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Cataract Power Company's 34-Mile Transmission Plant

WITH ILLUSTRATIONS

CANADIAN ELECTRICAL NEWS AND STEAM ENGINEERING JOURNAL

OLD SERIES, VOL. XV.—No. 6.
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DECEMBER, 1898

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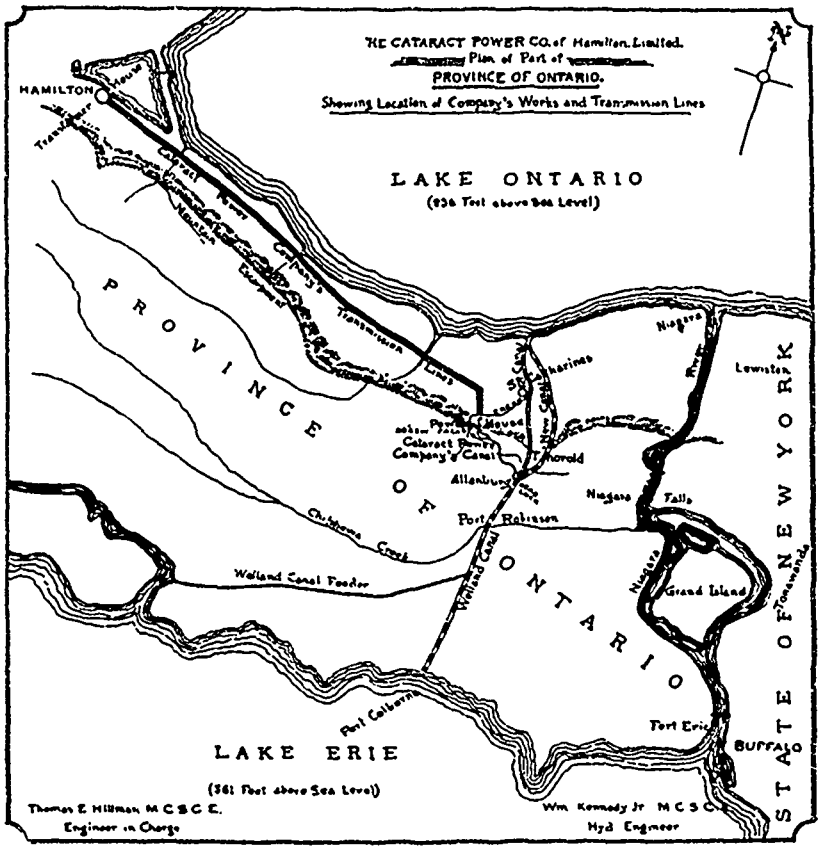
STEAM ENGINEERING JOURNAL.

VOL. VIII. DECEMBER, 1898 No. 12.

THE CATARACT POWER COMPANY OF HAMILTON.

Description of an Important Canadian Electrical Enterprise.—Demonstration of the Practicability of Long Distance Power Transmission.

SATURDAY, November 12th, will go down, in the electrical annals of Canada, a red letter day, as it will chronicle the formal opening of the electric power plant of the Cataract Power Company of Hamilton, Limited, for the transmission of electrical energy from a point on the Niagara escarpment, near DeCew Falls, to Hamilton, a distance of 35 miles, the conception and carrying out of which must always stand as a monument of business pluck and enterprise on the part of those interested in and forming the Cataract Power Company.



Over three years ago, when the transmission of energy by electricity over long distances for commercial purposes was still in much of an experimental stage, the possibility of utilizing the magnificent fall of over 200 feet, obtainable at DeCew Falls, where the waters of the Beaver Dam creek tumble over the Niagara escarpment, for the generation of electrical energy to be transmitted to the city of Hamilton, 35 miles distant, suggested itself to Mr. John Patterson, of that city. After numerous surveys and examining into the physical feasibility of the scheme, he associated with himself the Hon. J. M. Gibson, John Moodie, sr., James Dixon and J. W. Sutherland, all well-known citizens of Hamilton. Together they procured a charter and formed the Cataract Power Company of Hamilton, Limited, for the purpose of the development of this power and the transmission of it to Hamilton.

After the formation of the company the ground was again gone over carefully, and it was found advisable to abandon the original idea of utilizing the waters and water-ways of the Beaver Dams creek and the DeCew Falls, and by changing the plans some very material advantages were gained:

First, the securing of a supply of water which would be constant, through a feeder from the Lake Erie level of the Welland Canal at Allenburg.

Second, the construction of a canal, 4¾ miles long, over private right of way, thus giving the company an unobstructed water-way.

Third, the securing of land along the private water-way for storage basins, by which the company can conserve its water at a period of non use or light load for use at the time of heavy load.

Fourth, by going three-quarters of a mile east of DeCew Falls along the Niagara escarpment, an additional fall of 70 feet was obtained, which was a very valuable acquisition. At this point there were also exceptional natural advantages, both at the top of the escarpment for the anchorage of flumes, erection of penstocks, etc., and at the foot of it for the discharge of the tail water, as well as a splendid site for the power house.

The hydraulic development, as it was desired by the Cataract Power Company, presented obstacles which, owing to the large units and to the high head, made it exceptionally difficult to secure a builder of water-wheels who would give what the hydraulic engineer's specifications called for. After a long delay and much negotiation the Stilwell-Bierce and Smith-Vaile Company, of Dayton, Ohio, agreed to build special horizontal turbines of about 2000 horse power each, to work under a head of 265 feet, and to operate at a speed of 400 revolutions per minute. This required, also, special valve and valve gear and controlling devices, all of which were specially designed for this particular plant.

The generation of the electric power and the transmission of the same from the power house to the City of

MR. JAMES DIXON,
Vice-President.

MR. JOHN PATTERSON,
Secretary and Original Promoter.

MR. JOHN MOODIE,
Treasurer.

HON. J. M. GIBSON,
President.

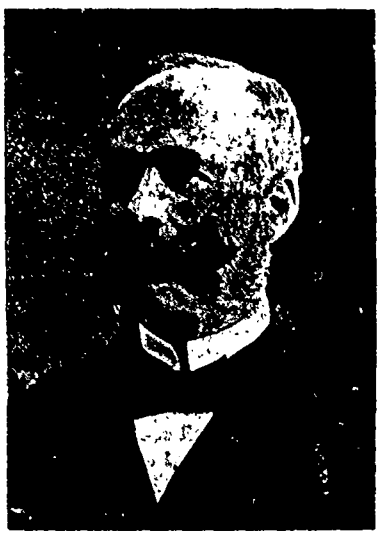
MR. J. A. KAMMERER,
Electrical Adviser.

MR. JOHN DICKENSON, M.P.P.

MR. J. W. SUTHERLAND.

DIRECTORS OF THE CATARACT POWER COMPANY OF HAMILTON, LIMITED.

Hamilton, a distance of 35 miles, presented at that time a seemingly insurmountable obstacle to the carrying out of the scheme, no transmission of energy such a long distance, for commercial purposes, having up to that time been undertaken. The largest electrical concerns, both in Europe and America, were consulted, but the limitation of a practical working pressure, sufficiently great to insure the transmission of power such a long distance, practically precluded the undertaking of the



MR. WM. KENNEDY, JR., M.C.S.C.E.
Hydraulic Engineer.

work by any of the companies consulted, the highest working pressure, up to that time, being not above 10,000 volts. At this pressure the cost of the transmission line became so great that the Cataract Power Company did not feel warranted to undertake the development of the enterprise. The longer the distance, the heavier the conductor must be; therefore to transmit over this long distance, it was necessary that the pressure be 20,000 volts or over, so that the cost of the conductor would be within the limit set, to allow the Cataract Power Company to undertake the development of the enterprise. After nearly a year of futile

MR. THOS. E. HILLMAN, M.C.S.C.E.
Engineer in charge.

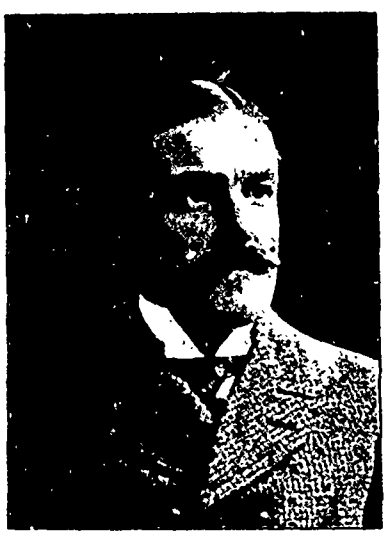
attempts to have the work undertaken at a pressure which would justify them in proceeding with the work, and being unsuccessful, they consulted Mr. J. A. Kammerer, one of the staff of the Royal Electric Company, of Montreal, and after careful consideration of the conditions, and preliminary estimates of cost prepared by him, with a working pressure of 24,000 volts guaranteed, the Royal Electric Company agreed to undertake the work which, with its consequent saving, brought the cost within the limits, deemed necessary by the Cataract Power Company to admit of the enterprise being proceeded with.

Ground was first broken on October 5th, 1897, and the work pushed with such vigor that the current was sent over the lines from DeCew Falls to Hamilton, on the afternoon of August 25th, 1898, or just 10 months and 10 days from the beginning of the undertaking.

THE CANAL.

The water for this plant is secured through a feeder from the Lake Erie level of the Welland canal at Allanburg. The arrangement of the gates, as shown in Fig. 1, is such as to admit of the unwatering of the lower levels of both the old and the new Welland canals without interfering with the company's supply of water.

From Allanburg the company has a private canal extending northwesterly to the edge of the Niagara escarpment, a total distance of about four and one-half miles. At three different points there are placed gates for regulating or shutting off the supply, so that the water is under complete control. Where the canal crosses the Beaver Dams creek, the water is carried in a closed wooden flume supported on a steel truss. This flume, which is



MR. H. R. LEYDEN,
General Manager Cataract Power Company.

shown in Fig. 2, is placed below the level of the water in the canal at each end so that the contained water is always under pressure, which is intended to prevent leakage. The water follows generally the water courses of a succession of small streams, consequently there are few heavy cuts or fills. In a number of places the contour of the ground formed a natural bed for the canal, and no work was necessary. At the heavy cuttings the banks to the bottom of the canal are pitched with stone, and the important embankments are rip-rapped to prevent erosion.

At the lower end of the canal near the mountain top are located three large storage reservoirs, having a total area of thirty-three acres. Two of these, known as lakes Moodie and Gibson, are shown in Figures 3 and 4. These three reservoirs are sufficient to contain forty-eight hours' supply of water, and will meet the hourly inequalities of demand usual in electric supply companies, as well as allowing the unwatering of the upper stretches of the canal for repair purposes, without the interruption of the company's service. Throughout the whole length the work is of particularly substantial character, the factor of safety being exceptionally large,

and the requirements of the service seem to have been carefully considered.

The large reservoirs, being located immediately at the mountain's edge where the water enters a steel pipe, the long stretches of slow current canal will, it is expected, promptly freeze over and prevent any trouble from frazil or anchor ice. In this matter the water

FIG. 1. ARRANGEMENT OF HEAD GATES.

power is particularly fortunate, as there is practically dead water to Lake Erie. The canal is designed to carry sufficient water to develop from 10,000 to 12,000 horse power without creating an erosive speed in the current. The waterways and appurtenances were constructed by Messrs. Angus McDonald & Company, under the supervision of Thos. E. Hillman, C.E., resident engineer, and under the general approval of Mr. Wm. Kennedy, jr., of Montreal, engineer in chief.

THE PIPE.

At the brow of the mountain the water is delivered through a concrete fore bay, protected by suitable racks and head gates, to a large steel pipe which carries it directly down the mountain slope to the power house, two hundred and sixty feet below. The pipe is of steel plate, double rivetted on both longitudinal and transverse seams. It is 745 feet in length and varies in diameter from 8 feet 6 inches at the top to 7 feet 6 inches at the bottom. The steel used for the top section is ¼ inch in thickness and gradually increases in size down the slope until at the bottom it is 13/16 of an inch. The weight of this pipe is all supported from the top, where a number of heavy flanges are built into several piers of concrete placed in the rock cutting. Down the slope, at intervals of fifteen feet, supporting masonry foundations are constructed. A substantial double housing of matched lumber is now being built

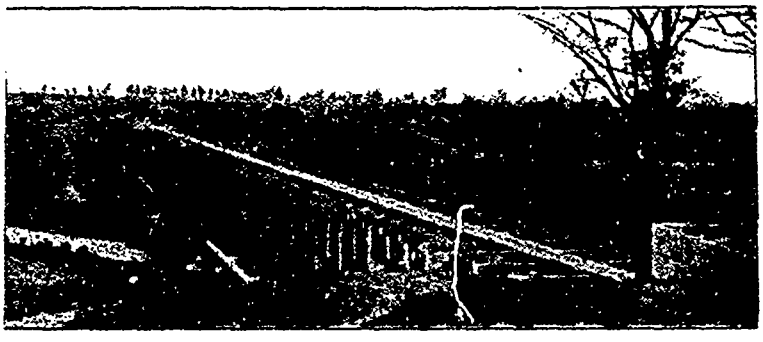


FIG. 2.—FLUME OVER BEAVER DAMS CREEK.

over the entire length to protect the pipe from extreme changes of temperature.

