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Montreal, Que.
JUNE 28th, 29th and 30th, 1898

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VOL. VIII. JUNE, 1898 No. 6.

INSPECTION OF THE CATARACT POWER COMPANY'S WORKS.

MUCH interest has been taken in the scheme of the Cataract Power Company to transmit electric energy from St. Catharines to Hamilton, owing to the fact that it is the first attempt in Canada to transmit current a distance of 35 miles. Such an undertaking naturally embodies many interesting engineering features, and difficulties must be overcome which had not heretofore been met with. The promoters of the above company are Hon. J. M. Gibson, James Dixon, John Moodie, J. W. Sutherland, John Patterson and E. B. Patterson, all of Hamilton, the latter being the originator of the project. It is to these gentlemen that credit is due for the enterprise and courage shown in financing the undertaking.

With the object of witnessing the progress that had been made a representative of the ELECTRICAL NEWS

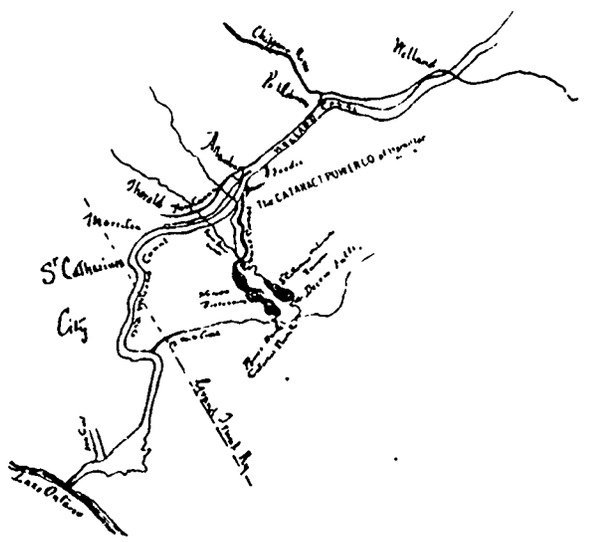


DIAGRAM SHOWING SOURCE OF SUPPLY AND PROPOSED CANAL - CATARACT POWER COMPANY'S WORKS.

recently visited the works, now in course of construction, and found that within one month the entire project will probably be completed.

To give an understanding of the scheme, it should be said that the company propose to obtain the water supply from the old Welland canal at Allanburg, and carry it by means of an artificial channel four and one-half miles in length to the brow of the mountain overlooking Twelve-Mile Creek, just east of DeCew Falls, and about two miles from St. Catharines. From the escarpment of the hill the water will be led down the face of the cliff by a huge steel pipe, the fall being 275 feet. At the foot of the hill will be located the power house, where the current will be generated and transmitted to the transformer station at Hamilton for distribution for lighting and power purposes.

Returning to the source of supply, it is scarcely necessary to explain that the Welland canal was constructed about forty years ago for the purposes of navigation, connecting Lake Ontario with Lake Erie, and being about twenty-seven miles in length. In less than twenty years afterwards it was found to be too narrow for the large vessels then sailing the lakes, and a new

FIG. 1. CATARACT POWER COMPANY HEAD GATES.

canal was built for the greater portion of the distance, joining the old canal near the village of Allanburg. It is almost at this junction that the canal is tapped to permit of the water being utilized for the generation of electricity, which in turn provides the motive power for industries in a city nearly forty miles distant. It will be seen that a constant supply of water is assured.

At the intake we find constructed the necessary head gates, of which there are two. These are shown in Fig. 1. From the head gates the water is conducted through an artificial channel or canal, as before stated, the first section of this work being also shown in Fig. 1. Work on this canal was commenced in November last, but had to be suspended during the winter months, as it was found impossible to make the banks watertight owing to the frost. Proceeding along the canal, we find some 200 men, with teams, engaged in construc-

FIG. 2.—AQUEDUCT OVER BEAVER DAM CREEK.

tion, filling in and excavating. Incidentally, it might be mentioned that the work has proved a boon to the farmers in the vicinity, who, besides selling at a good price the land necessary for right of way, are reaping additional benefit in the way of employment. The building of the canal necessitated the removal of immense quantities of earth, the required excavating

being about equal to the filling in. The heaviest cut was about 18 feet. For a distance of two miles from the intake the canal is now practically completed. Coming to the Beaver Dam creek at Miller's farm, about two miles from Allanburg, we observe a large aqueduct nearing completion for the purpose of carrying the water across the creek (see Fig 2). This is a wooden flume, 600 feet in length, 450 feet in the clear, inside diameter 8 × 8 feet, and supported by a steel truss. The top of the flume is two feet below the level of the canal, thus ensuring a constant pressure.

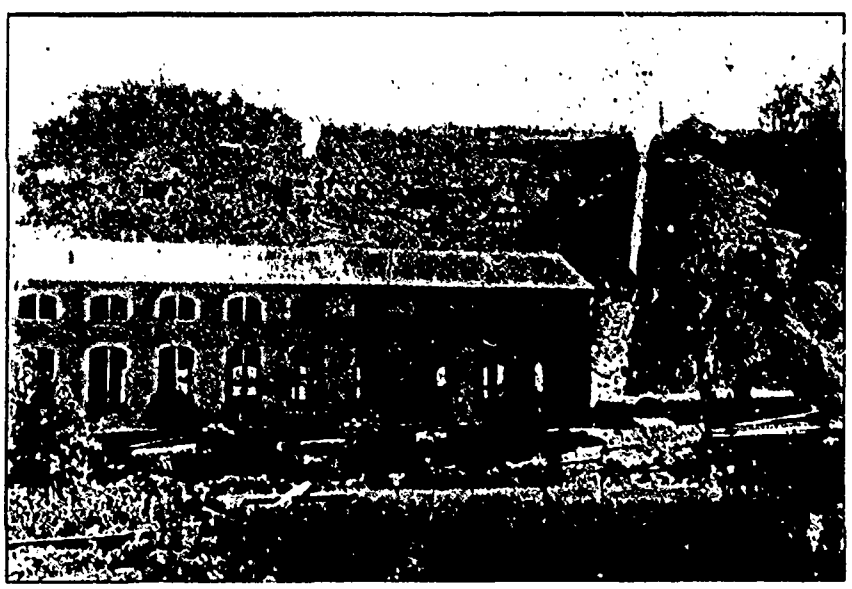


FIG. 3. CATARACT POWER COMPANY—POWER HOUSE AND PIPE LINE.

From this flume to the brow of the mountain there is considerable work yet to be completed, and numerous small bridges are in course of construction. It is the intention to have three large storage basins, one of which is completed. These will contain sufficient water for two days' operation, and will remove the danger from frazil, or small particles of ice getting into the water wheels. There will also be built, at the brow of the mountain, a concrete wall 600 feet in length and 15 feet high.

At this point we reach the most interesting portion of the work. After cutting away the bush for several hundred feet in width, a cutting 38 feet deep and 14 feet wide was made in the rock at the top of the bank, in which will be placed the pipe line. This is shown in Fig. 3, but the correct impression can only be gained by remembering that the distance from the top of the mountain to the base of the power house is 900 feet, and the fall in that distance about 275 feet. This gives a head nearly double that of Niagara Falls, and a pressure of 135 pounds to the square inch.

The construction of the pipe line is very interesting. The heel is about two-thirds of the way down, and is shown in Fig. 4. Only a portion of the pipe is yet in position, but it is all on the ground ready to be placed. The foundation for the pipe line is made of stone, with a pier and drain every 12 feet. At the commencement the pipe is three-eighths of an inch in thickness, gradually increasing to one inch. It is a circular steel tube, 900 feet in length, the first section being 9 feet in diameter, then 8 ft. 6 in., 8 ft., and 7 ft. 6 in. to end. It was rolled and put together by the Hamilton Bridge Company, and is a creditable piece of work.

The power house is located on the south bank of the Twelve-Mile creek, into which the water will discharge direct, the points of discharge being shown in Fig. 3. Workmen are still engaged on construction, although the exterior presents a completed appearance. It is 175 × 40 feet, the walls 30 feet in height, the framework being of steel filled in with brick. The roof is covered with lap seam metal. The floor is of concrete three inches thick, but where the generators and turbines will be located it will be laid to a depth of 12 feet. It is intended to finish the interior of the power house in white. No machinery has as yet been installed except a large travelling crane capable of carrying up to 20 tons. The generators, of which there will be four, will be located on the north side, as well as two exciters. The dynamos will, it is said, weigh 67 tons each. All the electrical apparatus, including dynamos, transformers, etc., is now nearing completion at the works of the Royal Electric Company, Montreal.

The water wheels have been manufactured by the the Stilwell-Bierce and Smith-Vaile Company, of Dayton, Ohio, and will be placed in position at once. They are necessarily of special design, with steel fly wheels weighing 7½ tons each, the total weight of case and turbine being 30 tons. The current will be generated at the power house at 22,500 volts, and transmitted to the transformer station at Hamilton, where it will be reduced by step-down transformers to 2,500 volts.

FIG. 4.—CATARACT POWER COMPANY—PIPE LINE, SHOWING HEEL.

The pole line has been completed for a distance of about 25 miles. Cedar poles 35 feet long are being used, with heavy cross arm, and Locust wood pins, boiled in linseed oil to increase their lasting and insulating qualities. There is a neat angle iron brace on the poles, making a remarkably solid job. The insulators,

which are porcelain, are tested at an enormous pressure before being placed on the line. The line consists of 4 separate strands of No. 4 B. & G. guage copper wire. The poles are placed 90 feet apart, thus necessitating the use of about 2,000.

The transformer station at Hamilton is also nearing completion. It is 50 × 100 feet, and of similar construction to the power house.

The completed work will cost in the neighborhood of $600,000. Messrs. Angus McDonald & Co., of Thorold, Ont., are the contractors for the canal, head gates, etc.; the Royal Electric Co., of Montreal, will supply the electric machinery; Messrs. Lowe & Farrell, of Hamilton, the pole line, with Mr. Woodman in charge of construction. Mr. H. R. Leyden, late of the Royal Electric Co., is general manager of the company; Mr. Wm. Kennedy, of Montreal, hydraulic engineer; Mr. T. E. Hillman, engineer in charge; and Mr. C. W. Moody, superintendent of construction of pipe line and power house.

The company expect to transmit power regularly to Hamilton before the close of July. In a later issue we expect to give a more detailed description of this interesting engineering work.

MR. F. C. ARMSTRONG.

Mr. F. C. Armstrong, general agent of the Canadian General Electric Co., has resigned from the staff of that company, having accepted an appointment to fill a similar position in connection with the electrical department of Dick, Kerr & Co., Limited, the well-known engineering and contracting firm of London, England.

Mr. Armstrong, who is well known in his official capacity to the electrical fraternity throughout the Dominion, is a Canadian by birth, and was educated under Dr. Tassie at Peterboro', Ont., and at Toronto University.

Mr. F. C. Armstrong.

He engaged in electrical work after leaving the University in 1889, and spent three years in those pioneer days of the industry in construction and engineering work.

Since 1892 he has been identified with the Canadian General Electric Co., and in the important position which he has filled has obtained a wide experience in electrical engineering and business matters, which should be of the greatest service to him in his new and more extended field.

Mr. Armstrong's departure will be felt as a loss by the members of the Canadian Electrical Association, to the success of which he has largely contributed by the preparation of serviceable papers, and as a member of the Executive Committee.

TO READERS.

This number of the ELECTRICAL NEWS contains the announcements of a large number of the leading manufacturers of electrical and steam engineering apparatus and supplies. Our readers are asked to peruse carefully the advertising pages, and when in need of goods of the character mentioned, to communicate with advertisers, mentioning their advertisements in this journal. This will be appreciated both by advertisers and the publisher.

THE MOOTED WIRELESS TELEGRAPHS.

By D. H. Keeley, M.I.E.E., A.M. Can. Soc.C.E.

A study of the published accounts of investigations made in the field of wireless telegraphy perhaps reasonably leads one to the conclusion that the different systems are after all identical in principle and dependent for their operation upon the effects purely and solely of electro-magnetic induction. Once this conclusion is arrived at, one might well pause to question the reasonableness of great expectations from such means of communicating actuating influences between points more or less widely separated.

It will perhaps serve a useful purpose to go over the ground from the writer's point of view, because, if it be not altogether incorrect, it may occasion some fresh arguments, and thus help to put the subject on a yet broader basis for treatment.

CURRENT INDUCTION, PURE AND SIMPLE.

To start from the beginning: Faraday's researches produced the induction coil, that in its more efficient form takes the shape of our modern transformer. The primary and secondary coils are wound on a common core, or, in the absence of a core, are in such juxtaposition that the lines of force begotten by one coil pass through and embrace the other. The effect of a pulsation of E.M.F. through either is the momentary creation of a magnetic field, which in its rise and subsidence produces in the other coil precisely the same effect as would the momentary insertion into and withdrawal from it of a permanent magnet of the same power. That being so, it follows that if the coils are axially separated a given distance—thus permitting some of the lines of force created by the primary to complete their circuit short of the secondary there is producible in the latter the effect of the introduction and withdrawal of a magnet of such reduced strength as is represented by the rest of the lines of force that are projected through and embrace it.

It seems this transmitted influence is subject to the same law as that governing the transmission of light, the intensity being inversely as the square of the distance from the source, so that, if at a given distance a certain effect is produced, it calls for four times the power at the source to produce the same effect at twice the distance, and sixteen times the power at the source to produce the same effect at four times the distance, and so on. It is then readily conceivable that to produce a measurable effect at a very considerable distance, the energy required to be applied to the primary must be enormous. Then, too, the greater distance we put between the coils the more nearly equi-distant they become, comparatively, between all their parts; and in the absence of an actual core conducting the lines of force, some of these latter will pass outside the distant coil and neutralize a corresponding number passing within.

Obviously the simplest way to meet this condition is to enlarge the diameter of the coils, so as to preserve a distinctive difference between the distances at which the respective sides of the two coils stand in relation to each other. Equally obvious, however, this expedient has but narrow limitations.

An experiment in this direction, perhaps on the largest scale ever attempted, is given an account of by Mr. C. A. Stevenson in The Electrician, London, August 3, 1894, Vol. XXXIII, P. 388. It was proposed to establish communication between North Unst light-house, off the coast of Scotland, and the mainland—a distance across the water of one-half mile and apparatus was got up to demonstrate what was required. Two huge coils "of nine turns of No. 8 iron wire in each coil, the coils being 200 yards in diameter," and presenting a resistance of 24 ohms, were laid down somewhere between Glasgow and Edinburgh at a distance apart of 850 yards. The applied current varied from one-half to one ampere, and signals (received in a telephone) were transmitted satisfactorily, the effect being of course better as the strength of the current was increased.

In experiments such as these, the practice has been to apply a rapidly alternating current to the primary coil, which produces in the distant secondary coil currents of sufficient strength to cause in a telephone included in its circuit a humming sound that can, by means of a key at the sending end, be set up and stopped at will, thus affording the elements of the Morse code, whereby the telegraphing is accomplished.

The unwieldiness of such apparatus as this, as well as the limitations of its application, made it manifest that something further must be accomplished before wireless telegraphy could be regarded as on the way to practical achievement.

HERTZ WAVES.

Was there anything left unconsidered in working the idea up to the stage arrived at in the foregoing?

We can best look into this question by returning to a considera-

tion of first principles. Let us first consider one of the coils—simply a wire wound in many convolutions. In early text-books it was called a MULTIPLIER—a multiplier of the effect that was referable to the employment of a single convolution. Let us take then a single convolution. If through this single turn of wire we pass a current of 10 amperes, we have 10 ampere turns; and since M.M.F. is proportional to ampere turns, we will by this single convolution be enabled to produce an electro-magnetic effect equal to that of a coil of 20 turns, to which we apply a current of half an ampere? Grant this. Then the single convolution is an important basis to start out from. In fact, one at once rises to the conception of a current so powerful that in passing through a single convolution would produce a magnetic field so intense as to project lines of force for unlimited distances.

But why stop at a convolution? If a single complete turn can do so much, it stands to reason a part of a turn—or say one side of the square, if the core space is quadrangular—will be proportionately effective.

Seeing then that a magnetic field is obtainable by the passing of a current along a straight wire, might we not go further, dispense with the wire altogether, and by causing the current to pass along an imaginary path, as across an air-gap, obtain likewise on all sides of this path that self-same magnetic field? It seems rational to suppose so. And if this whole line of reasoning is rational, might it not be admissable to assume that this was the road that led to the evolution of the Hertz Oscillator (see note 1) which to all interests and purposes fulfills this function of passing the current along an imaginary path (between the knobs of the spark gap of the machine) and projecting the magnetic lines of force in the way suggested. If this is correct, then one might readily believe that the alleged Hertz waves, about which so much has been heard lately in connection with the wireless telegraph experiments, are not Hertz waves at all. These latter are declared to be something distinctively peculiar and directly emanating solely from the spark gap of the apparatus. They may be a characteristic of the spark itself, belonging to another sphere of research. The great difference is that the effects we are dealing with here are apparently not confined to the spark gap, but are simply incidental to the passage of the current across the gap and common to all parts of the circuit.

If these effects have been mistaken for those attributable to Hertz waves proper, the chances are that, the distinction being suggested, the methods of attempting to utilize them will undergo some modification.

MARCONI'S ADAPTATION.

The most frequently mentioned personality in connection with the wireless telegraph of late is the clever student Marconi, who, with the co-operation of Mr. Preece, is exploiting and experimenting on an elaborate scale in England with an apparatus of his own that he is understood to describe as a refinement of what has heretofore been employed by others in the field. Hertz waves—influences directly projected from the spark gap—are the suppositions (or actual?) basis of his transmission. The receiver, a unique and original combination of ordinary Morse instruments, with a device that turns to account some peculiarities of metallic particles, and descriptively called a "coherer" (name due to Dr. Lodge, though he says he gave it to a different contrivance; see note 2), that is responsive to the feeblest magnetic influence. For description of this apparatus see references given in note 3. It is with his receiver maybe that Marconi's name will pass down to our distant posterity. He has been able, it appears, to telegraph over distances ranging from 9 to 20 miles with this machinery. Most all accounts, however, mark the performance as rather unreliable, still there is no gainsaying the wonderfulness of the achievement. The oddest thing of it all is, that despite the view that is understood to obtain with him as regards the nature of Hertz waves, the latest accounts represent that the greater distances are spanned and stronger effects produced by the employment of kites or balloons carrying terminal plates leading to the respective instruments.

Now, if the transmitted influences are projected direct from the spark gap, what on earth can the elevated terminal extension effect? The recourse thus had seems to support the view hereinbefore advanced. For if, during the passage of the spark across the gap, a given M.M.F. is produced, it must be that all parts of the circuit contribute to this production. The terminal plate, at the transmitting station, and its connecting wire take a part of the charge as well as any other part of the contrivance. Then the wire being for most part high above ground and nearly perpendicular to it, affords very little inductive capacity, and there is possibly no retardation at all in it; so that while the spark is passing between the knobs of the machine the terminal plate discharges, and this connecting wire for the instant has a flow of current down its length just as if it were part of an actual circuit, and its electro magnetic effects are probably more widespread than those due to the operation of other parts of the outfit.

If this is the explanation of the improved results it opens up a wide prospect for the simplification and permanency of the signalling plant.

POSSIBILITIES AHEAD.

Something remarkable has already been accomplished by those who have labored to bring about the results we have now in hand. But having grown accustomed to the marvellousness of it all, one can read with patience the arguments lately advanced as to the utter impracticability of adopting the system at its present stage for any actual service. The expedient of employing kites and balloons to help the matter out is regarded as the worst feature of the whole. It seems to be overlooked that in practice these would be replaced by some high towers and a hill or two at moderate range. However, if what is advanced in the foregoing has any scientific foundation, the necessity for extraordinarily high acrid exposures does not really exist.

An important circumstance seems to warrant this latter conclusion, as one can readily conceive, in view of it, that it is the wire itself more than its kite suspension that is efficacious. Let it be stated that, in offering the suggestion contained in the foregoing as to the part played by the kite-supported terminal plate and wire, it is reasoned that the volume of current passing down that single wire at the instant of discharge cannot easily be compared with the current that coursed through the big coil in the experiment described in the earlier part of this paper. Whence, then, its assumed widespread effects? Might they not be due to the suddenness with which the impulse moves? We have, on the one hand, a coil self-inductive and sluggish, as compared on the other hand with a single wire free from retardation. The lightning speed of the discharge may do more execution along that single wire than many times the same volume of current in the hampered convolutions of the coil.

If this reasoning is sound, the line upon which further advancement is to be made is clearly indicated.

