded as accurately as when installed, depending, of course, upon the location in which they were placed. Meters, he thought, were not as delicate as was generally supposed. He related an instance where a meter, while being installed, fell a distance of 20 feet without impairing its accuracy to any extent.

Mr. Siebert also questioned the delicacy of the mechanism of a meter, expressing the opinion that manufacturers did not expect the instructions regarding the handling of meters to be taken literally. The precautions were to prevent careless people from subjecting them to extreme violence.

Mr. MacKeen took issue with both Mr. Miller and Mr. Siebert regarding delicacy of meters, supporting his contention by explaining briefly the theory of their operation.

Mr. Freeman expressed the opinion that meters might be tested and sealed by government officials at the works of the manufacturers, and thus save central stations the trouble caused as at present. Mr. Freeman also asked for information regarding the life of the meter.

Mr. Smith explained the reason why meters were not sealed by government inspectors at the factory. The main object of testing when received was to adjust any possible error in its accuracy, caused by rough handling during transportation.

Mr. MacKeen, in replying to Mr. Freeman, stated that the life of a meter depended entirely upon the work imposed upon it, as far as the jewel was concerned. New jewels, however, could be inserted when necessary, the period of usefulness being practically unlimited.

Mr. Crosby, in reference to the accuracy of meters, cited instances where meters had been found perfectly correct after a continuous service ranging from two to three years.

Mr. Miller said that new jewels could be inserted without disturbing the government seal, in this way overcoming the expense of again sealing them.

Mr. Freeman then moved, seconded by Mr. Chambers, that a vote of thanks be tendered Mr. MacKeen. Carried unanimously.

Mr. J. H. Winfield submitted the following interesting paper:

THE LONG DISTANCE TRANSMISSION OF SPEECH.

By J. H. Winfield.

Long distance work is every day becoming a more important factor in the telephone business, and toll lines, instead of (as a few years ago) being regarded as mere accessories to the city exchanges, are now recognized as absolute necessities. We are talking over longer distances almost every month. A few years ago 500 miles was considered quite a feat; today we have conversations carried on over 1900 miles of wire with perfect ease. In view of this, it may not be amiss to speak of a few of the difficulties that are encountered in the design, construction and operation of these long lines.

The apparatus used in making a toll line connection may be divided into three parts: (1) the line; (2) the instruments; (3) the switching apparatus. The chief factor in extending the talking limit has been the improvement in the lines. Grounded circuits of iron wire are now practically obsolete, the recognized standard being a metallic circuit of hard drawn copper wire, generally No. 10 B. & S. weighing 170 pounds to the mile, but sometimes for short distances of No. 12 weighing about 104 pounds to the mile. The New York & Chicago line is constructed of wire weighing 435 pounds to the mile, but that is an exceptional case.

In speaking of the line I shall confine myself to the electrical rather than the mechanical difficulties that have been met with and overcome. Our object is to so construct the line and arrange the apparatus that the sounds at the receiving end shall possess the following characteristics: Loudness or volume; clearness; quality. Of these three clearness is by far the most important, for a faint sound, if clear, is perfectly intelligible, and a change in quality may only have the effect of disguising to some extent the speaker's voice. Volume is affected by any conditions which alter the amplitude of the wave.

Clearness is affected by any conditions which alter the position of the waves in regard to each other. Quality is affected by any conditions which alter the form of the wave. Therefore, the volume is reduced by resistance, leakage, static induction and self induction, the effect of these properties being to reduce the amplitude of the wave.

Clearness is reduced by static induction, and self induction, these tending to alter the inter-relations of the waves; static induction causing a rounding off of the top of the wave, thereby involving a loss of sharpness, while both static induction and self induction produce an unequal retardation of phase for vibrations of different periods, thus causing interference and a resulting deformed wave. In other words, the telephone current, being an alternating current of a frequency varying from 200 to 1,500 periods per second, according to the sound produced, static induction and self induction produce a greater retardation on the waves of high frequency than on the lower ones, thus mixing up the waves to some extent and rendering the speech muffled.

Quality is changed by all the properties which reduce the clearness, and by self induction in another sense as well, this effect of self induction being to reduce the amplitude of the overtone waves to a greater extent than of waves of a longer period.

Evidently then, in order to accomplish good telephonic transmission of speech, we must make the self induction and electrostatic capacity of our line and apparatus as low as possible, resistance and leakage being of less importance, though, of course, they should not be lost sight of. A small and well distributed leakage is often an advantage, as it allows the static charges to escape, clearing the line and to some extent neutralizing the effect of capacity, the slight loss in volume being more than counterbalanced by the gain in clearness. When iron wire is used there is a much further deformation of the waves than is caused by the increased resistance, due to the fact that the wire is circularly magnetized and this magnetism has to be reversed twice in every vibration. There is also a considerable increase in self induction due to the magnetic properties of the metal.

The self-induction of a copper metallic circuit of No. 10 or 12 wire is very small, but the self-induction of the apparatus which always forms part of a telephone circuit is sometimes very high and has a considerable effect on the current. Long distance lines would be particularly liable to disturbance from cross-talk if no means were taken to prevent it. There are two cases in which cross-talk will not be produced on a metallic circuit by a neighboring wire. The first is when the disturbing wire is at an equal distance from each of the wires of the metallic circuit. Were it always possible to string wires in this manner, there would be no trouble from cross-talk; but a little consideration will show that this is only possible for two circuits. The second method is known as transposing. The two wires of the metallic circuit are transposed at regular distances, or, in other words, they change places, A changing to the pin B was on and B going to the pin A was on, the effect being to place each wire of the circuit at an average distance from the disturbing wire or wires. As the number of wires on a pole increases, the difficulty of planning the transpositions increases also. With two circuits it is an easy matter; if, however, we have a third and transpose it, the same as we did the second, there will be cross-talk from the second to the third, because their relations to each other are the same as if there had been no transpositions at all. To get over this difficulty we must transpose the third twice as often as we did the second. A fourth circuit may be transposed at the middle points of the third, and so on. It has not been found necessary to transpose each circuit so that the induction currents are exactly balanced, and it is possible to use the same transpositions for every second crossarm, so that the first, third and fifth are alike, also the second, fourth and sixth. Transpositions are usually placed half a mile or a mile apart.

There has been very little change in the instruments in the past few years. The transmitter usually used is of the "Hunning's" type, and is known as the solid back; it does its work remarkably well. Some of them require a little attention now and then on account of the packing of the carbon granules, but a judicious tap generally puts matters to rights. The ringer magnets of the call bells should be wound to a resistance of 1,000 ohms on long spools, bringing the wire close to the core, and thus giving them a high co-efficient of self-induction, which effectually prevents any shunting of the high frequency telephone current, while allowing the ringing current to pass freely, the ringers being bridged across the circuit.

In order to connect a metallic circuit to a grounded line, what is known as a repeating coil or transformer must be used, otherwise the balance of the circuit would be destroyed and the line become noisy. This piece of apparatus is nothing more than a specially made induction coil, the metallic circuit being connected to the primary and the grounded line to the secondary, the other end of the secondary being put to ground. In connecting together two metallic circuits through an intermediate office, the connections should be so arranged that the lines are directly connected, and the two transformers cut out; otherwise, as a transformer only has an efficiency of from 85 to 90%, there would be a serious loss in volume.

All apparatus at intermediate stations should be bridged across the lines and the parts that are permanently in connection should have a high self-induction in order to avoid shunting the telephone current when the line is being used to stations farther on. Ring off drops should be wound to 1000 ohms resistance and also bridged. It is a good plan to use a tubular drop, as it not only increases the self-induction, but it also tends to prevent cross talk between the coils themselves, which is a frequent cause of disturbance and often not suspected.