About two-thirds of the way down the slope is placed an expansion joint to take care of any elongation or contraction. In addition to serving this purpose the joint is so designed as to support the part of the pipe below it. This is accomplished by means of the water pressure acting against an annular piston attached to the lower section, the piston working in a cylinder attached to the upper section.

From the top the pipe runs downward at an angle of about twenty degrees for about two-thirds of its length, where it reaches a level bench about sixty feet wide and then continues downward at the same slope to the bottom, where it turns with a gentle curve almost a right angle and extends underneath the floor of the power house.

POWER HOUSE.

The power house building (Fig. 5) is a substantial structure of iron and brick, 174 × 42 feet, with a galvanized iron roof over matched board sheathing. It is designed to accommodate four complete generating units and the necessary step-up transformers, switchboards, etc. Only two units and half the capacity in transformers are at present installed. The building is lighted by clusters of incandescent lights and will be heated by electric heaters.

The main supply pipe enters at the end of the building below the floor level, and inside the building widens out into a steel receiver ten feet in diameter, which is solidly imbedded in concrete underneath the floor. From this receiver four branch pipes come up through the floor with a quarter turn for delivering water to the turbines. In these branch supply pipes are placed large vertical hydraulic gates. These gates are 36" in diameter, and are operated by hydraulic pressure by means of a four way valve, controlled by a lever. These valves

FIG. 3.—STORAGE RESERVOIR NO. 1—LAKE MOODIE.

will open or close in less than a minute. The gates, as well as all the hydraulic machinery, were supplied by the Stilwell-Bierce and Smith-Vaile Co., of Dayton, Ohio. Beyond each gate valve is placed a 12" spring relief valve, to relieve the pressure when it exceeds that due to the normal static head. The turbines are 1,950 h.p. each, and run at 400 revolutions under the normal head of 280 feet.

The water wheels are of the inward flow central discharge reaction type, with cylinder gates. We believe that this is the highest head employing this type of turbine, most of the high head plants using the jet or impulse, peripheral bucket design wheels. In order to withstand the unusual pressure, the runners, the gates and all parts susceptible to wear are made of bronze, and everything is made extremely heavy and has been specially designed for this plant. The water enters the wheel horizontally and discharges vertically downward through a draft tube 14 feet in height. Each unit is equipped with a Stilwell-Bierce and Smith-Vaile electric governor of the Giessler design for controlling the speed. On the outer end of the shaft is placed a 7½ ton steel fly wheel with an outboard bearing. The combined influence of the enlarged receiver, the relief valves and the heavy fly wheels is

calculated to overcome any tendency to water hammer.

ELECTRICAL EQUIPMENT.

The Royal Electric Co., of Montreal, designed and planned the entire electrical equipment, which marks a long stride forward in the progress of electrical engineering as applied to the transmission of energy. All the electrical machinery and apparatus were supplied by that company, and manufactured at its shops at Montreal, and in character and finish are examples of Canadian manufacture highly creditable. The generators, illustrated in Fig. 6, are of their well-known S.K.C. inductor type, generating two-phase current at 2,000 volts, running at 400 revolutions per minute. Each of the two generators at present installed is of 1,000 k.w. rated capacity. They are connected direct to the turbine shaft by means of an insulated flexible coupling composed of two flanges with projecting pins, the alternate pins being joined by sole leather links. The generators rest on base frames of seasoned Georgia pine to insulate them from the foundations. The inductors of these machines weigh over twelve tons, which weight running at such a high speed, requires most careful workmanship. The entire absence of vibration and general smoothness of operation is certainly creditable to the manufacturers.

FIG. 4.—STORAGE RESERVOIR NO. 2—LAKE GIBSON.

The wires connecting the generators to the switchboard are laid in conduits in the floor, which are covered with iron griddles so that they are accessible at any point.

There are two exciters of 30 k. w. capacity, each driven by a separate turbine. Each exciter is calculated for supplying the full equipment of four generators. They are likewise directly connected to and insulated from the turbines. A view of the exciter unit is shown in Fig. 7.

The main switchboard, as shown in Fig. 8, is made up of three white marble panels, one for each generator and one for the exciters. On the generator panels all the connections are made on the back of the board, there being no terminals on the face. The switches are of the S.K.C. slide quick break type and are provided with automatic shutters to prevent arcing. They are double throw, connecting to two separate sets of bus bars so that the machines may be run on separate lines or in parallel, according to the future requirements of the service. Each generator panel contains a volt meter with a double throw switch connected to both phases, an ampere meter on each phase and a direct current ampere meter in the field circuit of the generator. The cases of the instruments are made of ground glass and present a very attractive appearance. The exciter panel contains the usual instruments for operating two shunt-wound direct current machines in parallel, and also contains the synchronizer, which is of the ordinary three lamp type.

A special feature is the absence of generator fuses. As the S.K.C. generators supplied were made especially by the Royal Electric Company to withstand a heavy overload it was considered safer to risk the strain upon the generators due to a short circuit rather than, by the blowing of generator fuses, to cause the instant removal of the entire load from the water wheels.

Immediately back of the switchboard and taking up one end of the building are located ten of a new type of S.K.C. transformers, used to raise the potential relieved by the generators to 22,500 volts on the transmission line, at which pressure it is at present operated. These transformers are arranged in batteries of five, each transformer having a capacity of 200 k.w. They are artificially cooled by means of water pipes supplied directly from the penstock, the pressure being reduced by means of throttle valves. The transformers are encased in tanks made of steel boiler plate and rest directly on the concrete floor. The coils are wound in sections carefully insulated and separated by unusually large air spaces, and the whole immersed in mineral-seal oil. This construction has been found to admirably answer the purpose of this exceedingly high voltage, each transformer being tested with a break down strain of 40,000 volts before being installed.

A novel feature of the installation is the switchboards which accompany each transformer. They are of specially selected white marble and contain two single pole high voltage switches and one double pole 2,000 volt switch, the two high voltages being separated by a marble barrier. The high voltage switches consist of a flexible cable, having a screw plug attached to one end and a socket to the other, the socket being attached to a hardwood pole four feet in length for safe handling. The socket and the plug which it fits over are tipped with non-arcing metal. By means of these specially constructed switches the 22,500 volt circuit can readily be opened. The low voltage switches are of the S.K.C. slide quick break type on the back of the switchboard. Each transformer is also equipped on both the primary and secondary sides with enclosed non-arcing fuses. The 22,500 volt wires inside the building are all covered with a specially heavy insulation of rubber and

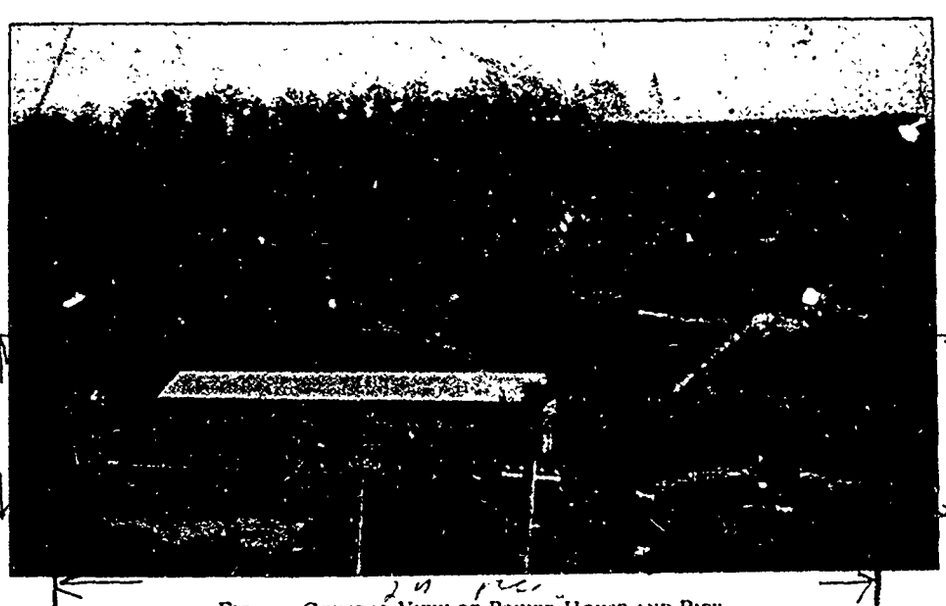


FIG. 5.—GENERAL VIEW OF POWER HOUSE AND PIPE.

are supported on porcelain line insulators on an overhead rack, all being in plain sight and easily accessible.

From the transformers, which are connected five in parallel on each phase, the circuit runs to the line terminal board, consisting of four high voltage switches similar to those placed on the transformer, except that they have double terminals, in order that they may be changed to either of the two lines contemplated by the company. Immediately above the line terminal board is placed a specially constructed lightning arrester equipment, composed of 60 S.K.C. non-arcing arresters with their special appurtenances and connections. From the lightning arresters the wires pass upward and out through the wall of the building at a height about 30 feet from the floor.

THE TRANSMISSION LINE.

The high voltage wires are carried through the brick wall forming the gable of the power house, by means of lead encased rubber covered cable, protected by vitrified pipe, the cable being kept clear of the pipe by wooden bushings specially prepared in oil. After passing over a cross-arm attached to the building, the lead covered cable is joined to the bare copper transmission wires, by means of a long carefully made water-proof joint. This special construction has proven entirely satisfactory.

From the power house the transmission line crosses the Twelve Mile creek and runs up the hill opposite on private property, to a concession road, thence along this roadway due north to the Grand Trunk Railway and then westward along the railroad right of way on an almost perfectly straight line to the company's step-down station at Hamilton, a total distance of a little less than 34 miles. The transmission wires are four in number, and are No. 1 B. & S. medium drawn bare copper. They are all placed on one four pin cross-arm $3\frac{1}{4} \times 5\frac{3}{4}$", spaced 18" apart, and are supported on porcelain insulators of the Redlands type, supplied by the Imperial Porcelain Co. The pins are of special design, holding the insulator two inches higher from the cross-arm than the standard practice. This is to avoid trouble from heavy snow or sleet. The pins are of yellow locust specially prepared in oil and are fastened into the cross-arm with a wooden pin instead of being nailed, so as to use as little iron as possible.

The poles are all specially selected, with 8" tops and not less than 35 feet in length. They are set 90 feet apart and 6 feet deep in the earth. The height of the poles varies with the contour of the ground, so as to keep the wires as nearly horizontal as possible. In marshy places a crib filled with stone is built around the base of the pole, and where the line crosses the Jordan river the poles are placed in a cluster of piles specially driven for the purpose. On the top of the poles is run a galvanized iron barb wire grounded at every pole by means of an iron plate for lightning protection. Below the transmission cross-arm is placed a two-pin cross-arm carrying the telephone circuit.

The telephone circuit is a complete metallic circuit of No. 10 B. W. G. galvanized wire, transposed at every fifth pole. This arrangement has been found to give satisfactory service with the heaviest currents yet passed over the line.

The insulators were all carefully tested with a break-down pressure of 60,000 volts, both at the factory and again at Hamilton before being put up, with the satisfactory result that not one has broken down, or produced the slightest trouble in the three months during which the line has been in operation, notwithstanding the unusual rain and sleet storms during that period.

FIG. 6.—INTERIOR OF POWER HOUSE, SHOWING GENERATORS.

The construction of the pole line was executed by Messrs. Lowe & Farrell, of Hamilton, the Cataract Power Company supplying the material. This work has been executed in a very creditable manner.

TRANSFORMER SUB-STATION AT HAMILTON.

The company's step-down station (see Fig 9) is located on Victoria avenue, immediately beside the Grand Trunk Railway's right of way, about one mile within the city limits. It is a neat structure, built of brick, with a slate roof and specially designed for its purpose. At this point the voltage is reduced to 2,000 volts, at which pressure the current is distributed through the city in four separate circuits.

The line wires are carried through the brick walls of the building in the same manner as at the power house. There is the same arrangement of lightning arresters, high voltage lines and two batteries of transformers. The transformers, however, are arranged so as to be

artificially cooled at times of heavy load by an air blast. The transformers rest over an air duct in the floor and are provided with a ring of vertical air ducts passing up through the oil. The blast arrangement, which consists of a No. 6 Sturtevant blower, direct connected to an S.K.C. two phase induction motor, delivers air directly into this duct, which then passes upward through the transformers.

