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NEW SERIES, VOL. IX.—No. 4.

APRIL, 1899

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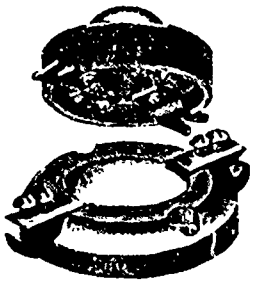

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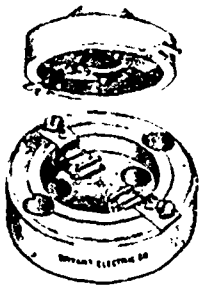

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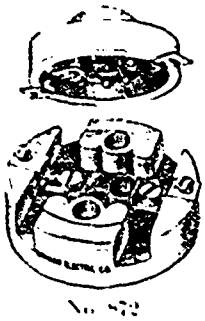

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CANADIAN

# ELECTRICAL NEWS

AND

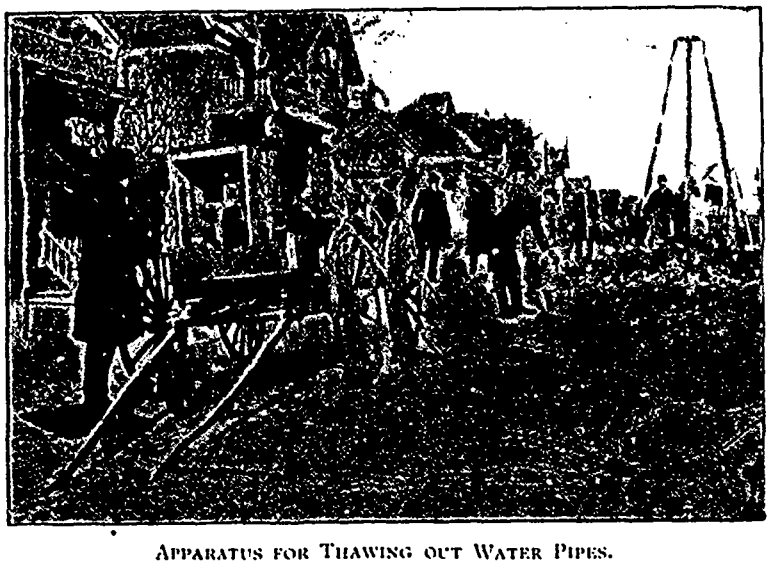
STEAM ENGINEERING JOURNAL.

VOL. IX. APRIL, 1899 No. 4.

## THAWING OF WATER PIPES BY ELECTRICITY.

A NUMBER of successful experiments have recently been made in Canada and the United States with the use of electricity for thawing out frozen water pipes. The Canadian experiments were made in Ottawa, Berlin and Chatham. Below are printed particulars of the methods pursued in the above mentioned cities, together with illustrations showing the apparatus employed :

The Berlin Gas and Electric Co. used alternating current of 2,080 volts primary and 104 volts secondary ; this was further reduced by means of a water rheostat as described below to 50 volts. The apparatus, as shown in accompanying cut, consists of a large 200 light (40 G. S.K.C.) transformer, switchboard, several switches, C.G. watt meter to measure the current, all of which is placed on a small waggon for convenience in transportation, and a water rheostat. The water rheostat consists of the most simple type, a copper plate placed in the bottom of a wooden pail, another copper plate placed some 6" to 8" above the first and so arranged that it can be moved up and down as found necessary. There is enough water poured into the pail to well cover both plates. When in use the water is kept from boiling by the addition of snow or ice.



APPARATUS FOR THAWING OUT WATER PIPES.

The waggon is placed as near as possible to the place of operation. The wires of the primary circuit are brought to a D.P. switch on waggon switchboard, are then taken to the transformer, and back to a second D.P. switch on switchboard. The current is then conducted by two No. 6 wires to afford ample capacity for current without heating the wires and by means of a simple clamp these wires are attached to one end of frozen pipe. The second wire from the switch is then taken to the watt meter then by means of two No. 6 wires, is connected to lower plate in water rheostat. The wires from the top plate in the water rheostat are so connected to the other end of the frozen pipe that the frozen part remains between the terminals of the secondaries. A volt meter should be inserted in circuit after leaving the rheostat, and the rheostat so adjusted that the current will be reduced to 50 volts. In ordinary sizes of black or galvanized iron pipe the voltage should not exceed 50 volts. For from 4" to 6" cast iron pipes the pressure may be increased to 100 volts. In any case a strong ampere current should be used. The current in then turned on and carefully manipulated.

Only a very few moments are necessary ordinarily to thaw out water service pipes. The connections are made at any most convenient point where the pipe is exposed, a city hydrant, private pipe, or faucet in dwelling may be used.

It is necessary to use a source of current which does not affect the electric light lines by the grounding effected through connecting with the pipe, or danger may result.

In using this method to thaw the frozen condensation found in gas pipes the experience was that the thawing process had to be continued for a longer period of time.

Mr. John Murphy, superintendent of power houses, and Mr. W. G. Bradley, superintendent of construction for the Ottawa Electric Company, along with a representative of the City Engineer, conducted the experiments in Ottawa. Two Packard transformers, type F, made for 1,000 and 2,000 volts on the primaries, ratio of transformation of one to twenty, 125 cycles, were mounted on a sleigh and driven around where required. It was usually drawn up to the foot of the pole and primary wires carrying about 1,000 volts were brought down to the transformers by means of flexible wires. The transformers were worked in parallel and had the connections so made as to obtain a ratio of transformation of forty to one so that about 25 volts were obtained on the secondary. With this arrangement it was found possible to do without the reactive coil and other means of regulation which had been used in the first trials, so that the pipe-thawing outfit consisted simply of the two transformers above referred to and an ampere meter which was inserted on the primary, their being no portable instrument with large enough range to put on

the secondary; a voltmeter was connected across the secondary coils.

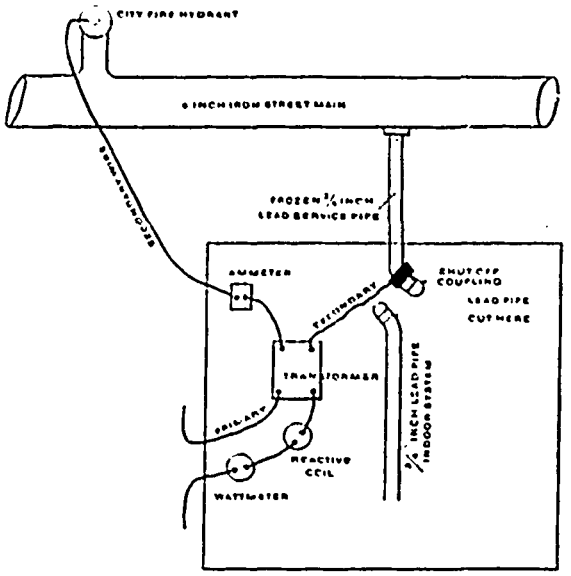
Following is the data of five trials which were made:

1st. Secondary volts 17, primary amperes 8. Connections made from water pipe 25 feet of ⅝" lead pipe to a hydrant at the door. Water flowed in three minutes and came out at full pressure in six minutes.

2nd. Secondary volts 21, primary amperes 5. Connections from water pipe in one house through about 100 feet ⅝" lead pipe and 16 feet 5" iron pipe to water tap in next house. One of the services only was frozen. Water flowed in eight minutes and with full pressure in ten minutes.

3rd. Secondary volts 22, primary amperes 9. Connections made to water tap inside and to iron main pipe in the street, which was reached by opening a man hole. Current passed through 25 feet ⅝" lead and 4 feet of 5" iron main. Water flowed freely in two minutes.

4th. Secondary volts 23, primary amperes 7. Connections made from water tap in one house through about 60 feet ⅝" lead and 24 feet of 5" iron pipe to the




APPARATUS FOR THAWING OUT WATER PIPES.

water taps in the next house. Water flowed in one minute and full pressure was on in 3 minutes.

5th. A lead pipe service between a residence and a stable being frozen, connection was made between the water taps in each place and water flowed freely in one minute. No reading of current was taken in this last case.

By the time the pipes completely thawed out the water in some parts of them had become very hot. In some cases it was found impossible to get any current through at all. This was due to the style of joints made in some of the main iron pipes where there was no electrical contact between the different lengths.

The experiment at Chatham, which was also entirely successful, was conducted by Mr. Jones, Superintendent of Waterworks, by the aid of current and a transformer of 100 amperes capacity supplied by the Gas and Electric Co. Using a current of 52 volts, two frozen hydrants were thawed in 45 minutes.

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From Germany comes another invention in the domain of electricity, says the Engineering Magazine, in the form of a remarkable current-interrupter, utilising a hitherto unappreciated fact in electrolysis, and this invention of Professor Wehnelt bids fair to effect a great increase in the capacity of induction coils, and in the generation of currents available for advanced researches in radiography.

## CANADIAN ELECTRICAL ASSOCIATION.

A WELL attended meeting of the Executive Committee was held on March 23rd. A number of persons were elected to membership in the Association. The arrangements for the annual convention to be held in Hamilton in June were considered, and committees appointed to carry the same into effect. The exact date of the convention was left undecided, pending more definite information on the subject of transportation rates. The representatives of the various electrical companies of Hamilton are taking an active interest in the arrangements, and there is no cause to doubt that the convention this year wil be as interesting, instructive and enjoyable as any that have preceded it.

## MARITIME ELECTRICAL ASSOCIATION CONVENTION.

THE annual convention of the Maritime Electrical Association will be held in the city of Halifax, N.S., on Tuesday, April 18th, 1899. The outlook for the convention is quite promising, and the officers hope for a large attendance of members and persons interested in the electrical business. Following is a copy of the preliminary programme:

The convention headquarters will be at the new Victoria Hotel, corner of Morris and Hollis streets, and the meetings will be held in the Assembly room. The programme will be as follows:

9.30 a.m.—Meeting of the Executive Committee.

10 a. m.—President's address; report of secretary-treasurer; report of committees; election of officers; general business.

2 p.m.—Papers will be read by various members on: "Iron Armoured Conduit Wiring," "Fire Alarm Systems," "Steam Engineering," "Telephone Work" and "Electric Meters." Questions which have been suggested by the members will also be discussed.

In the evening a reception, consisting of banquet and smoking concert, will be tendered by the Halifax members of the Association. No effort is being spared to make this convention a success from every point of view; and all members attending will not only receive some very practical information from the papers to be read and the discussions which will follow, but will also find the occasion a most enjoyable one socially.

It is hoped that each individual member will not only endeavor to be present, but will also try to induce any eligible persons in his vicinity to send in applications for membership.

Members will purchase a single first-class ticket from their station to Halifax, getting at the same time a standard certificate, which, after being signed by the secretary, will entitle him to a return ticket free if ten or more have come by that line; if less than ten, a return ticket at half price.

---

Mr. W. H. Preece, C.B., F.R.S., has recently retired on a pension from the position of engineer-in-chief and electrician to the British General Post Office, he having reached the age limit of 65 years. He will, however, continue to act in a sort of consultative capacity to the post office, and in addition will carry on business on his own account in consulting electrical work in connection with lighting and traction. His connection with the telegraph and telephone extends over a period of 47 years. No announcement has yet been made as to who will be his successor.

## QUESTIONS AND ANSWERS.

"S.T.D." writes: Will you kindly answer the following questions through the ELECTRICAL NEWS:

1st. What is the rule to find the amount of friction caused by the working parts of a machine, for example, say the piston, crank bearings, etc., of a steam engine of 100 h.p.

2nd. How do you find the striking force by gravitation—say a block of iron weighing 100 pounds dropped from a height of 100 feet.

3rd. Give rule to calculate the horse power developed by water, with a head 25 feet high and an outlet 3 feet square.

ANSWER.—1st. The easiest way of finding the amount of friction caused by the working parts of an engine is to take the brake horse power and subtract the same from the indicated horse power, and the difference is the amount spent on friction. In an engine the friction is distributed approximately as follows: Main bearings, 40%; piston and rod, 27%; crank pin, 7.%; crosshead and wrist pin, 5.5%; valve and rod, 14.%; eccentric strap, 5.5%. The ordinary laws of friction for plain surfaces as given by Coulomb are:

(a) The friction between two bodies is directly proportional to the normal pressure between them.