Long distance lines should always be well equipped with protective devices. The best form for protection from lighting consists of two carbon blocks, separated by a thin sheet of perforated mica, one block being connected to line and the other to ground. These have proved very efficient and when properly installed generally prevent any damage to instruments or transformers. They also prove useful in another respect, as the static charges seem to find their way across from one plate to the other, clearing the line to a great extent. Many lines could be improved by a judicious use of these protectors at different points, such as the way stations. A fuse is also generally inserted in order to prevent the entrance of heavy currents which might otherwise do considerable damage, when, as sometimes happens, an electric light or power wire comes in contact with the circuit.

In regard to the operation of toll lines, long distance telephony is much more expensive than telegraphy, as may easily be seen when we consider that a single iron telegraph wire can easily transmit forty messages per hour, and when duplexed the number is doubled; whereas in the telephone work we have to use two wires, and they must be of copper instead of iron, and even then under the best conditions it is hard to get more than seven or eight messages through in an hour. Add to this the fact that the sender of the message is aware of every minute of delay, and is usually very impatient when he has to wait a few minutes for the line, where in sending a telegram he just hands it in at the office and thinks no more about it, even though the message may not be sent for half an hour or longer, and it is easily seen that not only must the telephone message cost more than a telegram, but the lines are apt to be choked with business during a few hours in the middle of the day and comparatively idle the rest of the time. A great deal can be done by keeping the subscribers posted in reference to the hours when the lines are rushed, and very often they can so arrange their business that it will not come in the rush hours. They would thus save themselves the annoyance of having to wait for a connection and the lines would be worked more steadily.

DISCUSSION.

Mr. Hamilton opened the discussion by referring to the valuable character of the paper. He expressed his surprise that telephonic communication between cars on trains had not become more popular.

Mr. Freeman stated that telephones were used for that purpose in Pennsylvania, U. S.

A vote of thanks was tendered to Mr. Winfield for his paper.

The President then introduced Mr. Pickles, who submitted a paper giving a brief history of electric lighting in Halifax:

HISTORY OF ELECTRIC LIGHTING IN HALIFAX.

By W. Pickles.

The first electrical lighting in the county of Halifax for other than experimental purposes was an isolated plant owned and operated by the Dartmouth Rope Walk Co., of Dartmouth. It was not till the year 1881 that it was used in Halifax, and then only for an exhibition; thousands of people thronged the wharf of Lawson Harrington, where the dynamo was in operation, but owing to an open circuit the exhibition was not the success anticipated.

About a year later a company was formed, under the name of the Halifax Electric Light Company—Mr. J. Logan, superintendent—with a station on Black's wharf. The installation consisted of one T.H. arc machine and ten arc lamps, shortly increasing to thirty-five street lamps and forty commercial, at the same time installing one Siemens alternator with a capacity of fifty incandescent lamps. This machine was used to light the Halifax Club.

In a few months it became evident that the present station was much too small to meet the growing demand for this new system of illuminating. The company decided to erect a larger and more modern station at the Three Mile House, at the outskirts of the city.

About this time the Halifax Gas Company decided to enter the field of electrical illumination, and with this in view purchased the apparatus, rights and good-will of the Halifax Electric Company. They immediately increased the capacity of the plant by the addition of two 50-light Wood arc machines. Strange to relate, however, within an exceedingly short time another company was formed under the name of the Chandler Electric Light Company. This company commenced operations with two stations, one situated at Messrs. Henderson & Pott's paint factory, and the second one at Dempster's planing mills. Their plant consisted of Ball machines, operated by the engines of the respective factories, the

company being successful in securing the contract for the street lighting of Halifax. After being in operation for a short while, they decided to remove their apparatus to the head of the North-west Arm, where water power was used when available; but, owing to the scarcity of water, steam was almost exclusively used. After operating this station for about a year, and not being as satisfactory as expected, they again moved their apparatus to Black's wharf; after a brief period of time and owing to uncertain conditions, they changed their name to the Halifax Illuminating & Motor Company.

The gas company at this time were operating incandescent lamps, and the Halifax Illuminating & Motor Company, in order to successfully compete with them, decided to install incandescent apparatus, which necessitated their removal to Moran's wharf, where more spacious accommodations were acquired.

Halifax at this time was laboring under the unsatisfactory service rendered by the horse car system of transit, and Halifax promoters, inspired by the successful operation of electrically equipped street cars, formed a company under the name and title of the Halifax Electric Tramway Company, for the purpose of converting the motive power to that of electricity. In order to centre the electrical industries, arrangements were completed whereby this new company absorbed the Halifax Illuminating & Motor Company, thus combining the incandescent and arc lighting systems with that of the street railway. The wisdom of this is evident from the fact that the operation of street railway in conjunction with incandescent and arc lighting systems reduces the cost of operation to a minimum. It must be borne in mind that the gas company was still operating the Three Mile House plant and a sub-station at the gas works, the electrical department being under the supervision of Mr. P. R. Colpitt.

Shortly after the formation of the Halifax Electric Tramway Company, a new company appeared upon the scene, under the name of the People's Heat & Light Company, which finally absorbed the Halifax Gas Light Company and erected gas works on the Northwest Arm. This company disposed of the electrical apparatus previously operated by the gas company to the Halifax Electric Tramway Company, thus further combining the electrical interests.

In conclusion, it may be of interest to those present to give a brief description of the apparatus at present being operated by the Halifax Electric Tramway Company, under the management of Mr. F. A. Huntress. The apparatus consists of 900 k.w. for railway, 800 k.w. for incandescent work, and 250 k.w. for arc lamp service, operating thirty-two cars, 14,500 incandescent lamps, 240 arc lamps, and 300 h.p. in motors.

I have endeavored to give a brief history of the many changes that have taken place in the electrical industries of this city, and feel that it is impossible to do justice to this subject in so short a paper. If it has proved of interest to any present the object has been fully realized.

DISCUSSION.

Mr. Colpitt, in commenting upon the paper, stated that it brought many old recollections to mind. He related some interesting anecdotes in connection with regulating the voltage of an old Siemens alternator, a reel of iron wire with a poker as a contact maker being used in lieu of a regular rhoestat.

A hearty vote of thanks was then tendered to Mr. Pickles.

Mr. Bowman, in concluding the business of the convention, expressed his pleasure that so many valuable and interesting papers had been submitted. He felt that if the present interest manifested were sustained the Association would enjoy a long and brilliant career.

The President then declared the convention adjourned until next annual meeting, the date and place to be announced later.

THE BANQUET.

In the evening the Halifax members tendered the visiting delegates a banquet at the New Victoria Hotel. The arrangements were complete, and the unanimous opinion was that the affair was a great success and a fitting conclusion to the convention. Amid pleasing decorations the company sat down to dinner at 9 o'clock, when the following repast was furnished:

MENU.

"High Potential Transformer."
George's Island Punch. 30,000 Volts.

SUBMARINE CABLES.

Oysters on the Deep Shell. Consomme a la Nova Scotian.

TROLLEY POLES.

Baked Philadelphia Trout, Sauce Piquant.
Windsor Potatoes, "Self Regulating."

INDUCTIVE LOAD.

Queen Olives, "Rubber Covered." Lettuce.
Fillet of Beef, with Mushrooms a la Lyonnaise,
Croquant of Lady's Fingers, with Charlotte Russe.
Tutti Frutti with Whipped Cream.

SHORT CIRCUITS.

Westphalia Ham. Champagne Sauce "a la Overload."
Ox Tongue, Pecking Sauce, "High Potential."

JOINTS, "Soldered and Taped."

Haunch Prime Western Beef. Dish Gravy, "Lubricating."
Young Turkey, "Low Resistance." Oyster Dressing
Lemon Jelly, "Insulating Compound."