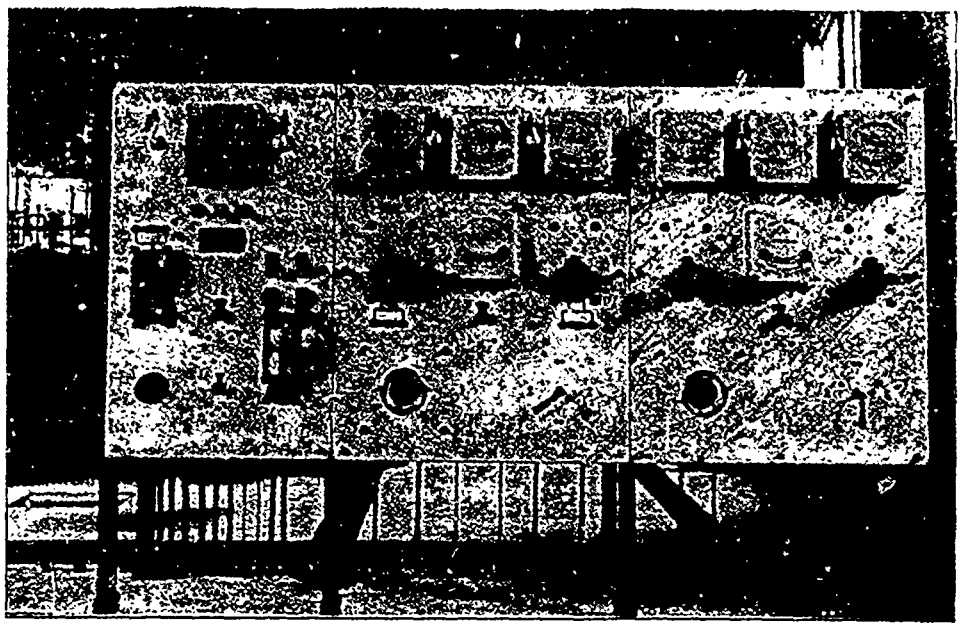


FIG. 7.—GENERATOR SWITCHBOARD.

In the transformer room is also placed the distribution switchboard, and, as at the power house, only half the ultimate capacity of the transformers has been installed, the building being designed to accommodate two more batteries of five, similar to those already placed, consisting of four panels each, containing two ampere meters, two double pole double throw switches and four duplex fuse blocks. From this distribution switchboard incandescent lighting current is supplied for the Hamilton Electric Light & Power Company, as well as for motors on premises of customers throughout the city. From the switchboard the circuit wires pass upward to a cupola in the roof, at which point they are joined to the distribution circuits. The line supplying the incandescent service is a four-wire two-phase circuit, but the circuits devoted exclusively to power are composed of three wires only. An interior view of the transformer station is presented in Fig. 10.

At the premises of the Hamilton Electric Light & Power Company is being installed a new circuit switchboard, arranged to accommodate the old single phase lighting circuits of this company. Each circuit is equipped with a double throw switch in order that the load may be divided with a regulating transformer, so that the pressure may be controlled upon this point. The old house-to-house 1000 volt 16,000 alternation transformers have all been replaced by new S. K. C. 2000 volt 8000 alternation transformers in larger units, and the service all changed to this higher pressure in order to reduce the losses and obtain better regulation.

In addition to supplying the Hamilton Electric Light & Power Co.'s service, the Cataract Power Company have already contracted for a large amount of power for operating factories of different kinds in the city. They expect within a short time to supply the various electric railways in and about Hamilton and to replace many of the steam engines in the various manufacturing establishments with electric motors.

The plant has been in practical operation for several months, and has thoroughly demonstrated the success of electrical transmission at this high voltage and long distance, which speaks well for the carefulness in designing and construction of the work.

The officers of the company are: Hon. J. M. Gibson, president; James Dixon, vice-president; John Moodie, treasurer; John Patterson, secretary; H. R. Leyden, general manager, the latter having had general charge of all the construction operations. Portraits of these gentlemen, as well as of the other directors of the company, will be found elsewhere in this number.

FORMAL OPENING.

Although the plant above described had been in operation for some time, it was not until Saturday, November 12th, that the formal opening took place. In response to the invitation of the Cataract Power Company, some 200 persons, chiefly business men of Hamilton, gathered at the Grand Trunk station in that city, and were taken by special cars to St. Catharines, where carriages were in waiting for conveying the guests to the power house, about three miles distant.

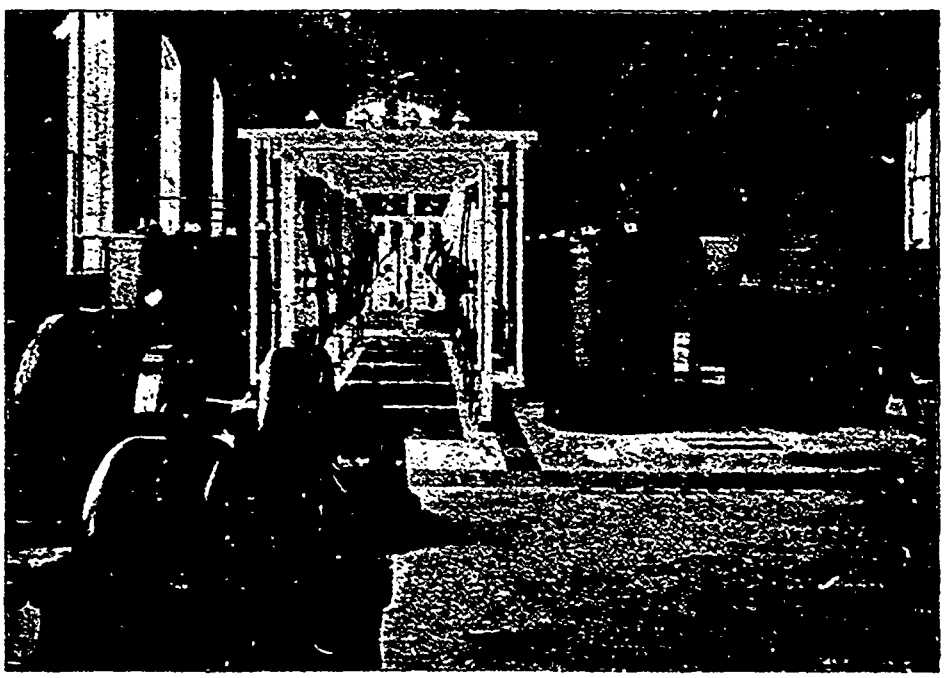


FIG. 8. HIGH VOLTAGE SWITCHBOARD, STEP-UP TRANSFORMERS AND EXCITERS.

Here an hour was spent in an inspection of the plant, which was running at full speed, after which the visitors were invited to partake of luncheon. Tables had been arranged in the reserve space in the power house. A sumptuous repast was served, and no evidence was lacking that the hospitality of the directors of the company was fully appreciated. The

closing down of the machinery signalled that some remarks were forthcoming. Hon. J. M. Gibson, in a few words, expressed his pleasure at being accorded the privilege of presiding upon an occasion which marked the inauguration of so important an undertaking. He announced a brief toast list, which elicited replies from Mayor Colquhoun, Ald. Carscallen, Messrs. A. T. Wood, M.P., T. H. Macpherson, M.P., John Stuart, W. F. Maclean, M. P., Wm. Gibson, M. P., John Moodie and others. Returning to Hamilton about 7 p.m., a visit was made to the transformer station, where further speech-making was indulged in.

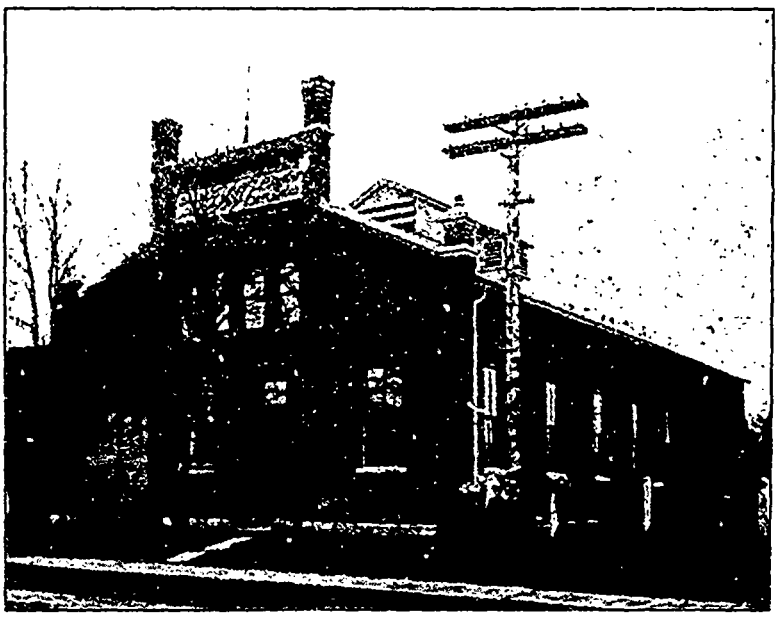


FIG. 9.—SUB STATION AT HAMILTON.

Mr. James G. Pennycuick, of Toronto, has invented a glass conduit for the conveying of electricity without material loss of power.

Mr. H. H. Pratt, Superintendent of Construction for the Central Construction Company, Buffalo, N.Y., was recently in Toronto and called at the office of the ELECTRICAL NEWS. Mr. Pratt informs us that his company are engaged in power plant construction, including water, steam and electric, and that it is the purpose to give greater attention to Canadian business.

Mr. J. J. Wright, manager of the Toronto Electric Light Co., recently visited Fenelon Falls, Ont., for the purpose of obtaining data upon which to base a report regarding the practicability of the proposal for the transmission of electric energy for light and power to Lindsay. Mr. Wright was engaged by gentlemen who have been asked to provide the capital necessary to carry out the scheme.

The annual statement of the Montreal Street Railway Company, for the year ending September 30th, 1898, has been submitted to the shareholders. It shows net profits of $661,704 18, as compared with $507,855 60 for the previous year. This is equivalent to an earning power of 13 % on a capital of $4,700,000. After paying a dividend of 10 %, $138,000 was carried to rest account. The rolling stock was increased during the year by the addition of 22 closed motor cars and 60 open motor cars, all constructed in the company's shops. There are also under construction at the present time 115 cars for next summer's traffic, together with 10 sweepers. The cost of road and equipment construction thus far has been $2,901,959.38, and of equipment $2,093,061.47.

Mr. R. C. C. Tremaine, B.A. Sc., of the Exeter Electric Light and Power Co., in remitting subscription to the ELECTRICAL NEWS, writes: "I am glad you continue it, both on my own account and that of my men, who take great interest in its practical articles."

MONTREAL.

(Correspondence of THE CANADIAN ELECTRICAL NEWS.)

The new theatre, "Her Majesty's," is now open, lit electrically from Lachine power. The switchboard is of the standard Cushing (Boston) type, somewhat similar to that of the Knickerbocker Theatre, New York. Dimmers are interlocking.

As winter approaches, Montreal abounds with the electric belt fiend and similar "parasites." Such articles, of course, prevent everything from consumption to broken limbs. The fools of this city are not all dead yet apparently, as the industry is evidently in a healthy (?) condition.

The Merchants' Cotton Co. are equipping their new wing electrically with 1,000 lights, 21 station watchmans' detectors, and some private 'phones. The work is in the hands of the Montreal Electric Co., who are using Crocker-Wheeler generator and Eco Magneto watchman's detector in their contract.

W. C. McDonald has again been McGill's benefactor in putting his hand in his pocket for new electrical apparatus. This will be greatly appreciated by the new professor of electrical engineering, for although the present laboratory is fitted with good apparatus, yet it cannot be classed as up-to-date by any means.

It is with regret that we learn of the departure of Mr. Gonzenbach, of the engineering staff of the Royal Electric Co. He goes to take a position with the Westinghouse Co. at Pittsburg, where we have no doubt his sterling qualities will commend him. He left numerous friends here, and was well liked by the trade.

At the ball lately given by Mrs. Meighen, 140 Drummond street (formerly the residence of Lord Mount-Stephen), an unique effect of lighting the main staircase and hall was produced with reflectors placed outside of the stained glass windows and ornamental skylight. As the art glass was exceedingly handsome, and the lights not spared, the effect was excellent. The job appears to be in for all time, as the rubber lead encased wire is laid firmly outside the house on the limestone, and does not make an unsightly piece of work either, as the lead makes a fairly good match as regards color to the stone.

That the Electric Street Railway has benefitted Montreal to a great extent cannot be denied, yet some of their arrangements, to those not initiated into their official mysteries, are hard to explain, viz.: The Windsor and St. Lawrence route is apparently the most paying one, and its patrons the most dangerous "kickers" if they should be put to it, and yet every evening cars loaded to the muzzle proceed out St. Catharine street west from down-town, whereas this very traffic could easily be relieved by a few cars run out St. James street west and up the Guy street line, which latter is

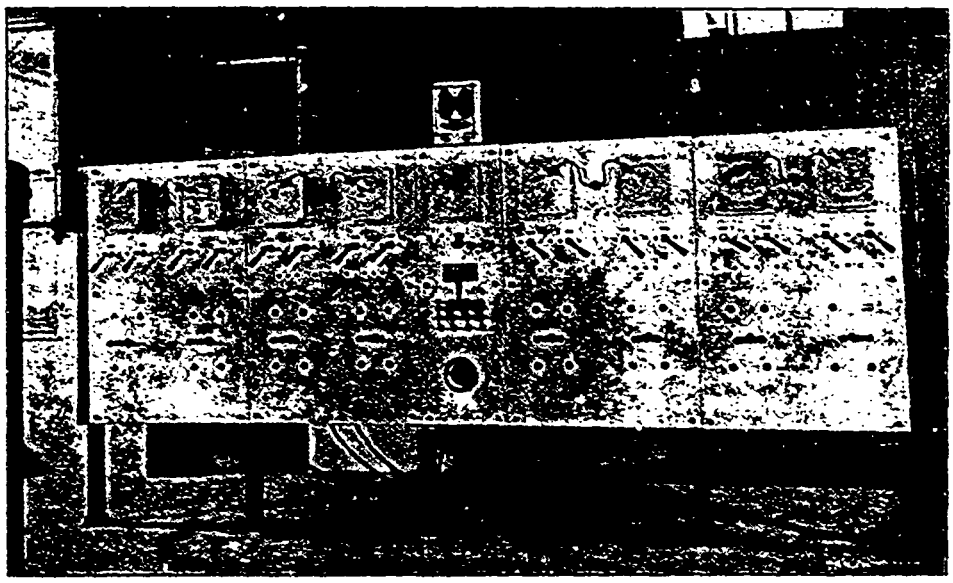


FIG. 10.—SUB-STATION DISTRIBUTING BOARD.

not used to any great extent, and will not be until the government give permission to cross the bridge at Seigneurs street.