Indeed, the influence exerted by a single wire circuit at a distance, even if in rather a bad way as regards retardation, has been well demonstrated in actual practice. The instance is found recorded in The Electrician, London (12th April, 1895; vol. XXXIV., p. 723): "The cable connecting Oban with Auchnacraig having broken down, a gutta percha insulated wire 1½ miles long was run along the ground from Morvern, whilst on the Isle of Mull the ordinary overhead circuit connecting Craignure with Aros was made use of; the distance intervening between the two parallel circuits was about 3½ miles. Using a vibrator as a transmitter, and a telephone as a receiver, the usual telegraphic traffic was dealt with until the cable was repaired."

Now, considering this performance in the light of the argument already offered, we would expect that if the insulated wire, instead of forming a closed circuit with alternating currents (as is implied by the "vibrator"), had been provided with a spark gap and associated with the discharge apparatus, it would have been found immensely effective. It is the seeming warrant we have for such expectations that should give the single wire first place in the equipment of the signalling station of the future.

There are two or three important points to be borne in mind in considering the possibilities of the wireless telegraph from the standpoint of practice. The system, unless capable of a multiplication of "lines" of communication, will be useless for any extensive application. To be reliable the apparatus must not be over-sensitive; if it can be made adjustable, and if near proximity will admit of wide range of adjustment, rendering the receiver insensible to interferences, a rough adjustment to this end should be chosen, even at the cost of numerous relay plants or stations. Then, too, these latter will have to be automatic.

This is a heavy bill of requirements, and a lot of engineering will have to be performed ere it can all be realized.

NOTES.—1. The Electrician, London, Vol. XXXIII., p. 153, contains descriptions by Dr. Lodge.

2. The Electrical Review, London, Vol. XLII., Art. Physical Society, p. 160.

3. The Electrical World, New York, Vol. XXXI, p. 17.

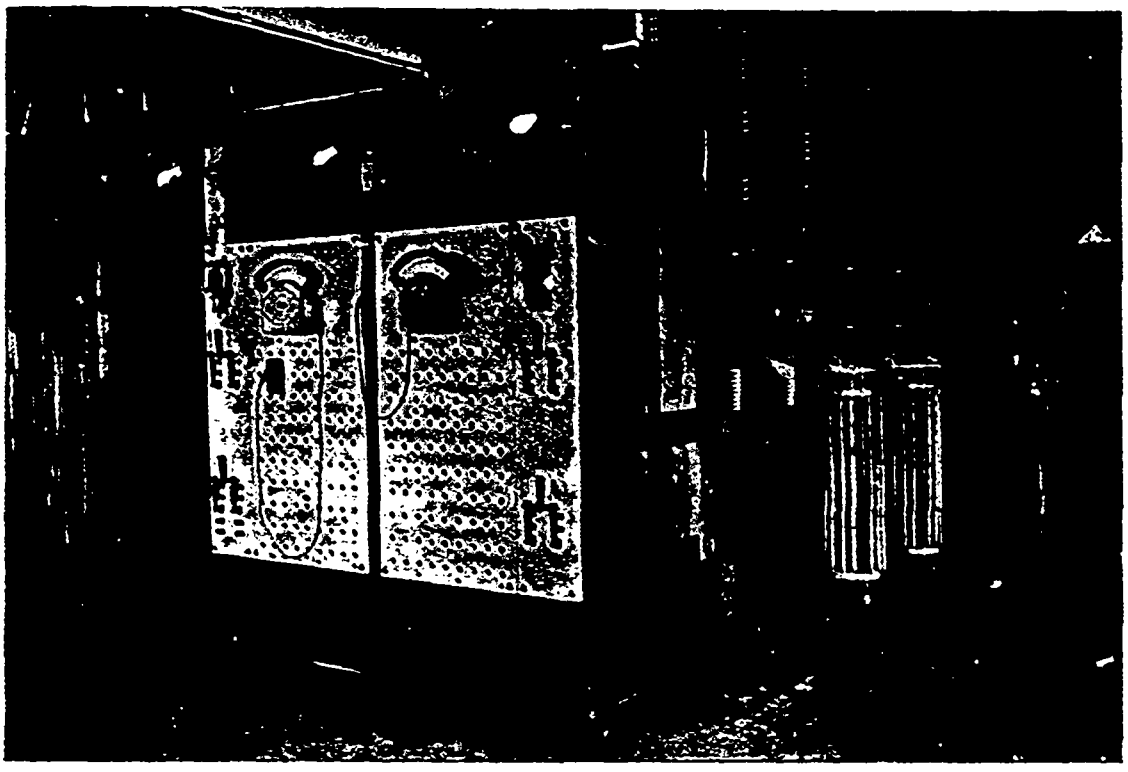
The British American Corporation of Rossland are pushing the development of their properties to the fullest possible extent. The Jenckes Machine Co. of Sherbrooke, through their Rossland branch, have supplied them with special pumping apparatus for their Nickel Plate and Columbia and Kootenay mines.

SWITCHBOARD AT SCHOOL OF PRACTICAL SCIENCE, TORONTO.

By T. R. Rosebrugh.

A switchboard for experimental purposes or for class work must, above all things, permit the greatest latitude in making connections, or, in other words, provide a high degree of "flexibility." In this respect it differs markedly from the switchboard of a power station, whose highest requirement is convenience in performing a certain definite service. This will perhaps be made clearer by example. A street railway generator is required solely for the pupose of supplying current to certain busbars, then it is either idle or appropriately connected by a switch directly to its work, and any more round-about connection would be both unnecessary and very inconvenient. On the other hand, a dynamo in a laboratory has no one duty; to-day its magnetization curve or one of its characteristic curves may be required, to-morrow it may be run as a motor to obtain its mechanical characteristic; another day its friction and iron losses may be measured. Or, to put it from the point of view of switchboard requirements, it is necessary, within reasonable limits, to be able to separately supply the fields with any current, the armature (as dynamo) with any resistance in circuit, or (as motor) with any potential difference. Evidently, under so varied conditions, all that can be done without limiting in some way the possible uses of the machine, is to provide at the switchboard two pairs of terminals, one for the armature and one for the fields. This need not necessarily mean that two pairs of terminals at the switchboard are exclusively devoted to these purposes, for by means of a branch switchboard (or its equivalent, a set of leads ending at convenient points) connection from armature and fields may be had when required, and at another time these points on the switchboard, with their attached leads, will serve for a different connection. It will thus be seen that a laboratory or general purpose switchboard should have much in common with the plug switchboard used in arc lighting. Another peculiarity of a laboratory switchboard is that the total number of connections to be provided for is likely to be many times as great as the number in use at any one time, so that to furnish every dynamo with suitable switches, rheostats and a magnetic cut-out, would result in an extremely unwieldy and expensive switchboard.

With this introduction, the arrangement of the switchboard recently constructed at the School of Practical Science may now be described. The two inner panels seen in the illustration are of marble, 2 inches thick, and 60 in. by 30 in. The arrangement of each of these panels may be understood by supposing thirty socket-sets, each of which is represented by Fig. 1, arranged in three columns of ten each; there are thus in all the six columns, A,B,C,D,E,F, numbered vertically downwards from 1 to 10. In the upright between the panels are also, similarly marked and numbered, six strips of ten jacks each, the same as are used in metallic circuit telephone switchboards. With few exceptions each lead to the switchboard descends vertically to its terminal, and all are rubber insulated and protected by tubes, which are secured together in bundles. Referring to Fig. 1, the leads are indicated as connecting to b and to the upper half of c. The sockets a and b are of copper, with a tapered hole, which passes right through. By means of a shoulder in the hole drilled through the marble, and nuts and washers behind on the threaded end of the stem of the socket, the latter may be secured in its place and the connection of the lead made to it at the same time on simply screwing up. The upper and lower contacts, c, are held together by being secured to flat springs, arranged in a special way. They are somewhat lipped in front, and sufficient clearance is given them in their cylindrical hole. So long as the two halves of c are electrically connected it will be seen that a and b are the actual terminals, and it is into these that the tapered plugs of the connectors are inserted. These connectors are simply pieces of rubber-insulated wire, of different suitable lengths, secured at



Switchboard at School of Practical Science, Toronto.

each end to the tapered plugs, and with insulating handles.

The use of a wedge consisting of two flat conductors separated by mica, each connected to a wire and suitably mounted, to introduce into a circuit already made up, an ammeter, the current coil of a wattmeter or Thomson balance, or other conductor of low resistance is borrowed from a similar device in arc switchboards. The two halves of *c* are intended to be thus forced apart when necessary, and it is our experience that absolute continuity of the circuit can always be maintained during the insertion of the ammeter, the ammeter being in parallel between the upper and lower contacts of *c* before the latter are separated. On inserting slowly, the ammeter reading increases steadily from zero to the full amount. In the illustration will be seen an adaptation of the idea which is believed to be new, a Weston shunt is enclosed in an insulating box, from which projects a wedge of two conductors insulated by mica, one secured to each terminal of the shunt. The branch wires to the Weston ammeter, of range 200 amperes, at the top of the left panel, are protected by a rubber tube. In this way the extra resistance brought in by the ammeter is reduced to the least possible. The illustration shows the Weston shunt in the *c* socket of circuit *A*2. In this way one ammeter may be used on every direct current circuit on the board and changes made if necessary as quickly as readings can be taken. If the direction of the current is not right for the ammeter a reversal of the shunt immediately corrects this. Advantage may be taken of this to mark one end of the shunt and thus use it to distinguish instantly the polarity of any current. Two pairs of circuits within reach also allow wedge connectors to be used to obtain current for any other ammeter or wattmeter which may be placed on bracket desks near by. Referring again to Fig 1., *p* and *q* indicate small rubber insulated pressure wires which lead to two contacts in the jack of the same letter and number, mentioned before; thus but for exceptions there would be sixty pairs of such wires. To connect with these jacks three "cords" are brought through the central upright, these terminate each in a metallic circuit plug which may be inserted into any one of the sixty jacks and thereby effectively prolong the corresponding pair of pressure wires to the distant ends of the two light flexible conductors which the "cord" contains. Two of the three lead to the bracket desks already mentioned, where they are intended for voltmeters and the pressure coils of wattmeters. The other one returns again to a reversing switch in the space just below the jacks (a small double throw switch adapted for the purpose); from this switch wires are continued to the Weston direct current voltmeter reading to 150 volts, on the right hand panel.

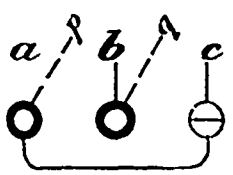


FIG. 1.

By this means the voltmeter also may be quickly transferred from one pair of terminals to another and measurements made of potential difference, the polarity being indicated by the position of the reversing switch when reading. When alternating current is used one of the two cords just mentioned must be employed. Suppose now that it is required to measure the power absorbed by the circuit *E*4; a suitable wattmeter being connected to the pressure and current leads it is now only necessary to insert the wedge plug in *E*4*c*, and the "metallic circuit plug" in jack *E*4.

Provision has been made for several connections to be simultaneously made to the city incandescent circuit (110 volt) by repeating this in five socket sets. When it is desired to connect in parallel in any other case this is done by the arrangement of paralleling bars shown in Fig. 2. Suppose, for instance, that *B*3 are the leads from a dynamo and *E*8, *E*9 and *E*10 rheostats, and it is desired to absorb the power of the dynamo in these rheostats in parallel, then on connecting *B*3 to *C*6 and connecting *C*7, *C*8 and *C*9 to *E*8, *E*9 and *E*10 respectively (i.e. *a* to *a* and *b* to *b* in each case, remembering that all but the terminals shown in Fig. 2 are like Fig. 1) it will be found on tracing out the connection that they are parallel as desired. A study of Fig. 2 will show that effectively all the *a* connections are on one bar just as the *b* connections are, thus the dynamo and rheostats have their terminals at two common points. The advantage of the arrangement of the figure, however, is that current and power measurements are made possible in all the parallel branches. The other set *D* provides for the possibility of another paralleling operation being conducted at the same time, or by joining the two sets, for paralleling as many as five paths.

But another use may be made of this double set; suppose it is desired to operate a three-phase induction motor from the three-phase terminals of a rotary transformer, and at the same time to measure the electrical power supplied to the motor. Connect the three rotary transformer leads to *C*6*a*, *C*6*b*, and *D*6*a*, and the three motor leads to *C*7*a*, *C*7*b*, and *D*7*a*, interchanging any pair of either if the direction of revolution is not right; this is sufficient for the operation of the motor. To measure the power, however, run a connector from either of the remaining *b* terminals on the C side to one of the *b* terminals on the *D* side, then on introducing, as already described, pressure and current connectors at the same time on circuit *C*6 and reading on a properly connected wattmeter, then immediately moving both wedge and metallic circuit plug to the corresponding *D*6 connections and reading again, the sum of the two readings gives the power (subtracting if reversal is necessary to secure a reading on the scale). The same method of measurement would hold good wherever three wires are used, whatever the system, symmetrical three phase, monocyclic, three wire alternating or direct. The general utility of the jacks for the purpose may be criticized, but here the circuits being limited to 150 volts no danger is felt from this source.

As only a few circuits are likely to be in use at once in a laboratory, only a relatively small number of switches need be provided. These are shown on the outer marble slabs and are double pole, one being double throw and the other single throw. While fuse blocks are arranged behind the switchboard on all circuits where they are needed, there are also two magnetic cut-outs, an "I.T.E." and a "cutter," one at the head of each of the outer marble slabs. These, as well as the switches, are provided each with its own switchboard terminals, so that they may be included in any circuit when required.

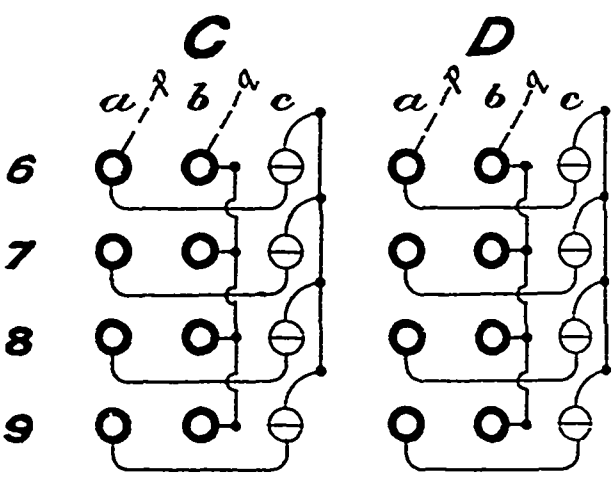


FIG. 2.

It may be added that the rather difficult drilling of the holes was done by the Messrs. Fensom, the brass work fitted by the Toronto Electrical Works, and the switches and outer marble slabs supplied by the Royal Electric Co. The wiring was done by Mr. A. Sanderson.

CANADIAN ELECTRICAL ASSOCIATION.

CONVENTION PROGRAMME

CONVENTION HEADQUARTERS—WINDSOR HOTEL, DOMISION SQUARE, MONTREAL, QUE.

BUSINESS PROGRAMME.

TUESDAY, JUNE 28TH.

9.30 A.M. Meeting of Executive Committee.

10.00 A.M. Opening of first session in Convention Hall, Windsor Hotel.
President's Address.
Reading Minutes of last Meeting.
Secretary-Treasurer's Report.
Reports of Committees and General Business.

2.00 P.M. General Business.
Presentation of Papers.
Discussion.

WEDNESDAY, JUNE 29TH.

9.00 A.M. Consideration of Reports of Committees.
Election of Standing Committees.
Selection of Place and Time of next Meeting.
General Business.
Presentation of Papers.
Discussion.

THURSDAY, JUNE 30TH.

9.30 A.M. Election of Officers.

LIST OF PAPERS.

"How to Overcome Some of the Difficulties Encountered by Central Station Men A. A. Wright, Renfrew, Ont.

(1) "The Unconscious Ownership of an Important Key"—(A Plea for the Introduction of Goods Traffic on our Suburban Tramways).

(2) "The Quimby Screw Pump." W. T. Bonner, Montreal.

"Experiences of an Inspector." Dr. J. K. Johnstone, Inspector of Electric Light, Toronto.

"The Electric Current in the Rainy River Gold Mines." W. W. Hopkins, B.Sc., C.E. etc.

"The Importance of Proper Methods of Illumination" F. A. Bowman, M.A., B.E., New Glasgow, N.S.

"Electric Utilization of Water Powers. Louis DeWitt Magie, Montreal.

"Economies in the Boiler Room." James Milne, Toronto.

SOCIAL FEATURES.

TUESDAY JUNE 28TH.

7.30 P.M.—Trip around Mount Royal by special Park and Island cars, afterwards ascending Incline Railway to lookout on mountain to view the city under illumination.

WEDNESDAY, JUNE 29TH.

1.00 P.M.—Visit to (1) Bell Telephone Company's new building, (2) Street Railway Company's power house; (3) power house and works of the Lachine Rapids Hydraulic & Land Company, returning to city at 7.30 p.m.

9.00 P.M.—Annual Association Banquet at Windsor Hotel.

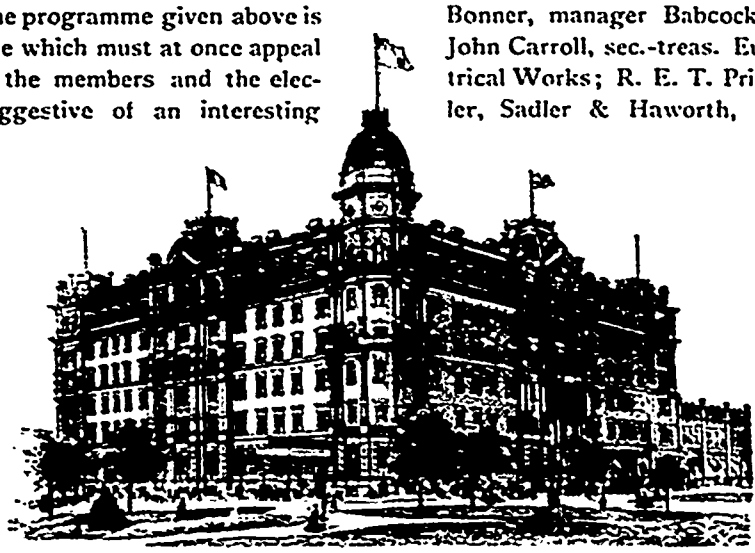
THURSDAY, JUNE 30TH.

11.00 A.M.—Visit to McGill University.

1.30 P.M. Visit to Royal Electric Company's lighting station and factory, then by special G.T. train to visit the works of the Chambly Manufacturing Company at Chambly.

THOSE who have the success of the Canadian Electrical Association at heart must indeed feel gratified that Montreal was chosen as the meeting place for the eighth annual convention of that society. The programme given above is one which must at once appeal to the members and the electrical fraternity as suggestive of an interesting and instructive meeting.

As will be seen, the papers to be presented cover a wide range of subjects, and it is hoped they will provoke discussion, which is one of their most useful purposes. The authors have given much time and labor to their preparation, but their true value can only be extracted by a thorough discussion of the points and claims embodied therein. Copies of the papers are now ready for distribution to members who signify their desire to be supplied with same.



CONVENTION HEADQUARTERS—WINDSOR HOTEL, MONTREAL.

The social features of the convention have been carefully arranged by the local committee, the members of which are as follows: William Thompson, consulting engineer; W. H. Browne, manager Royal Electric Company; W. B. Powell, G. N. W. Telegraph Company; L. B. McFarlane, eastern manager Bell Telephone Company; W. T. Bonner, manager Babcock & Wilcox Company; John Carroll, sec.-treas. Eugene F. Phillips Electrical Works; R. E. T. Pringle; Ald. G. W. Sadler, Sadler & Haworth, of Montreal; O. Higman, Inland Revenue Department, Ottawa; A. B. Smith, G.N.W. Telegraph Company, Toronto; F. H. Badger, superintendent Montmorency Light & Power Co., Quebec. The personnel of the committee is itself a sufficient assurance to the members of the Association that the arrangements for the entertainment of the delegates and their friends will be of the most complete character. The visit to the many electrical works, such as the Chambly and Lachine plants, the Royal Electric Company's lighting station, the Bell

Telephone building, etc., cannot fail to interest every visitor.

On the evening of the 29th inst. the annual banquet of the Association will take place at the Windsor Hotel. It will no doubt prove an altogether successful function, and the generator of pleasant memories in the minds of those who shall be privileged to attend.

VIEW OF THE DOCKS AT MONTREAL.

Altogether, the success of the convention would seem to be already assured. A good representation is expected from Ontario, while the local attendance is certain to be greater than at any previous convention. As stated in the programme, arrangements have been made with the Grand Trunk and Canadian Pacific Railway Companies for a rate of fare and one-third for the return trip. Should the present low rates continue, which now seems probable, the return ticket from Toronto will cost only about $7. This should prove a strong inducement to a good attendance.

The steps taken by some towns and cities in Ontario towards municipal ownership have been the means of increasing interest in the Canadian Electrical Association, the usefulness of which is now acknowledged. Electric light companies have become convinced of the necessity of organization in order to protect their property. There is also the problem of the insulation of electric wires, to meet the demands of the Fire Underwriters' Association. These questions are likely to be fully considered at the forthcoming convention.