HEAVY GROUNDS.

Whole and Mashed Potatoes, a la Creme.
French Peas, "Copper Plated." Bermuda Onions, "High Permeability." Beets

SHUNTS

Mayonnaise Jelly, "Vibratory." Lobster Salad, "Iron Armoured."

BOOSTERS.

English Plum Pudding, "Sound Proof." Sauce Cognac, "Circuit Breaker."
Snow Ball Pudding, "Light Load." Soft Custard, "X Ray."
Apple Pie, "Rubber Belting." Lemon Meringue Pie.

DESSERT.

Vanilla Ice Cream, "Self Ventilating."
Assorted Cakes, "Polyphase Currents."
Apples. Oranges. Layer Raisins, "Shellaced."
Nuts and Bolts. Confectionery, "Insulators."
Electric Heaters—Cafe Noir, Tea.
Blow Lamps—Cigars, "Soft Cured."
Change Cars! Trolley Off!! Link Down!!!
Toasts. Speeches.

President-elect Huntress occupied the chair. An informal toast list included "The Queen," "Our Past-President," "Our Guests," and "The Newly-Elected Officers," each of which brought forth fitting responses. Messrs. N. L. McDonald, C. Mitchell and A. Norman favored the company with songs, and music was discoursed by the Mystic orchestra.

MOONLIGHT SCHEDULE FOR MAY.

Day of Month.	Light.	Extinguish.	No. of Hours.
	H.M.	H.M.	H.M.
1....	P.M. 7.20	A.M. 1.40	6.20
2....	" 7.20	" 2.20	7.00
3....	" 7.20	" 2.50	7.30
4....	" 7.20	" 3.20	8.00
5....	" 7.30	" 3.50	8.20
6....	" 7.30	" 3.50	8.20
7....	" 7.30	" 3.50	8.20
8....	" 7.30	" 3.50	8.20
9....	" 7.30	" 3.50	8.20
10....	" 7.30	" 3.50	8.20
11....	" 7.30	" 3.50	8.20
12....	" 7.30	" 3.50	8.20
13....	" 7.30	" 3.50	8.20
14....	" 10.20	" 3.50	5.30
15....	" 10.50	" 3.40	4.50
16....	" 11.00	" 3.40	4.40
17 ...	" 11.20	" 3.40	4.20
18....	" 11.50	" 3.40	3.50
19....	.....	" 3.40	3.30
20....	A.M. 12.10	.....	
21....	No Light.	No Light.	.....
22....	No Light.	No Light.	.....
23....	No Light.	No Light.	.....
24....	No Light.	No Light.	.....
25....	No Light.	No Light.	.....
26....	P.M. 7.40	P.M. 10.10	2.30
27....	" 7.50	" 11.00	3.10
28....	" 7.50	" 11.40	3.50
29....	" 7.50	A.M. 12.10	4.20
30....	" 7.50	" 12.50	5.00
31....	" 7.50	" 1.00	5.50
		Total.....	155.10

Tenders were recently invited for the supply of an electric light plant for the new municipal buildings, Toronto. The Canadian General Electric Company were the successful tenderers, their price for a 100 k. w. generator being $4,287. The contract for electric wiring was given to the Bennett & Wright Company, at $2,250.

THE ELECTRICAL INDUSTRY IN BRITISH COLUMBIA.

A visitor to Toronto within the past month was Mr. L. A. Campbell, manager of the West Kootenay Power & Light Co., of Rossland, B. C. Mr. Campbell also spent a few days in Montreal, in consultation with some of the directors of his company. Talking with a representative of the ELECTRIAL NEWS, Mr. Campbell stated that many of the mines in British Columbia had lately been closed down for the purpose of increasing their equipment, and that in a short time they would be turning out ore in large quantities. Operations were being carried on day and night, eight hour shifts being employed. He remarked that much electrical apparatus had been installed in British Columbia during the last two years. At Rossland, for instance, motors of a total capacity of 2,600 h.p. were now connected up, the power being used for lighting and hoisting purposes. A 300 h.p. hoist was now in operation at one of the mines, and the owners of the Le Roi purposed putting in one of 500 h.p. The plant of the West Kootenay Power & Light Co., which supplies light and power almost exclusively for mining operations, has been steadily in operation since July last, and Mr. Campbell states that no trouble whatever has been experienced with climatic conditions. The distance from the power station to the sub-station at Rossland is thirty-one miles, but a motor is fed four miles beyond the sub-station, making the entire distance from point of development to end of distribution line thirty-five miles. The line passes through a rough section of country, including many high hills. It was learned that the West Kootenay Power & Light Company are about to install another 2,000 h.p. machine, thus doubling their capacity, this course having been rendered necessary by the steadily increasing demand for power. It is also the purpose of the company to extend their line to the boundary country and Greenwood Camp, seventy-two miles distant from the generating system, for the purpose of supplying power for the different mining properties in that district. In this connection it is interesting to learn that it is contemplated to use a pressure of 34,000 volts, the highest yet attempted in Canada. Mr. Campbell will look over the ground at an early date and report to the directors of the company.

POLE SETTING.

No definite rule can be given for the depth at which poles should be set in the ground. The character of the soil, the distance between poles, the number of wires carried, and the sharpness of the turns made in the line must all be considered in determining this question. For average work we would point out the following table, which we believe to be in accordance with the best practice:

25	foot	pole	5½	feet	in ground.
30	"	"	6	"	"
35	"	"	6	"	"
40	"	"	6	"	"
45	"	"	6½	"	"
50	"	"	6½	"	"
55	"	"	6½	"	"
60	"	"	7	"	"
65	"	"	7	"	"
70	"	"	7½	"	"

Where the ground is bad, or where the conditions are very severe, the holes should be larger than usual, and about six inches of concrete, composed of broken stone, sand and enough cement to bind them together, should be placed in the bottom. The pole should then be put in place and the hole filled in with the same mixture, which should be thoroughly tamped into place.

It sometimes happens that a pole cannot be set deep into the ground on account of some sewer, subway or other obstruction. In such cases the hole should be dug as deep as possible, and considerably larger than would ordinarily be necessary. The pole should then be set in place and its end thoroughly embedded in a mass of stone and cement entirely filling the hole. If the strain is at all severe, the pole should be thoroughly guyed in addition to the above precautions.

Great mistakes are often made in laying out pole lines by introducing unnecessary turns in the line. It should be remembered that where a line is straight the tendency of the wires when properly strung is simply to press the poles deeper into the ground. But where a bend occurs in the line an enormous side strain is present which tends to either break or loosen the pole. The magnitude of these strains can only be appreciated by those who have had actual experience in this work.

In running a line over undulating country it should be borne in mind that the poles in a hollow of the ground should be long and those on elevated positions comparatively short, the object being to avoid very great upward and downward curves in the wire. Where this precaution is neglected it is frequently found that the insulators are pulled off the pins and dangle several feet above the cross-arms, and frequently a short pole in a low position is pulled entirely out of the ground.

The butt of the pole should always be squared before setting.—The Telephone.

THE MEASUREMENT OF HIGH RESISTANCES BY THE WHEATSTONE BRIDGE.

BY A. O. BENECKE.

High resistances are usually measured by the deflection method, as the range and the insulation resistance of the Wheatstone bridge is not sufficient for this purpose.

It is, however, possible to use the Wheatstone bridge method for measuring resistances up to a thousand megohms even with greater accuracy than obtainable by the deflection method by simply measuring the high unknown resistance in multiple to another suitable resistance.

Suppose we have a five dial bridge and a resistance of say about 100,000 ohms. We can measure this resistance on the bridge accurately to single ohms. It may measure A ohms. Now we place the unknown high resistance in multiple and find the combination is balanced by B ohms. Then we have

$$\frac{A.\ x}{A+x} = B, \text{ or } x = \frac{A.\ B}{A-B}$$

In this result a surface leakage of the bridge is eliminated, as it is already contained in A.