The system of supplying current to several installations from one large transformer, although economical from the power company's point of view, can hardly be called a "good thing" just yet. Several houses are wired as per old underwriters' rules, and have no main cut-out; possibly among some of these stands one "up-to-date," yet by being connected with afore-mentioned ones (possibly grounded) the modern installation partakes of the faults of the old ones. As to the installations without main cut-out, what would happen were a short circuit to occur on their interior mains?

McGILL UNIVERSITY NOTES.

Prof. Owens, head of the electrical department of McGill University, accompanied by the students of the Department, visited Peterborough on the 2nd inst. for the purpose of inspecting the extensive workshops of the Canadian General Electric Company at that place.

Mr. Insull, president of the Chicago Edison Company, has consented to deliver a lecture to the students of the Electrical Department of McGill University about the middle of February. I am not able at present to give your readers the title of the lecture or the exact date of its delivery, but hope to do so later on.

The authorities of McGill University propose to substitute for the degree of B.A.Sc. (Bachelor of Applied Science) that of B.Sc. (Bachelor of Science), as being one more readily understood by the public. The Gazette remarks that the dropping of the word "applied" will also take away the opportunity now afforded (and not altogether neglected) for hostile critics to represent the training in this faculty as merely technical. While the faculty prides itself on turning out professional men as competent as college training can make them, the teaching is scientific in spirit throughout, and is founded on a basis of pure science which takes up a large part of the course.

AN ELECTRICIAN'S LUCK.

A well-known electrician of this city is now the possessor of a gold-headed cane, which came into his keeping in a most peculiar manner. While visiting the Toronto Industrial Exhibition last autumn, he got into the midst of a crowd who well-nigh squeezed each others' life out in an attempt to gain entrance to the grand stand. When the Montrealer emerged from the crush, he was not only surprised to find his bones intact, but also that somebody had come out of the scrimmage minus a gold-headed cane, which, in the absence of its owner, he felt free to appropriate.

ELECTRIC TRACTION ON STEEL RAILS.

ALTHOUGH several more or less important works have already been published under the above title, so far none have treated exhaustively the subject of electric traction as a topic by itself; all have neglected it for the fuller treatment of the widely different questions of energy and distribution to the rolling cars. Many engineers, therefore, who are not satisfied with superficial notions on the subject, complain at not finding, in technical works purporting to deal with the matter, sufficient data touching the conditions to be realized so far as electric motors and rolling stock are concerned.

The recent treatise on "Electric Traction on Rails," by Andre Blondel and Paul Dubois, is intended to fill this want in the electrical literature. In this it has succeeded remarkably, covering the field broadly, not only as to the variety of subjects dealt with, but as to the manner in which the different aspects of each particular subject or development is treated.

This work has been conceived in two main divisions, treating respectively (1) of the rolling stock and appliances in all classes of service, and (2) of the technical discussions of traction proper. The authors have added, as natural complements of the subject, a practical study of the track in the first part, and a careful exposition of the several methods of braking in the second, not only from a mechanical, but also an economical point of view. Two important appendices attached to the first volume treat respectively of the various costs and running expenses, and of the private and public precautions of safety. Numerous indexes added to the second volume give valuable information on specifications, designs of motors and other appliances.

Mr. George H. Cooper, of Oakville, Ont., in remitting his subscription to the ELECTRICAL NEWS, writes; "I find it one o he best mechanical magazines that I have ever read."

CANADIAN ELECTRICAL STUDENTS' COMPETITION.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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The "Canadian Electrical News" has been appointed the official paper of the Canadian Electrical Association.

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The Long Distance Transmission Plant of the Cataract Power Co.

WE present to our readers in this issue a description, with numerous illustrations, of the Cataract Power Company's plant for the transmission of electrical energy from a point near St. Catharines to the city of Hamilton, a distance of thirty-four miles. The successful completion of this undertaking marks an important point in the progress of electrical development, not only in Canada, but throughout the world, inasmuch as the generating plant is unique in many features. It is not known that turbines are operating elsewhere under so high a head, nor is it believed that current is being transmitted in daily service at so high a pressure. Again, this is presumed to be the longest distance transmission of electrical energy for power purposes in North America east of the Rocky Mountains. On the Pacific coast, where the highest price must be paid for coal, long distance transmission of power is a problem much less difficult of solution. The projectors of this enterprise had to compete with local steam plants using coal costing less than $3 per ton. It was perhaps natural that, in connection with a problem involving so many experimental features, the original promoters should first have applied to the best known foreign engineers and manufacturers for advice as to the practicability of the scheme both from an engineering and commercial point of view. It was less natural that they should have been obliged to fall back on the resources of Canadian engineers and manufacturers It is, however, cause for the highest gratification that these have proved themselves equal to the emergency, and that the credit of successful achievement in so important an undertaking belongs to Canada. The inference is clear that we have the men and the means to carry out the most difficult undertakings, and that until these have failed we should not go abroad for assistance. It is understood that the company's foreign advisers did not see their way clear to employ so high a voltage, owing to which fact the cost of copper was prohibitive. After careful consideration, Mr. Kammerer, the company's Canadian electrical adviser, working in conjunction with the Royal Electric Company, decided that a pressure of from 20,000 to 30,000 volts might with advantage be employed. The large saving thus effected in cost of copper went far towards insuring the commercial success of the undertaking. It is gratifying to learn that the company are not experiencing the heavy loss in their transmission lines which it was predicted would result from the use of high pressure over wires of small cross-section. Another important requisite to the commercial success of the enterprise was that the electrical machinery should be of the most efficient type. This requirement has been successfully met by the Royal Electric Company, of Montreal, with their S.K.C. system. Much credit is due

to Mr. John Patterson, in whose mind the scheme found its inception, and to the gentlemen whose portraits appear in this number as officers and directors of the company. These gentlemen pluckily stood by the enterprise through a period of much uncertainty and many discouragements. We join with all true Canadians in the wish that its future success will bring them ample reward. The fact that the Hamilton Electric Light and Power Company, and many other large users of power in Hamilton, have shut down their steam plants and contracted with the company for their power supply, seems to show that in this instance at least the steam engine has been outdone.

Central Station Management.

THE business of a lighting company is to furnish light, and not current, as appears to be the view of some. True, the bills are made out for so much current and not for so much light, but there are two parties to the bargain, and a continuance of the arrangement is dependent upon the satisfaction of both. The customer in exchange for his money, which has a pretty definite value, receives light which even in the laboratory is difficult of measurement, and he determines its value by comparison merely. If another premises is better lighted or one portion of his own lighting is better than another, or if his lamps are sometimes at normal candle power and sometimes above, he will use the better illumination as the standard, and any decrease is resented, even when it is just what he is paying for. The success of the company in the customer's eyes is measured by the brightness of the illumination given by the lamp, and this illumination is dependent not only upon the lamp itself, but upon its placing. To achieve the best results the illumination should vary as little as possible, as a continually dim light is less commented upon than if it be alternately bright and dim. This regularity is to be secured not only by a proper voltage regulation, but by choosing lamps which maintain their initial candle power as nearly as possible throughout their life. A poor lamp at start may have the same light-giving efficiency as a better one, or may even have a higher candle power for the same consumption, but its average efficiency throughout its life may be lower. Further, the lamp which gives the highest efficiency averaged throughout its life may not be as satisfactory as one of lower average, for many lamps are on the market which increase considerably in candle power during the first few hours of life and decrease thereafter rapidly, and the customer complains that the high illumination to which he has grown accustomed is not maintained. Of two lamps which commence life with an effective candle power of sixteen, one may rise to eighteen and then fall to twelve, while the other may decrease in a regular way from sixteen to twelve, and the latter will be the more satisfactory on account of its uniformity in spite of the fact that the total light given out is less during its life. Also, in replacing some of the lamps in an installation the contrast between the old and the new will be less marked in the latter case.

The rating of lamps at so many watts per candle at start is only tolerable when recognized as being not an indication of light-giving efficiency, but as a rating, for in the course of its life a lamp which begins with a consumption of 3.1 will increase to 3.5 or to 4 watts per candle—not, mark you, by the increase of current or of watts, but by the decrease of the light given out through changes which affect the light-giving efficiency of the filament and the smutting of the globe. Again, a rating to be of use must be understood to refer to the illumination given out at a specified voltage, as the same lamp may have any consumption per candle power according to the voltage at which it operates. For instance, a 104 volt lamp which gives 16 c.p. with 4 watts per candle, if raised to 108 volts will give about 20 c.p. with 3.5 watts consumption, and if the voltage be raised still further to 112 will give about 25 c.p., or one c.p. per 3.1 watts. It is to be noted, however, that this increase in efficiency is obtained at the expense of the life of the lamp. The essential difference between a low and a high efficiency lamp is that the latter is run at a higher incandescence, and in consequence its life is shortened. It will, however, appear to be giving more light than the former at the same c.p., thus illustrating the fact that the eye is a poor photometer. In consequence of its higher incandescence, the high efficiency lamp is unable to maintain a commercially useful length of life under conditions of variation of voltage, and where they are used the regulation must be correspondingly improved. A 3.1 lamp may be satisfactory where the regulation is within 2%, while for a 4% regulation it will be necessary to use 3.5 watt lamps, and for 6% variations a 4 watt consumption or higher will be advisable. It will be seen, therefore, that without great sacrifice of life a great saving in consumption may be made by the use of higher efficiency lamps, which is made possible by better regulation. This will be to the benefit both of the customer and the station, for the former will have decreased lighting bills, while the latter will be able to increase its output without extra cost for either new plant or running charges of the present. These are benefits which will appeal to every manager, and he naturally asks what price there is to pay for the better regulation which is responsible for this increased efficiency. The price in most cases is not large; it involves apparatus for indicating in the station the state of things at the lamp and the proper lay-out of feeders and distributing mains, and close attention in the station to the regulation. Many stations have plenty of copper in place, but not in the proper place, and an intelligent study of the existing conditions will indicate where that copper should be located. Having arranged the circuits intelligently, the station attendant is kept in touch with the voltage at the lamps by means of pressure wires to the centres of distribution or by means of a compensating volt meter adjusted to the feeder drops. If in addition a recording volt meter be used at the distributing centre, the manager is in a position to check the attendant and the chain is complete.

The above remarks are of more interest to the steam station manager where running costs are higher and speed regulation better than in water power stations, but only in degree, not in kind, as he will push lamp efficiency higher than would be advisable in the latter case to save coal at the expense of the small loss due to the shorter life of the lamp. To sum up, a large saving of energy, which is costing you money, may be made by keeping your voltage as constant as possible and using lamps of an efficiency to correspond, and by a simple system of testing the lamps to ascertain that those you purchase maintain their candle power as nearly as may be possible about their initial during the period of their life.

TWELFTH ANNUAL BANQUET OF STATIONARY ENGINEERS.