(b) The friction is independent of the areas of the surfaces in contact.

(c) Kinetic friction is less than static friction, and is independent of velocity.

General Morin's experiments on axles showed practically the same general results as Coulombs for plain surfaces.

The following example will show how the horse power lost in friction is arrived at:

A shaft 3" diameter has two bearings, one at each end, and between these bearings power is distributed from pulleys by belts. The tension in these belts has a horizontal pull of 1000 lbs and a vertical downward force of 550 lbs. at right angles to the shaft. The pulleys and shaft weigh 1750 lbs. The coefficient of friction ($\pi$) between shaft and bearings is .06. Find the horse power lost in friction if shaft makes 200 revolutions per minute?

We have here two forces acting on the shaft, (1) a horizontal force of 1,000 lbs., and (2) the vertical force of 250 lbs., together with the weight of pulleys and shaft, or altogether 2,000 lbs. These forces are at right angles, therefore the resultant pressure on the bearings is $R = \sqrt{1{,}000^2 + 2{,}000^2} = 2{,}244$ lbs.

This weight may or may not be equally distributed on the bearings, but for our present purpose we may consider same as being distributed on one.

The work lost in one revolution is = No. of feet travelled × coefficient of friction × resultant pressure = $\pi$ d n $\pi$ R

when d = diameter of shaft in feet.
$\pi$ = coefficient of friction = .06.
R = resultant pressure = 2244.
n = 3.1416.

$$\text{The horse power lost in friction is} = \frac{\pi\ d\ n\ \pi\ R}{33{,}000}$$

when n = No. of revolutions per minute.

$$3.1416 \times \frac{3}{12} \times \frac{200 \times .06 \times 2244}{33{,}000}$$

$$\frac{22 \times 3 \times 200 \times 6 \times 2244}{7 \times 12 \times 100 = 33{,}000} = .64 \text{ h.p.}$$

By referring to tables the coefficient of friction can be found or same can be arrived at by experiment.

2nd. The energy possessed by a moving body is obtained by finding the height through which it must fall to acquire the velocity of the motion. If this height is obtained the work done is equal to the height in feet × weight in pounds, or if

w = weight in lbs. and h = height in feet
the work done = w h foot pounds.

Therefore 100 lbs. × 100 feet = 10,000 ft. pounds would represent the amount of work stored up in the weight. This amount must be used up before the falling body can be brought to rest.

3rd. The power of a water fall is equal to the weight of water discharged in unit of time × total head.

If Q = cubic feet of water discharged per minute
W = weight of 1 cubic foot of water = 62.36 lbs.
H = total height in feet.

$$\text{Then } \frac{Q\ W\ H}{33{,}000} = \text{horse power.}$$

In the question the velocity of the stream is not given. This can be readily ascertained by measuring off say 100 feet on the bank, and throwing a piece of wood in the stream, and noting the time in passing the 100 feet marks. The average velocity is about 80% of the surface velocity.

The number of cubic feet that could flow through an outlet 3 feet square is about 2,200 per minute.

$$\therefore \frac{2{,}200 \times 62.36 \times 25}{33{,}000} = 104 \text{ h.p.}$$

From this amount would have to be deducted friction on turbine, etc., and the net available would be about 70 h.p.

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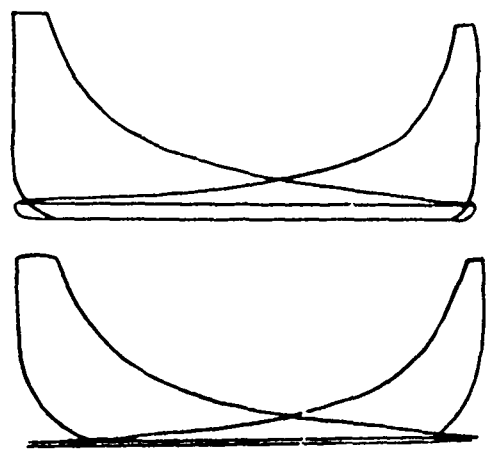
"J.M.," Aylmer West, Ont., sends us indicator cards taken from a Wheelock engine, with the request that we work out the results



for him. The original cards were 3½ inches in width, but as herewith shown are reduced by one-third.

ANSWER.—The diagrams, which we will call Nos. 1 and 2, were taken from a Wheelock engine, No. 1 with condenser on and No. 2 with condenser off; engine, 14 × 34; revolutions, 90; steam pressure, as per gauge, 100 lbs.

Area of piston, 153.93".
Speed of piston, 510'

$$\text{Constant, } \frac{153.93 \times 510}{33{,}000} = 2.38 \text{ h.p.}$$

From card No. 1 the mean effective steam pressure is:

Crank end, 17.0.
Bright end, 21.6.

$$\text{Average, } \frac{21.6 + 17.0}{2} = 19.3 \text{ lbs.}$$

Mean effective from the vacuum is 6.8 lbs.; total mean effective, 19.3 + 6.8 = 25.12, and 25.12 × 2.38 = 59.78 h.p.

Diagram No. 2 scales as follows:

Crank end, M.E.P., 14.2.
Bright end, M.E.P., 18.6.

$$\text{Total, } \frac{18.6 + 14.2}{2} = 16.4 \text{ lbs., and } 16.4 \times 2.38 = 39{,}032 \text{ h.p.}$$

The back pressure on this card is 2 lbs. This would represent 2.38 × 2 = 4.76 h.p., which is not taken into consideration in scaling for the above M.E.P., and should be added as load on the engine.

---

## PREVENTION OF SCALE IN BOILERS.

In an article in the November issue of the Home Study Magazine, in answer to the question, 'Will carbonate of soda or plain soda remove hard sulphate of lime scale?' the expert replies, 'I have never found it to be much good for that purpose. I can tell you, however, what will remove it pretty effectually—very cheaply too—and that is ordinary kerosene. If this is fed to the boiler at the rate of about one quart per day per 100 h.p., the benefit to the boiler will soon be apparent. It has also been found to prevent, to quite an appreciable extent, the formation of hard scale. Its action upon the sulphate of lime does not seem to be a chemical one, however, but rather a mechanical action. In my opinion, the minute particles of sulphate of lime precipitated by the action of heat, are first carried to the surface of the water by the boiling and bubbling of the water. There they become coated over with the kerosene, which prevents them from uniting in solid mass when deposited on the plates.'

---

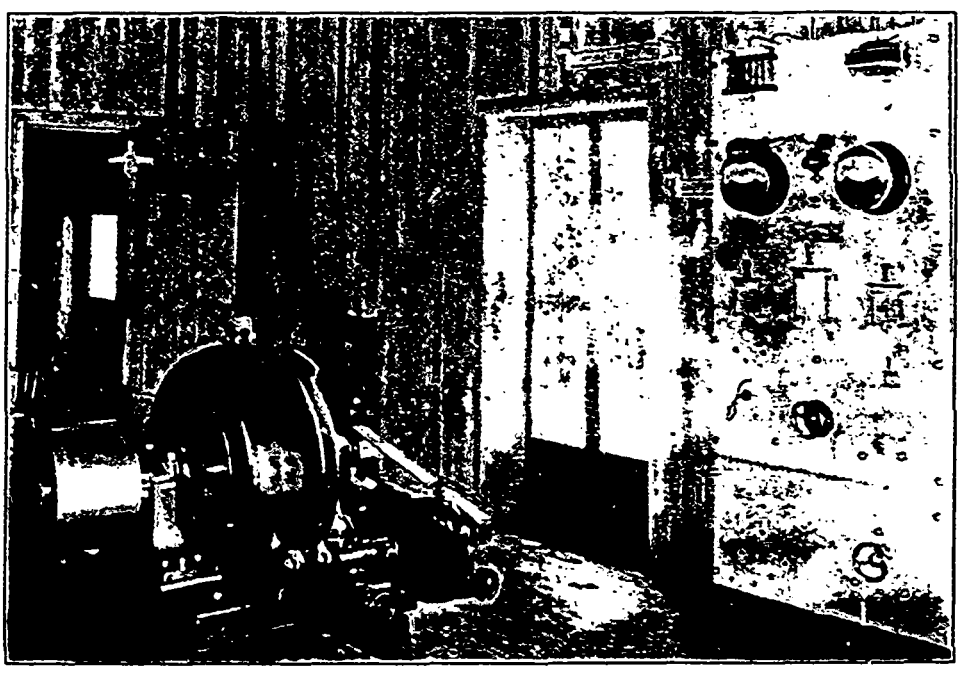
The Weston Electrical Instrument Company are making contracts for their new factory at Waverley, N.J., a suburb of Newark. A railway switch is now being constructed to the spot, and ground will be broken in a few days for the erection of what will probably be the most complete manufacturing establishment in the United States.

## TWO MUNICIPAL LIGHTING PLANTS.

We print herewith illustrations of municipal lighting plants recently installed by the United Electric Company

Municipal Plant, Beeton, Ont.

in the towns of Acton and Beeton. Some particulars of the former were printed in a previous number. The plant is installed in a stone building, 24 x 50 feet, and includes a 50 kilowatt alternating current generator with a capacity of 800 incandescent lights, a 2 panel marble switchboard fully equipped. Power is supplied by a 75 h.p. Wheelock engine manufactured by the Goldie & McCulloch Co., of Galt. The main driving belt is 16 inches in width and 65 feet long, and the dynamo a 10 inch, double, endless. There are fifty-six 32 candle power incandescent street lamps, arranged in two circuits independent of each other, and a third independent circuit for domestic and commercial service. The Beeton plant is very similar to the one at Acton. Besides furnishing light for the streets and commercial and domestic use current is supplied for 200 incandescent lights at the County House of Industry.



Municipal Plant, Acton, Ont.

In a letter to the Company the reeve of the municipality expresses his appreciation and that of the citizens with the satisfactory working of the plant, and refers particularly to the good regulation and freedom from heating. Over 600 16 c.p. lights have already been installed.

## GLASGOW AND ELECTRICAL PROGRESS.

Although Glasgow may consider itself in many respects the centre of light and leading, it has by no means made astonishing progress in municipal electrical work. The population of Glasgow is 657,000, and the rateable value £4,046,726; Manchester, on the other hand, has a population of 530,000, and a rateable value £2,911,083. Curiously enough, the municipal control of electric lighting commenced in these cities within a few months of each other, but the latest returns show a marked difference in the two systems, as will be seen from the following figures:

| | 35 watt lamps. | Units sold. | Revenue. |
|---|---|---|---|
| Manchester ..... | 423,595 | 1,748,244 | £38,253 |
| Glasgow... ..... | 79,140 | 1,090,959 | £25,862 |

For years past the Glasgow Corporation has owned probably the most paying system of tramways in the kingdom, and four or five years ago a committee collected an amazing mass of information on the subject of working tramways by electrical means; moreover, it was generally accepted that electrical working was far and away the best system. Four years ago the tramways in Leeds were owned and worked by a company, yet to-day the Corporation of Leeds has not only taken over the whole of the city tramways, but has equipped 10 miles with the overhead trolley system—and Glasgow to-day is in a difficulty about running a short experimental line on the same system. Notwithstanding, Glasgow has sufficient confidence in itself to be desirous of of acquiring and working a telephone system.—Electrical Review, London, Eng.

## CAPT. JAMES WRIGHT.

It is with much regret that we chronicle the death of Capt. James Wright, mechanical engineer, of Montreal. By his wide circle af acquaintances throughout Canada he was held in highest esteem, not only in recognition of his great ability in his profession, but also of his many sterling personal qualities. To such the accompanying portrait and biographical particulars will be of interest :

Capt. James Wright was born in Tarbolton, Ayrshire, Scotland, Sept. 23, 1826, and when about 12 years old emigrated to New York, where he received a common school education and at about 16 years came to Allenburg, Ont., where he served his time and learned the trade of blacksmith with an uncle. He then went to work with Jas. Oswald, a contractor, and got his first experience with dredging machinery in the harbors of Boston and New York, and later on in the Erie and Welland canals. He then came to Montreal with the first spoon dredge used in the Montreal harbor, and finally became mechanical superintendent of the Montreal harbor, which position he occupied for twelve years. In 1876, together with F. B. McNamee and A. G.