In case A = 99988 ohms and
B = 99978 ohms, we find
x = 1,110,722,254 ohms, or
1,1111 megohms.

This method of measuring an unknown resistance in multiple arc to another one will be found also very useful for the measurement of such resistances which otherwise would necessitate the employment of ratio coils widely differing in value. The sensibility of the galvanometer, and therefore the accuracy of the measurements on the bridge, is, as it is well known, the greatest if the four arms of the bridge are of the same resistance, i. e., if the ratio of the proportional coils is 1. If we want to make our measurements under these best conditions the range of a five dial bridge would be limited to 10,000 ohms. For the measurement of 1 megohm, we would have to use the ratio 100 : 1, but measuring the 1 megohm in multiple to 10,000 ohms we still could use the ratio 1 : 1.

MONTREAL

(Correspondence of THE CANADIAN ELECTRICAL NEWS.)

FOOD FOR THOUGHT.

A leaflet entitled "Food for Thought" has come before the notice of your correspondent. It consists of some extracts from remarks made by the Chairman of an Electrical Contractors' Association in an American city. Judging by the figures submitted for electrical work in Montreal, it is equally applicable to this side of the border. For instance, when tenders were opened a few days ago for the wiring of a public building, one tender was $250, another $235, and the third, and needless to say successful tender, was $79. I am credibly informed that the material alone for the work cost the contractor over $100. Let me give you another instance: Four tenders were submitted, $10,000, $9,500, $8,200 and $3,600. The latter tender was, of course, accepted, but the compliers of same found that they had missed a "small item of $6,000," much to their subsequent sorrow. Herewith are given extracts from the leaflet, which I seriously recommend to the electric wiring contractors of Canada:

"I should like to make a few general but not personal remarks before opening for regular business.

A few of the members are old-timers in the business, and I think they will bear me out in some of the statements I am about to make.

I think I can truthfully say that $150,000.00 will not cover the losses in the electrical fraternity, during the past few years, in this city alone.

There was a time when this business was a profitable and pleasant one. What is it now? You may possibly be grubbing out an existence—no more. Undoubtedly some are glad to get that. I am for one. At the rate you are going you will not be able to gather that in, in a very short time.

It is the old story told and re-told—a lesson taught but never learned. It will not take long to tell why we are now at the bottom of the ladder; round by round we have gradually descended. Low prices for material and for work have been the ruination of several in this city, and many in other cities.

The old worn-out saying so familiar to the old-timers, running something like this—"I will do up this and that concern, and soon I will be alone in the field to reap the benefit of my shrewdness." This makes the old-timer smile, for he knows that he has helped bury more than one.

The method adopted by the new-comer to him seems new. It is—as he reasons with himself—I am new on the ground and to get business and a little reputation I will cut the prices. I will do the job at cost.

What does the old-timer do when he sees trade drifting away. He cuts also, only a little more. The student has his war-clothes on and he proposes to show that he is no chump, and he goes one better. Down the ladder you go and the fight goes merrily on. What is gained? Nothing—the prices are down and never to be brought back. What is the next step—some one gets tired, is running behind with his credit, and a bold stab is made. Call on the stockholders, fire the worn-out partner, get a new partner or shut up shop. And the band still plays on. If one concern digs a big hole, crawls in and pulls the hole after him, he is not missed, but he is not forgotten. The warriors left on the field of battle are resting up. Along comes another, green in the business, but seeing fabulous wealth in a business that is still in its infancy, dumps his load of dollars in the hopper, and with the keen scent of a tried and true fighter follows in the steps of the departed.

Same old story that makes us all weary is again gone over and the fittest survives, but badly wounded. After all the wasted years you have laid nothing by: you are poorer in pocket and health, and you are finally carried to your long, last resting-place and the head-stone over your grave should be lettered—A life wasted in the electrical business that future generations can look with reverence on the burial place of one who fought well but not wisely.

Undoubtedly I shall be the first one of members present who will retire from the field, but do not think that my place will not be taken. I will not be missed—but I can rest on my oars and look back at the poor deluded mortals fighting and worrying for their daily bread in a business that has been ruined in its infancy. There is but one more round in the ladder for you to descend and then you are on the last: grip that and thank God that you are alive."

NOTES.

Mr. R. A. Ross, E. E., of this city, has left for a three months' sojourn in China, where he will be in consultation with Sir Charles Ross re electric power transmission in that country.

I note that Prof. Carus-Wilson, recently head of the Electrical Department of McGill University, Montreal, has taken an active part in recent discussions at the Institution of Electrical Engineers in London, Eng.

Mr. W. J. Plews, assistant to Mr. Badger, the expert for the Fire Underwriters Association in this city, has lately got out a form of main switch, or what at sight might erroneously be termed a circuit breaker. He has the article patented in five countries, and is likely to make a good thing out of it, as those who have seen it practically tested speak very highly of it. It opens with excess of voltage, even on one side. It will thus be seen that it is invaluable as a precaution when a transformer breaks down or when a high voltage line of any kind falls across the house mains.

QUESTIONS AND ANSWERS.

"F. B." writes: Will you kindly have the following question answered through the columns of your valuable paper: I have an E. P. Allis 14 x 36 Corliss condensing engine, of which the crank end valve carries (not released) over 5 h.p. before the head end. Card at proper load shows lead, compression, etc., all right. Of course, the crank end doing less work than the head end might cause it on overload to carry over first, but should there be the above difference? Can it be remedied except by changing cams?

ANSWER.—As we understand the question, you wish to know if the difference in the horse power developed at the two ends is greater than it should be. With an engine of this size, the difference is scarcely greater than might be expected, and we do not think there is anything seriously wrong with the engine.

"Re-Winder" writes: In an induction fan motor, can you tell me if a change in frequency would mean more or less copper bars inserted through the squirrel-cage rotor? Am trying the experiment of making 16,000 A. fan work on 8,000 A.

ANSWER.—The "squirrel-cage" rotor would be the same for both frequencies, but we do not think that the change as proposed is commercially practicable. It would cause the motor to heat beyond a safe point, due to the greater magnetic flux which will be necessary, and to the somewhat increased current taken. It will also be found that the speed will be a little less than half of what it should be to give a reasonable breeze.

DIFFERENCE BETWEEN THE NOW AND THEN.

Prof. Elisha Gray delivered an address at a recent convention of the Northwestern Electrical Association at Duluth, entitled "Reminiscences and a Glimpse into the Future," in which he introduced the following verses:

In the olden time along the street,
A glimmering lantern led the feet.
When on a midnight stroll;
But now we catch when night is night,
A piece of lightning from the sky
And stick it on a pole.

Time was when one must hold his ear
Close to the whispering voice to hear,
Like deaf men near and nearer;
But now from town to town he talks,
And puts his nose into a box,
And whispers through a wire.

In other days we took a car,
Drawn by a horse if going far,
And felt that we were blest;
But now the conductor takes the fare
And sticks a broom-stick in the air—
The lightning does the rest.

Just as we go to press we learn of the death of Mr. Donald Gibson, city electrician of Toronto, in his 74th year. Mr. Gibson entered the city service in 1872, and was one of its oldest employees. Under his superintendence the excellent fire alarm service in use was developed, and brought to its present condition.

The Dominion Publishing Company of Toronto have just completed a handsome publication entitled, "Canada from Ocean to Ocean." The work is descriptive of the resources of the various provinces of the Dominion, and is liberally illustrated with many beautiful engravings of the public buildings, leading industrial establishments, etc., throughout Canada. We understand that the publication of this work, which is in every way creditable to the publishers, is approved and assisted by the Dominion and provincial governments, and the leading municipal corporations. It will be placed in the Boards of Trade and public libraries throughout Great Britain and Canada, on the leading steamships, and in other places where it will be likely to prove a valuable advertisement for this country.