THANKSGIVING Eve is awaited with some eagerness by the engineers of Toronto, as it has become synonomous with a general hand-shaking and feasting of the members of Toronto No. 1, C.A.S.E., and their friends. This year the invitations announced that the dinner would take place at the Walker House. The accommodation there provided, coupled with the unceasing effort of the dinner committee, fully maintained the reputation of Toronto No. 1 in the direction of providing social entertainment. Four tables, nicely decorated, had been provided, two extending lengthwise of the large dining hall and one across each end. These, however, were found insufficient for the large number of persons present, and a fifth table had to be arranged in the centre. The duties of chairman were performed in a most efficient manner by Mr. Charles Moseley, president of the association. Among those present, there were noticed the following :

Mayor Shaw ; Ald. S. H. Woods ; C. H. Rust, city engineer ; Prof. Galbraith, principal School of Practical Science ; A. G. Horwood, secretary Toronto Technical School ; Alex. Fraser, secretary Boiler Inspection and Insurance Co. ; A. E. Edkins, inspector Boiler Inspection and Insurance Co. ; J. S. McKay, traveller Robb Engineering Co. ; George Anderson, manager Royal Oil Co. ; James McLaughlin, traveller Queen City Oil Co. ; William Sutton, manager Wm. Sutton Compound Co. ; C. L. Weeks, General Engineering Co. ; A. M. Wickens, chief engineer parliament buildings ; James Sinclair, manager Eureka Mineral Wool Co. ; E. G. Fowler, boiler inspector ; Geo. Grant, George Grant & Co., oil merchants ; W. G. Blackgrove, inspector Boiler Inspection and Insurance Co. ; George Clapperton, Bennett & Wright Co. ; F. H. Powers, traveller Vacuum Oil Co. ; James Litster, manager Pure Gold Manufacturing Co. ; Wilson Phillips, late mechanical superintendent T. Eaton Co. ; R. C. Pettigrew, executive vice-president, Hamilton ; George Mackie, Robert Mackie and J. Ironsides, Hamilton ; John Huckley, Waterloo branch ; G. C. Mooring, chief engineer Methodist Book Room ; E. J. Philip, chief engineer T. Eaton Co. ; John Dixon, engineer new city hall ; W. J. Webb, engineer Lawlor estate building ; H. E. Terry, engineer R. G. McLean ; J. W. Marr, engineer Metropolitan Railway Company ; James Huggett, chief engineer Freehold Loan building ; John Fox, engineer O'Keffe Brewing Company ; J. G. Bain, engineer Toronto waterworks ; T. Eversfield, engineer Toronto University ; George Thompson, engineer T. Eaton Co. ; W. Bourne, Toronto Electric Light Co.

The menu was all that could be desired, and after the appetites of the guests had been appeased, some opening remarks were made by the chairman. After welcoming the guests, Mr. Moseley referred to the progress which the Stationary Engineers' Association had made. The various reports of the officers and the unanimous good feeling which prevailed among the members was, he said, a source of congratulation. The present condition of affairs demonstrated the ability of those who had preceded him in office. The opportunities afforded the members of the association of improving themselves in the various branches of engineering were each year becoming more extended, and those opportunities, united with tenacity of purpose, would no doubt result in greater advancement in the future, so that each might extend his sphere of usefulness to the betterment of the condition of his fellowmen.

After the singing of the National Anthem, the chairman proposed the toast of "Toronto, Our City," coupling therewith the names of Mayor Shaw and Ald. Woods. In replying, Mayor Shaw congratulated the association upon the large number present, which, he thought, was one of the strongest evidences of prosperity. He referred to the encouragement which was being given to manufacturing industries, to the deepening of the canals, and to the improvements to Toronto harbor, expressing the hope that at an early date ocean vessels would come as far as Toronto. He understood that the engineers were endeavoring to secure a license law from the Ontario government, so that no man would be allowed to take charge of an engine unless he held a certificate of competency. Incompetency, he said, not only endangered the lives of those having charge of an engine, but life in general. His remarks were greeted with applause. Ald. Woods, being called upon, expressed feelings much in sympathy with the engineers. He was in favor of organized labor, and it had been a great pleasure to him to have been of some service during the past year to one or two members of the association.

Following came the toast of "Canada, Our Home." Mr. George Anderson, manager of the Royal Oil Company, in responding, stated his belief that we had entered on an era of prosperity in Canada which would continue for many years. He hoped to see the number of chimney stacks doubled in this country, and pointed to the wonderful agricultural, industrial and mining development. He deprecated strikes, and was pleased that the Canadian Association of Stationary Engineers was an educational society, as undoubtedly there was room for mechanical improvement. Mr. Anderson concluded by telling some humorous stories, and was followed by Mr. A. M. Wickens, who referred to the question of elevators for the new city hall, stating that he was such a thorough Canadian that he would not purchase American elevators. We had a number of things in Canada to be proud of, and Canada should also be proud of the C.A.S.E., as it had established the Toronto Technical School. Engineers were getting a greater salary to-day as a result of their connection with the association. They had become more valuable to their employers.

With the toast of "The Manufacturers" were coupled the names of Mr. C. L. Weeks, of the General Engineering Company, Mr. James M. Sinclair, of the Eureka Mineral Wool Company, and Mr. James McLaughlin, of the Queen City Oil Company. Mr. Weeks said that when we left school we had only learned how to study; then it was a question of application. He referred to the necessity of efficient employees. In their manufacturing business two forms of competition had been experienced. One of these was the cutting of prices below the point where good machinery could be produced ; the other was infringement of patent rights. In this connection the speaker incidentally referred to the suit now pending between the General Engineering Company of Canada and the American Stoker Company. The latter, he said, had infringed upon their patents in respect to mechanical stokers. Mr. Sinclair made a few pointed remarks, stating that many of the factories in Toronto were working day and night. The increase of factories would necessarily result in the employment of a larger number of engineers. Mr. McLaughlin, responding to the same toast, said that trade and commerce had lifted up the human family to its present eminence. The story of the growth of manufacturing was not alone the story of freedom, but the record of civilization, and the best evidence of freedom and well doing was the ring of the anvil and the hum of the wheels of industry. The manufacturers, by their skill,

have given cheaper and better products and added to the material welfare of the people. Canada certainly possessed advantages from her abundance of iron, copper, coal, nickel, lumber, and minerals of all kinds, but one disadvantage was the small population, scattered over such a vast country, 3,600 miles from east to west and 1,400 miles from north to south. He believed that a prosperous manufacturing industry in Canada could only be established by cultivating the markets of the world at large and by developing the agriculture of the country. Within the last few years an acceptable change had placed Canadian manufacturers on a fair footing with those of other countries. An opinion prevailed until recently that home-made goods were not equal to those imported, but to-day the products of Canadian manufactories were beginning to be appreciated, and in the markets of Europe they were taken in preference to goods of a similar kind from other countries. Touching briefly upon the oil industry, Mr. McLaughlin said that all were aware of the great difficulty there had been heretofore to obtain a good oil, either illuminating or lubricating, manufactured from Canadian crude material. To-day the oil manufactured at the Sarnia refinery defied competition either in illuminating, lubricating, or other fine products of petroleum. The Queen City Oil Company, which he represented, had recently expended a very large sum of money in the erection of a thoroughly equipped refinery at Sarnia, which he believed was one of the best on the American continent. Other Canadian manufactories had also demonstrated their capabilities. Figures were given showing our imports and exports. In 1888 we exported manufactured goods to the value of $4,161,282; in 1897, $9,522,014. In 1895 our total imports of all kinds were $110,781,682, and our exports $113,638,803. In 1896 our imports were $118,011,508 and our exports $121,013,852. In 1897 our imports were $119,218,609 and our exports $137,950,253, or $18,741,644 more than we imported, which was $16,000,000 in excess of the previous year and $27,000,000 in excess of the fiscal year 94-95. Therefore, he thought we had every reason to congratulate ourselves on our prosperity, our country and our manufactories.

Prof. Galbraith, principal of the School of Practical Science, and Mr. A. G. Horwood, of the Technical School, responded to the toast of "Our Educational Interests." The former stated that this year the attendance at the School of Science and the Technical School was larger than ever before. He was fully convinced that the C.A.S.E. were following the right course in encouraging education. They were justified in using every means to improve their position. He referred to the proposal to bring Niagara power to Toronto, pointing out that it would not be in the interests of engineers, and humorously alluded to the proposal of Mr. Nicolas Tesla to transmit power without wires from Niagara Falls to New York, and even to the European continent. Mr. Horwood pointed out the relation between technical schools and the manufacturers. The British manufacturers found that Germany was capturing their trade, so the British government established technical schools after the policy of Germany, and now they were getting their trade back again.

The toast of "The Executive" was next proposed, Messrs. E. J. Phillip and A. E. Edkins, past presidents, R. C. Pettigrew, vice-president, and Geo. C. Mooring, treasurer, responding. Coupled with the toast of "Sister Societies" were the names of Messrs. John Dixon, president Toronto No. 18, G. Mackie, vice-president of the Hamilton association, and John Huckley, of the Waterloo branch. Each of these gentlemen spoke briefly. Mr. Dixon thought that the association should take some steps to provide for aged members of the association. The toast of "The Press" was responded to by Mr. S. J. Robertson, of the Canadian Engineer, and Mr. T. S. Young, of the ELECTRICAL NEWS AND ENGINEERING JOURNAL. At this juncture Mr. Mackie proposed the toast of "Toronto, No. 1," which brought forth a reply from the president, Mr. Charles Moseley. Mr. Moseley said that the association had been of great benefit to him personally, having assisted him in an educational way. The object of the association in earlier years had been to lay a good foundation, and to-day they possessed a good library, hall, and every necessary accommodation. The toast list being concluded, the dinner was brought to a close by the singing of "Auld Lang Syne." The following gentlemen furnished the evening's musical programme: Messrs. W. G. Blackgrove, Bert Harvey, J. Litster, James Fax, Geo. W. Grant, W. H. Banfield, and E. Fisher, the latter acting as accompanist.

The dinner committee consisted of: J. Marr, chairman; George Thompson, secretary; George Mooring, treasurer; A. M. Wickens, J. Bannan, Albert Slute, W. C. Tait and J. G. Bain.

BARE WIRES AND ALTERNATING CURRENTS.

THE following letter from the city electrician of Winnipeg, Man., explains itself:

WINNIPEG, October 3, 1898.

MR. F. M. MORSE,
Secretary Winnipeg Electric Street Railway Company.

DEAR SIR,—I understand that it is the intention of the Winnipeg Electric Street Railway Company, operating the North-West Electric Company, to use the network of bare wires, forming the mains of the distributing system in connection with their proposed new system to be installed some time during the coming winter.

I further understand that it is the intention of the Winnipeg Electric Street Railway Company to employ on the aforesaid bare wires "alternating currents," using the mains as a three-wire secondary network, fed from transformers, the primaries of which, I understand, will have a difference of potential of something over 2,000 volts.

I consider that the above system, using bare overhead wires in the streets of this city, will be highly dangerous, both to life and property. It is a well-known fact that the insulation in transformers frequently breaks down, thus placing the secondaries in direct connection with the primaries; should this take place there will be a pressure of 2,000 volts between the secondary wires and the ground, forming a short circuit as soon as another ground is caused on the opposite side of the alternating circuit. Should this take place in even one transformer, the whole bare wire system, extending over miles of streets and connected to hundreds of private premises, would be thus affected.

This proposed system being thus radically different from that for which the city council authorized the use of bare wires, viz., the Edison direct current system, leads me to unhesitatingly condemn this proposed system of distribution for electric lighting in this city.

At the time of installing the North-West Electric Company's system, the representation was made as to the voltage of the direct current to be used, not to exceed 220 volts, and further that there would be a protection with guard wires on each side. This latter element of safety, I find, has not been provided.

I desire at this time to call attention to the matter so as to obviate extra expense being caused you, as I certainly would have to object to the system proposed to be used, or, to use other words, to the use which is proposed to be made of the bare wires of the North-West Electric Company's system.

Yours truly,
(Sgd.) F. A. CAMBRIDGE,
City Electrician.

MESSRS. NESS, McLAREN & BATE, MONTREAL.

It will be remembered that last spring the factory of Messrs. Ness, McLaren & Bate, at 749 Craig street, Montreal, was seriously damaged by fire, necessitating their removal to new quarters. These were found at the corner of Craig and Seigneurs street. In their new premises they put in a complete plant of special tools and machinery for the manufacture of telephones, telegraph instruments, annunciators, switchboards, fire alarm apparatus and electrical supplies of various kinds, and they now have one of the best equipped and most modern factories in Canada. A view of their premises is presented on this page, and on the following pages will be found glimpses of the interior of their factory, office and show rooms.

Messrs. Ness, McLaren & Bate advise us that at the present time they are busy in every department, and are doing almost double the volume of business which they were one year ago. Among their staff of employees there are a large number of experts, and the goods turned out are considered standard, it being the aim to make only the best quality.

STEAM BOILERS AND FROST.

Among the enemies which threaten the destruction of steam boilers, says the Journal of the Bavarian Society for the Inspection of Steam Boilers, frost is by no means the least formidable. The following two examples go to show that even boilers built of heavy plate and tested at high pressure cannot be exposed to the rigors of cold weather with impunity.

The boiler was, because of the scarcity of orders during the winter months, fired only two or three times per month, each time for several days, and was the rest of the time allowed to stand idle, filled with water. One fine day when the boiler, which consisted of upper and lower boiler, was being emptied and put in readiness for an inspection of the interior, it was found that the manhole cover in the rear head of the lower boiler had been forced out and the rim of the manhole badly rent and bent out of shape.