THE CITY OF MONTREAL.

Situated at the head of ocean navigation, and as the commercial metropolis of the Dominion, Montreal occupies an unique position among the cities of Canada. Within its borders are located great commercial institutions; public and educational buildings unsurpassed on the continent of America; churches of wonderful massiveness and architectural beauty; a number of public parks and squares; these, with other equally important features, make the city one of the most interesting, as well as instructive, in the world.

A few words of historical reference are necessary to an understanding of the many points of interest, and of the great strides that have been made by the city in a commercial way. As all Canadians know, Montreal is built on an island formed by the Ottawa river debouching into the River St. Lawrence, at its western and eastern extremities. It was founded on the 8th of May, 1642, by Maisonneuve, a knight of the mediæval school, 107 years after the visit of Jacques Cartier in 1535. Champlain visited the place in 1611 and founded a trading post on the site of the old Custom House Square. The first clearing for the city was made where the present custom house now stands.

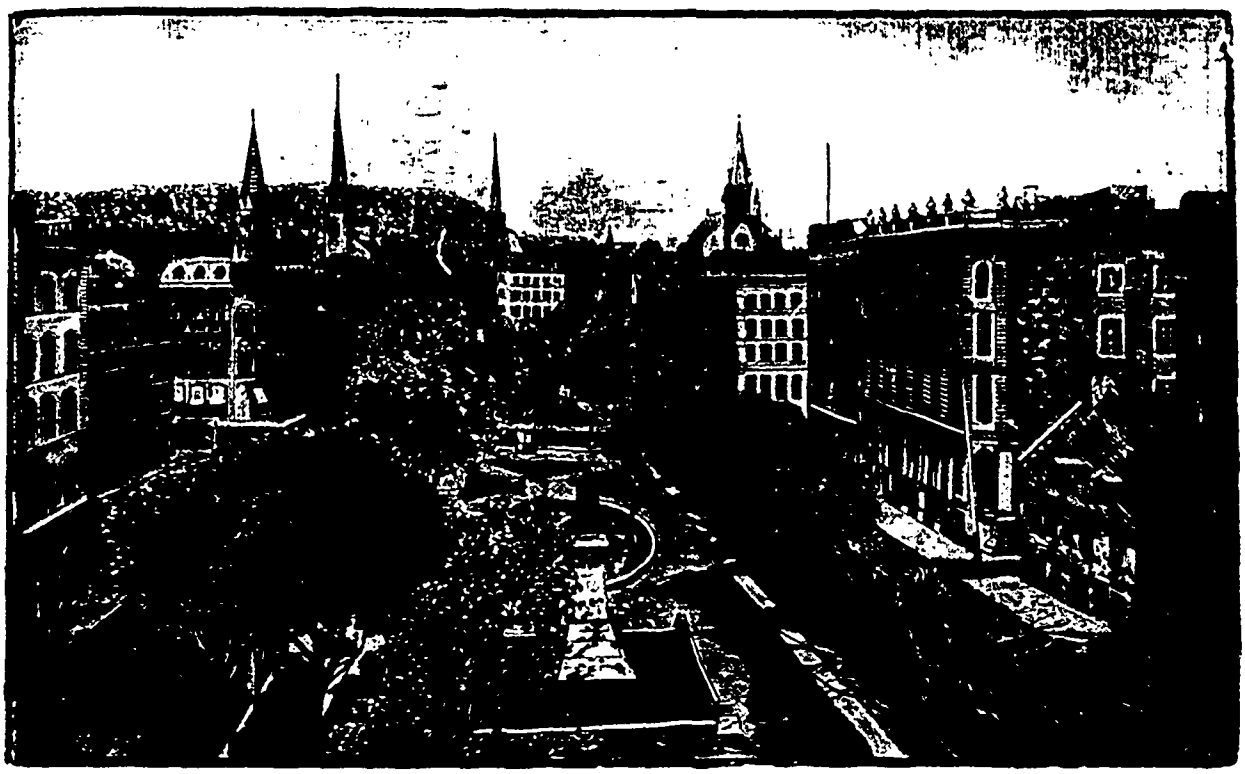
Montreal surrendered to the British forces on the 8th of September, 1760, one year after the capture of Quebec. The Americans captured the city in 1775, and it was again secured by the British the following year. From that time forward the growth of the city has been well nigh phenomenal, until to-day it has a population of more than 275,000. It is said that one-half of the population is of French origin.

The principal streets of the city running east and west are Notre Dame, St. James, Craig, St. Catharine and Dorchester, and on the first three of these are located many of the principal commercial houses and public buildings. The main streets running from the river towards the mountain are St. Denis, St. Lawrence Main and Bleury. The Windsor hotel, the headquarters of the forthcoming convention, is located on the corner of Windsor and St. Catharine streets, overlooking Dominion Square, and near the C.P.R. and G. T. R. stations, of which illustrations are given in another part of this paper.

PROF. ROVEY,
Dean Faculty of Applied Science, McGill University.

The churches of Montreal are one of the greatest attractions to visitors. Foremost of these is St. Peter's Cathedral, on Dominion Square, and which may be viewed from the Windsor Hotel. It is being built after

the model of St. Peter's in Rome, was commenced in 1868, and is yet in course of completion. The church Notre Dame, opposite Place d'Armes Square, is also built after the style of a church in Paris, and is said to have cost $6,000,000. The oldest church in the city is Notre Dame de Bonsecours, erected in 1771.

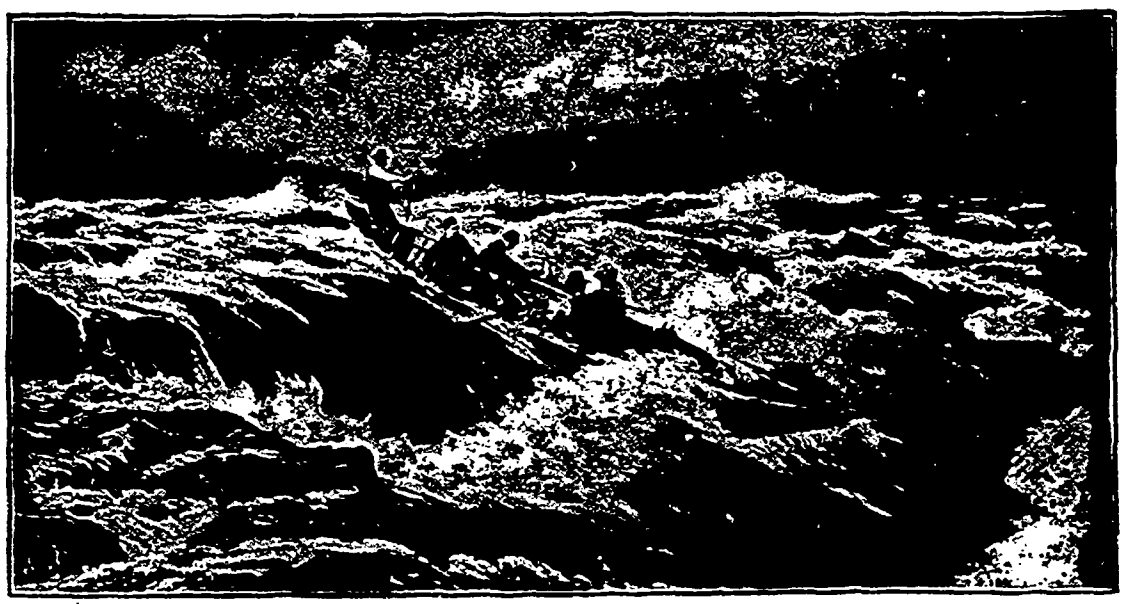


View of Victoria Square, Montreal.

McGill University, which is intended to be visited by the delegates to the convention, is one of the grandest educational institutions in the world. Forty-seven acres of land, on which the buildings stand, together with the sum of ten thousand pounds, was bequeathed by Hon. James McGill to the "Royal Institution for the Advancement of Learning," to establish a college for the purposes of education. With these funds the present institution was commenced, and, by donations received since, there have been erected large and thoroughly equipped buildings for the different branches of learning. The department of the Faculty of Applied Science, in which members of the Canadian Electrical Association will be most interested, consists of three separate structures the Engineering building, the Physics building, and the workshops. Prof. Bovey, whose portrait appears on the opposite page, is Dean of this faculty, and Mr L. A. Herdt, E.E., Ma.E., Demonstrator in Electrical Engineering, with charge of the electric light plant. A description of the electrical laboratory appeared in our May issue. We can safely predict that visitors will here find much of interest.

Among the public buildings of importance in Montreal might be mentioned the Court House, Bonsecours market, and the City Hall.

The three most noted squares are the Dominion, Victoria and Place d'Armes, views of which are shown. Reference has already been made to the first of these. Victoria square is situated between McGill street and Beaver Hall hill, and upon it is a colossal bronze statue of Queen Victoria. Place d'Armes, between Notre Dame and St. James streets, is surrounded on four sides by important buildings, the New York Life, in which are the Montreal offices of this journal,



Boat Shooting Lachine Rapids, near Montreal.

forming one section. Mount Royal Park, which may be reached by the Incline railway shown in the accompanying engraving, covers 430 acres of ground, and rises over 700 feet above the level of the St. Lawrence river.

One of the most important engineering works yet undertaken, the rebuilding of the Victoria bridge, is now

Incline Railway to Mount Royal Park.

in progress. The old Victoria bridge, at the time of its erection in 1859, was the greatest in the world, being nearly two miles in length. It is said to have cost $6,000,000, and to have occupied nearly six years in building, though used only by the Grand Trunk Railway. The new bridge will have tracks for steam railways and electric cars, besides a road for vehicles and sidewalks for pedestrians, a feature which will be greatly appreciated by the public. During construction traffic has continued incessantly, this being made possible by the utilization of portions of the old bridge.

ELECTRICAL FEATURES.

Electrically, Montreal is beyond doubt the most attractive city in the Dominion. It is fitting, perhaps, that reference should first be made to the electric railways, of which there are three distinct systems, viz., the Montreal Street Railway, Montreal Park and Island Railway, and Montreal Belt Line Railway. Six years ago the Montreal Street Railway was changed to electric traction, and the company have now in operation over eighty miles of road. The rolling stock consists of nearly 300 motors and trailers. The power house, on William street, is 290 x 233 feet. In the engine and dynamo room are located twelve Edison generators of 200 k. w. capacity each, six multipolar generators of 300 k.w. capacity, and a 4,500 h.p. Laurie engine installed last summer. This engine replaced six Corliss compound engines of 600 h.p. each, which were in use at the time the photograph was taken from which the accompanying illustration of the power station was made. An interesting feature of this installation is the switchboard, which is 60 feet long and 11 feet high, constructed of terra cotta lumber. The entire equipment is very complete and interesting. The offices of the company are at the corner of Craig street and Place d'Armes, Mr. F. L. Wanklyn, whose portrait we give, being general manager.

The Montreal Park and Island Railway affords the means of visiting the many beautiful suburbs of Montreal, passing, as it does, through a most picturesque country. There are two main lines, with some twenty miles of track. The Sault-au-Recollet line runs up St. Lawrence street, thence straight across the country to

Place d'Armes Square, Montreal, showing Notre Dame Cathedral.

Sault-au-Recollet, or Back River. The Cote-des-Neiges, or Outremont line runs up Bleury street and Park avenue, through Montreal annex, Cote-des-Neiges, Mount Royal Vale, and Notre-Dame-de-Graces, making a complete circuit of both mountains and connecting with the lines of the Montreal Street Railway at Westmount. Places of interest along the route are the Monument National, Shamrock lacrosse grounds, Convent of the Sacred Heart, Hotel Dieu, Royal Victoria Hospital, Monklands, ruins of Villa Maria Convent,

Dominion Square, Montreal.

and numerous historical landmarks. The power station of the company is located at Mile End, although it is intended to build a larger generating station when all the proposed lines of the company have been completed. Mr. Chas. A. E. Carr, whose genial countenance is portrayed on another page, is general manager.

The system of the Montreal Belt Line Railway has

recently been put in operation, and comprises thirteen miles of track. It is intended to serve the lower part of Montreal Island. The line leaves the Canadian Pacific Railway at Hochelaga, passes through the municipalities of Maisonneuve, Longue Point and Point aux Trembles, and, following the course of the St. Lawrence

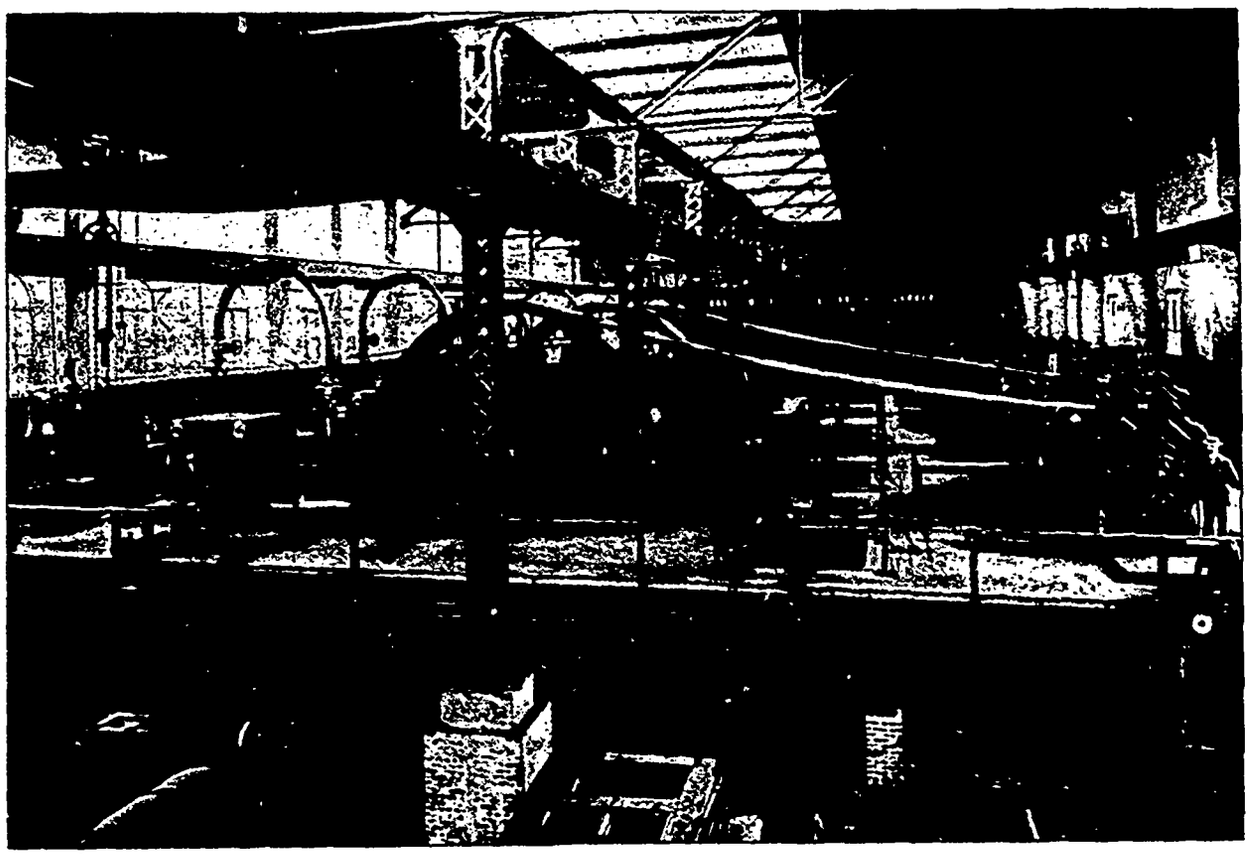
MR. W. L. WANKLYN,
Manager Montreal Street Railway.

river, reaches Bout d'Isle. At this point the cars are connected by a steam ferry with the town of Charlemagne and other points. The power house is built near the centre of the line, and contains two C.G.E. generators of 200 to 325 kilowatt, three Goldie & McCulloch compound condensing Wheelock engines,

So much for the electric railway systems. Turning to another branch of the electrical industry, viz., light and power, we find within the city of Montreal and in its immediate vicinity the two great hydraulic-electric plants of the Chambly Manufacturing Company and the

MR. C. A. E. CARR,
Manager Montreal Park and Island Railway.

Lachine Rapids Hydraulic and Land Company, an inspection of which is included in the convention programme. Chambly is the headquarters of one of the most comprehensive power and transmission schemes yet undertaken on the continent, and which is now



ENGINE AND DYNAMO ROOM, MONTREAL STREET RAILWAY COMPANY'S POWER HOUSE.

aggregating 700 h.p., with necessary boilers and other equipment. The cars comprise nine open and four closed, in addition to an electric freight locomotive. The manager of the road is Mr. J. P. Mullarky. Mr. John Rowley is superintendent, Mr. Robert Welsford, engineer, and Mr. C. H. Wright, son of Mr. A. A. Wright, of Renfrew, electrician.

nearing completion. The source of power is a large concrete dam and generating station on the Richelieu river at the village of that name, 25 miles distant from Montreal. It is intended to transmit 20,000 horse power to to the city for incandescent and arc lighting and direct current motor service, the main power transmission line to end in the electric light station of the

MR. WM. THOMPSON, Chairman, Montreal.

MR. W. H. BROWNE, Montreal.

MR. W. T. BONNER, Montreal.

MR. O. HIGMAN, Ottawa.

MR. L. B. MCFARLANE, Montreal.

MEMBERS OF LOCAL COMMITTEE—CANADIAN ELECTRICAL ASSOCIATION CONVENTION, MONTREAL, 1898.

Royal Electric Company, by whom the work is being carried out. From early days there was a wooden dam between Richelieu village on the one side of the river and Chambly on the other. This has been replaced by a new structure, which is one of the finest examples of hydraulic engineering on the continent. It consists of a massive concrete dam 2,000 feet long, in which, as an integral part, is built the power house. The dam consists of three portions, two of which run perpendicular across the course of the river, while the third and middle part is parallel with it. In the lower third of the dam is built the power house, a structure of steel beams and brick walls, 308 x 51 feet. The upper level will contain the switchboard, controlling devices and offices. There will be 32 turbines, each 46 inches in diameter and of 660 h.p. capacity, making a total of over 21,000 h.p. Each gang of four turbines will be directly connected to a 2,000 k.w. "S.K.C." generator, giving two phase current at 60 cycles per second and generating 12,500 volts. A view of one of these generators is shown in the advertisement of the Royal Electric Company on another page. They are of the induction type, and the insulation is necessarily most massive and substantial. Among the many interesting features of this plant is the novel method of carrying the wires over the new Victoria bridge.

The works of the Lachine Rapids Hydraulic & Land Company were completed in the fall of last year. As implied by the name, the water of the Lachine rapids is utilized. The hydraulic machinery, when all is installed, will consist of 72 Victor wheels of 300 h.p., and the electrical installation of twelve 750 k.w. C.G.E. three phase generators, direct connected to six water wheels and operating at 4,400 volts at 175 revolutions. The company practically have four stations. Their sub-station at the corner of McCord and Seminary streets, and the Standard Light and Power Company's station both obtain power from the rapids, being equipped with direct current apparatus driven by synchronous motors. The sub-station of the Citizen's Light and Power Company at Cote St. Paul was destroyed by fire a few months ago, but is now being rebuilt. The Lachine Company also supply power to the Temple Electric Company, in which they have a controlling interest. A fine new switchboard has recently been purchased. It is made of blue Vermont marble, with specially designed switches.

The lighting and power stations of the Royal Electric Company have been entirely reconstructed on the most improved methods within the last two years. These, together with the extensive works of this company for the manufacture of electrical apparatus, will doubtless prove a special attraction to central station managers.

The fine new building of the Bell Telephone Company

ALD. G. W. SADLER, Montreal.

MR. A. B. SMITH, Toronto.

MR. W. B. POWELL, Montreal.

MR. JOHN CARROLL, Montreal.

MR. R. E. T. PRINGLE, Montreal.

MEMBERS OF LOCAL COMMITTEE—CANADIAN ELECTRICAL ASSOCIATION CONVENTION, MONTREAL, 1898.

on Notre Dame street will well repay a visit. The equipment of the exchange is most complete and up to date, as becomes the headquarters of the company. The head offices of the G.N.W. and C.P.R. Telegraph Companies, located on St. Paul street, within a block of each other, should also be visited.