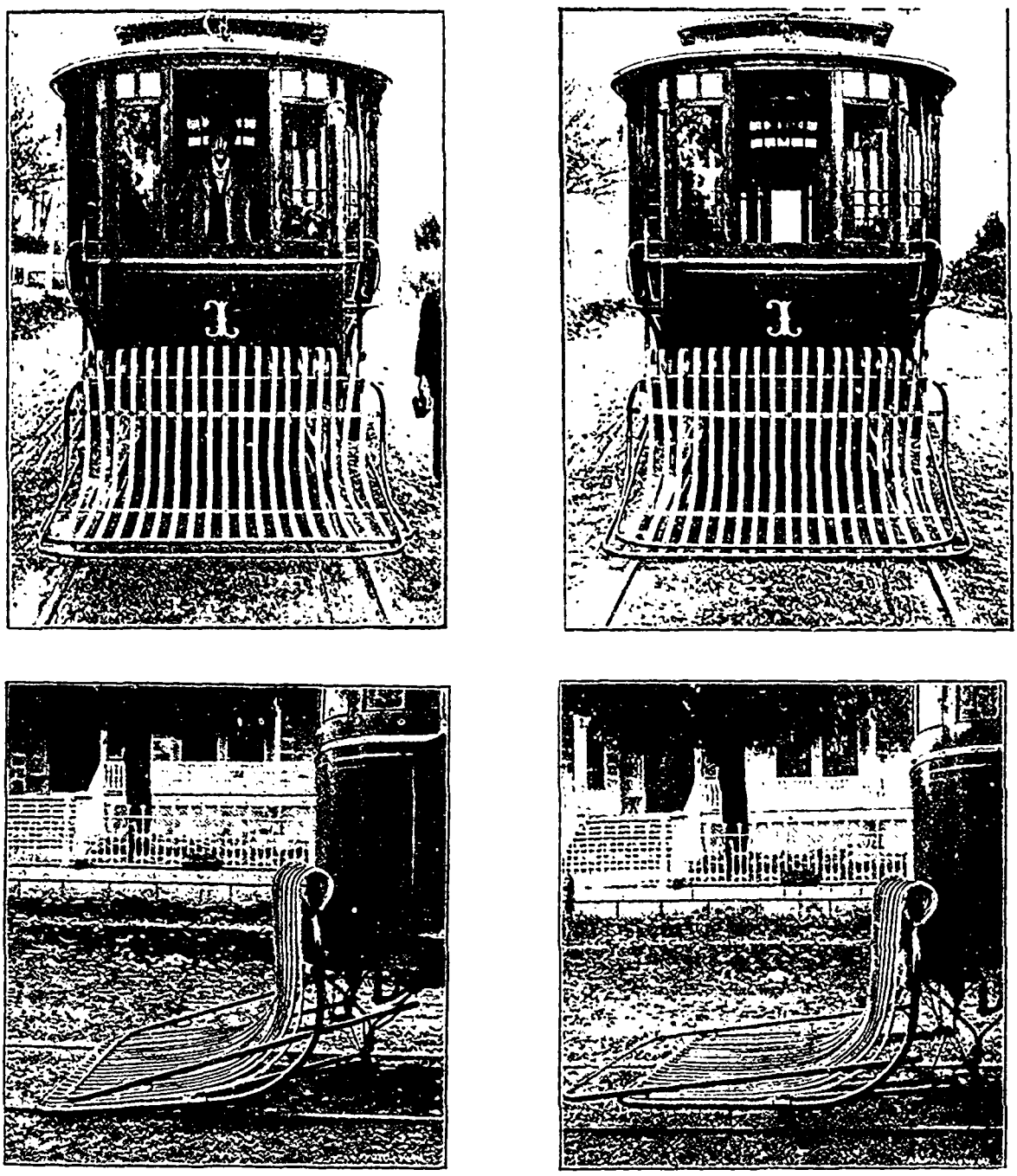
ELECTRIC RAILWAY DEPARTMENT.

AN IMPROVED STREET CAR FENDER.

On this page illustrations are presented of an improved street car fender invented by Mr. Geo. Sleeman, and manufactured by the Geo. Sleeman Fender Co., of Guelph, Ont. From the views shown the reader will clearly understand its construction and operation.

The fender is positively automatic, an advantage which it is claimed to possess over all other fenders in use. In front of the fender is a projecting guard, by which it is rendered automatic. When the fender is carried the usual height from the track, say eight inches, the guard projects about one foot. When this guard comes in contact with any obstacle, it is driven back, and the fender falls quickly to the track, thus preventing the obstacle from being passed over by the car. The fender is always down to the track before the object is reached, the fall being quickened by the tension of two strong spiral springs. By pulling the guard forward when the fender is down, the fender rises to the proper height from the track, where it remains until the guard is again struck.

This fender has been favorably received and commented upon by street railway people. It is used on the cars of the Guelph street railway, has been recommended to the Toronto Street Railway Company by the city engineer, and within the past fortnight the manufacturers have closed a contract to equip with this fender all the cars of the Winnipeg street railway system.



Views of Street Car Fender, Invented and Manufactured by Mr. Geo. Sleeman, Guelph, Ont.

One hundred open cars of new design are being built at the shops of the Montreal Street Railway Co. Besides adding extra cars, the company intend making them longer, with the result that the trailers will gradually become obsolete. This summer the company will build car shops at Hochelaga and also extend the system to Verdun.

CANADIAN ELECTRICAL STUDENTS' COMPETITION.

The publishers of the CANADIAN ELECTRICAL NEWS hereby offer a first and second prize of $15 and $10 respectively for the best thesis submitted by an undergraduate of a Canadian university on any one of the following subjects, viz. :

1. "The Magnetic Circuit of Dynamos."
2. "The Incandescent Electric Lamp."
3. "The Electric Meter."
4. "The Relative Advantages of Low and High Frequency in an Alternating Electric Lighting Plant."
5. "A Concise Description of a Method of Testing Transformers for Efficiency at Various Loads, both as Regards Regulation and Core Loss."
6. "Comparison between Two and Three Phase Installations for the Long Distance Transmission of Power."

It is required that each thesis submitted in this competition shall consist of not less than 5,000 nor more than 6,000 words, and shall be written in the third person, and typewritten for publication on one side only of foolscap paper.

To admit of a fair comparison of the merits of the theses which may be submitted, keeping in view variety of subjects, a system of marks will be employed such as is generally used in college examinations, and with which the competitors in this competition are familiar. These marks will be allotted under three heads, viz. :—

1. Subject Matter.
2. Arrangement.
3. English.

Taking 100 as the combined total, the maximum and minimum marks for each of the above classifications will be as follows :

Maximum.		Minimum.
50	Subject Matter	25
25	Arrangement	15
25	English	15

If any of the theses submiited should not be entitled to receive the minimum of marks as above, they will be entirely rejected.

There are three sources from which competitors must draw their subject matter, viz., books, periodicals and floating literature, personal or private channels. In judging of the subject matter, the following relative values will be attached to the above mentioned sources of information :

(a) Books	10
(b) Periodicals and floating literature	20
(c) Personal or private sources	20
	50

Where extracts are used, their source and names of authors should be clearly given.

Where diagrams are required to illustrate the text, they should be drawn with pen and perfectly black ink on pure white drawing paper, bristol board or tracing linen, and in such manner as to admit of their reproduction to a small scale.

Each thesis shall be submitted by motto only, and shall be accompanied by the name of the author enclosed in a sealed envelope bearing the same motto. This envelope will remain sealed in the hands of the publishers until the competition shall have been decided.