CAPT. JAMES WRIGHT.

Nish he formed the firm of F. B. McNamee & Co., which firm constructed that portion of the Montreal water works acqueduct, known as the Inland Cut, the Carillion dam across the Ottawa river, and took part in the deepening of Lachine and Welland canals, and the Toronto water works extension. Leaving the firm he then took up the business of a mechanical expert, and as an authority on the steam indicator was well known.

In 1885 together with A. G. Nish and M. F. Lefebre, he formed the Mount Royal Park Incline Co., which firm built the present incline railway up the side of Mount Royal, from plans drawn up by him and directly under his supervision.

Capt. Wright was noted for his wonderful memory, and it is said was never known to forget anything he had read twice.

He leaves a wife and one son, an electrical engineer in Mexico.

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Judgment has been reserved in the action brought to ascertain whether the mortgage held by the Sun Life Insurance Co., against the Cornwall Electric Street Railway Co., covers the rolling stock, extensions, etc.

## EDUCATING OPERATORS IN THE HANDLING OF THE SWITCHBOARD.*

WRITING a paper to be read before the members of the association is a difficult task for me, knowing full well that anything I might write, on any subject, would in no way compare with any paper prepared by any other member of the association. But if in writing a paper I chance to say anything that will be of any benefit to the association in general, or a single member of the same, I will feel that I have been amply paid for the effort.

In the beginning I will say that the chief trouble to the telegraph service on railroads is the inefficiency of operators. An operator may be able to handle train orders and other business in a highly satisfactory manner ; he may be a good sender and attentive, and still not be able to make the simplest kind of a patch in case of wire trouble when called upon to do it by the dispatcher. This one failure on his part very materially reduces his value as an operator, and the dispatcher, in nine cases out of ten, reports him as being unfit for his position, which is true to a certain extent.

Mr. A. R. Lingfelt produced a paper that was read before the members of the Association at the meeting of 1-94, which was able, concise, and deserved far more than a passing thought. Too much can not be said or written on this subject. Any one giving the matter careful thought can not help but see that the question of educating operators in the workings of the switchboard is one that demands serious consideration.

In hiring and placing operators, I feel sure that superintendents of telegraph and chief dispatchers do not always handle the matter as it should be handled. In far too many instances they hire and place an operator wholly on the grounds that "he is a fair operator, can handle train orders well, make a fair copy, and has a good record as to character." These qualifications are certainly essential, but his qualifictions ought not to end there. We will say that he is hired and sent to "J" to work nights. The dispatcher has outstanding orders to trains all over the division ; a storm comes, playing havoc with the wires, putting the train wire in a useless condition ; the dispatcher locates the trouble, and soon sees that he can get a through train wire by having the operator at "J" put No. 7 north to No. 10 south. He instructs him to make the patch, and finds out, to his disgust, that the operator cannot do it, and trains might remain tied up until doomsday, just because an operator does not know how to make a simple patch. As a general thing, when a dispatcher wants a wire, he wants it like the "man in Texas wanted the revolver ;" that is, bad ; and if he don't get it promptly—and his disposition is not the best in the world—he is apt to abuse the operator for being unable to render the proper assistance. This is wrong. The operator is not to blame. The official placing him in the office is far more responsible than the operator is, because the chances are that no one ever showed the operator how to manipulate a switchboard. Under the circumstances, he could not be expected to do it. Had he been shown by the superintendent of telegraph or chief dispatcher how to do such work before he took charge of the office, and been told plainly that he must be able to do such work when called upon, or would not be retained in the service, the chances are that he would have made a study of the

* Read before the Association of Railway Telegraph Superintendents, Fortress Munroe, Va., by W. F. Packard, of Lima, Ohio.

board from the time he went into the office, and would have been able to have made the patch when it was required of him.

One of the greatest troubles is wire failure, and if patching can not be done promply, trains have to suffer. If operaters do not know how to do it, it can not be done.

I do not wish to write or speak disparagingly of operators, or officials placing them, but I will venture to say that any division on any road in the country can be selected that has 20 offices, and there will not be more than two operators on it that can make a simple patch of one wire north to another south, east or west, unless they have had previous practical instructions. I do not think I have overdrawn this. I base my statement on the observations I have made during the years of experience I have had as a train dispatcher and in other capacities. I have never worked on a road that my experience has not been about the same in that respect. In my opinion, it lies with the superintendents of telegraph and chief dispatchers to obviate a great deal of this trouble.

No operator should be placed in charge of an office unless he is posted in working a board of an ordinary kind by the official placing him. He should be shown how to do patching, the position of the plugs when wires are in their normal condition or position ; in fact, the back straps should be gone over, explaining their relation to the plug strips, etc., etc. This would take but little time, and would be starting the operator in right.

There is another thing that could be done that would certainly prove to be a great benefit ; that is, to provide every office with a blue print or hektograph drawing of the standard switchboard, showing it in its natural condition. Plug holes should be numbered on the print. This, together with a "key" at the bottom or top of the print, showing where to place plugs for certain patches, would render the work simple, so much so that any one who could read could do it.

Any operator of limited experience, after working in an office a short while equipped as I have shown ; would be able to handle the board in any office whereever he might be placed, as there is no radical difference in boards now in use on nearly all the roads in the country. I feel sure that such a course as I suggest, if adopted on railroads, would not only benefit the telegraph service to a great extent, but raise the operators to a higher plane of usefulness.

Any superintendent of telegraph or chief dispatcher should be able to make a crude drawing of the print I refer to, to enable the engineering department to make the print. They could be made in the above department at a small cost, and in such a shape that they would meet all that would be required of them for the equipment of offices.

This communication is not intended as a criticism on any one hiring or placing operators, or on the operators themselves, but is written with a view of offering suggestions that I hope may turn some thought in the direction referred to, and that some practical improvement may be made.

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The Dominion Oilcloth Co., of Montreal have placed an order with the Royal Electric Co. for the complete equipment of their factory with S. K. C. motors, aggregate over 150 h. p., the different units as required throughout the building in the different departments.

## ELECTRICAL INSPECTION IN WINNIPEG, MAN.

A REPRESENTATIVE of the ELECTRICAL NEWS lately interviewed Mr. F. A. Cambridge, the newly appointed city electrician of Winnipeg, Man, in reference to electrical inspection. He learned that all new wiring and electrical installations have to be done in strict conformity with the National Code, 1897 edition, which is incorporated in the city regulations. No electrical work can be undertaken without a permit, and certificate must be obtained before work is finally passed. No fees are charged either for inspection or permits. Some difficulty has been experienced owing to the fact that the improved list of the National Code does not include many articles of Canadian manufacture. Mr. Cambridge hopes that before long other cities in this country will follow the example of Winnipeg, and that there may be formed some kind of a testing bureau, preferably by the associated Underwriters' associations, presided over by some reliable expert, who may be referred to in matters of dispute, or from whom impartial opinions may be obtained regarding materials or practice. In this connection Mr. Cambridge acknowledges the great kindness of Mr. Merrill, jr., the chief electrician of the National Board of Underwriters for America. That body maintains a complete bureau at Chicago. Winnipeg is acting in connection with the bureau, and gives and receives full accounts of all electrical burnouts, etc.

Regarding old installations it is understood to be the intention of the city electrician of Winnipeg to make a thorough inspection of all these. Some progress has been made already and the general public as a rule are pleased to carry out the alterations ordered. Mr. Cambridge believes that this work should be taken up at once by every city, for the longer it is left undone the greater expense the public will ultimately have to bear.

## ELECTRICAL EXHIBITION.

THE twenty-second convention of the National Electric Light Association and third Electrical Exhibition is announced to be held in Madison Square Garden, New York, during the month of May. The scope of the exhibition will not be confined merely to electrical apparatus and appliances, but will include all kindred industries as well, such as various makes of boilers, pumps, steam engines and other steam specialities. A special feature of the coming exhibition will be the display of patents and new devices. Last year the Electrical and Kindred Industries Exhibition was held under the auspices of the New York Electrical Society, but this year it is proposed to hold it in conjunction with the convention of the National Electrical Light Association. As a result, considerable interest has been awakened in the coming exhibition.

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The subject of the construction of an electric railroad from Guelph to Hespeler, Arthur and Erin, is engaging the attention of the Board of Trade and citizens of Guelph. It is stated that if $25,000 to $30,000 of local capital can be raised, capitalists can be found who will contribute the additional amount required.

The British Columbia Electric Railway Co. will no doubt pay a good dividend in the near future. The net earnings of the company from April 1st last to the end of the year amounted to $120,187, as against $67,582, for the like period of 1897. The company are now erecting a large car barn at Vancouver. Mr. J. M. Buntzen, manager of the company, has gone to England, where he will lay before the directors plans for several extensions of the system.

## TRIAL BY JURY.

TRUTH is stranger than fiction. Gilbert and Sullivan, in the wildest flights of their imagination could not have portrayed a more farcical denouement than that of a verdict brought in by a jury of twelve of our fellow countrymen at the assizes at Toronto. The case was that of Harris v. Toronto Electric Light Co. for $10,000 damages. Harris was a purveyor of rags and bottles, and kept these rags and bottles in a rough-cast building. In this building he had in use a motor, supplied with current from the wires of the defendant company. These wires were tapped on Harris' premises by a small pair of wires, which were attached to a corner of the rough-cast building aforesaid, and from thence taken over to a doctor's residence on the next street. Herein lay the offence—the wires leading to another man's premises were run on sideblocks on the outside of the rough-cast rag emporium, as the plaintiff said, without his consent. He saw the wires being so attached and enquired of the linemen what they were for, and was told. He made no objection. The wires remained there two years or more, and never a word was said. On the 18th of September last—a Sunday afternoon—the rags, as rags often will, ignited spontaneously or got on fire in some way, and the rag shop was laid in ruins. As the flimsy walls collapsed, the wires attached to the outside were tangled up and, of course, short-circuited, and burnt the insulation. Harris promptly brought suit for ten thousand dollars against the company defendant. The case was tried in Toronto last week.

The nature of the evidence put in may be gathered from the testimony of one of the witnesses. This was a lady who was oppressed with a foreboding that Harris's was to be destroyed by electricity. She said that she had frequently seen the electricity running up the wires on William street from Queen street and turning the corner and going into Harris's, and on this identical Sunday she had seen some of it go up the street and cross over into the rag bureau about two hours before the fire. Several other witnesses also testified that they saw the wires flashing fire, and then the raggery burst into a blaze of glory. There was a remarkable unanimity in their testimony—first, fire on the wires, then immediately the flames bursting out from the inside and through the roof. This was about the time of the arrival of the fire apparatus. These witnesses all were on the south side of the building.

Now for the defence. The evidence of several reputable witnesses living on Simcoe street, to the east of the building, went to show that they were the first to see the fire; that it started in the centre of the building entirely away from where the wires were attached; that they telephoned the alarm to the police station at 2.35, and that at this time there was no fire outside the building at all. Evidence was produced by a number of witnesses that the short circuit caused by collapse of building occurred at the power house at 2.47, or 12 minutes after the alarm was given, and probably 20 or 25 minutes after the fire broke out. The evidence of these witnesses was clear as to the facts.

As to the values.—It appears that Harris had appealed on his assessment and took an oath before the Court of Revision three days before the fire that there was not five hundred dollars' worth of goods in the place, and that a big pile of the stuff represented very little money. Two members of the Court of Revision were put upon the stand and testified to this. He now swore there was eight thousand dollars' worth. The defendants could not contradict, as the evidence was destroyed—Harris kept no books.

His Lordship was impressed throughout the case with the evidence submitted by the plaintiff's witnesses, on the ground that their statements were based on what they had seen with their own eyes. On the other hand, little or no importance was attached apparently by the jury to the evidence of the other gentlemen who said that they saw the fire start in another place and gave the alarm. The onus was upon the defendants to prove that the contents of the building were not worth $10,000; this they had failed to do. As to the plaintiff's sworn statement before the Court of Revision regarding the value of his goods, it was not allowed to affect his veracity in the present case. His Lordship left to the jury the difficulty of accounting for the difference in time between the fire alarm and the starting of the fire and the time of the short circuit at the company's works.