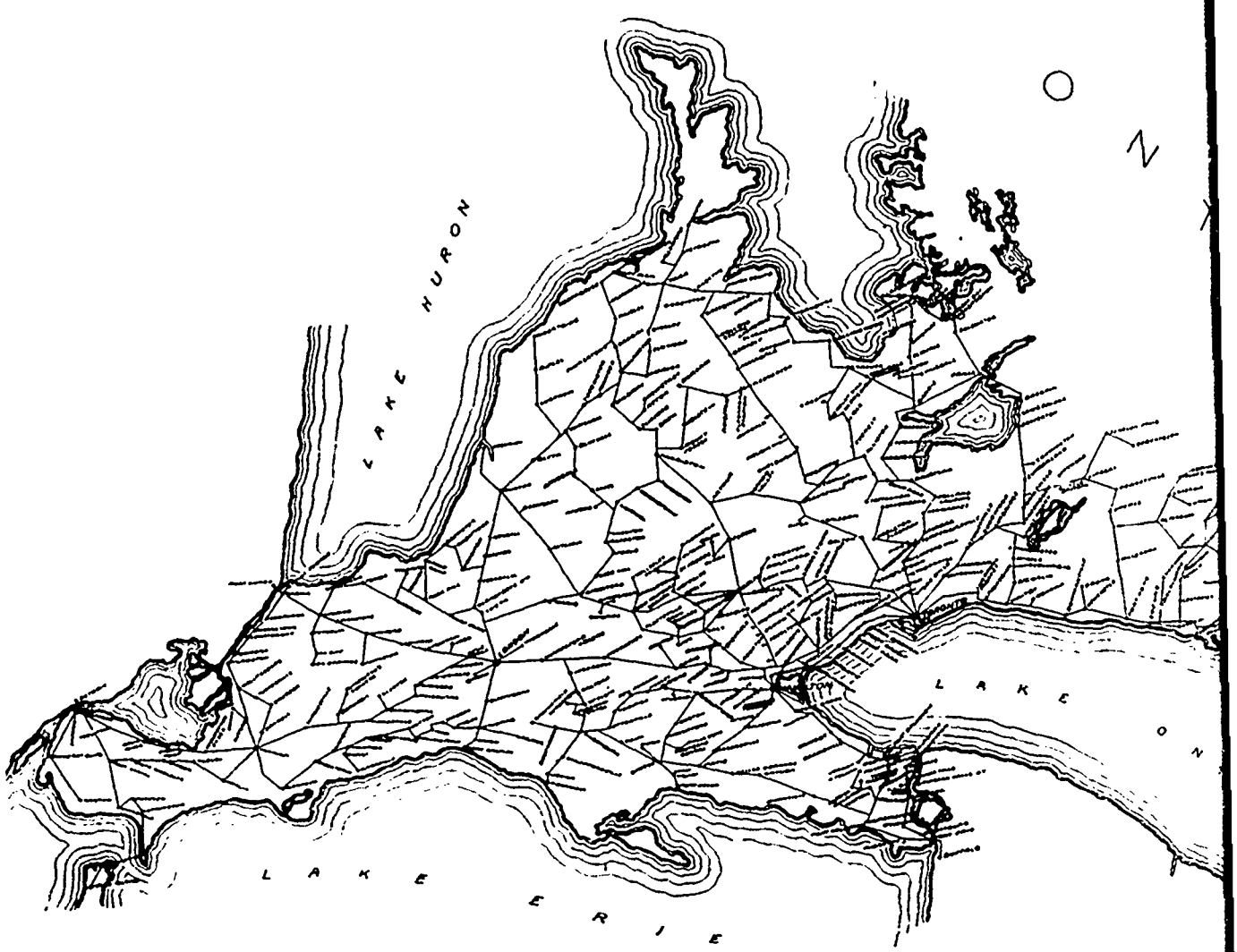
Nor should we overlook the manufacturers of and dealers in electrical supplies, who, through the medium of this journal, extend a hearty welcome to members of the Canadian Electrical Association and their friends to visit them. Ness, McLaren & Bate will be found in new premises at 419 St. James street; Royal Electric Company on Queen street; Canadian General Electric Company at 1802 Notre Dame street; R. E. T. Pringle at 216 St. James street; John Forman at 644 Craig street; Alex. Barrie & Co., manufacturer electric wires, at 589 St. Paul street; Munderloh & Company at 61 St. Sulpice street; Montreal Electric Company at 1898 Notre Dame street; the Electric Repair & Contracting Company at 621 Lagauchetiere street, and Fred Thomson & Co. at 7 Chenneville street. The factory of the Eugene F. Phillips Electrical Works, of which Mr. John Carroll is manager, is at Point St. Charles. E. A. Wallberg, sales agent for the Kingsley water tube boiler, is located in the Bell Telephone building. The J. C. McLaren Belting Company, 294 St. James street, will also keep open house during the convention.

Visitors should not fail to inspect the permanent exhibit of steam plant accessories at the offices of Babcock & Wilcox, Limited, 202 St. James street. The building is better known as the Mechanics' Institute, and is situated on the corner of St. Peter street. All Windsor and St. Lawrence, Notre Dame and P. and I. Lachine cars pass the door. In addition to installing a full sized working model of one of their forged steel boilers, erected with brick setting on structural iron foundation resting on concrete footings in the basement, Babcock & Wilcox exhibit in working order, automatic damper regulators, recording pressure and draught gauges, gauge testers, safety valves, steam traps, feed water filters, expansion joints, and all other steam plant accessories. Of the thirty odd thousand horse power of boilers listed on the official inspector's records in Montreal, Babcock & Wilcox have supplied over 8,000 h. p., or 25 per cent. At the Queen street and Sohmer Park stations of the Royal Electric Co., Montreal Street Railway, William Street Power House, Bell Telephone building, New York Life building, McGill College, Notre Dame Cathedral and many other places, visitors will find large installations of Babcock & Wilcox boilers.

Some of the natural, artificial and electrical features of Montreal have been briefly outlined in this article; there are others of equal interest. What has been written should be sufficient to induce every member of the Canadian Electrical Association to endeavor to be present at the forthcoming convention and participate in the programme which has been prepared.

BELL TELEPHONE COMPANY'S LONG DISTANCE LINES.

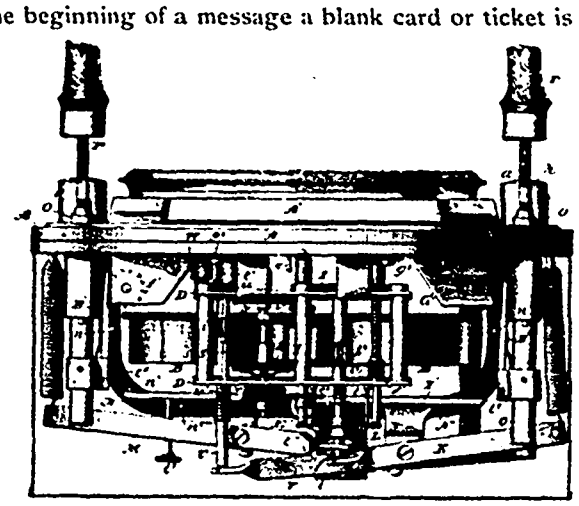
The accompanying map shows the long distance lines and offices of the Bell Telephone Company in the provinces of Ontario and Quebec, for particulars of which the reader is referred to the article in our April issue under the heading "Long Distance Telephony in Canada." The company have now in operation in these provinces 6,095 miles of poles, bearing 16,567 miles of wire. Connections have been established with the long distance system of the American Telegraph and Telephone Company and affiliated companies in the United States, affording a system of direct communication as far south as Virginia and Tennessee, and from the cities and towns of the Atlantic seaboard westward to Nebraska.



MAP SHOWING BELL TEL

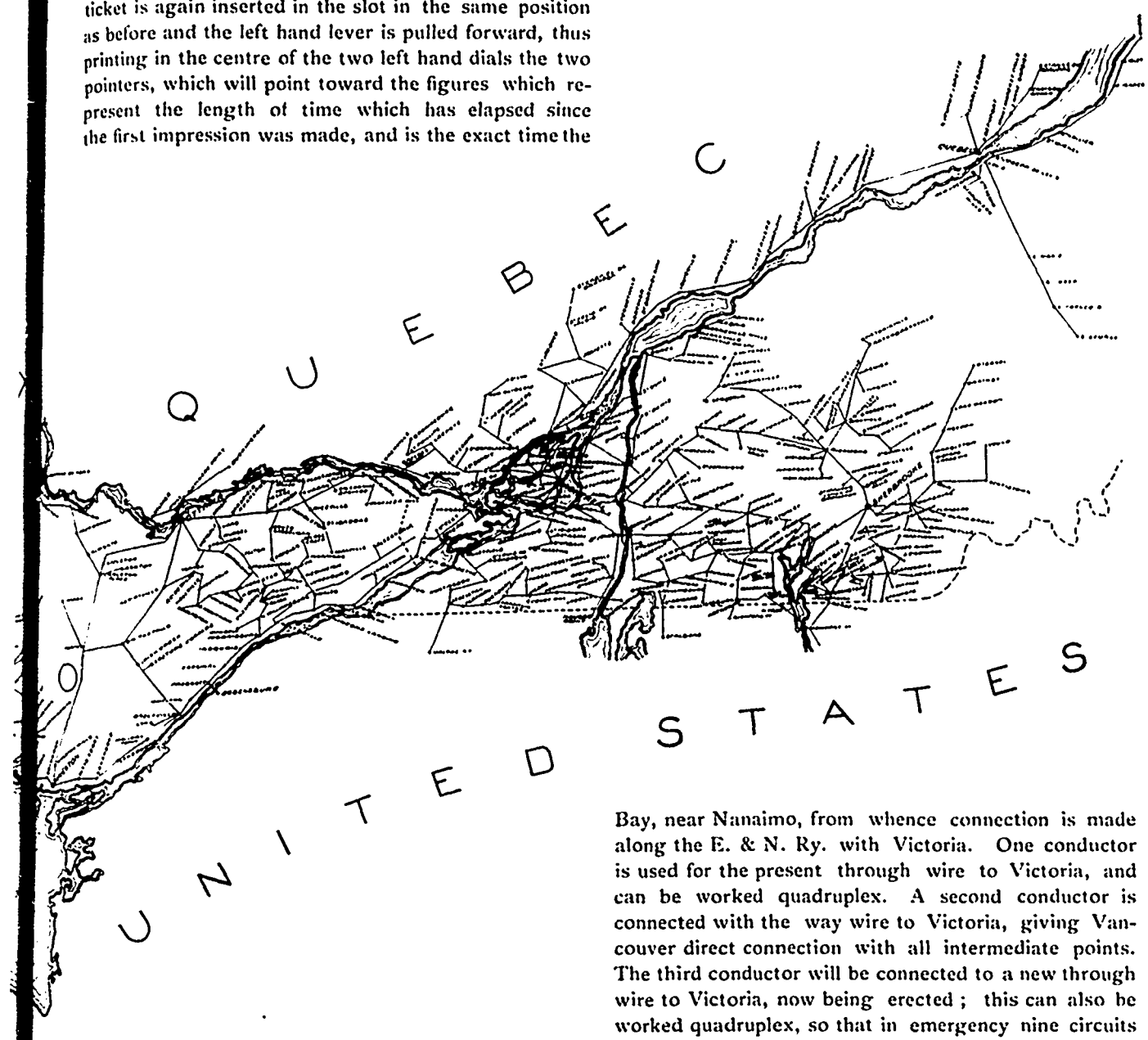
The efficient service now afforded by long distance telephone lines has been quickly recognized by the commercial world, the putting into operation of the service appearing to immediately create new business—that which could not be done either by mail or telegraph. We are informed by the Bell company that conversations are now frequent from Ottawa to Baltimore, and from Montreal to Cincinnatti, Pittsburg, Philadelphia, Chicago, Portland, Richmond, Virginia, Evanston, Illinois, and other distant points.

In order to make the service as efficient as possible, and also to ensure perfect accuracy in calculating the time for which a customer is charged, the Bell Telephone Company have recently equipped all their principal long distance exchanges in Canada with a novel but most ingenius and useful device called the calculagraph. The purpose of this little machine, of which an illustration is given below, is to check automatically the time occupied by a conversation. It is encased in a stand, the face of the machine bearing an exact resemblance to an ordinary clock. Two dials on the left indicate elapsed time; the first dial and pointer make a complete revolution in five minutes, and the smallest division represents one-quarter of a minute. The second dial and pointer make a complete revolution in one hour, and the dial is divided into periods of five minutes each. The method of using is as follows: At the beginning of a message a blank card or ticket is inserted in the slot at the front of the instrument against the guide, and is shoved to the right until it fits in the



BELL TELEPHONE COMPANY'S CALCULAGRAPH.

corner; the right hand lever is then pushed backward and forward; this records the time of day and also makes an impression of the two dials at the left, but not of the pointers. At the conclusion of the message the ticket is again inserted in the slot in the same position as before and the left hand lever is pulled forward, thus printing in the centre of the two left hand dials the two pointers, which will point toward the figures which represent the length of time which has elapsed since the first impression was made, and is the exact time the



LONG DISTANCE LINES.

speaker has occupied the wire. The time is guaranteed to be accurate, the clock running continually, no matter whether any person is speaking or not. The device, which has been patented, has proved a great boon to operators as well as to the company.

C. P. R. CABLES IN BRITISH COLUMBIA.

THE telegraph business at Victoria, B. C., increased so largely during the past year that the single conductor cable across the gulf was found insufficient to carry it. Owing to some injuries received through contact with electric light wires in Vancouver, the cable could only be worked duplex. In addition to this, part of the line was built through the woods and was subject to interruptions from the severe wind storms which sweep across that district. Last winter the Canadian Pacific Railway's Telegraph Department ordered a new three conductor cable from the Telegraph Construction and Maintenance Co., London, Eng. The factory was worked night and day and the cable completed in time to go forward by the new C.P.R. steamship "Tartar," which had been purchased for the Klondyke travel.

This cable was successfully laid on April 8th, directly from the steamship, from Vancouver city to Departure Bay, near Nanaimo, from whence connection is made along the E. & N. Ry. with Victoria. One conductor is used for the present through wire to Victoria, and can be worked quadruplex. A second conductor is connected with the way wire to Victoria, giving Vancouver direct connection with all intermediate points. The third conductor will be connected to a new through wire to Victoria, now being erected; this can also be worked quadruplex, so that in emergency nine circuits can be utilized between Vancouver and Victoria. The old cable has been picked up, all faults cut out, some new single conductor cable added, and was laid on May 21st between Beecher Bay on Vancouver Island and Crescent Bay in Washington. Land lines will connect this with Victoria and Seattle, and, by the end of June, Victoria will have an alternate route. A few years ago there was a cable direct from Victoria to New Dungeness, but it had to be abandoned owing to the armour being destroyed by galvanic action, caused by copper veins in the bottom of the straits. On account of these veins the cable was not replaced, but it is hoped that the new route, via Beecher Bay, will be free from them.

The work of laying and picking up these cables was done under the superintendence of Mr. F. B. Gerrard, of the Commercial Cable Co.'s staff.

The Jenckes Machine Co., of Sherbrooke, Que., have equipped the Athabasca mine, Nelson, B.C., with complete hoisting outfit and boiler.

D. S. McArthur & Co., of Nelson, B. C., are developing their properties, and recently purchased through the Rossland branch of the Jenckes Machine Co. one of their complete hoisting plants.

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Electric Roads in New York.

THE Metropolitan Street Railway Company, and the Third Avenue Railroad Company, of New York, have made application to the State Railroad Commission for permission to change the motive power on the various lines not now operated by electricity. It is said that these changes will cost thirty million dollars, and will apply to about 150 miles of road. It is probable that the underground conduit will be adopted. When the improvements are completed both horse and cable power will be done away with.

Central Stations As Fire Risks.

A DETAILED summary of the fire losses of Canada will, we believe, show that central stations for electric light and power are by no means undesirable risks for insurance companies. Comparatively few stations are destroyed or seriously injured by fire. Indeed it would seem that, owing to their operation at night, when the greater percentage of fires occur, the danger is to a large extent minimized. This being the case it is probable that all central station managers have not given sufficient attention to the adoption of proper methods for the prevention of fire. The Underwriters' Association is now having an inspection made of central stations in Ontario, with a view to learning how far they meet the demands of the association. It is therefore in the interest of the electrical industry that reasonable precautions against fire be taken by the owners of light and power stations. In this connection we might point out the necessity for a more thorough understanding between the Underwriters' Association and the electrical companies. While it is desirable that the demands of the underwriters should be complied with in so far as is expedient, some of their requirements are believed to cause unnecessary hardship. This not only applies to central stations, but also to electric wiring of buildings. We hope that this subject will be brought up and fully discussed at the forthcoming convention of the Canadian Electrical Association.

Electrical Conventions in Chicago.

THE National Electric Light Association and the Illinois Street Railway Association held their annual conventions in Chicago on June 7th, 8th and 9th. At the former Mr. W. McLea Walbank, of Montreal, read a paper on "The Cost of Producing Electric Power by Water Power from Lachine Rapids." A paper on "General Distribution from Central Stations by Alternating Currents," was presented by Mr. H. A. Wagner, of St. Louis, and a companion paper on "General Distribution from Central Stations by Alternating Currents," by Mr. Louis A. Ferguson, of Chicago. An interesting feature of the programme was an illustrated lecture on "Electricity Direct from Coal," by Mr. Joseph Wetzler, of New York.

Cost of Niagara Power.

IN view of the agitation by a section of the press and community in favor of attempting to bring electric power from Niagara Falls to Toronto, interest attaches to a schedule of charges recently adopted by the Cataract Power and Conduit Co. for power delivered in Buffalo, the rates being for three-phase alternating current delivered on the premises of the user at a potential of 2,200 volts: For use not exceeding 1,000 units, two cents per unit; for use exceeding 1,000 units, but not exceeding 2,000 units, the rate shall be, for 1,000 units two cents per unit, and for the excess one and five-tenths cents per unit; for use exceeding 2,000 units, but not exceeding 3,000 units, the rate shall be, for 2,000 units one and five-tenths cents per unit, and for the excess one and two-tenths cents per unit; for use exceeding 3,000 units, but not exceeding 5,000 units, the rate shall be, for 3,000 units one and two-tenths per unit, and for the excess one cent per unit; for use exceeding 5,000 units, but not exceeding 10,000 units, the rate shall be, for 5,000 units one cent per unit, and for the excess eight-tenths of a cent per unit; for use exceeding 10,000 units, but not exceeding 20,000 units, the rate shall be, for 10,000 units eight-tenths of a cent per unit, and for the excess seventy-five hundredths of a cent per unit, for use exceeding 20,000 units, but not exceeding 40,000 units, the rate shall be, for 20,000 units seventy-five hundredths of a cent per unit, and for the excess seven-tenths of a cent per unit; for use exceeding 40,000 units, but not exceeding 80,000 units, the rate shall be, for 40,000 units seven-tenths of a cent per unit, and for the excess sixty-six hundredths of a cent per unit; for use exceeding 80,000 units, the rate shall be, for 80,000 units sixty-six hundredths of a cent per unit, and for the excess sixty-four hundredths of a cent per unit. There will be an additional charge for "service" of about 75 cents per horse power per month.

CORROSIVE AND SCALE-FORMING AGENTS IN BOILER FEED WATERS.

By Wm. Thomson.

(Article 6).

Having considered the scale forming properties of various impurities contained in natural waters, it naturally now requires our attention to be drawn to remedial measures. This we can only discuss in a general way, since conditions of use and impurities in feed waters vary so widely; it is obviously impossible to lay down any single method to suit all cases. Perfectly satisfactory results can only be obtained by individual examinations of each case, taking into consideration not only condition and nature of impurities in feed waters, but also the condition of service and style of boilers or other heating apparatus in use.

While we cannot lay down a rule and formula adapted to each case, we can, at least, intelligently discuss the nature of the reaction it is our desire to bring about, and in this way, I hope, enable the engineer to have reliable data at hand for his guidance.

As already pointed out during the early stages of these articles, the solid impurities contained in the feed water may be in either of two conditions—suspended mechanically, or held in solution. The first of these has quite as important a bearing upon final results as has the latter, and requires just as careful consideration. Since, however, matter held in mechanical suspension requires nothing but mechanical treatment or filtration to effect removal, the question does not involve any serious difficulty. The writer cannot impress too strongly, however, upon his readers the very great importance that this kind of impurity has upon formation of scale. It is comparatively easy in many districts, for various reasons, for the pumps to be continually delivering to the boilers varying quantities of finely divided clay, sand, etc., when water on surface of source of supply appears to be perfectly clear, and presence of such impurities is not even suspected until the engineer finds his boilers coated with thick scale of a most dangerous type. Where there is the slightest danger of anything like this occurring, engineers should insist upon a first-class filtering medium being placed between source of supply and boilers, and small first cost of a real first-class article of this kind will be amply repaid in a very short time.