Theses submitted in this competition must reach the C. H. Mortimer Publishing Company of Toronto, Limited, Toronto, Ont., publishers of the ELECTRICAL NEWS, before the first day of October, 1899.

A competent judge has been chosen to decide the competition in accordance with the method explained above. This gentleman, whose name will be given at a later date, will no doubt be acceptable to all concerned.

The result will be published as soon as possible after the close of the competition.

The publishers of the ELECTRICAL NEWS reserve the right to publish such of the theses submitted as in their judgment may appear to be desirable for that purpose.

SPARKS.

The Montreal Street Railway Co. have placed an order with the Canadian General Electric Co. for twenty C.G.E. 1,000 railway motors.

Provincial legislation will be sought to permit towns in Manitoba to install and operate electric light and telephone stations for commercial purposes.

The Canadian General Electric Company have just received an order from the Rubber Tire Wheel Co., of Springfield, Ohio, for a complete tire welding plant.

The Winnipeg Street Railway Co. have placed another order with the Canadian General Electric Co. for 18 of their standard C.G.E. 1,000 railway motors.

The amalgamation is announced of the Lakefield electric lighting plant and the Burleigh Falls-Lindsay electric power scheme, the promoter of which is Mr. J. A. Culverwell, of Toronto.

The Canadian General Electric Co. have received another additional order from the Montreal Cotton Co., of Valleyfield, Que., for one 200 h.p. and one 100 h.p. induction motors, also for one 20 h.p. motor of the inverted type.

The Royal Electric Company are installing in the works of the Hamilton Bridge Company one of their 40 h.p. two phase induction motors for operating the cranes and machinery. The works are also being lighted throughout by electricity.

The Toronto Electric Light Co. has entered an appeal in the Court of Appeal against the decision of the jury in the recent Civil Assizes awarding W. G. Harris $10,000 for a fire in his factory, alleged to have been due to a defective electric wire.

The Lachine Rapids Hydraulic & Land Co., of Montreal, have, during the past 30 days, ordered from the Canadian General Electric Co. induction motors of the following sizes: one 100 horse power, four 5 horse power, two 3 horse power, and two 2 horse power.

The Lunenburg Gas Co., of Lunenburg, N.S., through their manager, Mr. E. L. Nash, are now offering to supply the inhabitants of Lunenburg and Mahone Bay with electric lights. As soon as their new power works at Mahone are completed, they will supply an all night service.

The British America Corporation, who control the Le Roi and other valuable mining properties at Rossland, B. C., have decided to equip these electrically for power and hoisting purposes, and have ordered four 150 h.p. special three-phase induction motors and controllers from the Canadian General Electric Co.

In connection with the Y.M.C.A., Montreal, an electrical society has been formed, with Professor L. A. Herdt, of McGill College, as teacher. The new society will hold monthly meetings during the summer for discussion, excursions and visits to electrical plants. Professor Herdt is president, and Mr. James C. Bray secretary-treasurer.

To close out the estate of the Eastern Townships Light, Power & Carbide Company, of Sherbrooke, Que., tenders were recently invited by John J. Griffith, liquidator, for the entire electric plant of the system at present supplying electric light to the villages of North Chatley, Eustis, Capelton, Waterville, Compton and Lennoxville.

The Grand Trunk Railway Company have decided to extend their electric system in order to furnish light and power to their new freight sheds, as well as their present repair shops. For this purpose they have placed an order with the Canadian General Electric Co. for two 500 light direct curennt multipolar dynamos, complete with marble panel switchboards.

The Gurney-Tilden Company, of Hamilton, are having installed in their works, by the Royal Electric Company, one 50 h.p., three 15 h.p. and one 7 h.p. "S.K.C." two-phase motors, which are to drive the machinery and elevators in their entire works, entirely replacing steam. At this rate Hamilton will soon be a smokeless city, as the Hamilton Electric Light & Power Co. were closed down on March 5th, and have not been in operation since, everything being driven by the large S.K.C. motors with power from DeCew Falls.

The Water Commissioners of the town of Fort William, Ont., have purchased from the Royal Electric Company an additional S.K.C. two phase generator having a capacity of 200 kilowatts. Their lighting has increased so rapidly that the 75 kilowatt plant which was put in a year ago was not sufficiently large to supply the demand. They are also relamping a portion of the city and extending their lights. About 500 lights capacity of S.K.C. transformers are being put in. The changes will be made and the additional plant in operation about the middle of June, after which it is proposed to supply the requirements of the C. P. R. in their large passenger station, elevators, freight sheds, round houses, and the Kamanistiquia hotel. The growth of the lighting has been phenomenal, and has been taken care of by Mr. T. Ed. Oakley, secretary to the commissioners. The waterworks and electric light plant are in charge of superintendent W. H. Smith, formerly of Goderich, Ont.

PERSONAL.

Mr. Matthew Stanley, of Perth, Ont., has received the appointment of superintendent of the street car shops of the Birmingham, England, tramway. This system is operated by a Canadian syndicate, Messrs. Wm. Mackenzie and James Ross being the chief members.

Mr. L. J. Breithaupt, manager of the Berlin Gas and Electric Co., has been chosen as the Liberal candidate to contest the riding of North Waterloo in the coming bye-election. The seat was made vacant through the unseating of the successful Conservative candidate, Dr. Lackner, of Berlin.

Mr. D. R. Logan, who was for several years connected with the Canadian General Electric Company and the W. A. Johnson Electric Company, has accepted a position with Mr. John Forman, dealer in electrical supplies, Montreal. Mr. Logan will act as travelling representative for Mr. Forman in Western Ontario, with headquarters in Toronto.

Mr. W. B. Chapman, who is interested in electrical enterprises in the West India Islands, returned to Montreal last month, after spending the winter in these British possessions. In Jamaica Mr. Chapman met Lieut. Col. Henshaw and Mr. W. Porteous, of Montreal, who are interested in the tramway system. Mr. Chapman states that upon his arrival in Kingston, the work on the electric tramway was well advanced, and that the citizens were delighted with the work the Canadian syndicate had done. The Kingston electric tramway is about twenty miles in length and twenty-eight cars are operated.

SPARKS.

The Canadian General Electric Co. have sold the West Kootenay Power & Light Co., of Rossland, B. C., one of their standard 50 h.p. three-phase induction motors.

The Guelph Light & Power Co. have placed an order with the Canadian General Electric Co. for one of their latest multipolar type 500 volt generators of 100 horse power capacity.

The Columbia Telephone & Telegraph Co., an American concern, will apply to the Dominion parliament for a charter to extend its system to all parts of British Columbia and the Northwest Territories.

The Metropolitan Electric Co. has been granted a charter for twenty-three years by the city council of Ottawa, Ont., for the supply of electricity for light and power purposes. The Deschenes Electric Co. have renewed their application for a charter, but the city council does not seem to be disposed to favorably consider it.

The John McPherson Company, Limited, manufacturers of boots and shoes, Hamilton, Ont., have placed their order for a 40 h.p. S.K.C. two-phase induction motor, which is to be used to operate their entire plant, replacing their present steam equipment. They are also having their factory lighted throughout by electricity.

The Cataract Power Co. have made a proposition to light the streets of Hamilton for ten years at the following prices: For the first 425 arc lights, $85 per lamp per year, and any additional lamps, up to 500, for $82.50 a year. If over 500 lamps are required at any time during the contract, the rate will be $82.50 for the first 500 light, and $80 for each additional lamp.

Mr. W. H. Kent, superintendent of the Vernon & Nelson Telephone Co. and the New Westminster & Berrard Inlet Telephone Co., states that important improvements to the system have been decided upon. An additional wire will be erected between New Westminster and Vancouver, and the old instruments replaced with more modern ones. A local exchange will be established at Greenwood City.