The jury went out and deliberated for a couple of hours, and then came into Court and asked the Judge if they could not make the damage $14,000 instead of $10,000! The Judge appeared staggered at this, and he instructed them that they could not award more than was claimed, so they made it the ten thousand.

The only serious feature of this case appears to be the position in which the defendant company is placed by the jury's award, and the effect of the decision upon electrical companies throughout the country. There is no doubt that every company doing business has a number of these double services in operation. Electric light companies will be kept in hot water unless they find means to protect themselves. This can be done by special agreement before entering upon any person's premises for purposes of business—an iron-clad agreement of protection and indemification from risks of damage of every kind—alleged and actual—from fire, flood and the fortunes of war.

## MOONLIGHT SCHEDULE FOR APRIL.

| Day of Month | Light. | Extinguish. | No. of Hours. |
|---|---|---|---|
| | H.M. | H.M. | H.M. |
| 1 | P.M. 6.50 | A.M. 1.00 | 6.10 |
| 2 | " 6.50 | " 1.30 | 6.40 |
| 3 | " 6.50 | " 2.20 | 7.30 |
| 4 | " 6.50 | " 3.00 | 8.10 |
| 5 | " 6.50 | " 3.40 | 8.50 |
| 6 | " 6.50 | " 4.20 | 9.30 |
| 7 | " 7.00 | " 4.40 | 9.40 |
| 8 | " 7.00 | " 4.40 | 9.40 |
| 9 | " 7.00 | " 4.40 | 9.40 |
| 10 | " 7.00 | " 4.40 | 9.40 |
| 11 | " 7.00 | " 4.30 | 9.30 |
| 12 | " 8.00 | " 4.30 | 8.30 |
| 13 | " 9.40 | " 4.30 | 6.50 |
| 14 | " 10.20 | " 4.20 | 6.00 |
| 15 | " 11.00 | " 4.20 | 5.20 |
| 16 | " 11.10 | " 4.20 | 5.10 |
| 17 | " 11.50 | " 4.20 | 4.30 |
| 18 | ..... | " 4.20 | 3.50 |
| 19 | A.M. 12.30 | ..... | |
| 20 | " 1.20 | " 4.20 | 3.00 |
| 21 | " 1.50 | " 4.20 | 2.30 |
| 22 | No Light. | No Light. | ..... |
| 23 | No Light. | No Light. | ..... |
| 24 | No Light. | No Light. | ..... |
| 25 | No Light. | No Light. | ..... |
| 26 | P.M. 7.00 | P.M. 9.20 | 2.20 |
| 27 | " 7.20 | " 10.20 | 3.00 |
| 28 | " 7.20 | " 11.20 | 4.00 |
| 29 | " 7.20 | A.M. 12.20 | 5.00 |
| 30 | " 7.20 | " 1.00 | 5.40 |
| ..... | ..... | ..... | ..... |
| | | Total..... | 160.40 |

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

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

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**Water Power Problems.**

The severity of the weather during the past winter proved a serious obstacle to the operation of water powers, more particularly at Lachine and Niagara, where Jack Frost seemed determined to seal up the water supply and compel the closing down of the electric power stations. The water in the canals leading to the stations on both sides of the Niagara river was diverted by masses of ice which became attached to projecting rocks above the falls. On several occasions the Niagara Falls Park and River Railway was obliged to cease operations on account of lack of water due to the above cause and to the blocking of the water inlet. Reference has been made in previous issues to the unusual difficulties under which the plant of Lachine Rapids Hydraulic and Land Company was operated owing to the large accumulation of frazil or anchor ice. These troubles emphasize the fact, says the Electrical Engineer, that hydraulic engineering can no longer be excluded from the scope of a complete electrical engineering education, any more than civil and mechanical engineering.

**The Consolidation Idea.**

The rapidity with which enormous business combinations are being formed in the United States is the most wonderful feature in the record of recent events. The trend of business and capital in this direction is being watched with the greatest interest and not without anxiety as to the outcome. Naturally the influence of these combinations is felt in Canada, and there is a disposition to follow on a smaller scale the example so daringly set us by our neighbors. Combinations have already been effected between several of the most important financial corporations of Toronto, with a prospect of more to follow. It is reported that the Canadian manufacturers

of bicycles will be forced to form a trust among themselves or become a part of the combine recently formed in the United States. The electrical interests are also likely to be affected. Indeed, a report is current that negotiations are now in progress for the consolidation under one management—probably that of the Cataract Construction Co.—of the various electric lighting and street railway companies whose headquarters are in Hamilton. We certainly think that benefit would accrue to the industry from the amalgamation of a number of the rival lighting companies which are now engaged in the unprofitable and thankless task of cutting one another's throats in some of the smaller towns.

**The Conmee Bill**

In this issue will be found Mr. Conmee's Bill as adopted by the Ontario Legislature, defining a method for the adjustment of disputes between municipal corporations and private electric lighting companies as well as the terms upon which municipalities shall in future be permitted to engage in the business of public lighting. The measure has been carefully framed, and when put in operation will no doubt prove advantageous to both the municipalities and the companies. It puts an end to a condition of affairs under which electric lighting companies were in constant danger of having their property wiped out of existence by the municipality, and therefore were not in a position to make further investments for necessary improvements. On the other hand the municipality is now able to secure public lighting from the companies on their own terms or at a price which competent arbitrators shall decide to be reasonable and fair. During the time that the Bill was before the Legislature it was subjected to much unfair criticism and opposition from some of the public newspapers, which, in their anxiety to appear as public champions, did not take the trouble to learn what its provisions were. Since its adoption they have declared that the electric lighting companies will now proceed to tyrannize over the municipalities. A perusal of the Bill will show that even should the companies desire to act the part of tyrants, which they certainly do not, the restrictions put upon them by the new legislation are a sufficient safeguard to the public interests. In consequence of the relations between lighting companies and municipalities having been thus defined, there is likely to be a return of confidence leading to the investment of capital in the improvement and extension of electric lighting properties.

**Price of Electric Power.**

THE councillors of the town of Orillia, Ont., apparently have but a vague conception of the cost of producing electricity. As our readers know, they are about to embark upon an undertaking to supply light and power to the town from Ragged Rapids, nineteen miles distant, this being the first instance in Canada, if not in the world, of a municipality installing a long distance electrical power transmission plant. There are two essential features necessary to the successful operation of any plant, whether controlled by public or private interests. The first is, that the design and construction of the plant shall be as nearly perfect as possible, and adapted to the conditions under which it must operate; the second is of equal importance, that the power shall be disposed of at a price which bears due relation to the cost of production. As to the design and construction of the Orillia plant it is yet too early to speak definitely, but in this respect we anticipate no obstacle to success. Our skepticism is aroused, however, by the price which has been placed upon the power to be produced, and we are led to the conclusion that upon this point the councillors must have shouldered the responsibility themselves, instead of obtaining proper advice. It is reported that power is being offered, delivered in Orillia at about fourteen dollars per horse power per annum, while the town of Gravenhurst which recently applied for power, was quoted a price of ten dollars per horse power per annum for one or two hundred horse power, at the power house at Ragged Rapids, the town to build and maintain its transmission line and transformer station. We believe that these prices will be found to be below the actual cost of operation, and that if the plant is to be a financial success, the rates for current must necessarily be increased in a substantial degree.

**Copper and Aluminium.**

There is no occasion to doubt the tenacity of the grip which the copper trust of the United States have secured. Prices have been forced upward to an extent which has very seriously affected the electrical industry in particular, as well as many other departments of trade. We are advised that many electrical enterprises which had been planned for this season, are hanging fire because of the unexpected and serious increase in cost of construction due to the heavy advance in copper. Building enterprise in cities where electric wiring is employed is being hampered from the same cause. Under these circumstances the electrical fraternity will watch with interest the experiment which is to be made at Orillia with aluminium as a conductor. Reference was made in our last issue to the fact that with the consent of the municipality of the town of Orillia a contract had been given to a Pittsburg firm for aluminium wire conductors for the electric transmission system at that place. The manufacturers of aluminium wire are to be congratulated upon the opportunity thus afforded them to demonstrate its utility and advantages for electrical purposes. It may occasion surprise that the Council of Orillia should have consented to allow the new material to be used for so important a transmission line. It is understood however that the town's consulting engineer, Mr. R. J. Parke, has carefully investigated the matter and is satisfied that aluminium wire will meet the requirements, and at a substantial reduction in cost. Furthermore the contractors have given the municipality their written guarantee concerning the tensile strength, conductivity, durability and less liability than copper to physical disintegration under the natural conditions which may affect the transmission line while in operation on the poles, and have undertaken to replace and put in satisfactory working condition any wires which may prove defective. The conductivity of pure aluminum wire is given as 63% and about 54% when containing 2% of alloy. The tensile strength of pure aluminium in sizes such as will be required for the Orillia line is about 24,000 lbs. It is proposed however, to employ a wire with a conductivity of 59% and a tensile strength of 29,000 lbs. per square inch. Assuming that aluminium has a conductivity of 59% and copper a conductivity of 97% the comparative cross-section of aluminium wire of equal conductivity to copper will be as 163 to 100. The diameter of No. 4 B. & S. copper wire, which would be the size required

for this line, is .204, or an area of 41742 circular mills. It is estimated that aluminium wire of equal conductivity should have an area of 68,000 circular mills and a diameter of .260. The weight of aluminium as compared with copper is 3.33. The weight of aluminium of equal conductivity with copper, is 49 per cent. of the weight of copper. As to comparative price, assuming a fair price for copper to be 20 cents per lb., 41 cents per lb. for aluminium would give the same cost per mile of line work, inasmuch as the weight of the aluminium would be only 49 per cent. of the weight of the copper. It is understood that the manufacturers of aluminium are watching very closely the copper market and are advancing or lowering the price of their material in such a way as to be able to offer an inducement to purchasers, while not letting go more profit than is absolutely necessary. Owing to its greater cross-section, due to lesser conductivity, the cost of insulating aluminium wire is almost double that of copper wire. Thus there is little or no advantage in price, except where bare wires can be used. This fact will greatly restrict the use of the new material. The only transmission line thus far constructed with aluminum wire is that of the Snoqualmie Falls Power Co., Seattle, W. T. This line, including branches, is 74 miles in length, and was completed in the autumn of last year, but has not yet been put in operation, so that no practical working results are obtainable.

## BY THE WAY.

Mr. Carter, an old time Canadian operator tells an interesting story of his work with Edison 25 years ago. The two were working at Stratford, where Edison was station telegraph operator. There was a mistake in some order, and a collision was narrowly averted, Edison in consequence, had to face the superintendent at the old Union Station, Toronto, who rated him roundly for his "criminal carelessness." It was more than the young genius could stand, and, quietly exclaiming that he had had enough, Edison slipped on his coat and then severed his connection with the company. A short time ago Mr. Carter visited Edison at Jersey City, and the two laughed over the Stratford episode.

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This is the way municipal control of the electric light and telephone has worked out at Crawfordsville, Ind., as recorded in the Indianapolis News of March 15th: "More rottenness is being unearthed by the investigating committee of the city council. Last week it developed that a number of city employees were supplied with telephones for which the city paid, and last night it came out that a number of others are supplied with free service by the management of the city electric light plant. All those connected with the plant are said to be using the light without price, whereas the management began to refuse pay applicants on the service some time ago, on the ground that the plant was already loaded to its carrying capacity. It now develops that every employee of the plant has his house wired and is using all lights desired. The exposure has caused a breeze of indignation, and the superintendent has been ordered to cut off all deadhead service at once."