The idea that any kind of water will do for boiler feed purposes so long as it is "wet" is far too prevalent. The presence of such impurities as are usually met with in mechanical suspension has a very important bearing on scale formation, especially so in the presence of salts of lime and magnesia, and the extraction of matter held in mechanical suspension in very many cases largely tends not only to reduce, but to actually prevent the formation of scale, and the first important requirement necessary for the building up of a good feed water is that it should be clean. As a matter of fact, insoluble matter in suspension should in no case be allowed to exceed .5 grains per gallon. If care and judgment are exercised a good filter can be easily secured, set up, and kept clean, and a very large proportion of the matter held in mechanical suspension removed.

Impurities in solution are of quite a different class, inasmuch as they cannot be extracted by mere mechanical filtration, since by being in solution in the water they will pass through the finest filter, and as a consequence before they can be extracted a change of state must take place, and they must be changed from soluble to insoluble salts, whereby they appear in condition first mentioned and in a position to be extracted by purely mechanical means.

Before proceeding to discuss how this can be brought about, I wish briefly to refer to my first article on this subject dealing with the application of electrical current for prevention of corrosion. A great deal has been claimed by various inventors and writers as to the adaptability of methods of this kind for preventing the formation of scale and effecting its removal after formation. In some instances remarkable success was attained, in many others complete failure resulted. The method has not been universally successful, nor can it be, for many reasons.

I have already pointed out that there are certain scales such as those formed from the carbonates of lime and magnesia that are not very compact, but porous and easily penetrated by the water, consequently the water easily reaches the boiler shell, and when brought into contact with a voltaic current decomposition of the water as an electrolyte sets in, and the hydrogen gas bubbles which form on the iron plate very soon form a thin film of hydrogen gas, interposed between the scale and the plate; as a consequence, scale having poor adhesive qualities soon peels off. Such a result cannot be obtained except in the presence of fairly pure carbonate scale.

Other scales such as are formed from carbonate of lime and organic matter, sulphate of lime, etc., are hard, compact, tenacious in their hold upon iron, and quite impervious to water. Under such conditions as these decomposition of the water cannot take place in contact with the plate, and consequently the thin film of hydrogen gas cannot form between the boiler and the plate.

The methods usually adopted to prevent the formation of scale are to render the scale forming impurities insoluble by physical or chemical changes, thus precipitating impurities either previous to or after reaching boilers. It will be readily seen that before treatment of this kind can be effective certain precautions must be taken.

First—precipitate so formed must be of such a nature that it will not harden or bind together into scale, next, chemical compounds added must also be of such a nature that they themselves will neither form scale nor yet attack the boiler parts, as with either of these it is quite possible to get, as a final result, a condition of affairs worse in effect than would result from impurities originally existing.

A process for softening water, originating from Scotland and known as the Porter-Clark process, may here be referred to as a very useful method for improving feed waters containing the soluble bi-carbonates of lime and magnesia.

This method consists essentially in adding to the feed water a quantity of lime water which first combines with free carbonic acid to form bi-carbonate of lime, and then combining with the excess of carbonic acid contained in the bi-carbonate thus formed as with the excess of carbonic acid already existing as bi-carbonate of lime and magnesia—this final reaction is represented by following equation (in the case of lime salts, a similar reaction taking place with magnesia.)

Lime Water.		Bi-Carbonate of Lime.		Carbonate of Lime.		Water.
$Ca(OH)_2$	+	$Ca(HCO_3)_2$	=	$2CaCO_3$	+	$2H_2O$

Both the carbonate of lime and magnesia are insoluble at 211° F., and nearly so at 60 F., so that the separation of the precipitate becomes mechanically possible.

As will readily be seen, however, care must be taken to add just the quantity of lime required to effect precipitation of the bi-carbonate, as carbonate or calcium hydro-oxide will pass on to the boiler and deposit lime on the boiler parts as evaporation proceeds, and if in any great excess a worse scale will be formed than would have been formed if original matter had been allowed to deposit in the boiler. Moreover, since action of lime water is limited to excess of carbonic acid, free or combined with lime and magnesia as bi-carbonates, no reaction will set in between sulphate of lime and lime water, consequently use of this process is limited to waters rich in bi-carbonates, and may be easily detrumental if applied to waters containing much sulphate of lime, particularly if any excess is added, as then the whole of the essential requirements for the formation of a hard compact scale would be present.

It was originally my intention to show the reaction that would set up between a number of the many compounds on the market, but I find to do this, subject will become unreasonably long. I will then confine myself to a few of the most commonly used substances.

Possibly the chief of these is common hydrated carbonate of soda, or what is commercially known as "sal soda." This compound is largely used for softening water both of temporary and permanent hardness, reactions setting in with both bi-carbonate and sulphate of lime, as shown in equation:

Bi-carbonate of lime (soluble).		Carbonate of soda (soluble).		Carbonate of lime (insoluble).		Bi carbonate of soda (soluble)
$Ca(HCO_3)_2$	+	Na_2CO_3	=	$CaCO_3$	+	$2NaHCO_3$

In this case the basic carbonate of soda absorbs or combines with the excess of carbonic acid combined with carbonate of lime and soluble bi-carbonate of soda, and insoluble carbonate of lime is formed. (Note, the reaction with the magnesia salts is similar.)

A reaction also sets in between the sulphate of lime present and the carbonate of soda; thus:

Sulphate of lime.		Carbonate of soda.		Carbonate of lime.		Sulphate of soda.
$CaSO_4$	+	Na_2CO_3	+	$CaCO_3$	+	Na_2SO_4

Another commonly used and useful reagent is the tribasic phosphate of soda, which is in many cases to be recommended as a good reagent, its chief property being the ease with which the reaction sets in and the entirely unhardenable properties of the precipitate. With sulpphate of lime the reaction is:

Tri-basic phosphate of soda.		Sulphate of lime.		Phosphate of lime.		Sulphate of soda.
$2Na_3PO_4$	+	$3CaSO_4$	=	$Ca_3(PO_4)_2$	+	$3Na_2SO_4$

The chief objection to use of chemical compounds of this type is their property of throwing precipitates down, which, if allowed to accumulate, become very troublesome, and, to overcome this, frequent efforts are being made to introduce compounds that will bring about a chemical change but leave the product soluble in water. A great deal may be said for and against use of compounds of this kind particularly against.

Many compounds of this nature contain a compound known as "sal ammoniac," a salt known in chemistry as chloride of ammonia, or muriate of ammonia, and having the composition NH_4Cl.

The reaction between the lime salts and ammonium chloride is a very distinctive one; taking, for instance, sulphate of lime, we get:

Sulphate of lime		Sal ammoniac.		Chloride of lime		Ammonium sulphate.
$CaSO_4$	+	$2NH_4Cl$	=	$CaCl_2$	+	$(NH_4)_2SO_4$

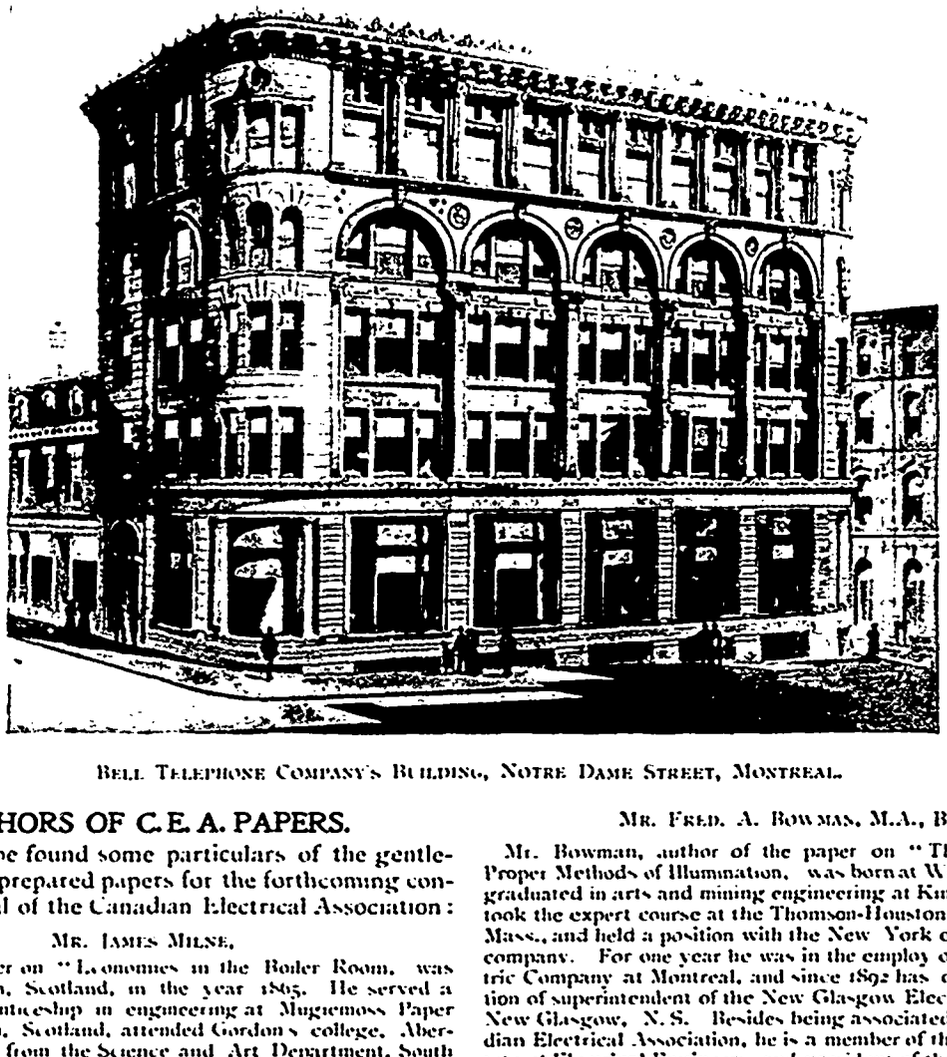
Both sulphate of ammonia and chloride of lime (note 1) are easily soluble in water, and a high degree of concentration would have to be reached before deposit of solid matter could take place; but, as I have already pointed out, natural waters containing lime salts, either sulphate or carbonate, nearly always contain magnesia in some form or other, and I may be pardoned for once more referring to the great danger attendant upon the use of sal ammoniac in presence of magnesia. Taking, for instance, magnesia as commonly present as bi-carbonate, a reaction between this salt and sal ammoniac would set up as follows:

Bi-carbonate of magnesia.		Sal ammoniac.		Magnesium chloride.		Bi-carbonate of ammonia.
$Mg(HCO_3)_2$	+	$2NH_4Cl$	=	$MgCl_2$	+	$2NH_4CO_3$

Magnesium chloride is very unstable, and in presence of heat at once breaks up into oxide of magnesia and hydro-chloric acid. The acid, being volatile, passes off with the steam, and plays havoc with steam pipes and engine valves; while magnesia salt is in even worse shape than it was originally, since oxide of magnesia is a very fine substance, entirely insoluble in water, and forming a ready bonding agent. Any compound containing even a small percentage of sal ammoniac should be looked upon with suspicion, unless magnesium salts are entirely absent from feed water.

(Concluded in Next Issue.)

Note. $CaCl_2$ must not be confounded with the compound usually sold as a disinfectant under the name of chloride of lime, which is a mixture of chloride and hypochlorite of lime.



Bell Telephone Company's Building, Notre Dame Street, Montreal.

AUTHORS OF C.E.A. PAPERS.

Below will be found some particulars of the gentlemen who have prepared papers for the forthcoming convention in Montreal of the Canadian Electrical Association:

Mr. James Milne,

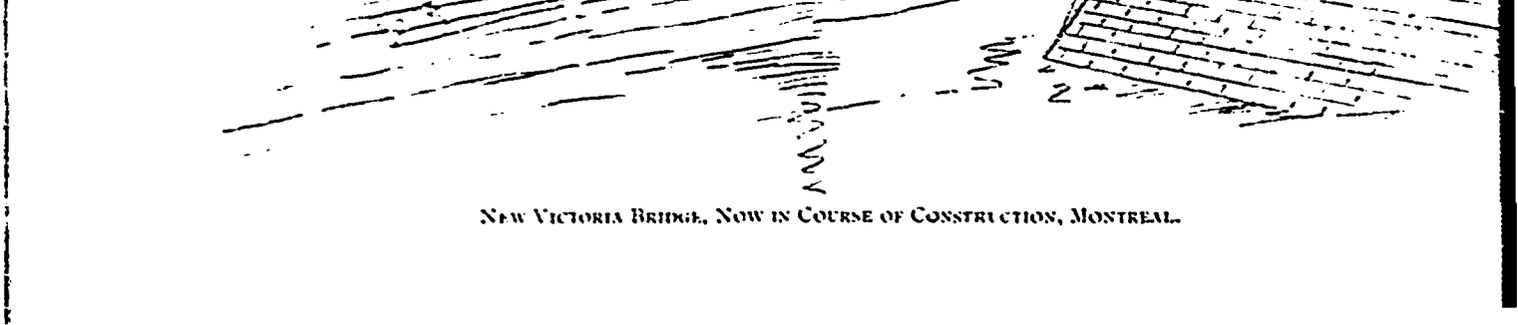
Author of the paper on "Economies in the Boiler Room," was born in Aberdeen, Scotland, in the year 1865. He served a five years apprenticeship in engineering at Mugiemoss Paper Works, Aberdeen, Scotland, attended Gordon's college, Aberdeen, and secured from the Science and Art Department, South Kensington, London, first-class diplomas in machine construction and drawing, applied mechanics, steam and the steam engine and other branches. Twelve years ago he came to Canada and was engaged by M. D. Barr & Co. and the Edison General Electric Company, afterwards becoming a partner in the Keegans-Milne Company, electrical engineers and contractors, Montreal. Withdrawing from this firm he was appointed general superintendent of the Toronto Incandescent Light Company, and while thus engaged lectured on "Electricity" and "Steam and the Steam Engine" at the Toronto Technical School. A few months ago Mr. Milne became associated with the Weeks-Eldred Company, now the General Engineering Company of Ontario, of which he is now managing director

Mr. Fred. A. Bowman, M.A., B.E.

Mr. Bowman, author of the paper on "The Importance of Proper Methods of Illumination," was born at Windsor, N. S., and graduated in arts and mining engineering at King's College. He took the expert course at the Thomson-Houston Works at Lynn, Mass., and held a position with the New York office of the same company. For one year he was in the employ of the Royal Electric Company at Montreal, and since 1892 has occupied the position of superintendent of the New Glasgow Electric Light Co., of New Glasgow, N. S. Besides being associated with the Canadian Electrical Association, he is a member of the American Institute of Electrical Engineers, and president of the recently organized Maritime Electrical Association. His portrait appeared in our May issue.

Mr. A. A. Wright

is a Canadian by birth, having been born in the county of Leeds on the 6th of June, 1848. He received his primary education at the Farmersville High School. From there he went to the Toronto Normal, where he obtained his first-class certificate. Being anxious to acquire a thorough knowledge of the French language he proceeded to Berthier-en-Haut, in the Province of Quebec, where he devoted his time entirely to the perfecting of his knowledge of that language. Leaving Quebec in 1870 he returned to his native province of Ontario and engaged in mercantile business



New Victoria Bridge, Now in Course of Construction, Montreal.

in Renfrew, where he has remained, and is now the head of the firm of A. A. Wright & Co. In 1886 his firm first entered the field of electric lighting, purchasing two Ball arc machines, which they ran in connection with their grain elevator. Later on they added a T. H. alternating plant, and have continued in the electrical business ever since. Mr. Wright was one of the originators of the Canadian Electrical Association. He was chosen as one of its first directors, and still continues to take no small interest in the working of the society. He is an ardent politician, but has successfully withstood all attempts to allow his name to be put forward for political honors, although frequently urged to do so.

Dr. J. K. Johnstone.

Dr. Johnstone was born at Brantford, Ont., in October, 1849. He graduated in medicine in the year 1870, and practiced for about twelve years, when he received an appointment to the Inland Revenue Department as Inspector of Gas. Upon the adoption by the Dominion Government of an act for the inspection of electric light, he was appointed inspector for the inland revenue districts of Toronto, Guelph and Owen Sound, in addition to his former duties, with head office in Toronto.

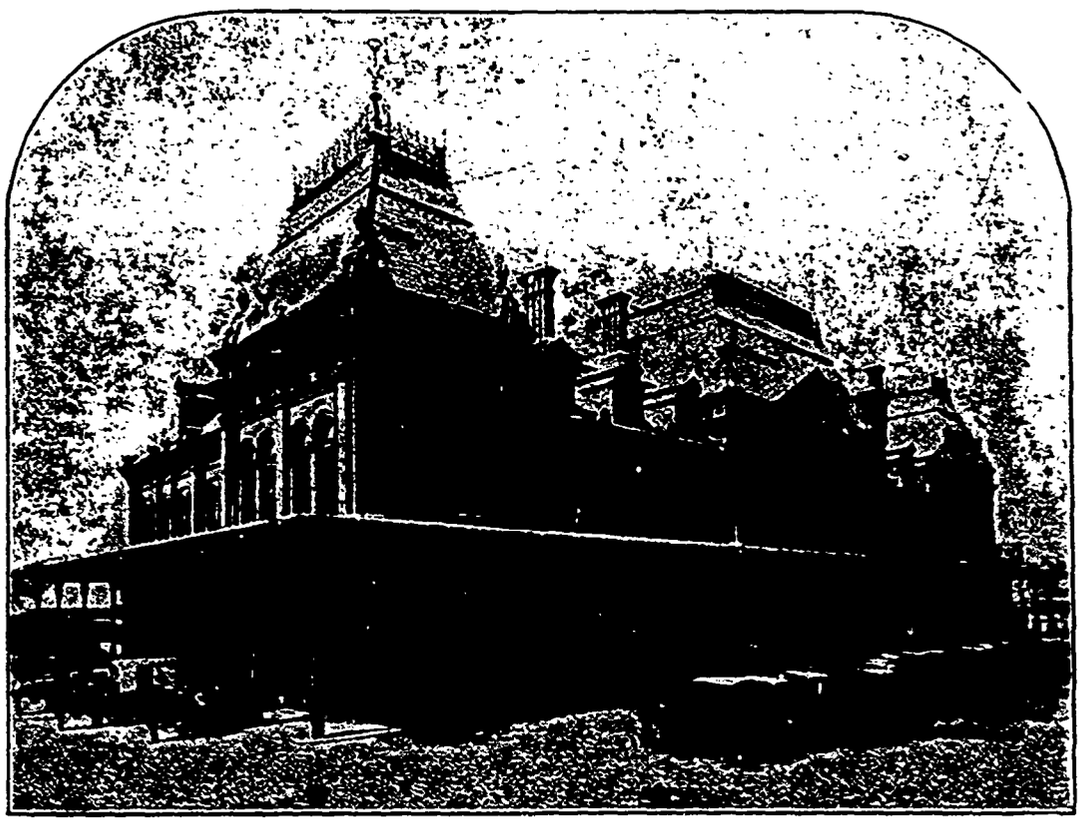
Mr. Wm. T. Bonner,

who contributes two papers for the coming convention of the Canadian Electrical Association, and whose portrait appears in the group of the local committee on another page, is a native of Ohio. His early education was commenced in a private school in Chillicothe, where he remained until finishing in the high school, when he took a practical engineering course in field work under Wm. E. Strong, an eminent civil engineer engaged in railroad construction and river improvement for the United States government. About this time he contracted the West Point fever, and through personal application at Washington, received from President Hayes promise of appointment. Some trivial incident occurred, however, which caused him to adopt a commercial course, filling two positions between 1878 and 1883 with book and stationary firms in Chillicothe and Toledo.

In 1883 Mr. Bonner married Miss Baker, of Toledo, and returned to Chillicothe to manage the grain and feed business of his father, who died early in 1884. A few months later he was elected secretary and manager of the Great Western Carbon Co., organized by a syndicate of Toledo capitalists to build and operate large works in Omaha for the manufacture of ammonia sulphate and bone charcoal for refining sugar. Although the feed mill in Chillicothe offered some opportunity for practice in mechanical engineering, it was not until the carbon works were being built that Mr. Bonner's natural tastes were given full scope, and he realized the opportunities before him. Although absolutely without experience and entirely ignorant of the character or process of manufacture of the product to be turned out, the executive and technical management of the carbon business was entrusted to him, and within a year he brought the works to a state of perfection highly satisfactory to his company—certainly a creditable achievement for a youth of twenty-four. In 1888 the business was wound up owing to failure of supply of raw material, and he then commenced business for himself as contracting mechanical engineer, making a specialty of designing and installing steam power plants. In this he was fairly successful until the repeated failure of crops in the west burst the bubble of inflated values in Omaha, Kansas City and other places in 1890.