The Bell Telephone Co. is establishing a number of pay stations in Montreal on the nickel-in-the-slot principle. The instruments will be placed in drug stores, but the system will be distinct from the ordinary telephone in the store. The person who desires to use the instrument will call up central, but connection will not be made until five cents has been deposited in the slot.

The Lachine Rapids Hydraulic & Land Co. believe that the stealing of electricity is carried on to some extent in Montreal. In one instance, it is said to have been discovered that a saloon keeper who paid for about five lights had some twenty-five more put into his place, supplied by connections unknown to the company. Steps are being taken to prevent this practice. Under the new law of the State of Illinois, a conviction was recently obtained in Chicago by the Chicago Edison Co. Practical demonstrations of the use and measurement of electricity were given in court at the trial. Wires were connected on the witness stand with the electric wires of the building and apparatus attached. Expert electricians illustrated the art of "plugging," "cutting off," and "cutting in." The "cutting in" of the criminal court building wires and the flashing of a light full of force and brilliancy was considered a particularly apt and convincing illustration of how electricity might be stolen. The penalty in Illinois for thefts of this nature is a term of not more than three months in all and a fine not exceeding $500.

The town of Picton, Ont., opened tenders recently for additions to its electric lighting plant. The tenderers for alternators were the Central Construction Co., Buffalo; Canadian General Electric Co., Toronto; Royal Electric Co., Montreal; Munderloh & Co., Montreal; and Westinghouse Electric & Manufacturing Co., Pittsburg. For steam boilers the tenderers were E. A. Wallberg, Montreal; Robb Engineering Co., Amherst, N.S.; Babcock & Wilcox Co., Montreal; Goldie & McCulloch Co., Galt; and Central Construction Co., Buffalo. The tenderers on steam engines were the Goldie & McCulloch Co., Robb Engineering Co., and Central Construction Co. The Northey Manufacturing Co., Central Construction Co., Robb Engineering Co., and Goldie & McCulloch Co. tendered on pumps and condensers. For the supply of the complete equipment the only tenderers were the Canadian General Electric Co. and the Central Construction Co. The consulting engineer, Mr. Roderick J. Parke, of Toronto, has made a report to council, but the contracts will not be awarded until the by-law has been sanctioned by the ratepayers. A vote is likely to be taken early in June.

SPARKS.

The Bell Telephone Co. will probably put in a metallic circuit at Orillia, at a cost of about $7,000.

The formal opening of the new electric light plant at the Mimico Industrial School, near Toronto, took place a few weeks ago.

The Bell Telephone Co. will build a new copper metallic line between Arnprior and Ottawa. Work will be commenced immediately.

The Canadian General Electric Co. have received an order from the Strathroy Electric Company for a 25 kilowatt 500 volt generator of their latest type.

The E. T. Wright Company, of Hamilton, manufacturers of tin and stamped ware, are having their steam engine replaced by a 30 h.p. S.K.C. two-phase motor, receiving its current from the lines of the Cataract Power Company.

The road masters of the Toronto Railway Company recently tendered a complimentary banquet to their superintendent, Mr. Gunn, at McConkey's restaurant. Mr. Gunn has been associated with the Street Railway Company for over thirty years.

Capt. G. H. Couverette, of Montreal, has patented an electric grain shovel, to be worked in connection with the floating elevators now in use in Montreal harbor. By the use of this shovel it is claimed that grain can be trans-shipped in less than half the time it has taken heretofore.

Incorporation has been granted to the Smart-Eby Machine Co., Limited, of Hamilton, Ont., to carry on business as iron founders and manufacturers of engines, boilers, pumps and other machinery. Mr. W. C. G. Smart, one of the company, was recently associated with the Jenckes Machine Company.

A canal boat propelled by electricity has been invented by Mr. H. L. Welsh, of Cowansville, Que. It is claimed that the boat will do away with the necessity for locks. At a recent meeting of the Amalgamated Hudson Canal Association, it was decided to offer a prize for a practical canal boat propelled by electric power, and Mr. Welsh hopes to obtain the prize.

Mr. Frank A. Cote, of the firm of Cote & Courselles, electricians, Ottawa, has invented a new lightning arrester which he claims will greatly minimize interruptions of telephone service caused by wires coming in contact with those of stronger currents, and also prevent overheated wires from setting fire to buildings. Mr. Cote's invention was tested recently in the presence of experts of the Bell Telephone Co., and is said to have proved successful, the strongest currents being intercepted.

The record for long distance telegraphing is claimed to have been broken by the Associated Press on its regular system of wires leased from the Western Union Telegraph Company. A continuous circuit of six thousand miles, reaching from New York city to the Pacific coast, and from Chicago to New Orleans, was successfully worked for several hours. There were forty-one operators copying from a sender in New York, with 41 newspapers being served directly from this one circuit in thirty-eight of the leading cities of the United States.

The owners of the Wellington Extension Mine at Oyster Bay, B.C., have let a contract to Geo. C. Hinton & Co., of Vancouver, for a complete tramway and electric light system, the cost of which will be about $100,000. The electric tram lines will be about five miles in length, operated by two 150 h.p. generators, direct connected to two automatic high speed horizontal engines of same capacity. The contract also includes two standing mining locomotives of 100 tons capacity and the electric lighting of the entire mine. Messrs. Hinton & Co. will complete the contract this summer.

An English contemporary is responsible for the following: Everything industrial in Germany, as is well known, is carefully inspected and supervised by the authorities, but the education of these gentlemen is not always up to the average of that of their fellow-countrymen, as the following story shows. The other day a government official inspected an iron foundry, and remarked in his report to his superior that there was no incrustation in the boilers at the works. Upon which the superior, in evident disgust at what he considered a want of enterprise on the iron founder's part, at once issued the peremptory order: "The deficient incrustation of the boilers at this factory is to be remedied forthwith."

The West Kootenay Power & Light Co., of Rossland, B.C., have, in order to meet the demands for power, found it necessary to increase their generating plant at Bonnington Falls to double its present capacity. This company commenced furnishing power to its customers a little over one year ago, and to-day have their two 1,000 h.p. generators loaded to their fullest capacity. This speaks well for the management of the company, who deserve to be congratulated on the success of a venture such as they have undertaken in transmitting electric energy successfully over a distance of nearly 40 miles. They installed originally two 1,000 h.p. three-phase revolving field generators of the Canadian General Electric Company's type, and have recently placed an order with the same company for one 2,000 h.p. machine of the same type, together with marble panels, switchboard, etc. They have also ordered from the Canadian General Electric Co. 3,000 kilowatt capacity in high potential step-up and step-down transformers.

The city council of Winnipeg, Man., recently invited tenders for the installation of a system of arc lighting. The by-law having been carried by the ratepayers on April 6th, it is proposed to proceed at once with the installation of the plant. For the supply of two 100 light 2000 c.p. arc dynamos, a marble switchboard, and necessary instruments for double the number of circuits at present required, including station wiring, the tender of the Western Electric Co., of Chicago, at $5,320, has been accepted. This company will also supply 220 single carbon arc lamps for $4,532, and extra globes at $7.80 per dozen delivered. The Polson Iron Works Co., of Toronto, will furnish two compound cross condensing engines, at the price of $7,800. The tenderers for electric plant were: Western Electric Co., Chicago; Canadian General Electric Co., Toronto; Royal Electric Co., Montreal; and United Electric Co., Toronto. For engines the tenderers were: Polson Co., Toronto; Goldie & McCulloch Co., Galt; John Inglis & Sons, Toronto; and Robb Engineering Co., Amherst.

TRADE NOTES.