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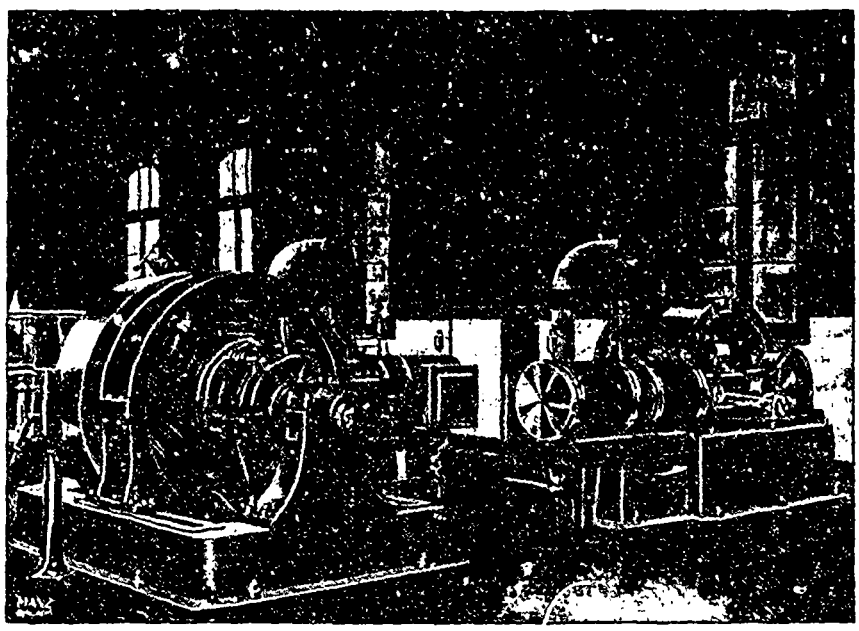
In the early '80's, when electricity was indeed in its infancy, Mr. J. J. Wright, the present manager of the Toronto Electric Light Co., started into the business on a very modest scale in Toronto. He rented a small machine shop off Yonge street, and there made his own apparatus. No attempt was made to light the streets, but a number of the stores were served with arc lights. In the day time the promoter of the new enterprise was busily engaged in stringing wires, trimming lamps and soliciting customers, and at night he took charge of the operation of the plant and the construction of dynamos and other apparatus. He even tried his hand at making carbons in the hope of reducing their cost, the price then being nine or ten cents apiece. In the following extract from a letter written to a friend Mr. Wright describes in characteristic language the modus operandi of carbon making as practiced by himself: "The first carbons I ever made or used were round in the shape of a wheel and I rammed the stuff in a cast iron mould and then made the mould red hot something after the manner of the Chinaman who when he wanted roast pork burnt down his house to cook the pig. You make me smile when you ask me the resistance of the first carbon I used. In those days I was 'unacquainted with the nature of an ohm' so to speak, and considered myself pretty lucky if I could get a current to go through my carbons on any terms. I wasn't fastidious. I didn't require to know system, candle power and strength of current in use' and whether *coppered or plain—not much—I was perfectly satisfied* when I could make a carbon that wasn't an insulator, and did not worry myself into a decline because two of them did not last an equal time on the same current to a fraction of a second. The first carbons I remember as practical carbons were Brush. They were square, but I have no data respecting them. Since then, I have used every kind, round, square, soft, hard, some with a hole through the center and some with a core, but I never knew what fun was till I started in to make carbons in Canada. I didn't have the first idea what they were made of and had to work it all out for myself. Carbons were costing me from 9 to 10 cents each in those days and it was an inducement. If I was to tell you the different kinds of stuff I put in carbons, you would die standing up. You would not have time to fall down. I got very fair results from gas carbon and molasses, but dropped the molasses and took to tar. The carbons were all right but would blaze somewhat. At last I got to making fair to middling carbons, but they were of the now-you-see-'em-and-now-you-don't kind. One lot would go all right, and then the next night my lamps would not start up, and after forcing the current round for a time, I would go round and find all the fine wire shunts burnt to a cinder. Another time they would get red hot all the way up to the holders and they would burn to a beautiful point. After a while I got to making them all right, and had pretty fair success, but the reduction in price knocked me out. I could buy cheaper than make, but if it were profitable to rake up such matters, I could a tale unfold in regard to what I know about carbons 'that would make your knotted and combined locks to part and each particular hair to stand on end like quills upon the fretful porcupine,' but of what avail? it would be of no use, so I have only to repeat what I said at the start, that for accurate data I am not there, but for experience, largely comic but quite often the reverse, I believe I could fill a book."

Charles J. Pippin, night watchman, at the parliament buildings Toronto, has been appointed engineer at the Deaf and Dumb Institute, Bellville.

## CANADIAN ENGINES IN SPAIN.

In October, 1897, contracts were placed for the equipment of electric tramways in Barcelona and Madrid, the two most important cities in Spain. The work was completed a few months ago, and the lines are now in successful operation. Barcelona, with a population of about 600,000, is the largest city in Spain, and is an important seaport and manufacturing centre. It is an



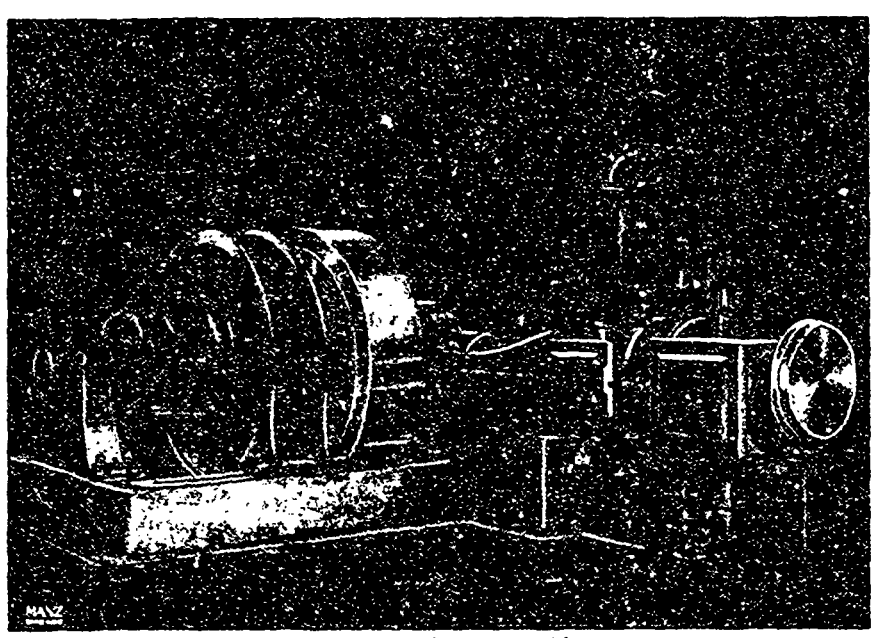
ROBB-ARMSTRONG ENGINES AT BARCELONA.

ideal city in many respects, but particularly from the standpoint of the owners of the electric railway, as it is well patronized on account of the climate being too warm for much walking. Madrid is the capital of Spain, and is nearly as large as Barcelona. It is situated inland, and has many parks, broad streets and fine buildings. In the character of its population it resembles a western American city, as not more than 40 per cent. of its residents are natives.

Although these systems are owned by British capital, and were built by British contractors, much of the apparatus was purchased on this side of the Atlantic. The main engines were manufactured in the United States, and three smaller engines were supplied by the Robb Engineering Company, of Amherst, N.S. These latter engines, as shown in the accompanying illustrations, are tandem compound, side crank type, with dynamos direct connected. They were installed principally for lighting the extensive car sheds and driving the machinery in the workshops connected with the tramway system, but are also used for running part of the cars late at night or early in the morning when the main engines are shut down.

The high pressure cylinder of these engines is 10 inches in diameter, low pressure 16 inches in diameter, stroke 15 inches, and they are rated at 115 horse power each. Both valves are controlled by the automatic governor in such a way as to divide the work equally between the two cylinders. The crank shaft, connecting rod and crank pin are of hammered open-hearth steel. The high pressure cylinder is placed next the frame, and the low pressure in the rear, so that the cylinder heads and pistons can be removed without disturbing the cylinders. The throttle consists of a flat valve rotated through one-half revolution by a lever, and as the valve and seat are protected from the steam whether open or shut, they can neither wear nor rust. The main bearings have a ring oiling device, the oil being continuously conveyed from a cavity beneath the bearing to the top of the shaft by metal rings which dip in the oil. All bearings are large and the parts of the engines few and simple and as strong as possible, making them well adapted to any service where continuous running and variable or severe work is required.

It is highly creditable to the Robb Engineering Company that their engines were selected as part of these installations, which are said to be the most important undertakings of the kind completed in any part of the world during the year 1898. The products of the Robb Company have been favorably known throughout Canada for a number of years, and we have no doubt their foreign shipments, which have been quite numerous during the past year will give as good satisfaction and lead to a large increase of their business.



ROBB-ARMSTRONG ENGINES AT MADRID.

## ACETYLENE GAS EXPLOSION.

On January 5th the village of Merrickville, Ont., was startled by a terrific explosion, which, on investigation, proved to have occurred on the premises occupied by the A. B. Scott Co., general merchants, due to the explosion of their acetylene gas machine. The plate glass windows in the front of the building were almost totally wrecked; the windows on the second floor were also broken out. A large window in the centre of the back of the building was completely destroyed, being blown out, with its frame, leaving nothing but the brickwork. The cellar doors leading to the machine were broken from their hinges. Fortunately, no one was seriously injured.

## THE CONMEE BILL.

Following are the provisions of the Conmee Bill as adopted by the Ontario Legislature a week ago, defining the relations which shall in future exist between municipalities and electric lighting companies :

14. (1) Sub-section 4 of section 566 of the said Act is amended by striking out the first six lines and article (a) thereof, and inserting in lieu thereof the following words and articles (a) to (a9) inclusive : —

By the councils of cities, towns and villages.

4. For constructing gas, electric light or waterworks, and for levying an annual special rate to defray the yearly interest of the expenditure therefor and to form an equal yearly sinking fund for the payment of the principal within a time not exceeding thirty years and not less than five years for gas or waterworks, in the case of any such city, town or village, or for electric light works, in towns having a population of 5,000 or less, as ascertained by the latest census of Canada, and in villages and not exceeding twenty years or less than five years for electric light works in cities and towns having a population of over 5,000 as ascertained by such latest census. (a) In case there is any gas, electric light or water company incorporated for or in the municipality, the council shall not levy any such special rate, or construct works for lighting the public streets, until such council has, by by-law, fixed a price to offer for the works and property of the company or companies, nor until after thirty days have elapsed after notice of such price has been communicated to the company or companies without the company or companies having accepted the same, or without the company or companies, having, under the provisions of this Act, as to arbitrations, named and given notice of an arbitrator to determine the price, nor until the price accepted or awarded has been paid, or has been secured to the satisfaction of the company or companies, and in case the company or companies and the municipality do not agree, the said price shall be determined by arbitration under this Act : And where there is more than one such company in the municipality the arbitrators shall determine the share or proportion of the price to be paid to each company. This clause (a) shall only apply to a gas or electric light company that has supplied or shall supply gas or electric light for street lighting in the municipality, or to a water company that has supplied or shall supply water for street hydrants in the municipality.

(a2) In any arbitration under clause (a) hereof to determine the price to be paid for the works and property of a gas or water company, the arbitrators shall determine the actual value of such works and property having regard to what the same would cost if the works should be then constructed or the property then bought making due allowance for deterioration and wear and tear, and making all other proper allowances, but not allowing anything for prospective profits or franchise and shall increase the amount so ascertained by ten per cent. thereof, and such increased amount shall be the amount which the arbitrator or arbitrators shall award as the price to be allowed for the said works and property.

(a3) In any arbitration under clause (a) hereof to determine the price to be paid for the works and property of an electric light company the arbitrators shall determine the actual value of such works and property having regard : (1) To what the same would cost if the works should be then constructed or the property then bought ; (2) to the condition of the works and to any deterioration thereof from use and wear and tear or by reason of the system or appliances having become in whole or in part absolete ; (3) to the value of such works and property to the municipal corporation for the purposes, and to the extent to which the municipality can make use of the same and to such value for commercial and such other purposes as a company could use them for ; and (4) to the cost of procuring more valuable or modern improvements or appliances therefor, if any, and the cost of acquiring the right to use and of adapting such improvements, the arbitrators making all proper allowances but not allowing anything for prospective profits or franchise, and such amount so ascertained shall be the amount which the arbitrators shall award as the price to be allowed for the works and property hereunder.