Mr. Bonner then moved to Chicago and accepted a situation as Chicago salesmanager for Fraser & Chalmers. This position was soon enlarged to include cable railway and steam power work generally. During the summer of 1891 he engineered the deal which secured for Fraser & Chalmers the complete contract for the great Masonic temple, up to that time the largest known steam power installation for commercial buildings. Owing to his success in this connection he was afterwards given charge of many important negotiations for power installation all over the continent, including the great Broadway cable plants in New York city in 1891, requiring over 4,000 tons of boilers, engines, cable winding machinery and connections, and costing more than half a million dollars. Mr. Bonner still regards with pardonable pride the flattering comments of his principals in their letters to him while engaged on this negotiation in New York. After the close of the World's Fair he went to New York as general eastern agent for the Butman Company, of Chicago, builders of a new type of vertical boiler, continuing there, with the exception of a short engagement in Chicago late in 1894, until January, 1895, when he came to Montreal as general Canadian agent for the Babcock & Wilcox Company of New York.

Although Canada had been included as a part of the territory ceded to the English company at the time of its organization in 1880, the New York company continued to operate it up to July, 1896, when Babcock & Wilcox, Limited, assumed active charge and Mr. Bonner accepted the Cincinnati office as his choice of the United States districts offered him by the New York company. Within a few months, however, he was called to London to consult with the English company regarding Canadian business, with the result that he returned to Montreal in October, 1897, as manager for the entire Dominion of Canada, which position he now holds.



Bonaventure Station, Montreal.

Mr. Bonner is very enthusiastic about his chosen profession, and makes it an invariable rule to study the principle and plan of any important engineering work or power installation wherever he goes. During the past fifteen years he has visited every important place in Canada and the United States east of the Rocky mountains, and the information gained from personal observation of engineering methods here and also in England, Ireland, Scotland and France, places him in a very enviable position as a consulting engineer. Naturally of an inventive turn of mind and quick to devise methods for overcoming difficult engineering problems, his contracts are carried out with satisfaction alike to his company and their customers. The Babcock & Wilcox offices in Montreal also reflect his taste and ingenuity, being generally regarded by well posted authorities as unequalled for convenience and effective display.

Although a member of several social and athletic clubs, Mr. Bonner is not in any sense a club man, preferring the more profitable pleasure of technical organizations. A member of the American Society of Mechanical Engineers since 1892, Mr. Bonner, on coming to Canada, soon became interested in the Canadian Electrical Association and the Canadian Mining Institute, being re-elected in March last a member of the executive council of the Quebec division.

As early as 1876 he contributed to the local publications notes on his observations at the Centennial and other subjects. His paper on ancient Pompeiian boilers read before the New York meeting of the American Society of Mechanical Engineers in 1896

was very extensively copied and commented upon by the technical and news papers all over the United States, and also by London Engineering and many other journals in nearly every foreign country.

MR. M. W. HOPKINS.

Mr. M. W. Hopkins, B.Sc., C.E., author of the paper on "The Electric Current in the Rainy River Gold Mines, was connected with the construction of the Hamilton, Grimsby and Beamsville Electric Railway. Recently he has been engaged in civil engineering in the gold fields of Northwestern Ontario.

MR. L. DEWITT MAGIE.

MR L. DeWitt Magie was born in Northern Pennsylvania about 32 years ago. He became connected with the Stanley Electrical Mfg. Co., of Pittsfield, Mass., at its inception in 1890, remaining with them until June, 1895, when he received the appointment of chief electrical engineer of the Royal Electric Company, Montreal, with whom he has been engaged since that time. Mr. Magie gained considerable prominence in Canadian electrical circles in connection with the electrical work on the North Shore Power Company's plant at Batiscan Chute, Que., carrying power to Three Rivers, a distance of 16 miles, and also in the reorganizing of the Montmorency Power Company's work at Montmorency Falls, Que., transmitting power to Quebec city, a distance of 10 miles. He is also chief of the Chambly Mfg. Co.'s plant, which will transmit power from Chambly Rapids to Montreal. This plant is the largest of its kind in Canada, conveying electrically 25,000 h.p. a distance of 14 miles.

THE ELECTRIC LIGHTING FRANCHISE AT OTTAWA.

THE following review of the steps that have been taken in connection with the application of the Deschenes Electric Company for permission to supply light and power within the city of Ottawa is furnished by a correspondent:

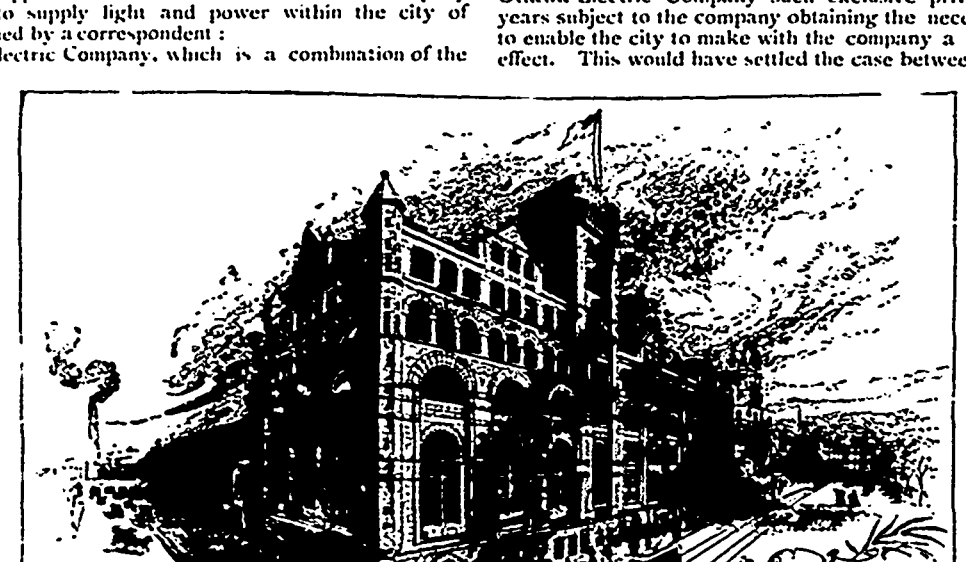
The Ottawa Electric Company, which is a combination of the three electric lighting companies formerly existing in the city of Ottawa, namely, the Chaudiere Electric Light & Power Co., the Standard Electric Co. of Ottawa, Limited, and the Ottawa Electric Light Co., have had a busy time lately fighting off opposition.

The Deschenes Electric Company, incorporated by letters patent and promoted by the principle owners of the Hull Electric Company, applied to the Dominion government and obtained permission to lay cables across the Ottawa river opposite the city, and to bury such cables on the government reserve along the banks of the Rideau canal to a point opposite the Canada Atlantic central station, from where they could distribute current to the city. The cables having been successfully laid, they were connected to the Russell Theatre, which they could light without using any of the city streets. Later on they filed an application with the City Council asking for permission to supply light and power to the citizens of Ottawa. This application was referred to a special committee, who asked both the Ottawa Electric Company and the Deschenes Company to make proposals to the city as to what rates they were disposed to accept, etc. The Deschenes Company asked a rate of one cent per ampere hour, with cash discount of 40 , while the Ottawa Company offered a similar rate, with 33⅓ for prompt payment. On account of the large number of customers who would get immediate benefit of the discount, and the fact that the Deschenes Company had not yet any business in the city, it was urged by the Ottawa Company that their offer was as advantageous as that of the Deschenes Company. They were later asked to make their discount 40 , which they agreed to do, and which they immediately did, announcing in the city papers that this discount would be granted from that date.

When the question came up before the City Council, the application of the Deschenes Company (which, by the way, did not offer to pay the city anything, although the company is not a local one and were paying nothing to the city in the way of taxes, etc.) was refused by a vote of 14 to 10. Notice of reconsideration was immediately given by one of the aldermen.

During these events a gentleman connected with the Deschenes Company made statements in the public press charging certain aldermen with getting their lights from the Ottawa Electric Company free of charge. This was immediately taken up by the Ottawa Company, who appointed the president of the Board of Trade as referee, and asked him to appoint certified accountants to go through the books of the company. This he did, and published a report completely exonerating the aldermen from the charge, and showing it to be absolutely false. In the meantime, a public meeting had been called at the city hall to consider the question of these charges, at which meeting the accuser of the aldermen was to substantiate his charges, or failing to do so was to give $100 to the charities of Ottawa. The meeting was largely attended and proved a boomerang to those who had called it. Not only were the charges dropped in the most ignominous manner, but the meeting proved itself in favor of municipal ownership, and asked that no other company be allowed to do business in the city, and thus complicate matters for a transfer to the city.

At a later meeting of the City Council the aldermen refused to re-consider the question. A motion to rescind at the end of the meeting was also voted down. The motion adopted by the Council gave the Ottawa Company a monopoly of electric lighting in Ottawa for seven years, the unexpired portion of their contract for lighting the city streets, and the company agreed to sell out to the city by arbitration at any time the city might wish to acquire their plant and business. The legality of this was attacked on the ground that the Council could not give exclusive privileges; this was confirmed by the City Solicitor's opinion in writing. A motion was then introduced providing that the city give the Ottawa Electric Company such exclusive privileges for seven years subject to the company obtaining the necessary legislation to enable the city to make with the company a contract to that effect. This would have settled the case between the companies and the city, but it was side-tracked by an amendment referring the question back to the committee in order that they might ascertain from the Ottawa Company on what terms it would sell out to the city. The matter now rests there, and it would be interesting to know what the next move will be.



The Ottawa Electric Company, who spend $100,000 per year in the city, and pay several thousand dollars in taxes, and whose employees all reside in the city of Ottawa, felt that they could not allow a company whose plant and business was all outside to come into the city, and, without paying anything for the privilege, cut rates and take a part of their business from them, without making strenuous efforts to prevent it. In this they were supported by a large portion of the citizens, who felt that the home company should be given the preference, especially when they were willing to make their rates as low as any that had been offered, and it was also the general opinion that it would be better to have only one company to deal with should the city ever wish to acquire a plant.

It is not unlikely that a plebiscite will be submitted to the electors asking if they are favorable to the city owning and operating an electric plant, not only for street lighting of the city, but also for distribution to the citizens generally.

In the Council fourteen of the aldermen are stated to have supported the contentions of the Ottawa Company. There were some among the ten who opposed it who fought bitterly against the company. One would think from their treatment of the matter that the company had been a public nuisance rather than the means of introducing electricity into almost every home in the city at a time when it was difficult to get any capitalist to invest his money in electrical enterprise. Now that the company has shown that the business can be made to pay, there are many ready and anxious to spoil their business in order to get a small slice themselves.

The Royal Electric Company is installing an arc plant for the Soulanges Canal.

CANADIAN PACIFIC RAILWAY COMPANY'S LONG COPPER WIRE.

Owing to the Yukon excitement, and the greater prosperity now prevailing throughout Canada, the telegraph business between the far west and eastern Canada has so largely increased as to necessitate the erection of additional wires by the Canadian Pacific Railway Company's telegraph department. In addition to over 1,000 miles of iron wire put up on different sections this year, the management decided on stringing a copper wire weighing 300 pounds per mile from Montreal to Vancouver, to be used for Pacific coast business. Montreal to Vancover being too great a distance for the practical working daily of a through connection by means of an iron wire, all transcontinental telegrams are at present received and transmitted at Winnipeg, two iron wires of 580 pounds per mile being used. This entails additional expense for salaries, and, of course, a certain amount of delay. Copper being about six times better as an electric conductor than iron, the new wire will bring Vancouver nearer to Montreal, electrically, than now Winnipeg is.

The circuit will be worked duplex, i.e., telegrams passing in opposite directions simultaneously. Automatic repeaters will be placed at Fort William, Ont., and Swift Current, N.W.T., thus dividing the line into three, approximately, equal sections. It is quite likely that during part of the year repeaters will only be required at Winnipeg. The copper wire will be reserved for transcontinental business, and the present two heavy iron wires will be used for business with Winnipeg and the Northwest and any overflow from the copper wire.

Should the overland business increase beyond a certain point, the copper wire will be quadruplexed, i.e., two telegrams sent each way, or four in all, at the same time. When completed this will be the longest land line circuit worked daily in the world.

The wire is being drawn by the Dominion Wire Manufacturing Co., at Lachine, from Calumet and Hecla copper. Tests are made daily from every tenth bundle at McGill college by Graham Drinkwater, under the supervision of Prof. Bovey, L.L.D., C.E. The wire is required to stand a breaking strain of 960 pounds, with an elongation of one per cent; 30 twists in a six inch length; to be wound in six close turns around wire of its own diameter, and untwisted without breaking; weigh between 295.6 and 304.3 pounds per mile; diameter between .136 and .138 of an inch; and a minimum conductivity of 96 per cent. of pure copper. Should any sample not pass the tests, each remaining bundle in the lot of 10 is tested and all not passing are rejected. The approved bundles must have an inside diameter of 24 inches, and weigh between 150 and 220 pounds without splice or brace, either in the original rod or the completed wire. Mr. Drinkwater tags each bundle and looks after the shipments. The tie wires are soft copper of the same diameter as the line wire, the manner of tying being one designed by Mr. Townsley. The joints in construction are made with what is known as the McIntyre sleeve with the ends soldered, it having been found that without the solder as made in the United States the joint broke at about 500 pounds strain. By soldering the breaking strain is increased to 900 pounds.

It was intended to use white porcelain insulators, and 120,000 were ordered from Europe; but on account of delay in shipping the work was commenced and glass insulators used on the section from Montreal to Winnipeg. They are manufactured by the Diamond Glass Co., at Montreal. From Winnipeg west, the porcelain insulators will be used, and probably the glass east of Winnipeg will be replaced with porcelain later on. The insulators will weigh 75 tons.

Although the distance, via new short line to Ottawa, is only 2,897 miles, 3,000 miles of wire is required, equal to 450 tons or 23 car-loads. To make the joints, nearly two miles of wire is used, and the necessary slack between poles takes up some six miles more. A small supply must be left with each lineman for any repairs; this will eat up about 25 miles more. The tie wires use up six and a quarter tons of copper.

Work was commenced on April 7th by one gang, and as soon as sufficient wire could be supplied other gangs were started out, until there were seven gangs, consisting of 150 men, employed. It was intended to have two more gangs on the work; but on account of considerable reconstruction of the pole line west of Winnipeg, now going forward, it was thought best not to string the copper until after this work was finished, so as to handle it as little as possible.

The section from Montreal to Winnipeg will be completed during the latter part of June, and will be put in use at once. The whole line is expected to be finished by the first of August, in time to accommodate the heavy fall business.

W. J. Camp, electrician for the department, has supervision over the whole work, which passes over three divisions. The first one from Montreal to Fort William, Ont., 990 miles, is being constructed by four gangs under Jos. Townsley, Superintendent of Construction, eastern division, assisted by J. F. Richardson, Assistant Electrician.

The second stretches from Fort William, Ont., to Donald, B. C., 1450 miles. On this section there are three gangs on the wire and two on pole work, under B. S. Jenkins, Superintendent Telegraph, western division, assisted by S. Edwards, inspector.

The last section is from Donald to Vancouver, 458 miles, J. Wilson, Superintendent Telegraph, Pacific division, assisted by E. H. Grindrod, inspector, will have two gangs on this portion. They are now on reconstruction and will start work on the copper about the middle of June.

MR. CHAS. R. HOSMER.

Mr. Hosmer, who is at the head of the Canadian Pacific Railway Co.'s telegraph system of Canada, was born of American parents in the small village of Coteau Landing, Que., (about forty miles from Montreal) in November, 1851. He started learning telegraphy at the Grand Trunk railway station at that village when a lad of thirteen, and took charge of his first telegraph office

MR. CHAS. R. HOSMER.

in August, 1866, since which time he has been constantly employed in the telegraph business in one capacity or another. He taught telegraphy at Beauharnois, Maskinonge and Ratiscan, in the province of Quebec, during the year 1868. From Coteau Landing he went to Kingston, Ont., in the service of the Montreal Telegraph Company, and was made manager of the Dominion Telegraph Company at that place in 1870. With the same company he worked in Buffalo in 1871, and was transferred to Montreal as superintendent of the Dominion Telegraph Company in 1873, at the age of 22. He remained in the service of the Dominion Telegraph Company until it was amalgamated with the Great North-Western Telegraph Company, when he organized the Canada Mutual Telegraph Company (in 1881), which was the Canadian connection of the Mutual

Union Telegraph Co. He was president and general manager of this company until he went into the service of the Canadian Pacific railway in 1886.

Mr Hosmer is one of the vice-presidents of the Commercial Cable Company, and is also a director of the Postal Telegraph Company in New York, as well as of the Direct West Indies Cable Company.

MR. W. J. CAMP.

Mr. Camp, electrician of the Canadian Pacific Railway Company's telegraph department, was born April 2nd, 1855, at Oakville, Ont. He entered the service of the Dominion Telegraph Company at Prescott, Ont., in 1874, and in a few months was in charge of the wire testing in that district; the following spring he was

MR. W. J. CAMP.

transferred to Montreal as book-keeper. In 1876 he was promoted to be manager of the office at Watertown, N. Y., but a few months later left the service and worked on different points on the New York Central railroad, Troy and Boston railroad, and for the Western Union Telegraph Co., at Albany, N. Y., leaving the latter place to re-enter the service of the Dominion Telegraph Company at Montreal, where he was appointed night chief. In January, 1878, he became train despatcher for the Q. M. O. & O. R. R., but on the government seizing that road he returned to the night chiefship of the Dominion Telegraph Co., later on being advanced to assistant day chief. When the amalgamation of the telegraph companies took place he was retained by the

MR. JOSEPH TOWNSLEY.

Great North-Western Telegraph Company. In 1884 he was appointed superintendent of the Holmes Electric Burglar Alarm Company at Montreal, from which he resigned to accept his present position.

MR. JOSEPH TOWNSLEY.

Mr. Townsley was born at Rockfield, Ont., on the 24th day of January, 1842. On the 1st day of May, 1867, he entered the employ of the Montreal Telegraph Company on line repairs and construction, and only severed his connection with the old company on May 1st, 1882, to accept his present position of superintendent of construction and repairs on the eastern division of the Canadian Pacific Railway Company's telegraph.

MR. B. O. JENKINS.

Born April 8th, 1859, at Richmond Hill, County York, Ont., Mr. Jenkins entered the telegraph service at fourteen years of age at Madoc, Ont. After several

MR. B. O. JENKINS.

years service with the Montreal and Dominion telegraph companies at different points, he went to Manitoba in 1881 for the Canadian Pacific Railway Co., and was appointed superintendent of telegraphs on the western division of the system in 1883.

MR. JAMES WILSON.

Mr. Wilson was born in Elora, Ont., 1856. He first worked in the Montreal Telegraph Company's office at his native town until August, 1870. In 1872 he joined the Dominion Telegraph Company's staff in Toronto, and was transferred in 1876 to the direct United States cable station at Tor Bay, N. S. In 1876 he was inspector and paymaster of construction, and in 1879 superintendent of construction for the Dominion Telegraph Com-

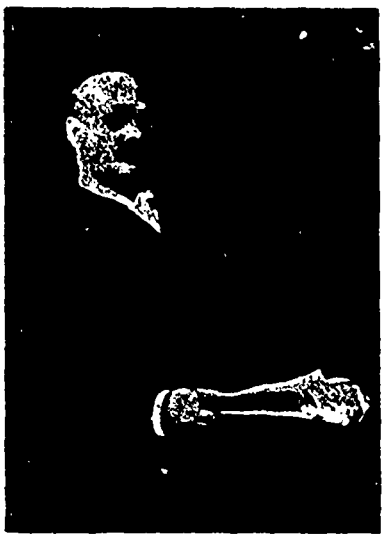
MR. JAMES WILSON.

pany in the maritime provinces. In May, 1880, he was appointed district superintendent in British Columbia of the Dominion government telegraphs, which position he held until the system was purchased by the Canadian Pacific Railway Company, October 1st, 1886, when he was appointed superintendent of the Pacific division of the Canadian Pacific Railway's telegraph system.

MR. JAMES KENT.

Mr Kent, Superintendent of the Canadian Pacific Telegraphs, Montreal, Quebec, was born in Montreal on January 15th 1854. He entered the service of the

Montreal Telegraph Company as messenger, shortly after leaving school in 1868. He was promoted to the operating room as check boy, and after a short time became an operator. After working as such for five years he was appointed night chief, and subsequently day wire chief for the same company, which position he held until 1886, when he resigned to accept the position of chief operator of the Canadian Pacific Railway Telegraphs at Montreal, which opened for business that



MR. JAMES KENT.

year. In 1890 he was promoted to the superintendency of the eastern division of the same system, which position he still holds.

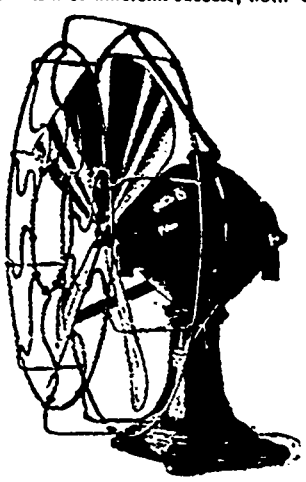
AN UP-TO-DATE SUPPLY HOUSE.