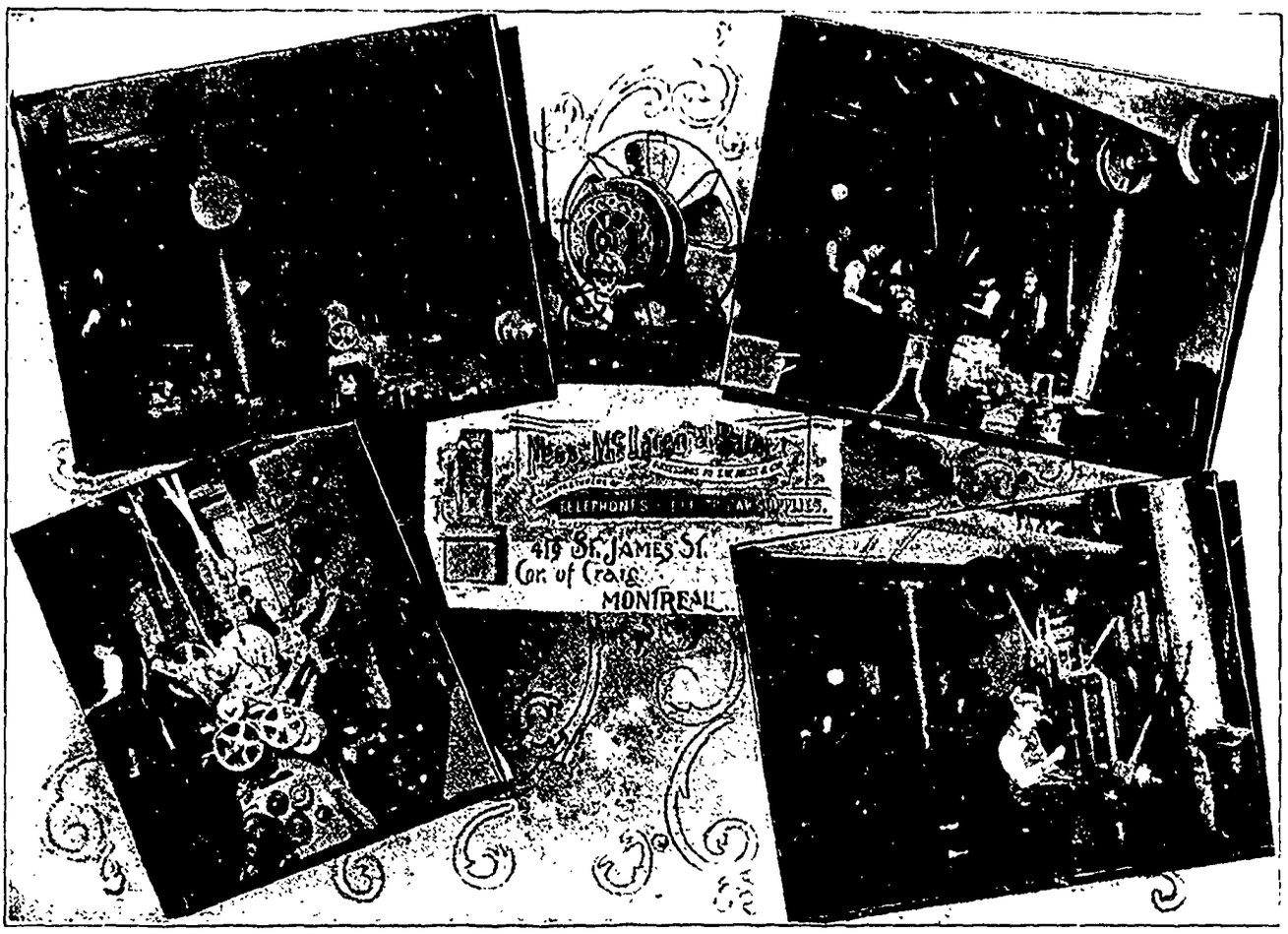
Further examination revealed a cone of ice behind the damaged boiler head. The water in the upper boiler, which was at the proper level, was covered with a crust of ice about one centimeter, 0.4 inches thick. There could be no doubt that the ice cone in question had caused the damage, the mass of ice, in freezing from the outside toward the interior, having found sufficient hold on the heads of the rivets and irregularities of the flue to cause the pressure developed by the final freezing of the core of the cone to act, instead of toward the free interior, upon the head of the boiler, until the latter gave way and became rent at its weakest point—the unfortified rim of the manhole. The process of destruction was favored by the fact that the door leading from the boiler-house into the open air was only a short distance from and directly opposite the unprotected boiler head.

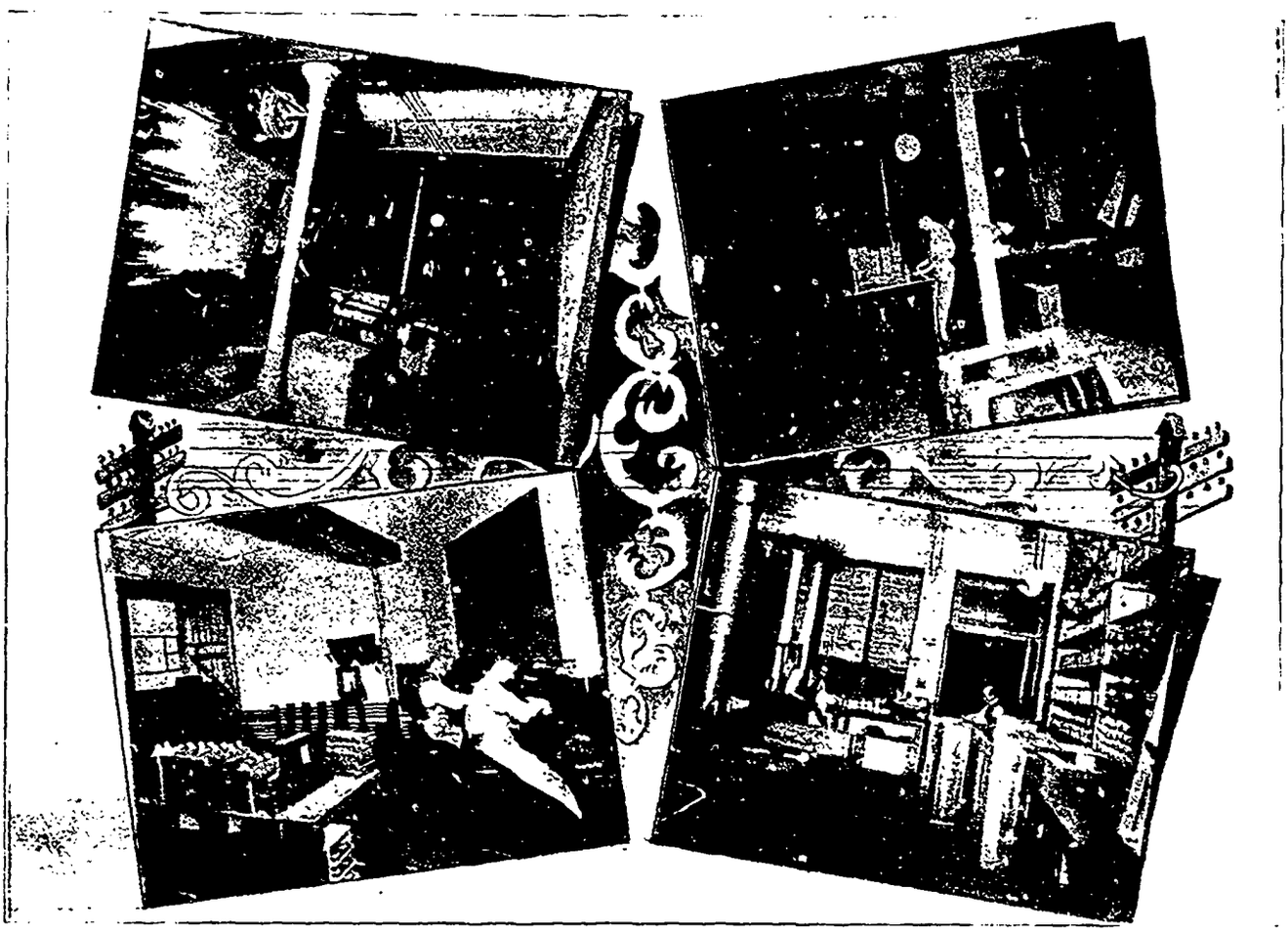
Another boiler, which was used only once a week, was situated in a small stone building in the middle of the farmyard.

When on a certain winter day the boiler was to be heated, it was noticed that it was rent from the mud-hole of the cross-tube along the lengthwise seam to a point beyond the fourth rivet, but that no water flowed from the rent. On opening the man-hole over the crown of the fire-box it was found that the water between the shell and fire-box, as well as in the cross-tube, had frozen, and this at once explained the cause of the damage. The cylinder of ice which had formed in the cross-tube had pressed against the shell of the boiler and had caused it to burst along the seam—its weakest spot.

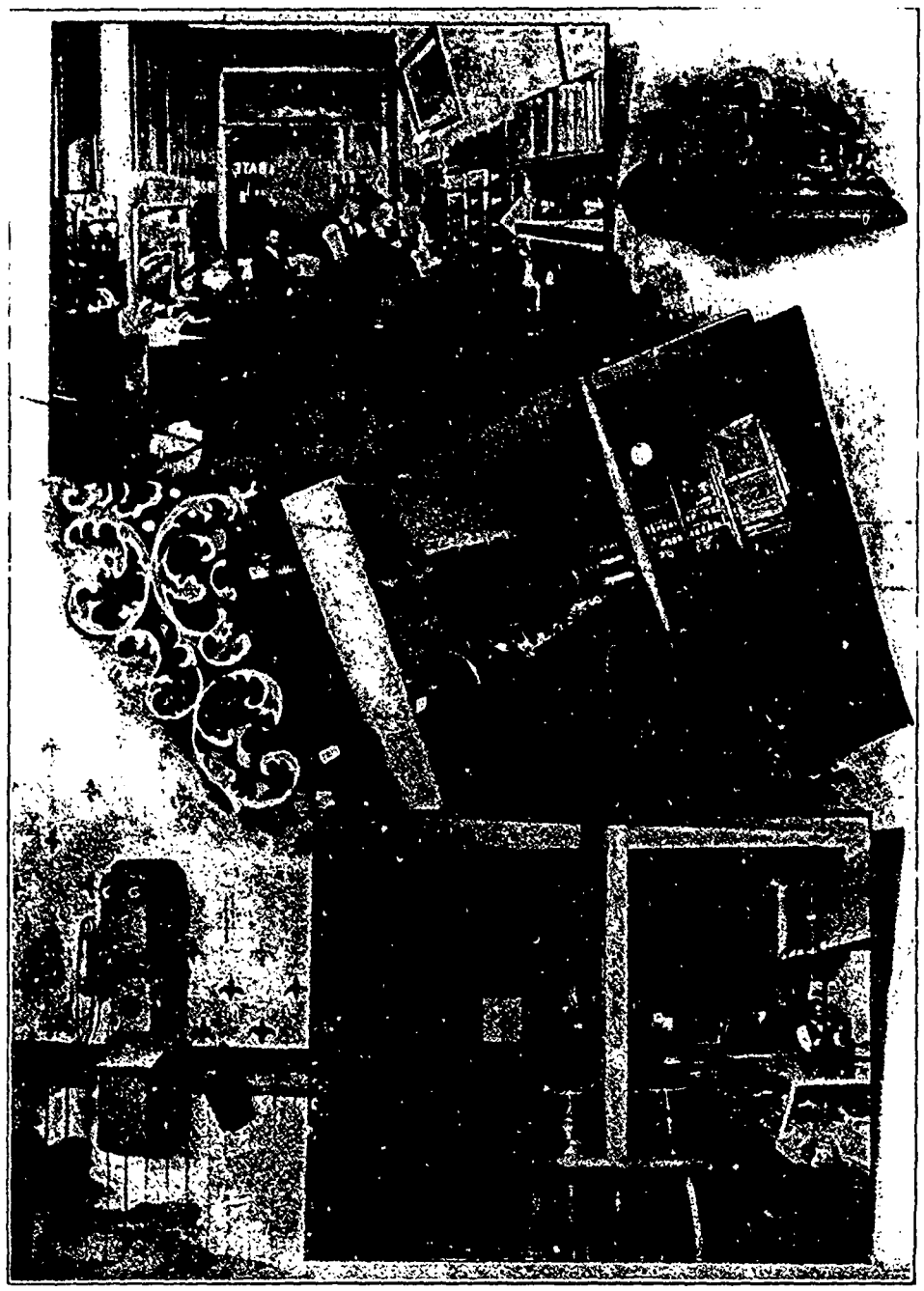
These two examples demonstrate that boilers which are little used and exposed to the cold must be protected in winter against freezing, and this is effected best by discharging the water or by maintaining on cold days a light fire under the boiler or in the boiler-room.

The number of periodicals dealing exclusively or largely with electricity amounts to sixty-six. Of these eighteen are published in France, fourteen in the United States, twelve in Germany, six in England, three in Switzerland, two in Austria, Belgium, Holland, Italy and Spain, and one in Canada.





INTERIOR OF FACTORY OF MESSRS. NESS, McLAREN & BATE, MONTREAL.



OFFICE AND SHOW-ROOMS OF MESSRS. NESS, MCLAREN & BATE, MONTREAL.

QUESTIONS AND ANSWERS.

"G.W.V." asks: What horse power motor would be required to run two one-inch shafts, one 82 feet and the other 48 feet in length, at a speed of 560 revolutions per minute. No. 1 shaft running 40 sewing machines and No. 2 shaft 20 sewing machines.

ANSWER. A four horse power motor would be economical for doing the above work. A three h.p. motor might do it, if the shafts were in good shape and there was no excessive friction.