(a4) Where in any of the said municipalities the municipal council desires to construct works as aforesaid to supply light for street lighting and other public uses on highways, or to supply water for street hydrants and other public uses on highways, but not for commercial purposes, the council may, by the said by-law, limit the price to be offered as aforesaid to a price for part only or for the use of part or for the purchase of certain parts and the use of other parts of the works of a company, that is to say, to so much thereof as may be required for such public uses, and in the event of an arbitration hereunder thereafter held to determine as to such offer and price, the arbitrator or arbitrators shall have power after taking into consideration the effect of severance, if any, or user on the remaining property and business of the company to award a severance of the works if the arbitrator or arbitrators shall determine that after severance, if any, or user, the company will be, in all probability, having regard to the nature of the business and all the circumstances, in a position to successfully carry on that part of their business which consists in supplying private consumers at rates not less favorable to the consumers, the company to have the right to continue to operate the balance of their works for that purpose, and if the arbitrator or arbitrators shall so award a severance, they shall by their award, determine what part of the works the municipality shall acquire for said purposes before levying the said special rate, as well as the price thereof, but nothing herein contained shall affect the right of the council at any subsequent time to offer a price for the said balance of the said works, under the provisions of this Act.

(a5) And, if within one month, after the publication of any award made under article (a) or (a4) hereof the municipality shall give notice in writing to the company that they will not accept the terms thereof, their offer may be withdrawn provided they first pay all costs of the reference and award and provided also that in the event of such withdrawal the municipality shall not, until after the expiration of two years from such withdrawal be entitled to again avail themselves of the provisions of the clause under which the award is made.

(a6) In case there is any gas or electric light company supplying gas, electric energy or light or water company supplying water in any municipality the council may, by by-law, fix a price and terms to offer for the supply by contract by such gas or electric light company of gas or electric energy or light for street lighting and other public uses, or for the supply by contract by such water company of water for street hydrants and other public uses for a term of not less than five years and not more than ten years and after thirty days have elapsed after notice of such price and terms has been communicated to the company without the company's having accepted the same the council may, under the provisions of this Act, as to arbitrations, name and give notice of an arbitrator to determine the prices and terms of the contract for such supply of gas or electric light as aforesaid, and in case the company and the municipality do not agree, the said price and terms shall be determined by arbitration under this Act.

(a7) Upon an application in writing signed by not less than five ratepayers of the municipality the council of any municipality may, at its discretion, by by-law, permit the persons making such application to use the name of the municipal corporation for the purpose of taking proceedings to determine the price at which electric light shall by supplied to inhabitants of the municipality for domestic and other purposes ; provided that no such by-law shall be passed until the persons making such application have given satisfactory security to the council to indemnify the municipal corporation against all costs which may be incurred in the arbitration proceedings. After the passing of such by-law the said applicants may, in the name of the municipal corporation, name and give notice of an arbitrator to determine the price and terms of the contract for the supply of electric light or energy to the inhabitants of the municipality for domestic and all other lighting purposes ; and for the purposes in this paragraph set forth, the said applicants so acting in the name of the municipal corporation shall have the power to do all necessary things and take all necessary steps, and their acts shall be as binding upon the municipal corporation as if the said proceedings were taken by the municipal council thereof, and in case the company and the applicants so acting in the name of the municipal corporation do not agree, the said price shall be determined by arbitration under this Act. The municipal corporation shall have the right and is hereby authorized to take proceedings by arbitration in its own name for the purposes in this sub-section mentioned, and shall have all necessary powers for that purpose whether on its own motion or when used as in this sub-section is provided.

(a8) All the provisions of this section shall apply where an individual supplies electric light or electrical energy or gas or water for municipal and public purposes. In all such cases the municipal corporation and the individuals shall proceed hereunder

and be subject to the provisions hereof in the same manner as if the individuals were a company.

(a9) Any municipal corporation and company or individual may agree that the official arbitrators appointed under The Act respecting Municipal Arbitrations shall determine any matters in difference hereunder, and in such case his award shall be final and binding upon the parties as if such award had been made by arbitrators appointed under this Act.

2. Article (b) of the said sub-section 4 and sub-section (7) of section 569 of the said Act are hereby amended by adding at the end thereof respectively the following words: "Or the provisions contained in any contract now existing between any municipal corporation and any company."

(3) Articles (d) and (e) of the said sub-section 4 of section 566 are amended by adding the words: "Electric light" after the word "gas" wherever the latter word occurs in the said clauses, and by inserting after the words "supply pipe" in the seventh line the words "or wires."

(4). Sub-section 5 of section 569 of the said Act is hereby amended by inserting the words "electric light" after the word "gas" wherever the latter word occurs in the sub-section 5 of the title thereof.

(5) Nothing in this section contained shall apply to or affect any by-law now in force or which has, at the time of the passing of this section, come into effect, or contract heretofore made or entered into between a municipal corporation and any gas, electric light or water company; nor shall anything in this Act contained be deemed to prevent any contract being entered into hereafter between a municipal corporation and any such company or any by-law being passed by a municipal council not inconsistent with this Act in the same manner and for the same purpose and to the same extent as heretofore.

## WHEN WAS COAL FIRST USED AS FUEL.

The general opinion, according to the "German Pottery and Brickmaker's Gazette," has been that coal was first used as fuel about 700 years ago, at Leige, in Belgium, but the fact is it was employed for this purpose at a much earlier date. The discovery was made on German soil in the beginning of the 12th century that the mineral we call coal was good to burn. The place where it was first obtained is exactly known; it is the present Kohlenberg, in Wurmthal. In the ancient chronicles this place was called Kalkulen, the same thing as Kohlenkull; later it was called Koalberg.

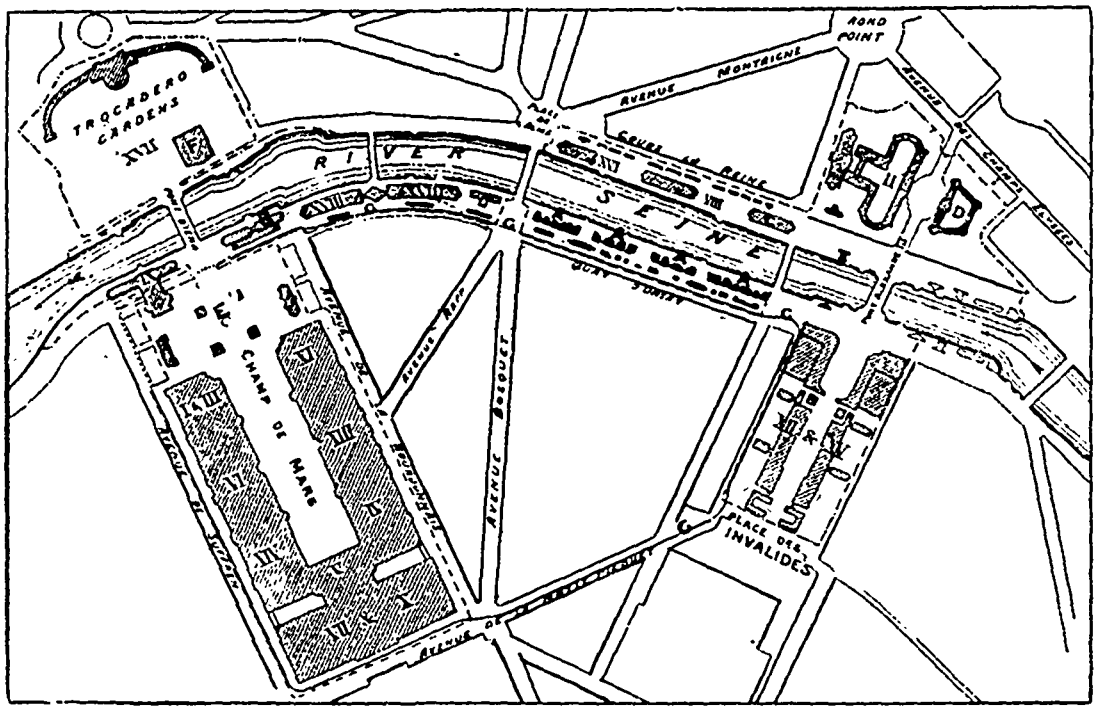
At the present time the good people of the Wurmthal call a coal mine "Kull," and the coal miner is not called a miner, but a Kohler (coaler), the common name in other parts of Germany for a charcoal burner.

The City Council of Hamilton, Ont., have appointed Campbell Leckie as engineer of the sewage disposal works.

## REGULATIONS OF THE PARIS EXPOSITION.

The Canadian Commission for the Paris Exposition of 1900 have issued a booklet giving regulations, classification of exhibits, and general information for intending exhibitors. The accompanying plan, which is herewith reproduced, shows the arrangement of the Exhibition grounds and buildings, and will no doubt be found of interest. The Exhibition will open on the 15th of April and close on the 5th of November. The Colonial building will be situated on the Trocadero grounds overlooking the Champs de Mars, not far from the Great Eiffel tower, and will cover 36,000 square feet, of which 27,100 feet has been allotted to Canada.

Forms of application for space must be returned to the Canadian Commission, Department of Agriculture, Ottawa, not later than June 1st, 1899. It is the desire of the Commission to secure the best possible exhibit of Canadian goods, and there will be no charge to exhibitors for space. Accepted exhibits from Quebec, Ontario and the west must be delivered at the exhibitor's expense at Montreal or Quebec not later than November 1st, 1899, and exhibits from the Maritime provinces at Halifax, N. S., not later than November 15th. These will be shipped to Paris by the Commission free of charge. Exhibitors are expected to dispose, in Paris, of their exhibits when these have a commercial value, as only valuable collections of objects of special character will be granted free return transportation. The exhibits are divided into eighteen groups, which are again subdivided into numerous classes.




PLAN OF EXHIBITION GROUNDS AND BUILDINGS—PARIS EXPOSITION.

Group four includes apparatus pertaining to mechanical engineering, and is divided into three classes, as follows:

Class 19.—Steam Engines: Fire boxes, furnaces, boiler chimneys; stationary, semi-portable or portable boilers; packings and boiler fittings; feed apparatus; steam jacketing anti-fouling compounds; water softening; feed water heaters, steam driers, superheaters; steam piping, joints, cocks, piping; stationary, semi-portable and portable engines; valve gear; condensers; regulators and governors; lubricators and fittings; engines set in motion by evaporation other than that of water; methods of testing and examining steam apparatus; associations of owners of steam plants.

Class 20.—Various Kinds of Engines: Engines worked by hot

air, gas, petroleum, compressed or rarified air, ammonia, carbonic acid gas; parts and fittings of such engines; hydraulic motor, wheels, turbines, water pressure engines, etc; wind mills and wind motors; gins, tumblers, spring counterweight and pedal motors, etc.

Class 21.—General Machinery: Apparatus for the transmission of power; shafting, plummer guides and slides, jointed systems; gearing; clutches, pawls; pulleys, belting and cables for transmission of power; funicular systems; governors and speed regulators; lubricators; recording instruments, engine counters, recorders, speed indicators, dynamometers, pressure guages, weighing machines; machines for testing materials, apparatus for measuring fluids and gases; machines for moving loads; cranes, lifts, etc; machines for raising water; hand or steam pumps, norias, hydraulic rams; hydraulic presses and accumulators; water pipes and accessories; air compressors and piping; ventilators; power transmission and distribution at a distance by means of water, steam, air or vactuum; apparatus and associations for preventing accidents caused by machinery.

The exhibit of electrical apparatus is placed in group five, divided into five classes, as below:

Class 23.—Mechanical Production and Utilization of Electricity: Apparatus for generating electrical currents; continuous, alternate and polyphase current dynamos; transmission of power to a distance; continuous and alternate current motors; motors with rotating fields; alteration of currents; dynamo and alternate current transformers; application of electricity to transport purposes, electrical locomotives, electric tramways; application of electricity to mechanical purposes, such as elevators, winches, cranes, capstans, traversers, machine tools, magnetic warping; special methods of wiring; safety appliances and regulators.

Class 24. Electro Chemistry: Batteries, accumulators; plant and processes generally used in electro-plating and electrotyping, production and refining of metals or alloys; application of electro chemistry to commercial purposes, such as bleaching, sugar refining, treatment of sewage water, manufacture of soda, chlorine, chlorine of potassium, etc.

Class 25. Electric Lighting: Use of continuous or alternate currents; arc lamps; regulators; carbons for lighting purposes, incandescent lamps; special installations for factories, public buildings and private dwelling houses; central stations; application to light houses, navigation, military engineering, public works; safety and regulating apparatus; meters; photometry; appliances for determining the intensity, distribution and illuminating power of light; special electrical appliances, such as chandeliers, candelabra, ornaments, brackets, etc.