The Royal Electric Company are installing in the premises of the Hudsons Bay Company at Winnipeg a complete electric lighting plant.

The Montreal Island Belt Line Railway Company, of Montreal, have purchased four additional C.G.E. 1000 railway motors from the Canadian General Electric Company.

The Hamilton Brass Mfg. Company, of Hamilton, are installing in their factory, a 30 h.p. S.K.C. induction motor to drive their shafting. They are also being lit throughout by electricity.

The British Columbia Sugar Refining Company, of Vancouver, B. C., are increasing their lighting plant, and have purchased another 500 light multipolar dynamo from the Canadian General Electric Company.

The Cataract Power Company, of Hamilton, are installing in the premises of the Norton Mfg. Company, three 15 h.p. and one 20 h.p. S.K.C. induction motors to operate the entire factory by electricity.

The Canadian Pacific Railway Company have just placed an order with the Canadian General Electric Company for one 75 h.p. induction motor, and one 75 h.p. synchronous motor which are to be used at their smelter at Trail, B. C.

The Dowswell Mfg. Co., of Hamilton, Ont., are having installed in their works one 30 h.p. two-phase motor of the Royal Electric Company's make. The current for this installation is to be taken from the Cataract Power Company's service.

The B. Greening Wire Co., of Hamilton, Ont., had installed in their works about three months ago, a 40 h.p. S.K.C. two-phase motor by the Royal Electric Co. They receive their current from the Cataract Power Co. This has worked so satisfactorily that they have placed an additional order for one 50 h.p., one 30 h.p. and one 20 h.p. motors of the same type, to operate their entire works by electricity.

The ELECTRICAL NEWS acknowledges receipt of the annual report issued by the Engineering Society of the School of Practical Science, Toronto. Among the papers of interest to the electrical and steam engineering fraternity are the following: "Modern Systems of Interior Wiring," by L. B. Chubbuck; "Construction of the Cataract Power Company's Plant at Decew Falls," by W. Hemphill; "The High Pressure Steam Boiler," by E. Richards.

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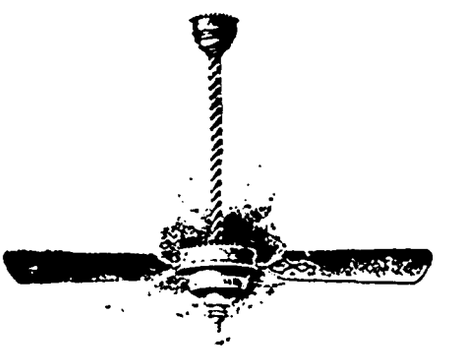

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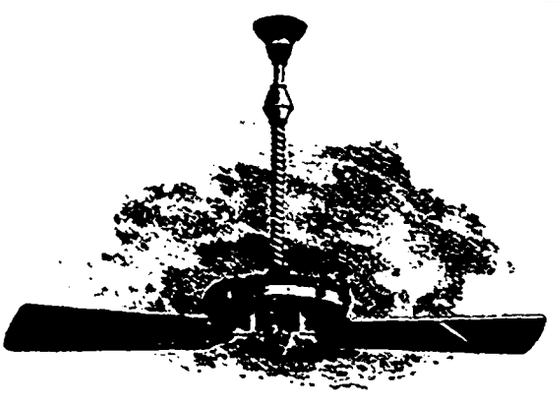

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SPARKS.

Arrangements are being made for installing an electric plant for lighting the village of Columbia, B. C.

The Palmerston, Ont., Electric Light Co. has entered into a five years contract with the town for street lighting.

The Parry Sound Copper Mining Co. propose to erect at Parry Sound a factory for the manufacture of copper wire.

The Almonte town council have asked the electric light company to sell their plant to the town. The company, it is said, ask $20,000.

Mr. R. A. L. Gray, of Toronto, is the successful tenderer for electric wiring of the Presbyterian church to be built at Oshawa, Ont.

The tender of the Electrical Construction Co., London, has been accepted for supplying an electric light plant for the Jubilee Hospital in that city. Two dynamos and two engines will be put in.

McColl Bros. will supply the engine oil for the Works Department of Toronto, at 40 cents per imperial gallon. The Royal Oil Co. will supply extra cylinder oil at 45 cents, and boiler purger at 35 cents.

The town of Galt, Ont., invites tenders up to May 10th for the installation of an arc and incandescent lighting system. Particulars may be obtained from Mr. J. H. Scott, Chairman Fire and Light Committee.

The City of Ottawa, Ont., invites tenders up to May 16th for furnishing water turbines and pumps for waterworks plant, to be so arranged, if preferred, that auxiliary electric motors may be attached at a latter date.

The [redacted] purchased four Babcock & Wilcox boilers [redacted] works plant, at the price of $14,952. A contract [redacted] given to John Macdougall & Co., of Montreal, for a [redacted] pumping engine, at the price of $89,080.

The Chicago Mica Co., through its president, Mr. Milton A. Snyder, has placed a trial order for mica with Blackburn Bros., of Perkins' Mills, near Ottawa. This company, which has a capital of $10,000,000, will probably invest extensively in the mica mines of the Ottawa vicinity.

The town of Barrie, Ont., through its consulting engineer, Mr. Roderick J. Parke, of Toronto, invites tenders up to May 17th for the supply of low speed 125 h.p. steam engine, two 125 h.p. steam boilers, two independent condensers, one duplex feed steam pump and necessary piping and connections.

A deal has recently been closed by the Shawinagin Water & Power Co., of Montreal, which will enable the company to proceed with the development of the water power at Shawinigan, near Three Rivers, Quebec. Reference to this proposed scheme was made in our March issue. The contract for the construction of canals, bulkheads, foundations for power houses, etc., has been given to the Warren-Scharff Company, at a price in the vicinity of $300,000.

A company, in which Canadian capitalists are interested, has been incorporated in New Jersey for the manufacture of automobiles under the patents of Mr. C. E. Woods. The company, known as the Woods Motor Vechicle Co., is capitalized at $10,000,000, and will establish two factories in Chicago. Mr. Frederick Nicholls, of the Canadian General Electric Co., is vice-president, and Mr. H. P. Dwight, president of the Great North Western Telegraph Co., one of the directors.

The Ogilvie Milling Co., of Winnipeg, Man., have invited tenders for furnishing a 1,200 h.p. engine for their mill.

Tenders are invited up to Thursday, June 15th, for lighting the town of Petrolia, Ont., by electricity. The present contract expires at the end of this year.

Mr. M. Martin has asked the town council of Wallaceburg, Ont., for an electric lighting franchise, but as yet his request has not been granted.

Telephone Girl "You must never swear over the telephone, sir!"

Indignant Voice (at other end of wire) "I'm not swearing over it. I'm swearing at it!

Mr. B. F. Reesor, manager of the Lindsay Light, Heat & Power Co., states that his company is negotiating with the Peterboro Light and Power Co. for power to operate their plant in Lindsay.

Incorporation has been granted to the Standard Mica Co., of Toronto, Limited, with a capital of $90,000. The promoters are H. A. Clarke, Ewan Mackenzie, and E. W. Klotz, of Toronto, E. I. Sifton, of London, and Charles M. Clarke, of Cape Vincent.

The Ottawa Electric Light Co. have made an offer to the city to dispose of their plant business and good will to the corporation at par. The stock amounts to about $1,000,000. The company agree to hold this offer open for one year, on condition that no other lighting franchise is given during that time.

At the forthcoming exhibition in London, Eng., fourteen commercial efficiency tests of motor cars will be made. The distance will vary from twenty-five miles to seventy miles per day. The trials will be for vans carrying from 15 cwt. to three tons, and pleasure and other carriages carrying from four to sixteen passengers, with prizes for the longest run without stopping for adjustment or fuel.

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