"Subscriber," Perth, Ont., writes: Kindly advise me if it is possible to change a 50 ampere 1000 volt primary Thompson-Houston alternator to run on a 2000 volt primary, without the use of step-up transformers. Can this be done by changing the connections on armature, say from multiple to series? How can I use transformers wound for 1000 volt primary, 50 volt secondary, on a 2000 volt circuit? Would it be safe to use them on a 2000 volt circuit, using 100 volt secondary, or would it be better to couple two together?

ANSWER. If the dynamo is wound so that one-half of the coils are connected to the other half in multiple for 1000 volts, it can be easily changed to 2000 volts by connecting the two halves in series. If the coils are already all in series, it cannot be done. You can easily see by examining the connections whether the coils are all in series or not. The transformers should run on 2000 volt primary and 100 secondary if the insulation is good enough. Modern transformers are usually wound and insulated so as to run either way. If your transformers are old and the insulation deteriorated, a doubling up of the E.M.F. may burn some of them out.

PERSONAL.

Mr. John S. Craig has been appointed electrician to the Toronto Fire Department.

Mr. John W. Keeley, the inventor of the Keeley Motor, died at his home in Philadelphia on November 18th, after a brief illness. Mr. Keeley was 61 years of age.

Mr. J. K. Ross, B.A.Sc. (McGill), who was recently appointed assistant engineer of the Birmingham Street Railway, has gone to England to enter upon his duties.

Mr. L. R. Carmichael, lecturer in mathematics and electrical engineering in Queen's University, Kingston, Ont., was recently married to Miss Jenkins, of Strange, Ont.

Mr. P. F. Hodgson, railway signal engineer for the Grand Trunk Railway, has resigned his position, to accept the management of the Saxby and Farmer Engineering Works, of London, Eng. Mr. Hodgson will assume his new duties in January.

Mr. F. A. Wunder, travelling representative for New York State and foreign countries for the Fort Wayne Electric Company, of Fort Wayne, Ind., was in Toronto last month in connection with the tendering for an electric light plant for the city.

SPARKS.

The Prescott Electric Light Company, of Prescott, Ont., is announced to have assigned to W. T. Scott.

The Ottawa Electric Company have completed a new flume in connection with their power house, the cost of which was $5,000.

The Northern Electric & Manufacturing Company, of Montreal, has been authorized to increase its capital stock from $50,000 to $1,000,000.

A company, represented by Dennis Murphy, of Ashcroft, B.C., purposes supplying West Yale with electric power, utilizing the waters of the Thompson and Bonaparte rivers.

The cars of the Hull & Aylmer Electric Railway Company have been equipped with new head-lights. Five lamps of 16 candle power are placed together before a strong reflector.

The Ottawa Electric Company has just installed what is claimed to be the largest electric light dynamo in Canada. It is of the Westinghouse type, and has a capacity of 10,000 lights.

The Bell Telephone Company is erecting a new exchange building in the city of London, Ont. It is said that this exchange will be one of the most complete in point of equipment to be found in Canada.

The council of the municipality of Rossland, B.C., have accepted the proposition of the West Kootenay Power & Light Company to furnish arc lights of 2,000 candle power, at the rate of $96 per lamp per year.

Tenders are invited by the town of Sherbrooke, Que., for lighting the streets by arc and incandescent electric lights. The date limit is December 15th. C. W. Cate is chairman of the lighting committee.

A company of Chicago and Eastern capitalists is being formed, with a capital of $10,000,000, for the purpose of building electric railways in Japan. The name of W. D. Eastlake has been mentioned in connection with the scheme.

"I say," said Fuddles, who sometimes thinks he is smart, "what sort of fruit can you raise on an electric plant?" But Faddles, who also thinks he is smart occasionally, promptly replied, "Currents,"—Washington Star.

It is reported that a New York company have taken an option on the plant and charter of the Canada Electric Company, of Amherst, N.S. Should the purchase be made, it is probable that the new proprietors will increase the capacity of the plant.

Mr. Hartley Gisborne, M. Can. Soc. C.E., of Winnipeg, is reported to have been appointed by the council of the Institution of Electrical Engineers, London, England, their honorary secretary and treasurer for Canada, vice Prof. Carus-Wilson, late of McGill University, resigned.

The Ottawa Electric Co., Ottawa, Ont., are increasing the arc lighting capacity of their power station, and have placed an order with the Canadian General Electric Company for one of their two circuit automatic regulating "Brush" arc dynamos, having a capacity of 125 arc lamps.

The West India Electric Company, of which Mr. Henry Holgate, late of Montreal, is manager and chief engineer, expects to have 22 miles of electric railway in operation at Kingston, Jamaica, by next spring. The principal stockholder in this country is Mr. James Ross, of Montreal.

Messrs. Cornell Bros., of Stanbridge East, P.Q., are installing an electric lighting plant, and have purchased for their requirements, from the Canadian General Electric Company, a 400-light dynamo of the latest M.P. type, together with marble panel switchboard and wiring supplies.

The Montreal Belt Line Company have adopted a novel method of lighting their railway to Bout de l'Isle. An arc light reflector is located on the vestibule of the car, which does the work of a powerful search light, the smallest objects being visible to the motorman a quarter of a mile ahead.

An American inventor has submitted a scheme to the Toronto Street Railway Company to prevent overcrowding of street cars. His proposal is to fit up the cars with movable chairs, which close up automatically when not in use, and when in use increase the seating capacity by economizing space.

The arbitrators in the case of the Laurentide Pulp Company and the province of Quebec, regarding water power at Shawenegan Falls, Que., have given their award. The company are to pay the sum of $5,000 to the province, in consideration of which they will control all rights and privileges for all time to come.

Mr. A. L. Breithaupt, president of the Berlin and Waterloo Street Railway, recently made an inspection of the fender as employed on the Guelph Street Railway. He announced himself as well satisfied with its operation, and is said to have placed an order for a supply of fenders for the Berlin and Waterloo road.

On the invitation of the directors of the Canadian Electric Light Company, a number of the leading citizens of Quebec and Levis visited the company's water power at the Chaudiere Falls recently. Mr. H. M. Price, who is largely interested in the company, acted as guide, and explained to the visitors the extent of the power. The distance from the feed-head to the foot of the falls is 110 feet, while the drop is 94 feet.

The largest locomotive engine ever built in Canada has just been completed at the works of the Kingston Locomotive & Engine Company, Kingston, for the Intercolonial Railway. The driving wheels are 72 inches in diameter, the boilers designed to carry a pressure of 180 pounds to the square inch, the water tank will hold 3,000 gallons of water, and the tender nine tons of coal. The engine weighs 70 tons and the tender 44 tons, making a total weight of 144 tons.

In the Exchequer Court December 5th will be heard the argument in the suit of the General Engineering Company of Ontario vs. the American Stoker Company and the Dominion Cotton Mills Company. This is a case of an injunction granted to restrain respondents from using certain improvements in mechanical stokers, of which appellants claim the possession of the patent rights. They ask an injunction against defendants that they be prohibited from using such improvements, and be ordered to surrender them, as well as pay damages for infringement.

The Ottawa Electrical Association has taken on new life, and at a meeting held last month Mr. W. M. Wier was elected secretary, in lieu of Mr. E. Bailey, who has removed to Perth. Several members were initiated and a committee appointed to arrange for technical papers and a programme of entertainment. The association has adopted a unique and appropriate crest. The letters "O.E.A." are mounted on a horse-shoe magnet which rests upon a bank of clouds, with streaks of lightning flashing in all directions, the whole being emblematic of electricity and magnetism.

The official announcement has been made of the amalgamation of the Quebec, Montmorency & Charlevoix Railway Company, the Quebec District Railway and the Montmorency Electric Power Company. The company, which will be known as the Quebec, Montmorency & Charlevoix Railway Company, announces its intention of electrifying the road running from the city of Quebec to Cap Tourmente, a distance of about 30 miles, and to construct an independent branch to Montmorency Falls. The estimated cost of the proposed improvements is given as $330,000, and when completed the system will comprise over 60 miles of electric railway, which will be one of the most extensive systems under one management in Canada. Mr. Edward A. Evans, C. E., is general manager and chief engineer of the consolidated system.

The Welland-Vale Mfg. Company, of St. Catharines, Ont., have increased their factory buildings and are making a change in their lighting plant. They have heretofore operated a direct current two wire system, but have decided to keep pace with the times and for this purpose are installing a 600 light alternating current two-phase S.K.C. plant, which will operate on the three-wire system, giving them a much cheaper distribution, as well as the benefit of having an inductor type dynamo, which, they believe, possesses a great many advantages over those of the old type. They are following in the lines of the Penman Mfg. Co., of Paris, and the Cockshutt Plow Co., of Brantford, who have replaced their direct current incandescent plant by inductor type machinery.

The new electric light plant at Tilbury, Ont., owned by Mr. R. H. Smith, was put in successful operation on the 14th October, and is, we learn, giving entire satisfaction. The station is a one story brick building, 36 x 26 feet, with engine room 35 x 15 feet, and boiler room 11 x 35 feet. The power equipment consists of a 60 inch by 12 feet tubular boiler, Northey steam duplex feed pump and heater, and Leonard-Ball automatic high speed engine. The electrical apparatus comprises two 15 k.w. Edison bi-polar 125 volt dynamos, operating on the three-wire system, with white marble switchboard and full complement of instruments, and one 35 light Reliance dynamo and polished skeleton switchboard and necessary instruments. There are in use 13 arc lights for street purposes and over 300 incandescent lights. The plant, which was installed by the Canadian General Electric Company, is in charge of Mr. Joseph H. Ward, who for some time was superintendent of the St. Mary's electric light plant.

The Edison Electric Company, in New York, has just decided to make an experiment which may result in a wonderful increase in its business, as well as in revolutionizing the domestic economy of many homes. The company has reduced the price for domestic lighting to three-fourths of a cent an hour for each incandescent lamp of 16 candle power, the offer to be good for three months, with a promise to make yearly contracts at that rate. If the people show a disposition to adopt electricity in place of gas which will warrant it, the low rate will be made permanent. Not only does the company purpose invading the field of domestic lighting, but it will offer special inducements to those who desire to use electricity for cooking purposes, even though such use at the best price which can be made would be a luxury at present. Nevertheless, the company displays a complete electric kitchen in its office, where practical demonstrations are made of the various appliances for cooking and heating.

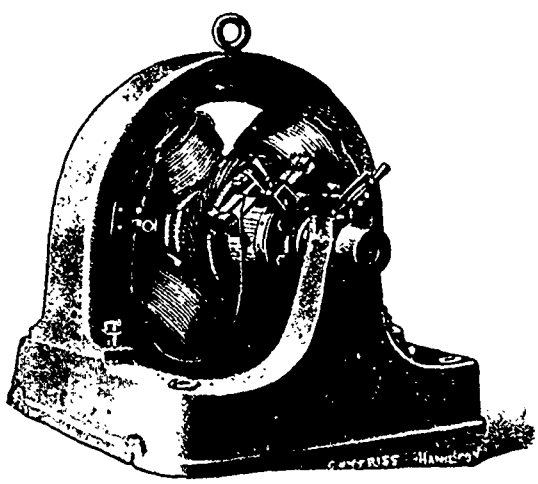
The Parry Sound Electric Light Company, of Parry Sound, Ont., has just completed the installation of new water wheels, purchased from Charles Barber, of Meaford, Ont. They comprise two 42-inch improved Canadian turbines, horizontally set. Work was commenced in September, a pit being blasted out of the solid rock some ten feet to the south of the old mill building; a stone foundation was built around the wheel pit to support the bulkhead, and rock bolts were carried up through this foundation to secure the floor of the bulkhead from any possibility of shifting its position. A floor of 12-inch timber was placed across the foundation, and on this the bulkhead, 8 x 16 feet and 18 feet high, was erected. A draft tube, 5 feet 6 inches long, extends from the floor of the bulkhead down into the wheel pit, and, being air tight, the water, in falling through it after leaving the wheels, exerts as much force as the same amount of water would if above the wheel. The speed of the wheel shaft being 128 revolutions per minute, and the proper speed of the line shaft 15 revolutions per minute, it was necessary to belt from a 72-inch pulley on the wheel shaft to a 28-inch pulley on the line shaft. The connection is made by a double leather endless belt 20 inches wide and 64 feet in length, supplied by the J. C. McLaren Belting Company, of Montreal. At present the head of water is 21 feet, and the wheels are developing about 200 horse power. The work was carried out under the superintendence of Mr. W. H. Train, of Burk's Falls.

HIGH CLASS GENERATORS AND MOTORS.

In order to meet the growing demand for direct current electrical machinery of a higher order of excellence than that heretofore usually offered, the Toronto and Hamilton Electric Company, of Hamilton, have prepared designs for a line of machinery which is claimed to embody the most modern features of correct electrical and mechanical construction. Regarding these machines the manufacturers say: In these the highest possible efficiency is obtained compatible with moderate speeds, and their output is based on a low temperature rise. Careful attention has been given in the matter of correct saturation of the armature teeth, while the density of the remainder of the magnetic circuit is such as to require a minimum current for excitation and least loss in compounding against armature drop and reaction.