THE establishment of R. E. T. Pringle, 216 St. James street, Montreal, is now well and favorably known throughout Canada as one of the leading supply houses. Previous to 1898 Mr. Pringle had only a small office, from which he transacted a small but growing business, confining his efforts, however, almost exclusively to the sale of Packard lamps and transformers and Toronto motors and generators; but in January of last year, realizing the large field and increasing demand for all lines of electrical goods, he opened his present establishment, where, notwithstanding keen competition, he has, by sound business principles and straightforward dealing, built up what is generally conceded to be one of the most up-to-date supply houses in Canada. Intending visitors to the Electrical Association Convention should not fail to call on Mr. Pringle, who is a member of the local committee, and whose genial countenance appears on another page of this issue.

FAN MOTORS.

SOME means of maintaining a circulation of air to lessen the oppressive heat of summer have been employed by all nations for many centuries. A marked difference, however, exists between ancient and modern methods, and the development of the electric fan motor is one of the triumphs of nineteenth century civilization.

Now that the fan motor has passed through the experimental stage, and is a commercial success, both electrically and mechanically, it has become an important factor wherever the electric system is in use, in making more endurable the heat of the summer months.



C. G. E. FAN MOTOR.

For the season of 1898, the Canadian General Electric Company, Limited, present a splendid line of fans for both direct and alternating current circuits. These machines are designed with great care, special attention being paid to thoroughly tested construction. The best of material is used, and the workmanship is first-class in every particular, thus ensuring both durability and noiseless operation. They are artistic and substantial in appearance, besides embodying every valuable improvement suggested by long, practical experience. The various parts are as well proportioned as in larger machines, and no fear of excessive wear or heating need occur where the motors are operated continuously. Attention is called in our advertising columns to the specifications of the various types of fan motors handled by the Canadian General Electric Company.

MR. WILLIAM SUTTON.

WE present herewith a portrait of Mr. Wm. Sutton, a charter member and past vice-president of the Canadian Association of Stationary Engineers, and president of the Wm. Sutton Compound Co., of Toronto, Limited. Mr. Sutton is the inventor of the Sutton boiler compound, Sutton steam blower and vaporizer, and the Sutton tile machine. He was born in 1834, in Lincolnshire, England, and received his engineering training at Messrs. Tuckford's Engine and Machine Works in the city of Boston, Lincolnshire. After a few years he was appointed assistant-engineer at Billinghay Dales pumping station, and while thus engaged began first experiments in connection with boiler scale and its removal by vegetation. While pumping the water off the moors into the sea, a marked improvement was noticeable at different periods of the year. He continued his study along these lines until a few years ago, when he completed his task and placed upon the market the now famous Sutton boiler compound, which is said to be meeting with success wherever used.

Mr. Sutton came to Canada forty-two years ago, when a young man, and since that time has held responsible positions, being chief engineer of the Orangeville waterworks, travelling engineer for the Slate Line and Sullivan Railroad, and engineer for the Pure Gold Mfg. Co., of Toronto. It was while in the employ of the last-named company that the final tests of his study and experiments were concluded. By the advice and persuasion of his friends, and realizing the field for a first-class article for the removal of boiler scale, he decided to manufacture the compound for the benefit of steam users. Mr. Sutton claims for his invention that it contains no acids, caustic soda, or zinc, and that those who have given it a trial acknowledge it a superior compound, its use resulting in no injury to the boiler, valve seats or packing. It is therefore used extensively by breweries, bakeries, dye works, steam laundries, etc.

Owing to increased business, it was soon found desirable to form a company to undertake the manufacture and sale of the compound. This is known as the Wm. Sutton Compound Com-

MR. WILLIAM SUTTON.

pany, Limited, being composed of some of the leading manufacturers in the city, the office being at 206 Queen street east, Toronto. Since placing the compound on the market, the sales have increased so rapidly as to necessitate several additions to plant and stock. Mr. Sutton naturally feels a justifiable pride that, after years of study and experiment, carried on under rather unfavorable circumstances, satisfactory results have finally been accomplished. Upon request the company will gladly furnish a sample of the compound to steam users.

PUBLICATIONS.

E. L. Powers, of Monadnock Block, Chicago, issues quarterly the American Electrical Directory and Buyer's Manual, combining what is claimed to be a complete list of electric lighting central stations in the United States, Canada and Mexico, with details and other valuable information. It is issued in January, April, July and October, the subscription price being $4 annually.

We have been favored by the Canadian publishers, The Copp Clark Co., Limited, of Toronto, with a copy of a Pocket Hand Book for Mechanical Engineers recently compiled by Mr. David Allan Low (Whitworth Scholar), M. I. Mech. E., Professor of Engineering East London Technical College. The book, which is well printed and bound in cloth, is 4 x 6 inches in size, and comprises 750 pages, with upwards of 1,000 illustrations. The author claims to have spared no pains to verify the correctness of the tables and calculations embodied in this book so as to make it thoroughly up-to-date. The price is not given, but may be obtained by persons interested on application to the Canadian publishers as above.

G. B. Burland, of Montreal, has installed a Kingsley water tube steam boiler plant in the Union Card and Paper Company's new works. This is the second order that Mr. Burland has given for Kingsley boilers after using them for four years. They were installed by E. A. Wallberg, of Montreal.

SPARKS.

Steps have been taken at Truro, N. S., to improve the quality of electric light wiring done in buildings.

The Toronto Railway Company have ordered from the Canadian General Electric Company twenty additional C.G.E. 1000 motors.

Charles Baillairge, C.E., of Quebec, at the request of a Belgian firm, has made a test of the water power of a river about twenty miles below Malbaie, Que.

The Jenckes Machine Co., of Sherbrooke, Que., shipped on the 5th May one of their complete 10 stamp mills to the Cariboo Mining, Milling & Smelting Co., Fairview, B.C.

The Great Northwestern Telegraph Company have completed an extension of their line into British Columbia. Offices will shortly be opened at Vancouver and other important points in the province.

Mr. R. Prefontaine, of St. Agathe des Monts, Que., has placed an order with the Canadian General Electric Co. for one of their thousand light single phase standard ironclad armature type of alternating current generators.

Messrs. Geo. M. Webster & Co., of Quebec, coal handlers, are improving their facilities for unloading steamers, and for this purpose have placed an order with the Jenckes Machine Co., of Sherbrooke, Que., for four of their double cylinder rapid coal hoisting engines, with boilers.

The Finance Committee has made a recommendation to the City Council that steps be taken to acquire the street railway system, and that the committee be authorized to obtain such information as will enable it to recommend to the council an offer for the company's property.

The Pembroke Navigation Company has placed an order with the Canadian General Electric Company for equipping their steamer Victoria with a complete electric lighting plant, which will include a six kilowatt Edison type dynamo, a vertical automatic engine, and a search lamp of 4000 candle power.

The Cornwall Electric Street Railway Company, Limited, have ordered from the Canadian General Electric Company four C.G.E. 1200 motors, to be used in the equipment of another freight locomotive which they have been obliged to put on their road to supply the increased demands on them for freight service.

The Smuggler Gold Mining Co., with headquarters at Toronto, have decided to put a 20 stamp mill on their property at Fairview, B. C., this summer, and an order for the same has been placed with the Jenckes Machine Co., of Sherbrooke, Que., for Corliss engine, 20 stamps, vanners, and four miles of Aerial tramway.

The Canadian Copper Co., of Copper Cliff, Ont., are fitting a new shaft, and have placed an order with the Jenckes Machine Co., of Sherbrooke, for two 100 h.p. special steel boilers, one 12 ×15 double cylinder double drum winding engine, three large steam pumps and rock breaker, and necessary gear for operating same.

The Toronto Electric Light Co. and G.N.W. and C.P.R. Telegraph Companies are considering the question of putting the electric wires underground on Yonge street, between Front and King streets. The city engineer estimates that a conduit containing twelve ducts, each capable of carrying 200 wires, would cost $29,000.

The North Shore Electric Railway Co. has been granted a Dominion charter, the promoters being William Owens, of Westmount, R. Prefointaine and A. J. Corriveau, of Montreal, and others. It is intended to build a railway from Three Rivers along the north shore of the St. Lawrence river, and to use the power generated at Shawenegan Falls.

The city engineer of London, Ont., has submitted an estimate for the construction and operation of a civic electric lighting plant, showing the cost to be 25.06 cents per light for 350, as against 25 cents per light for 298 lights 2,000 candle power, as at present paid, per contract. The estimate for the proposed arc plant of 350 lights is $80,236.50.

The Bell Asbestos Co., of Thetford Mines, Que., are changing their system of operating their mine hoist, and for this purpose have placed an order with the Jenckes Machine Co., of Sherbrooke, Que., for one of their 100 h.p. steel tubular boilers, and have also purchased from the same company one of their small locomotives, for shifting cars in pits.

In the Hull Superior Court recently judgment was rendered by Judge Lavergne in the case of the Bytown and Aylmer Turnpike Company against the Hull Electric Company. The judgment recited that defendant against the will of the plaintiff forcibly took possession of certain portions of the Aylmer road and built an electric railway along and across the highway. The judge ordered defendants to forthwith remove all its tracks, poles, wires and other apparatus from the portions of the road, and in default 15 days from the service on the defendant of the present judgment plaintiff is authorized to do so at the expense and risk of the defendant, and the defendant is enjoined to refrain for the future from using the highway, and is condemned to pay plaintiff $1,056 with costs.

The Recorder at Montreal has given judgment against the Montreal Street Railway Company for the nominal sum of $25 and costs for refusing to build and operate their line up Cote des Neiges Hill, as agreed by them in their contract with the city, within a certain space of time that expired on the 1st of May, 1897. The company argued that the road would be too dangerous, but the city obtained evidence from experts to prove that the new street car line in Quebec is built with much shorter curves, much steeper hills, and much shorter declines and inclines than would mark the line in question. The Recorder said: The preponderance of testimony shows that if there is to be any danger attached to the line, that danger can only be caused by negligence, ignorance or imprudence on the part of the company, its engineers or other employees, and to this all institutions of a similar nature are liable. He regretted exceedingly to be compelled to find the company guilty, because, as a rule, it had fulfilled its duties towards the city well; but it had neglected its agreement with the city in this instance, and without being able to prove that there was really anything to prevent its carrying out its obligations.

As the first step towards the inauguration of a system of radial railways for Toronto, a committee of the Board of Works had a conference recently with the management of the Metropolitan street railway. It was suggested that the Toronto Street Railway Company give running powers over the Church street route, which could be used as a trunk line for all the radial roads. One difficulty in the way, however, is that the statute provides that the standard width of all radial railways shall be 4 feet 8½ inches, while the Metropolitan and Toronto railway tracks are 4 feet 10½ inches apart. The committee decided to have an interview with the manager of the Toronto street railway and endeavor to formulate a plan which would be acceptable both to the street railway and suburban companies.

MOONLIGHT SCHEDULE FOR JULY.

Day of Month.	Light.	Extinguish.	No. of Hours.
	H.M.	H.M.	H.M.
1....	No Light.	No Light.	.....
2....	No Light.	No Light.	.....
3....	No Light.	No Light.	.....
4....	No Light.	No Light.	.....
5....	P.M. 8.00	P.M. 10.30	2.30
6....	" 8.00	" 10.30	2.30
7....	" 8.00	" 11.00	3.00
8....	" 8.00	" 11.30	3.30
9....	" 8.00	A.M. 12.10	4.10
10....	" 8.00	" 12.40	4.40
11....	" 8.00	" 1.00	5.00
12....	" 8.00	" 1.20	5.20
13....	" 8.00	" 2.00	6.00
14....	" 8.00	" 2.40	6.40
15....	" 8.00	" 3.40	7.40
16....	" 8.00	" 3.40	7.40
17....	" 8.00	" 3.40	7.40
18....	" 8.00	" 3.40	7.40
19....	" 8.00	" 3.40	7.40
20....	" 8.00	" 3.40	7.40
21....	" 8.00	" 3.40	7.40
22....	" 8.00	" 3.50	7.50
23....	" 8.00	" 3.50	7.50
24....	" 8.50	" 3.50	7.00
25....	" 9.30	" 4.00	6.30
26....	" 9.50	" 4.00	6.10
27....	" 10.40	" 4.00	5.20
28....	" 11.00	" 4.00	5.00
29....	" 11.30	" 4.00	4.30
30....	.....	.....	.....
31....	A.M. 12.40	" 4.00	3.20
		Total.....	150.30

IMPROVED STORAGE BATTERY EQUIPMENT.

UNDER the supervision of Mr. A. B. Smith, superintendent of construction, the Great Northwestern Telegraph Company have just made an important change in their battery system at the London office, by the installation of a very complete storage battery equipment, consisting of 260 chloride accumulators, which displace 600 cells of the common form of gravity battery, which has been the standard form of battery for telegraphing purposes for so many years past. In the matter of efficiency the storage battery has proven so much superior to the gravity that the company have decided to install these batteries at other important terminal offices. The battery is in duplicate, two sets of which are in service for 24 hours, while the other two sets are being charged or at rest. The period of charge is generally three hours for both the main and local batteries, and the current is supplied from the Electric Company's power circuit, to which the main batteries are connected direct, at the rate of 1½ amperes per hour, but for the cells which supply the "local" instruments it was necessary to reduce the charging pressure from 260 volts to 2½, which is done by means of a motor-generator, at a charging rate on the generator side of 15 amperes per hour. For wire service there are four battery "leads," paired negative and positive, to the switchboard, from which the current is taken at a pressure of 130 and 70 volts from each pair. To prevent an over-discharge to line in case of accident, each of the 115 battery discs on the switchboard is connected in series with the battery "lead" through an ordinary incandescent lamp, the voltage of which is 125, or 75 volts, as the "lead" may require. Should any wires become "crossed," or "grounded," the lamps on the wires affected will glow, thus acting as an indicator as well as preventing more than a safe amount of current from passing into the interrupted wires. The resistance of the magnet spools of the "local" sounders was increased from 2 ohms to 10 ohms each to prevent a short circuiting of the local cells.

ONTARIO ASSOCIATION STATIONARY ENGINEERS.

The yearly meeting of the Ontario Association of Stationary Engineers was held in the Oddfellows Hall, Oshawa, on May 30th. The meeting was very well attended, having representatives from London, Brantford, Hamilton, Toronto, Oshawa, Bowmanville, Cornwall, Ottawa, Uxbridge and Belleville. Three members of the board were unavoidably absent. The one change on the personnel of the board was the substitution of Mr. Rodger Fishleigh, of Bowmanville, for Mr. Wilford Phillips, of Niagara Falls.

The Registrar's report showed that there were 756 names on the membership roll, some 108 of which are yet to be renewed for this year. The Legislative Committee submitted a report upon the work done during the year, the result of which was to get a decision from the Minister of Justice that the Dominion Parliament has no jurisdiction in the case of the Engineers' Bill, and that it is entirely under the different provincial legislatures, the same as a lawyer, doctor, or land surveyor.

The financial statement of the Registrar and the Treasurer was presented and adopted. It was also arranged to apply to the Ontario legislature for amendments to the present law.

A long and useful discussion upon bringing up the engineers generally to a higher standard of efficiency, and raising the qualifications for each grade, brought out the fact that Association certificates are looked upon as accredited marks of worthiness in every province in the Dominion. Hamilton was chosen as the next place of meeting.

The personnel of the board is now as follows: President, O. P. St. John, Toronto; vice-president, A. E. Edkins, Toronto; registrar, John Bain, 113 Yorkville ave., Toronto; treasurer, Robt. Mackie, Hamilton; Arthur Ames, Brantford; F. G. Mitchell, London; Thos. Elliott, Hamilton; Thos. Wensley, Ottawa; Jas. Devlin, Montreal; T. G. Donaldson, Ottawa; A. M. Wickens, Toronto; Rodger Fishleigh, Bowmanville.

TRADE NOTES.

The Ottawa Porcelain and Carbon Works have just filled an order for 50,000 electric light carbons for the Winnipeg Electric Light Company.

The McEachren Heating & Ventilating Co., of Galt, Ont., has placed an order with the Jenckes Machine Co., of Sherbrooke, Que., for one of their patent Dake engines.

The Alberta Railway & Coal Co., of Lethbridge, N.W.T., has ordered two more Mumford improved boilers of 150 h.p. each from the Robb Engineering Co., Amherst, N.S.

The Great Northwestern Telegraph Co. is installing a new heating system in their large building in Montreal, using the Kingsley water tube boiler installed by E. A. Wallberg.

Catalogue "B" has just been issued by Mr. John Forman, electrical goods, Craig street, Montreal. It contains much information regarding the many lines of supplies carried in stock.

Mr. E. A. Wallberg, Montreal, has recently installed boilers in the Russell Theatre, the Sun Life Insurance building, the Hotel Cecil, the Harmony Hall, and Grand Opera House, in that city.

The Western Loan & Trust Co., Montreal, are installing a new heating system in their building, using the Kingsley water tube boiler installed by Mr. E. A. Wallberg, of that city. David Ogilvy is the architect.

Messrs. Sadler & Haworth, of Montreal and Toronto, have just furnished the Niagara Falls Electric Power Co. with two double belts, 44" wide, for their new generators; the Montreal Belt Line Railway, Montreal, with one 36" double belt; and the St. Thomas Street Railway with two 15" double belts.

The Dominion Coal Co. are improving their facilities for unloading from their steamers at Levis, and have purchased for this purpose four 8¼ × 10 double cylinder special coal hoisting engines from the Jenckes Machine Co., of Sherbrooke, Que., with a powerful 100 h.p. locomotive boiler to supply steam for the same.

In our last month's issue we illustrated a new switchboard recently installed in McGill University, Montreal. Messrs. Munderloh & Co. have written to us asking us to call the attention of our readers to the fact that this board was supplied and installed by them. They are also supplying and installing the electrical equipment in the new Mining and Chemistry building, which will be completed by the fall.

The Canadian Chemical Compound Company report that their special boiler compounds are meeting with a large sale, and they are well satisfied with the business secured. A sample of the orders received is shown by a letter from the Town Clerk, Mitchell, Ont., which reads as follows: "By to-day's mail I send you sample of scale taken from boiler. Please examine same and send barrel of your best material for removing same." The company are about to open a branch office in Montreal.

The General Engineering Company of Ontario have requested us to inform prospective purchasers of mechanical stokers that the American Stoker, sought to be introduced into Canada by the American Stoker Co., is an infringement on the Canadian patents owned by their company. They state that as soon as an American stoker is installed in Canada, their solicitors have instructions to take proceedings in the Exchequer Court of Canada against the user as well as against the manufacturer and importer, and they desire to give a warning in order that no underfeed mechanical stoker may be installed by any person without full knowledge of their rights under their Canadian patents.

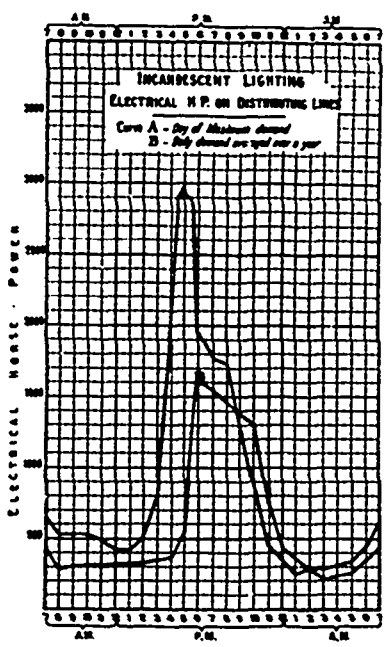
Intending purchasers of electrical apparatus, when writing to advertisers, are asked to mention the ELECTRICAL NEWS.

ELECTRICAL POWER TRANSMISSIONS.*

By R. A. Ross, E.E., M.Can.Soc.C.E.

THE subject of electric power transmissions over long distances has for the last few years been the field in which the most prominent electrical engineers have found a scope for their energies, and the advance in consequence has been most marked. So much so that, while four years ago there was not a power scheme of any magnitude, at the present they are numbered by the score, and are of such size as to utilize an immense amount of power formerly unavailable. A noteworthy point in modern plants is the similarity of the methods in use, especially in America, which is always more given to standardization than are European countries. The several types of alternating transmission have practically crystallized into two standard forms remarkably alike in detail and equally applicable to most cases. The controversies over the relative merits of direct and alternating current for transmission purposes have been settled, and the latter having come out victorious, is now carrying the war into the hitherto undisputed territory of the former, namely, the application to general motor purposes, and the results are not doubtful. With the application of alternating current motors to traction purposes, which appears to be not far distant, the last territory held exclusively by the direct current will have been invaded. The reason for this state of things is not far to seek, as the alternating system which formerly was applicable only to incandescent light, has recently made such strides as to prove itself more generally useful for all purposes of transmission and for most cases of distribution than the other. This triumph of the alternating is due to the fact that with extremely simple and durable apparatus, the power is so readily transformed into that form which meets the requirements of most cases.