Class 26.—Telegraphy and Telephony: Telegraphic instruments; transmitters and receivers; multiplex instruments; multiplex telegraphy; various parts; relays; repeaters, lightning conductors; speaking instruments; telephones and microphones; telephone exchanges, bells, alarums, sounders; simultaneous telegraphy and telephony; wiring for telegraphs and telephones: overhead wires; subterranean and submarine cables.

Class 27.—Various Applications of Electricity: Scientific apparatus and measuring instruments; medical electricity; electric clock-work; application of electricity to railways, mines and public works; signals; exploders; distance indicators and recording apparatus for all kinds of phenomena; electric furnaces; electric welding; electric heating apparatus.

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The Riordon Paper Mills Co. of Hawksbury, Ont., are lighting their plant throughout by electricity. An order has been placed with the Royal Electric Company of Montreal for one of their 25 K. W. S. K. C. two-phase generators, wound to deliver 110 volts. There will be 200 incandescent lamps installed from this throughout their mills as well as ten alternating inclosed arc lamps. This is the fifth large mill or factory, which has within the past year installed alternating current apparatus of the S. K. C. two-phase type in preference to direct current apparatus, which the alternating current in three cases replaced, and in two cases were new plants. It shows the trend toward alternating current apparatus for all purposes, and the prediction is heard that before many months we will have alternating current street railway apparatus in use in Canada. It is already extensively used in Europe, especially in Switzerland, and the larger companies in the United States are experimenting with it and have already built a new road entirely equipped with alternating current apparatus, which is said to be giving perfect satisfaction. We may therefore in the near future have the alternating current in use for factory lighting, central station or street railway apparatus.

## BLINDNESS FROM THE ELECTRIC ARC.

The danger to one's sight from the light of an electric arc, no matter whether produced for a useful purpose, or the result of some chance short circuit, should be clearly understood by every one, writes Prof. Arthur J. Rowland, in the American Electrician. This is especially true, in view of the many uses of electric arcs, besides those so familiar in the common 1,200 and 2,000 candle power arc lamps.

If one's line of vision takes in such an arc as that in the ordinary arc lamp, or that due to an accidental short circuit, or one at the break of a large current at high potential, the eye suffers a sort of paralysis, and on looking away one sees as through a fog. This effect soon passes away, and at worst requires a sojourn of a day or two in a dark room to produce a cure.

With arcs taking large currents, and especially if one electrode is metal, the effects are quite different and much more serious. At night one notices the intense brilliance and is on his guard. In daylight the contrast is not so great, and so one is more likely to suffer because of lack of care. After working with such arcs the eye does not immediately feel the effect; but after a time, perhaps hours afterward, a slight scratching is felt in the eye, as though there were some fine dust or cinders there. As time goes on, this is followed by a feeling of dryness on the eyeball, accompanied by a very profuse shedding of tears, and all the symptoms of a heavy cold in the head are felt. If the attack is a bad one, the pain becomes a very intense aching and may be accompanied by a twitching of the eyelids. In these worse attacks the afflicted one can bear no light on the eyeball, and if the eyes are opened finds he is blinded.

In case of slight attack a simple eyewash is all that is necessary for a cure. Use one made of six grains of borax in a fluid ounce of infusion of sassafras pith, or one of ten grains of boric acid in an ounce of camphor water. I can vouch for the first and have almost equal confidence in the second. In a very bad case a physician will apply cocaine, that local anæsthetic so commonly used in the eye. No one but a physician should do this.

After a few hours the pain passes away, and by keeping in a darkened room and then wearing smoked glasses for a couple of days, the eye wash being kept in use, all ill affects pass away, leaving the patient with a firm resolve to avoid further experience in this direction.

It is found that the effect of the arc has been to produce an external burn—like a sunburn—on the conjunctiva, or outer membrane covering the front of the eye-ball. If one protects the eyes, this "sunburn" from the arc affects the skin; and results precisely like those after a day's outing at the seashore in midsummer are experienced.

In protecting the eyes against the burning power of such arcs it is not sufficient to simply wear such glasses as are made for those who adjust and repair common arc lights. Far too much of the light gets around them. It is necessary to use a mask covering the whole face. Even if one thinks to protect himself from all direct rays, by holding his hand before his eyes for example, there will still be likelihood of his suffering to some extent. In this way one who stops to look on may suffer from an eye trouble, the cause for which he has quite overlooked.

## PERSONAL.

Mr. F. Poste has recently taken the management of the Prescott Electric Light Co.

Mr. C. F. Sise, president of the Bell Telephone Co., of Canada, is at present enjoying a brief vacation.

Mr. W. H. Browne, general manager of the Royal Electric Co., Montreal, is spending a few weeks in the Southern States with the object of regaining his health which had become impaired by a severe cold.

The death is announced of Mr. F. B. Beckett, a well known engine builder of Hamilton. The late Mr. Beckett was also interested in the Hamilton, Ancaster and Brantford electric railway project.

Mr. J. M. Campbell, President of the Gananoque Electric Light and Water Supply Co., who has been in British Columbia for the past year or two has returned to Gananoque, and will likely reside there in future.

A recent visitor in Toronto from the Pacific coast was Mr. H. Pim, the Vancouver representative of the Canadian General Electric Company. Mr. Pim came east upon one of his occasional visits to the head offices of his company. He reports a steadily increasing demand in the west for electrical apparatus.

Mr. John Inglis, of the firm of Inglis & Sons, engine manufacturers, Toronto, died suddenly in that city last week. The late Mr. Inglis came to Canada from Scotland forty seven years ago, and carried on business successively in Chippewa, Simcoe, Dundas, Guelph and Toronto. He had received the benefit of a thorough training in his native land and was recognized as being one of the most skilful men in the business. Three of his sons were associated with him in business.

Mr. E. B. Merrill, formerly lecturer in electricity at the Toronto Technical School, has recently returned from Great Britain, where he resided for upwards of two years. During the greater part of this period he was connected with the Siemens Bros. Co. He states that a number of underground electric railroads are projected in London, one of which, between one and two miles in length, is now under construction. The proposal has been made to substitute electricity for steam on the main lines of the underground railway system which has served the central part of the city for a number of years past. One of the principal objects in view in making this change is to get rid of the sulphurous fumes and soot which are the unpleasant accompaniments of the present system.

## TRADE NOTES.

It is rumored that the Smith's Falls Electric Light Co., and the Smith's Falls Power Co., will be amalgamated.

We are advised by Mr. Edward Slade, electrical contractor and engineer, Quebec, that in future his business will be carried on under the name of The Slade Electric Co., with offices and show rooms at 137 John street.

A new descriptive and fully illustrated catalogue and price list has recently been published by the Weston Electrical Instrument Co., of Newark, New Jersey, the well known manufacturers of standard recording instruments.

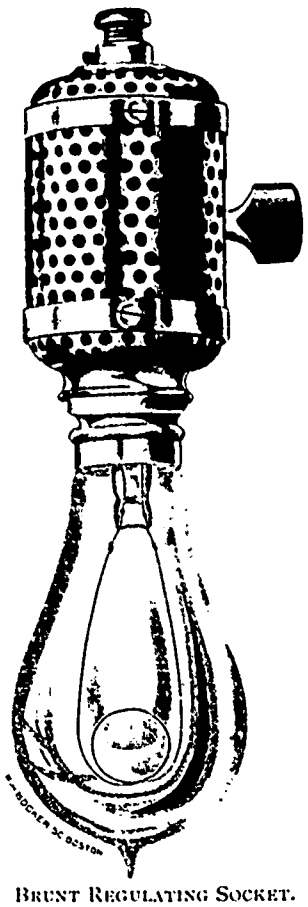
The corporation of the town of Joliette, Quebec, are extending their arc system and have placed their order with the Royal Electric Company for one of their 50 light 2000 c. p., T. H. royal arc machines with a full equipment of lamps. This is an addition to their recent purchase of an 120 k. w. S. K. C. generator with transformer, etc., which was started in operation two weeks ago.

The Consumers' Cordage Co., of Montreal, are fitting out their entire factories with electric power and have placed their order with the Royal Electric Co. for two 50 h.p. S. K. C. synchronous motors. The current for these motors is to be furnished by the Chambly Mfg. Company as soon as they have their current in the city, which is expected about the first of May.

The Esquimalt & Nanimo Railway Co., who are opening up their coal mines at Oyster Harbor, B. C., have decided to operate the entire mining and hauling apparatus by electricity, and for this purpose have placed their order for two direct connected units of 150 h.p. each, with Ideal engines and two 40 h.p. mining locomotives with switchboards and all the necessary supplies for the complete installation, with the Royal Electric Co., of Montreal. This is the second order that the Royal Electric Co. have received for mining locomotives and apparatus on Vancouver Island.

## THE BRUNT REGULATING SOCKET.

The Packard Electric Company, of St. Catharines, Ont., in conjunction with their general agent in Montreal, Mr. R. E. T. Pringle, have recently placed upon the market the Brunt regulating socket, which they advertise to control an incandescent lamp in its radiation of light in the same manner as a gas jet is ordinarily controlled. The socket, illustrated herewith, admits of five conditions of light, with a positive saving, it is claimed, of current at the different stages, as specified below:



Brunt Regulating Socket.

Assuming a 16 candle 64 watt lamp is used, the first contact in the socket will give 16 candles at 64 watts; then by simply turning the key through an arc of 180 degrees, the light is diminished from 16 candles to 2 candles and the watts diminished from 64 watts to 27 watts; the intermediate stages of light consuming respectively 60, 52, 45, 37 and 31 watts. The socket is adapted to either direct or alternating current, the latter of any frequency; and it is also adapted to any voltage from 50 to 118. The construction of the socket renders it practically indestructible, being operated upon an entirely new principle.

These sockets have been found useful as night lamps in vestibules, hallways and sleeping apartments, and especially desirable for the sick room.

## ELECTRIC LIGHTING AT WINNIPEG.

A tender was recently submitted to the city Council of Winnipeg by the Winnipeg Electric Street Railway company through H. J. Somerset, superintendent, for street lighting, at rates per light per night as follows: 10 years 175 to 250 lights, 29 cents each; 5 years, 150 to 200 lights, 34 cents; 5 years, 200 to 250 lights, 32 cents; 3 years, 150 to 200 lights, 39 cents; 3 years, 200 to 250 lights, 37½ cents. All lights to be 2,000 nominal candle power, each developing an electrical efficiency of 450 watts, and to be of the most recent type of lamps, such as the "Brush Improved," "Adams' Bagnall," or focusing lamps, as may be decided by the city, with the right only to use the lamps at present in use, so far as they are found in a satisfactory condition and subject to specifications, which will in every way meet the public requirements. Mr. Somerset wrote: "In order to bring the company's power house and generating system to a strictly up-to-date standard as the council are aware, the company is expending a large sum of money, and in order to establish the lighting system tendered for further large expenditure will be necessary and the company feel that with their modern system and facilities they are in a better position than the city would be for furnishing a satisfactory lighting service. It is the intention of the company to meet the views of the council in every reasonable way and if awarded the contract to furnish a first class service in every respect."

## THE AMERICAN STOKER.

THE American stoker shown herewith offers the steam-using world a most thoroughly practical method for the economical use of coal.

Not only is a great saving effected in the actual amount of coal used, but the apparatus provides at the same time a practical and efficient means of smoke prevention. In this connection we show

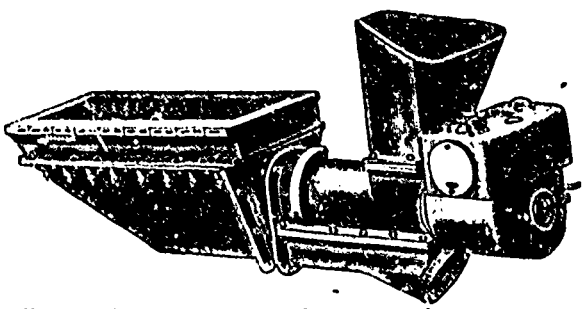


FIG. 1. AMERICAN STOKER READY FOR INSTALLATION.

two views of the Dominion Cotton Company's mills at Montreal, that will be studied with interest by our readers.