The reluctance of the air gap is reduced and a proper distribution of the flux is obtained by the use of a correctly shaped pole shoe, and as a result the brushes do not spark under different loads.

The energizing coils are circular in form, and their careful and even winding results in a high insulation resistance and affords the most economical ratio of turns to weight and length. The armature coils are form wound and thoroughly insulated, and the winding



is perfectly symmetrical and balanced. The commutator is massive, made from the best copper, and wholly insulated with mica. Mechanically, the machine is unsurpassed. The armature is built on an open-work hub, which allows of thorough ventilation, and the commutator is directly keyed to same hub, the two forming a unit independent of the shaft, thus eliminating all strain at the armature leads, which often obtains in some types of machine by commutator working loose on the shaft.

The shaft is of the best machinery steel, generously proportioned and carefully finished, and runs in gun metal bearings of the self-oiling and self-aligning variety. The pedestal seats are bored at the same operation with the poles, the pedestals being carefully turned to suit, and this construction insures perfect concentricity of the armature and field magnet, and a regular air gap, important matters in a multipolar machine. The yoke crown is of soft cast iron, the magnet limbs of round wrought iron, and the pole shoes of cast steel, a combination which practice has shown to give the best results for either generators or motors, and to possess the finest regulating qualities.

The excellent balance, generous weight of metal and low centre of gravity insures the smoothest attainable running qualities.

The accompanying cut clearly illustrates the general outline of the belted machine as made in sizes ranging from 7½ to 30 kilowatts, the same being of course suitable to direct connection, their capacities being based on a speed consideration.

The Richelieu and Ontario Navigation Company purpose installing a new electric light plant in the steamer Richelieu. Her boilers and engines will also be overhauled.

SPARKS.

The ratepayers of the town of Liverpool, N.S., has voted in favor of expending the sum of $31,000 for installing an electric light plant and waterworks system.

The city council of Toronto, Ont., has requested the street railway company to make a trial of various fenders, with a view to the adoption of the one found most efficient.

The town of Neepawa, Man., has deferred the installation of its electric light and telephone plant until next spring. An electrician for same has not yet been appointed.

Sir Charles Ross, president of the West Kootenay Light and Power Company, states that it is the intention to make further improvements and additions to the plant next year.

The town council of Cornwall, Ont., is considering the question of putting in apparatus for operating the waterworks by water power. Mr. Weller, C.E., is acting as consulting engineer.

Mr. James Johnston, electrician of the Department of Public Works, Ottawa, is preparing plans for an electric light plant to be installed at Kingston, Ont., for lighting the graving dock.

The time for receiving tenders for an electrical power transmission plant for the town of Orillia, Ont., has been extended to December 10th. Mr. Roderick J. Parke is consulting engineer.

Tenders for the installation of electrical power for operating the locks, bridges, etc., and lighting the Soulanges canal, closed at the Department of Public Works, Ottawa, on December 1st. The result has not yet been learned.

Directors of the Lake Megantic Electric Light Company, Lake Megantic, Que., have been elected as follows: Rev. Father Choquet, president; Dr. Codere, secretary; L. Becigneul, treasurer; C. A. Leger, managing director.

The ELECTRICAL NEWS was last week favored by a visit from Mr. T. C. Frenyear, manager of the Buffalo office of the Westinghouse Electric and Manufacturing Company, of Pittsburg, Pa. The Buffalo office of this company is now located at 782 Ellicott Square.

The lectures on "Steam and the Steam Engine" at the Toronto Technical School are now given on Thursday instead of Friday evening. This change has been made in order that the large lecture room on the first floor may be used, as well as the electrical apparatus for illustrating.

Judge Davidson has dismissed the case of Albert Besner vs. Montreal Street Railway Company. The plaintiff claimed $280 damages on account of the killing of his horse and injuries to himself. The court held that the company was not to blame, as the car was slowing up when it neared Gabriel street, and stopped within sixty feet. It was shown that the plaintiff was driving rapidly and tried to cross the track, instead of remaining on the south side of the street, where there was a vacant space of over 19 feet.

Mr. James Ross, vice-president of the Montreal Street Railway Company, returned from England recently. Speaking of electric transportation, he stated that the overhead system has become to be generally accepted in Great Britain, the cities of Glasgow and Liverpool each having several miles in operation. Dublin and Bristol are also to have trolley lines. As to the Birmingham system, in which Mr. Ross is financially interested, little progress has been made. The people have not yet decided what course to pursue.

The city of Hull, Que., received the following tenders for lighting the streets by sixty arc lamps: Ottawa Electric Company, 1,600 c.p. lamps, $49.50 each per year, or 2,000 c.p. lamps at $65 each; Hull Electric Company, 2,000 c.p. lamps, $62.50 each per year. The council decided not to accept either of these tenders, but to obtain estimates of the cost of installing a municipal plant. Mr. Farley has submitted to the council the desired estimates, which show that a complete plant of sixty arc lamps, with poles, wires, etc., would cost $4,938. The improvements of water power on Bowery Creek, including water wheels, flume and building, is placed at a cost of $4,060, and the running expenses of the plant at $2,075. It is probable that tenders for a plant will be invited, although the Hull Electric Company claim that in the year 1894 they were given the exclusive right to furnish electricity in Hull for a period of 35 years.

Owing to the small number of tenders received by the city council of Toronto for the installation of a municipal electric light plant, it has been decided to accept none of the tenders. From the tenders submitted it was found impossible to arrive at even an approximate cost of an electric plant. No tenders were received from Canadian manufacturers. It will be remembered that in the year 1894 similar tenders were asked for by the city, and bids were submitted by fourteen firms. The Bertram Engine Works Company were the lowest tenderers for engines and the Brush Electric Company for dynamos and lamps. In this case, as in the present instance, no further steps towards the establishment of a plant were taken. In this connection we observe that the Anglo-American Electric and Supply Company, represented by Messrs. H. M. East, G. P. Magann, Dr. R. A. Pyne, M.P.P., and G. S. Ransom, have made a proposition to supply electric energy to the city. The company ask similar privileges to those enjoyed by other companies, the right to use the street for carrying wires, and generally the powers necessary and incidental to the carrying out of an electric lighting power and supply business. Power is offered at cost after paying a dividend of 10 per cent. to the shareholders upon a capital stock of $5,000,000. It is guaranteed that the cost to the public will not exceed one cent per horse power per hour.

SPARKS.

There is some talk of the electric railway at Peterboro', Ont., being extended to neighboring villages.

The town of Windsor, N.S., is considering the advisability of installing an electric plant for street lighting.

The Little Salmon River Telephone Company has been granted the privilege of carrying its line into St. John, N.B.

The Canadian General Electric Company are installing a 100-light electric plant for the Guelph Carpet Company, of Guelph, Ont.

The electric light plant at Cookshire, Que., is nearing completion, and it is expected that the light will be available early this month.

The Stromberg-Carlson Telephone Manufacturing Company, of Chicago, are said to be considering the establishment of a factory in Canada.

The Montreal Street Railway Company are said to be experimenting with some of the latest inventions for the purpose of consuming smoke.

It is understood that the Mimico Electric Railway Company have decided to extend their railway to the Long Branch ranges, work to be commenced after the new year.

John Kerr, who was injured by a collision on the street railway at Sherbrooke, Que., while employed as a motorman, has instituted a claim for $7,500 against the company.

The Board of Trade of Parry Sound has appointed a committee to obtain information as to the cost of constructing an electric railway to connect Parry Sound and Depot Harbor.

J. E. Valois has been appointed a commissioner to inquire into the management of the electric light system in Lachute, Que., at present under the control of Mr. J. M. Fulton, liquidator.

On December 17th the ratepayers of Galt, Ont., will vote on a by-law to raise $67,750 to purchase the gas and electric light plants. The company owning these plants has offered to sell at that figure.

The British Columbia Telephone Company, Limited, are seeking enlarged powers, to enable them to absorb the business of the New Westminster and Burrard Inlet and Vernon and Nelson telephone companies.

A report is current that an English syndicate is preparing to build a pulp mill in the Saguenay district, province of Quebec, and that the construction of an electric railway from Alma Island to Tadousac is part of the scheme.

The Toronto Electric Light Company have placed an order with the Canadian General Electric Company for a large power generator of the latest multipolar type. This machine is to be wound to deliver current at 250 volts pressure, and has a capacity of 600 h.p.

The tender of Alex. Anderson, Toronto, for installing an electric fire alarm system for Owen Sound, Ont., has been recommended for acceptance, the price being $1,225. The other tenderers were: Parker & Co., Owen Sound; Rodgers Electric Company, Toronto; Geo. Scott, Oshawa; Bell Telephone Company.

The Canadian Peat Fuel Company recently conducted some experiments at Trenton on a locomotive of the Central Ontario Railway Company, using peat as fuel. A train of 22 freight cars was drawn over a distance of 30 miles, a considerable portion of which was heavily graded. The master mechanic of the railway company is said to have pronounced the results as extremely satisfactory.

The Railway Committee of the Privy Council has refused the application of the Ottawa Electric Street Railway for permission to cross the Canada Atlantic Railway tracks at Elgin street, Ottawa, so as to continue their line to the exhibition grounds. This case is interesting, inasmuch as the city issued an injunction against the street railway company to compel them to continue this line.

The lighting plant of the Stouffville Electric Light Company, of Stouffville, Ont., which was installed about 5 years ago, suffered damage a short time ago by the armature bands breaking and wrecking the machine. In replacing this dynamo, they installed an S.K.C. inductor type machine, which will, at least, do away with the possibility of having another wrecked armature, or a burn-out, or troubles from brushes and commutators. The plant, as remodelled, is strictly up-to-date.

TRADE NOTES.

The Davidson Manufacturing Company, of Montreal, Que., have purchased a 30 h.p. induction motor from the Canadian General Electric Company.

The Canadian General Electric Company are installing an electric plant of 100 lights capacity for the Williams Shoe Company, of Brampton, Ont.

C. O. Beauchemin, Montreal, P.Q., has purchased from the Canadian General Electric Company a 30 kilowatt generator of the latter company's latest multipolar type.

The Mispec Pulp Mills, of St. John, N. B., are installing an electric lighting plant, and have purchased a 400-light dynamo from the Canadian General Electric Company.

O. & W. McVean, of Dresden, are installing an electric lighting plant for use throughout their various mills. The Canadian General Electric Company are furnishing all the apparatus and wiring supplies.

The Canadian General Electric Company have recently closed a contract with Messrs. Geo. Matthews Company, of Peterboro', for the installation of electric lighting plant, the dynamo to have a capacity for 150 lights.

The Penberthy Injector Company, of Detroit, Mich., is announced to have won its suit against the Lee-Penberthy Mfg. Company, restraining the latter company from using the name Penberty on its goods.

Mr A. E. Payne, E.E., who has been associated with the Royal Electric Company for the past four years, will in the future represent the Packard Electric Co., of St. Catharines, and Mr. R. E. T. Pringle, Montreal. His friends throughout the country will be pleased to learn that Mr. Payne will be able to offer them the standard apparatus and lamps of the Packard Company, as well as the very large line of supplies handled and kept in stock by Mr. Pringle.

PUBLICATIONS.

The Robb Engineering Company, Limited, of Amherst, N. S., have issued a condensed catalogue of their engines and boilers. The booklet contains views of their Robb-Armstrong simple, tandem and cross compound centre crank and side crank engines, the Mumford improved boiler, with sectional views thereof, portable boiler and engine, and return tubular boiler, together with some selected testimonials from customers.

The Executive Committee of the Canadian Association of Stationary Engineers have favored us with a copy of a handbook of engineering information compiled in accordance with a resolution passed at the annual convention of the society held in Brockville on August 16th, 1897. The book contains nearly 300 pages, nicely printed, bound in leather, and is replete with valuable tables and data of every-day use to engineers. Copies may be obtained from Mr. J. G Robertson, executive secretary, Montreal.

The first number of the American Street Railway Directory and Buyers' Guide has been issued by Mr. E. L. Powers, of New York and Chicago, and contains a complete list, with general statistics, of the electric, cable, horse and elevated railways in the United States and Canada. This directory was formerly published as a feature of the magazine "Electrical Industries." Later, when this publication became merged into the "American Electrician," the railway and lighting directories were both incorporated into the "Standard Electrical Directory." Owing to the pressing demand, however, for a purely class publication, it was decided to issue the Street Railway Directory separately.

We have received from Mr. W. T. Bonner, of Montreal, manager of the Canadian branch of Messrs. Babcock and Wilcox, Ltd., a copy of the 30th edition of their book entitled "Steam." This book contains much valuable information regarding the subject of steam generation and the economy of steam plants generally. The articles bearing on the construction, erection and operation of the Babcock and Wilcox water tube boilers are especially interesting, while the rules and practical data make it valuable to engineers and steam users in general. It is also profusely illustrated. We learn that each edition of this book includes two or more issues of from 1,000 to 5,000 copies, and that it is sent free to all applicants. The Babcock and Wilcox Company are therefore entitled to considerable credit for their efforts in an educational way.