The efficiency and durability of the newer types of apparatus are such as to leave but scant room for improvement, and it appears probable that unless some fundamental discovery is made which will render present types entirely obsolete, these forms will persist for some time to come. Accompanying this standardization of apparatus has come a remarkable decrease in first cost and maintenance charges, affecting the interest and depreciation accounts correspondingly, and resulting in decreased cost of power to the consumer. In consequence we may expect to see the field of steam generation for many purposes invaded by the simpler, cheaper and more cleanly electric power. If we may judge by present indications, the next phase of the problem to be attacked will be the



adaptation for railway purposes of power from large water falls. This only awaits the development of a satisfactory motor for alternating traction purposes, and, from the reports of several recent installations in Europe and the statements of prominent traction engineers in this country, the day of the alternating railway motor for use on the longer railways is not far distant.

To illustrate the methods adopted in transmission work, a few of the larger plants in operation or building are given below:

	System.	Distance.	Voltage.	Horse Power.	
Brescia,	Direct current	12	15,000	700	
Pomona,	Single phase	29	10,000	800	
Fresno,	Three phase	35	11,000	1,400	
Lauffen,	"	100	30,000	300	Experimental
Portland,	"	12	6,000	5,000	
Ogden,	"	38	16,000	3,000	
Three Rivers, Que.,	Two phase	17	12,000	600	
Kootenay, B.C.,	Three phase	..	20,000	2,000	Building
Hamilton, Ont.,	Two phase	38	20,000	3,000	"
Lachine, Que.,	Three phase	5	4,400	20,000	
Chambly, Que.,	Two phase	16	12,500	20,000	Building.

With one exception these are all alternating plants, and it will be noticed that Canada is well to the fore, as might be expected from the almost unlimited powers available. Montreal stands at the head of the world so far as transmitted power is concerned, and it appears probable that the two magnificent schemes at present under construction will find an ample market in the city and vicinity. Montreal's demands, covering as they do the whole field of consumption of power for street railway, incandescent and arc lighting, and motor power, offer a good example for illustrative purposes, and it has been deemed advisable to

* Paper read before the Canadian Society of Civil Engineers, March 10th, 1898.

gure point to the discussion to follow by reference to the demands existing here at the present time, without reference to future necessities, as these will no doubt be much of the same kind.

With this end in view, the accompanying curves have been drawn, showing the demands for all classes of power at the present time for twenty-four hours.

The highest curve in each case shows the maximum demand during the year, and the lower the average load at each hour of the day for the year. From these demands the transmission scheme will be figured, but necessarily in a general way for illustrative purposes. The problem consists in laying down the power in the city to suit the demands in the most complete way as regards economy, efficiency and suitability. As these demands affect the transmission by their nature, as well as by their amount, they must be considered briefly before taking up the transmission proper.

Incandescent Lighting. – The demand curves shown have been figured from the actual curves of one of the present stations in the city, with an allowance for the loads of the other operating companies; in all to cover 100,000 lights wired up. To meet this demand it will be readily granted that direct current is unsuitable, owing to the distances to be covered, and alternating currents of single, two or three phase are the only alternative, any of these being readily obtained from the transmission voltage by means of static transformers to feed the distribution at a voltage of say 2,000, which is considered safe for city work. This potential will of course be again reduced before entering customers' premises, thus involving two sets of transformers. This system will also cover interior lighting by alternating arc lamps, and perhaps a few small alternating motors.

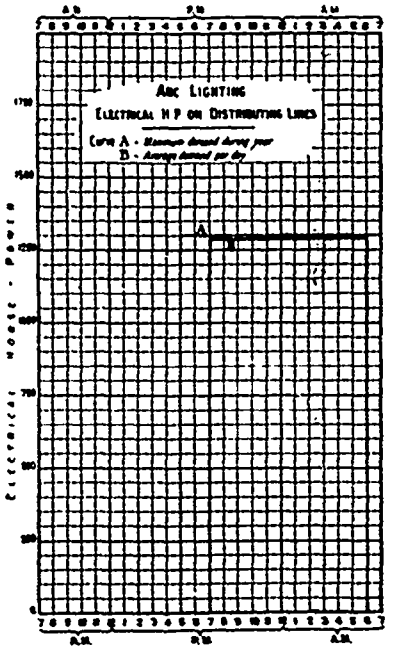
ARC LIGHTING.

The demand curves for the arc lighting have been figured on the supposition that there are 2,000 arc lamps on series circuits in the city, lighted from dusk to dawn, the curves in this case being elevated into straight lines. For this service several plans present themselves as below.

(1) By rectifying the alternating transmission currents into direct through the agency of rectifiers, which are simply revolving commutators driven by small synchronous motors from the transmission line, and using this current in the present series arc lamp. This system has been in use for a short time in several European cities, with varying results. It appears to have a great future before it when it has come through the present doubtful stage.

(2) By means of alternating arc lamps fed from the incandescent circuits. This system, while perfectly applicable for interior lighting, where each unit is treated as an incandescent lamp, and turned on or off at will, is not so suitable for street lighting, as it does not lend itself to ready control from the station. Further, as the light distribution of alternating current lamps is inferior per watt of consumption to that of direct, it becomes more expensive in operation.

(3) The series arc system as at present used, with motors instead of engines to drive the dynamos, while necessitating more apparatus than either of the others, is more simple and controllable in operation, and will be accepted for illustration. The number of units necessary to cover the 2,000 lights will be 16 if of 125 lights each, which is about as



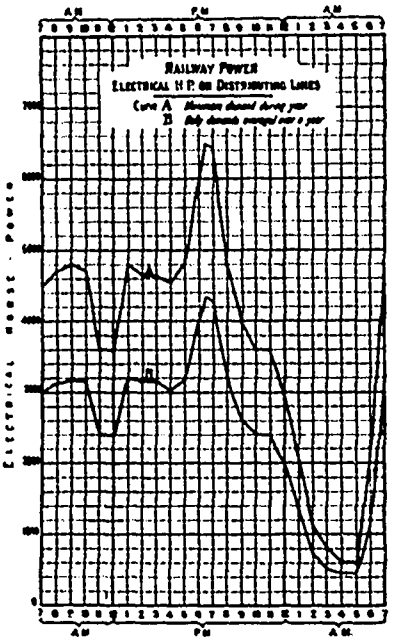
high as is available per machine. If these were coupled in pairs to 200 h.p. motors, the units would be eight, and the addition of a spare would make a total of nine, which would be ample for present demands.

MOTOR POWER.

Either alternating or direct current motors are suitable for general work, but, where variable speeds are necessary, as for elevator purposes, the direct is at the present time the only one available. The cost of the former is also higher at the present time. The advantages of the alternating motor distribution are, less cost of circuits, greater simplicity of apparatus, and the ability to reach outlying demands at small cost, and that it involves no special apparatus in the distributing station other than the necessary lowering transformers. As the objections to the alternating (on the score of price and unsuitability where speed regulation is required) appear to be within reach of correction in the near future, that method will be adopted for this case. The demand curves are based upon the actual load curves of one of the present stations, with allowance for the other operating companies' loads. In all it represents about 1,100 h.p. of motors installed, to be driven from a two or three phase motor circuit, fed directly through reducing transformers from the transmission line, at a voltage of say 2,000, and again reduced by individual transformers at the motors.

RAILWAY POWER.

These curves are shown in the figure below, and are the actual records for the past year for the railway company's plant. As at the present time only direct current motors are applicable to this purpose, means must be adopted for transforming the alternating to direct current for the trolley circuit. This is easily accomplished by means of rotary transformers, with small loss. These rotaries are practically direct current



generators, with collector rings, through which the alternating current flows to the windings driving the machine as a motor, while from the commutator connected to the same windings the direct current, which has been commutated from the alternating, flows to the trolley line.

TOTAL DEMANDS.

The load for all classes of demand is given to the last curve, which is formed from the others, and shows the period of the greatest station activity to be about 6 p. m.

It is evident that apparatus must be installed to meet this maximum demand, while the average output could be met by a much smaller plant.

The interest and depreciation charges on plant, which forms such a considerable percentage of the cost of the output, is a constant no matter what that output may be, so that, when it is possible to fill up the hollows in the curve by the sale of additional power during periods of light load, which shall not be operative during the period of heavy demand, the cost of this addition is only that of additional coal in steam stations, and in waters powers is nothing, and for this reason may be disposed of at low rates.

(To be Continued.)

SPARKS.

A charter has been granted to the Canadian Electric and Water Power Co., of Perth, Ont.

The Canadian Brewing Company, Montreal, is installing a new steam plant, using the Kingsley water tube boilers, ordered from E. A. Wallberg, Montreal.

On Wednesday, July 6th, the ratepayers of Listowel, Ont., will vote on a by-law to provide $2,200 for the acquisition of a street arc lighting plant. W. E. Binning is town clerk.

The Niagara Falls, Ont., Electric Light Company are preparing to branch out into new fields, having purchased machinery to supply electricity for heating and power purposes. Improvements will be made to the power house and line.

The Tobique Mfg. Co., which proposes to obtain power by damming the Tobique river at Oxford, N. B., has been granted incorporation by the Dominion government. The company comprises Hon. John Costigan, Fred A. Hale, M.P., and Senator George T. Baird.

The Laurie Engine Co., Montreal, has recently installed in its works a high pressure compound Corliss engine and a Kingsley water tube boiler designed for 175 lbs. working pressure. This is considered in every way a model and a highly economical plant, and is said to produce power at a considerably less price than quoted by the electrical power companies. The boilers were installed by E. A. Wallberg.

The City Council of Brantford, Ont., recently invited tenders for lighting the streets of the city for a term of years, and also for furnishing an electric plant to be operated under municipal control. After opening the tenders the Fire and Light Committee decided to recommend the abandonment of the municipal idea, and the acceptance of the offer of the Brantford Electric and Operating Company. This offer is to furnish one hundred and twenty-one arc lights and 132 incandescent, of 32 candle power, at the price of $7,300 per annum. The electric company are also to take over the present municipal incandescent system for $600, paying in six annual instalments.

TRADE NOTES.

The Condensed Milk & Canning Co., of Truro, N. S., have ordered a 50 horse power engine from the Robb Engineering Co., to replace the one destroyed in their recent fire.

The Hamilton Electric Light and Power Company, Limited, have ordered from the Canadian General Electric Company a 200 kilowatt, 250-volt multipolar generator for their power circuit.

N. P. Tanguay, of Weedon, Que., has placed an order with the Jenckes Machine Co., Sherbrooke, Que., for one of their patent Crocker turbines, complete with gate, draft, tub and gearing.

Mr. M. McLaughlin, Buctouche, N. B., is building a large flour mill and wood-working factory, the boiler and engine for which are to be supplied by the Robb Engineering Co., of Amherst, N.S.

The owners of the Monte Cristo mine continue sinking in their main pit, and have lately added a No. 6 Cameron vertical pump, purchased through the Rossland branch from the Jenckes Machine Co., of Sherbrooke, Que.

The Wm. Cane & Sons Mfg. Co., Limited, of Newmarket, have ordered from the Canadian General Electric Company a lighting plant for their factory premises, consisting of a 17½ kilowatt multipolar dynamo and marble switchboard.

The London & British Columbia Gold Fields, Limited, of Rossland, B.C., are developing their property, and recently added to their equipment a 6 × 8 special hoisting engine and 40 h.p. locomotive type boiler, from the Jenckes Machine Co., of Sherbrooke, Que.

The daily note books and blotters sent out monthly by the Packard Electric Company, of St. Catharines, serve to remind the trade that they have constantly on hand a complete assortment of electric light supplies. Their "L" transformers are rapidly growing in favor.

The Jenckes Machine Co., of Sherbrooke, Que., recently supplied the Sydney mine at North Sydney, Cape Breton, with one of their special coal hoisting engines, to be operated by compressed air. The compressor was supplied by the Canadian Rand Drill Co., of Sherbrooke, Que.

Mr. John Forman, of Montréal, has recently been appointed Canadian agent for the Upton enclosed arc lamp. This lamp is adapted for either outdoor or inside service and for operation on alternating or direct current circuits, and is said to be giving excellent service wherever used.

PERSONAL.

Mr. Norman C. Smith, of the W. A. Johnson Electric Company, Toronto, has just recovered from a serious illness, which necessitated a surgical operation.

Mr. E. I. Sifton has been appointed manager of the Electrical Construction Co. of London, Ont., in place of Mr. S. R. Break, who has gone to reside in Arizona.

Mr. J. A. Kammerer, manager of the Toronto branch of the Royal Electric Company, has just returned from a trip to Winnipeg and other western points.

Mr. Frederic Nicholas, general manager of the Canadian General Electric Co., accompanied by his daughter, is at present on a visit to Great Britain and the continent.

Mr. D. A. Carr, manager of the Cornwall Electric Street Railway, was presented by his employees with a gold-headed cane, on the occasion of his birthday.

Mr. Charles Nicholson Peake, electrical engineer, of Toronto, was recently married in St. Paul's church, Wingham, to Miss Davis, daughter of Mr. Henry Davis, collector H.M. customs.

Mr. T. Ahearn and family, of Ottawa, returned a fortnight ago from a trip around the world, after an absence of six months. They came from Yokohama to Vancouver in the steamer Empress of India.

Mr. D. W. Robb, of the Robb Engineering Co., Amherst, N.S., and Mrs. Robb, have gone to London, Eng., and the Isle of Man. Mr. Robb will superintend the erection of some Robb-Armstrong engines shipped to the old country.

The many friends of Mr. S. G. Lawson, formerly on the staff of the Canadian General Electric Co., will regret to learn of his death at Barcelona, Spain, while superintending the construction of 150 car electric roads in that city and Madrid for Messrs. Dick, Kerr & Co., of London, Eng.

Mr. C. A. Barton, for three years past chief engineer at the General Electric Company's works at Peterborough, Ont., has accepted a position with the Walker Manufacturing Co. of Cleveland, Ohio. Mr. Barton will have charge of the alternating work and the designing of alternating machinery for the above company.

Mr. C. A. E. Carr, who has been manager of the London Street Railway for the past three years, has received the appointment of manager of the Montreal Park and Island Railway at Montreal, the duties of which he will perform in addition to those at London. Although a young man, Mr. Carr has shown great ability in street railway management, and his continued advancement is well deserved.

Mr. Edward Bourne, chief engineer of the Toronto Electric Light Company, was recently the victim of a bicycle accident which it was at first thought would result fatally. While wheeling east along College street he collided with a bicyclist going the opposite direction, with the result that Mr. Bourne was thrown violently on the pavement, sustaining a fracture of the base of the skull and other injuries. We are pleased to learn that he is now on the road to recovery.

Mr. J. Alex. Culverwell, of Toronto, has relinquished the local management for Toronto and Central Ontario of the Royal Victoria Life Insurance Co., of Montreal, to undertake the business of an electrical and mechanical financial broker, he still retaining a special agency with above company. He had several years' successful connection with the old Edison General Electric Co., having exploited their business for them in Western Ontario and Quebec province. Of late Mr. Culverwell has interested himself, along with Mr. White-Fraser, C.E., the well-known electrical engineer, in the promotion of the Fenelon Falls-Lindsay Transmission Company, having secured the town lighting contract for Lindsay for ten years and private contracts amounting already to about $17,000, yearly renewal, and also having interested some of Toronto's leading capitalists in the enterprise. Mr. Culverwell is a young man, and as a promoter is most energetic and untiring in his efforts, and has established for himself an honorable reputation. He was educated at Upper Canada College, Toronto.

The town of Brampton, Ont., invites tenders up to July 1st, for lighting the streets either by gas or electricity. Mr. T. J. Blain is town clerk.

The Marsh Stethophone, invented by Rev. D. B. Marsh, of Black Heath, Ont., is now patented in Canada, United States, France and Great Britain, the latter patents having been secured last month.

It is now thought that the proposed electric plant at Ragged Rapids, for the purpose of supplying light and power to the town of Orillia, Ont., can be installed for $75,000. This is the sum which the ratepayers will be asked to grant for carrying out the work.

The Montreal Street Railway Co. will make considerable extensions to their lines during the present year. It is proposed to lay a double track along St. James street, from McGill street to the city limits, and to commence the Verdun extension of one and one-half miles at an early date. The company have erected a new blacksmith shop, 75×58 feet, at Hochelaga, to be used for repair work.

SPARKS.

The firm of H. Chubb & Co., electrical supplies, St. John, N. B., has been dissolved.

The annual meeting of the Northwest Electric Co. was held at Winnipeg on May 20th.

The Sydney Electric Light Co., of Cape Breton, is now operating from an S.K.C. plant.

The Council of Wyoming, Ont., are said to be in favor of lighting the village by electricity.

The Charlottetown Light and Power Co., of Charlottetown, P.E.I., has been granted incorporation.

The Canadian Locomotive & Engine Co., of Kingston, Ont., will hold their annual meeting on June 14th.

It is expected that the new electric railway in St. Thomas, Ont., will have cars running during the present month.

It is said that Irwin Joyl, of Fulford, Que., intends putting in an electric plant for lighting his tannery and the streets of the village.

The Kingsville Electric Light Co. has placed an order with the Royal Electric Co. for a 500-light alternator and transformer.

G. D. Campbell, of Weymouth, N. S., has closed a contract with the Royal Electric Company for an electric lighting plant.

A committee of the City Council of London, Ont., will recommend that tenders be invited for a municipal electric light plant.

The employees of the Ottawa Electric Railway will hold their first annual excursion, to Gracefield, Que., on Sunday, June 19th.

A special committee of the Hamilton City Council will report at an early date on the question of establishing a municipal lighting plant.

An effort is being made to form a joint stock company at Shawville, Que., for the installation of electric light and waterworks systems.

The People's Telephone Co., of Windsor, Ont., has been incorporated, with a capital of $25,000, to do business in Windsor, Sandwich and Amherstburg.

The authorities of the Grand Trunk Railway have not yet come to a definite conclusion regarding the adoption of electricity for hauling trains through the Sarnia tunnel.

A by-law to authorize the issue of $12,000 of debentures for an electric railway between Waterloo and Galt, will be voted on by the ratepayers of Waterloo on the 10th inst.

William Snider & Co., of Waterloo, Ont., have recently put in a new arc dynamo supplied by the Johnson Electric Co., of Toronto, and have replaced their lamps by new ones.

The amalgamation of the Quebec and Montmorency Railway and the Quebec District Railway is said to have been effected. The motive power of the former road will likely be converted to electricity.

Wood Bros., of Brantford, Ont., have installed a 70 h.p. S.K.C. synchronous motor, to operate from the lighting circuits of the S. K.C. generator owned by the Brantford Electric & Operating Co.

The C.P.R. Telegraph Department are building a new telegraph line between Montreal and Hamilton, to be used for railway work only. They are also building a line from Montreal to Megantic, Que.

The work on the large C. P. R. station and office building in Vancouver and the hotel at Revelstoke is progressing rapidly. Most of the materials were procured in the west, the steel structural work being supplied by E. A. Wallberg, Montreal.

The Montmorency Power Co., of Quebec, have purchased a 600 k.w. S.K.C. generator from the Royal Electric Co., this being the sixth S.K.C. machine of this size that they have installed, making a total altogether of 4,000 k.w in S.K.C. generators.

The case of Easton vs. Brantford Street Railway Co. has been settled out of court, the company agreeing to pay $400 and costs. The original verdict was for $12,000, but this was reduced on appeal to $9,000, when the company went into liquidation.

The Toronto Street Railway Co. has again appealed against their assessment of $84,861 on rails, poles and wires. The Bell Telephone Company and C.P. R. Telegraph Company have also appealed, the former claiming that they are not liable, and the latter that they have no plant in ward one.

A prize of 1,200 marks is offered by the German Association of Mechanical Engineers for the best method of lifting and turning trains on the Berlin elevated electric railway. The competition closes at noon on the 20th October next. Full particulars are obtainable at the offices of the association, 80 Linden street, Berlin, S.W.

The electric street railway system of Dublin, Ireland, nearly all the machinery and equipment for which was furnished by United States manufacturers, has just been put in operation. The steel work for the boiler house, 131 x 76 feet, was furnished by Riter & Conley, of Pittsburg, Pa. Twenty Babcock & Wilcox boilers and two Green economizers were supplied by the respective companies, while all the valves and piping were made by the Crane Co., Chicago, Ill. "Stratton" separators, "Hunt" coal conveyors, "Wheeler" condensers and boiler feed pumps, and Reynolds-Corliss engines, built by the E. P. Allis Co., Wilwaukee, Wis., are also included. The 500 k.w. generators were manufactured by the General Electric Co., as were also the car motors. The trolley wire, feeders, etc., came from John A. Roebling's Sons & Co., and the trucks from the Peckham factories. The capital stock of the company is said to be $1,200,000.