Fig. 2 is a reproduction of a photograph taken July 22nd, 1898, at 10 a.m. before the American stoker was put in, while Fig. 3 shows a view of the same chimney taken Sept. 9th following, at the same hour, with the whole of the steam plant of 700 h.p. in operation, the boilers fired by means of the American stoker, using soft coal screenings.

These photographs were taken without the knowledge of any one connected with the cotton mill, and show in a striking manner how effectually the vexatious "smoke nuisance" question may be settled by the use of this type of mechanical stoker.

The principle upon which the American stoker operates practically reduces the coal to gas and coke and insures complete combustion. Immediately beneath the coal hopper, and communicating with it, is the conveyor pipe; this in turn communicating with the coal magazine. A screw conveyor or worm is located in the conveyor pipe and extends the entire length of the magazine. Immediately beneath the conveyor pipe is located the wind box, having an opening beneath the hopper. At this point is connected the piping for the air supply, furnished at low pressure by a volume blower. The other end of the wind box opens into the air space between the magazine and outer casing. The upper edge of the magazine is surrounded by tuyeres, or air blocks, these being provided with openings for the discharge of air, inwardly and outwardly. Each stoker is driven independently by a small steam motor, located immediately in front and beneath the hopper. The motor has a simple reciprocating piston. Its piston rod carries a crosshead, which, by means of suitable connecting links, operates a rocker arm having a pawl me-

FIG. 2. PHOTOGRAPH OF CHIMNEY BEFORE THE AMERICAN STOKER WAS INSTALLED.

chanism, which in turn actuates the ratchet wheel attached to the conveyor shaft. The stoker is thus entirely self-contained and complete in itself, and consequently there is no danger of the driving and feeding mechanism (the only working parts) ever getting out of alignment.

The rate of feeding coal is controlled by the speed of the motor, this being effected by the simple means of throttling the steam in the supply pipe to the motor.

The shields covering the motor effectually protect the mechanism from dirt and dust.

The coal is fed into the hopper, carried by the conveyor into the magazine, which it fills, "overflows" on both sides, and spreads upon the sides of the grates.

The coal is fed slowly and continuously, and, approaching the fire in its upward course, it is slowly roasted and coked, and the gases released from it are taken up by the fresh air entering through the tuyeres, which explodes these gases and delivers the coal as coke on the grates above.

The continuous feeding gives a breathing motion to this coke bed, thus keeping it open and free for the circulation of air. Particular attention is called to the fact that every pound of coal fed into the hoppers passes through this gas-making process, and there is no loss of coal through grates, by reason of the use of dead grates in the furnace, in place of open grate bars.

The non-combustible is taken from the furnace in the shape of vitrified clinker. There is practically no soot, and with these results it is obvious that the combustion must be extraordinarily good.

The finest of slack coal can be used with the American stoker;

FIG. 3.—THE SAME CHIMNEY AFTER THE AMERICAN STOKER WAS INSTALLED.

it can also handle lump coal, as any lump that can be fed into the hoppers will be crushed by the conveyor, there being provided a set of teeth, placed at the mouth of the conveyor, against which the coal is squeezed and broken.

The American Stoker Company is located in the Washington Life Building, New York City. It has Canadian offices at 54 Street Railway Chambers, Montreal.

Since equipping the Dominion Cotton Co.'s mill, four other mills belonging to the same company have been equipped with the American stoker. In addition thereto the American Stoker Company have put their apparatus into a number of other prominent mills in Canada, among them being the British Columbia Sugar Refinery, St. Lawrence Sugar Refinery and one of the plants of the Canadian Pacific Railroad.

A large number of notable plants in the United States are now employing the American stoker. Further particulars with handsomely illustrated catalogue may be obtained by addressing the manufacturers.

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The town council of Whitby has given a five years contract to the local electric light company for 27 arc lights at $1,000 a year. The council refused to entertain the request of some of the citizens to take tenders for the purchase of a civic plant.

For the first time in the history of the English Institution of Electrical Engineers a woman has been invited to read a paper at one of its meetings. Mrs. Ayrton, the wife of Professor W. E. Ayrton, F. R. S., professor of applied physics in the Central Technical College of the City and Guilds of London Institute—has just read a paper on "The Hissing of the Electric Arc" at the meeting of that body. She has carried out a series of original investigations on the electric arc, and has contributed many papers on the subject.

## SPARKS.

An electric plant is being installed in the Fort Saskatchewan Milling Co's. mill, N. W. T.

A scheme is mooted at Chilliwack, B. C., to purchase an electric light plant for lighting the town.

Mr. Geo. Stitt, of Cardinal, Ont., has invented a device to regulate the light of an incandescent lamp.

The Protestant School Commissioners of Montreal have decided to fit Mount Royal school with electric clocks.

The bill incorporating the Nova Scotia Electric Light Co., has reached an advanced stage in the Legislature.

The village of Nelson, B. C., is now in possession of its electric plant, having purchased it from the Electric Lighting Company.

The Canadian Water Power Company of Quebec, want a manager for their works now being constructed at Chaudiere Falls, near that city.

The annual meeting of the Amherstburg Electric Light, Heat and Power Company was held last month, at which the old officers were re-elected.

It is improbable that the proposed extension of the Ottawa Electric Railway from Rockliffe Park to the rifle range will be carried out this summer.

Mr. Saxby, of Kingsville, has submitted a proposition for electric lighting to the council of Bradford, Ont. He proposes to install a plant to cost about $8,000.

Mr. M. Martin has applied to the town council of Wallaceburg, Ont., for permission to erect poles and wires for the purpose of operating an incandescent lighting plant.

The city surveyor of Montreal has been requested to report on the feasibility of placing underground electric wires in Craig street from St. Lawrence to St. Antoine street.

The Anglo American Power Company, which was refused permission to lay underground wires in the city of Toronto, has asked for another conference with the Board of Control.

Mr. R. E. T. Pringle, Electrical Supplies, 216 St. James st., Montreal had his stock damaged somewhat by water during the fire which recently took place in Bett's restaurant, next door.

A by-law will probably be submitted to the ratepayers of Rat Portage, Ont., to raise the sum of $40,000 to purchase a half interest in the Citizens' Electric Light and Telephone Company.

On the 20th of this month the ratepayers of Winnipeg will vote on a by-law to install a municipal lighting plant. Tenders for the supply of the plant are invited by C. J. Brown, city clerk, up to the 17th inst.

The Pontiac Telephone Company are offering for sale their rights and plant, the line being about sixty miles in length. Tenders for purchase are to be addressed to F. C. Dezouche, Bryson, Que., by April 15th.

The Hamilton Electric Light and Power Co. are negotiating with the city of Hamilton for a renewal of its lighting contract. If given a ten years franchise, the company will spend about $100,000 in improving the system.

An arrangement seems likely to be made by the corporation of Gravenhurst for the purchase of the electric lighting plant now owned and operated in that town by Mr. Fletcher, who has offered to sell at the price of $10,500.

According to Mr. Hugh McCutcheon, Collector of Customs at Nakusy, B. C., a Toronto syndicate has purchased mineral springs near that place and intend building a $50,000 sanitorium, to be equipped with an electric light plant.

Frank Tushingham, an engineer at the power house of the Toronto Street Railway, recently had his left arm torn off at the elbow. Tushingham was repairing one of the pumps, when it started suddenly, resulting in the accident.

Buffalo capitalists are said to have decided to build an electric railway from Fort Erie, Ont., to Point Abino, a distance of thirteen miles, and to Chippewa, from which point an electric road runs along the Canadian side of the river to Queenston.

Mr. S. R. Ickes, of Harrisburg, Penn., was in Woodstock, Ont., recently, negotiating with the Council and Board of Trade regarding the construction of an electric railway to connect that city and Ingersoll. He proposes to locate the power house at Beachville, about midway between the two places.

News has reached Toronto that the city council of Birmingham, Eng., have decided, by a vote of sixty to one, to take over the street railway at the expiration of the Mackenzie-Ross franchise and operate it as a department of the municipal service. Mr. Granville C. Cunningham, formerly city engineer of Toronto, is manager of this road, which a few years ago was converted into an electric system.

Mr. E. A. C. Pew, is again to the front with his proposed power canal scheme. He states that the necessary capital has been subscribed for its construction and that the contracts will be let at an early date. The canal is intended to extend from the Welland river, two and one half miles below Wellandport, to the Jordon river, the power to be developed at what is called Ball's Falls.

The West Kootenay Power and Light Co., of Rossland, B. C., are experiencing a large demand for light and power. They are at present lighting up the shaft of several large mining properties, and are operating with complete success one of the largest electrical hoists ever installed. The hoist is designed to lift 12,000 lbs. at a speed of 800 feet a minute, and is driven by a 300 h. p. induction motor.

An engineer named Germain, in the French ministry of Posts and Telegraphs, has brought out an invention which he claims will revolutionize the telephone. By an ingenious adaptation of the telephone wire, the microphone is made to develop and intensify the vibration received, so that conversation can be carried on between two persons, both of whom may be several yards distance from the instrument.

The St. John Street Railway Company has been ordered by the court to pay $25,000 as damages to Professor Hesse. The professor was organist of the Roman Catholic Cathedral in Providence, R. I., and received injuries while a passenger on a car of defendants which necessitated the amputation of his left foot, and rendered him incapable of performing his duties as organist. The Street Railway Company will probably appeal the case.

According to the statistics issued by the Treasury Department of the United States, there were imported into Canada from that country during the fiscal year ending June 30th, 1898, electrical apparatus and instruments to the value of $300,530. Of this sum Nova Scotia and New Brunswick were represented by $24,506, Quebec and Ontario by $254,182 and British Columbia by $21,482. the total exports of electrical apparatus from the United States for that period were $2,770,803.

A bill passed the Ontario Legislature at the recent session containing an agreement between the corporation of the town of Peterboro and the Peterboro Electric Light and Power Co. The bill provides that the town may supply electric light and heat for municipal purposes only and power for all purposes except commercial and private lighting, and should it engage in these undertakings, it must purchase by agreement or arbitration the street lighting plant of the company.

The Metropolitan Electric Co., of North Toronto, are building a first-class power station of 1,000 h.p. capacity at Bond Lake, to supply current for the operation of that portion of their system now under construction, extending from Richmond Hill to Roach's Point on Lake Simcoe, as well as the proposed new line under survey to Schomberg and Tottingham. The company propose to establish picnic and camp grounds at Bond Lake, for which object they have purchased two hundred acres of land.

It is definitely announced that the Trenton Electric Company and the Trenton Water Company have amalgamated, under the name of the Trenton Electric and Water Company, Limited. An arrangement has been entered into with the town of Trenton whereby the new company is given entire control of the town's water power, including the privilege of transmitting power to outside points. The new company will proceed at once to construct a transmission line to Belleville, and intend doing their own construction work.

Mr. Chas. Brent, M. E., of the Rat Portage Metallurgical Works, has recently pointed out the fact that electric power might advantageously be supplied to and employed by the mines located within a radius of twenty-five miles of the water power at Rat Portage. He points out that in winter especially electric hoists possess a distinct advantage over steam hoists, as the use of steam when the thermometer is 40 degrees below zero is attended with many difficulties. This also applies to diamond drill work both on surface and underground. Mr. Brent estimates that electric power can be supplied at less expense than for plant, and at half the cost of steam power. In this connection the Rat Portage Reduction Works are being equipped with motors to which current will be supplied at a cost of $8 per day of twenty four hours for 75 h. p.

# ELECTRIC RAILWAY DEPARTMENT.

## THE NIAGARA GORGE ROAD.

THE accompanying illustration shows the present condition of the Gorge electric railway at Niagara, which recently passed into the hands of a receiver. The expense of maintaining the road in running condition, coupled with the shortness of the season during which a paying traffic might be counted upon, were the chief causes which brought failure to the enterprise. It is reported that the road will pass into the hands of the syndicate which is said to have recently secured control of the Buffalo street railway and the electric railway lines tributary to that city, including the Niagara Falls Park and River Railway.

Doubtless the promoters of this deal have in view the great exhibition which is to be held in Buffalo two years hence, which should provide a tremendous business for these electric roads and make handsome profits for the owners. The Gorge road could no doubt be made to pay as a part of such a system, but a considerable expenditure must be incurred if the lives of passengers are to be safeguarded. Some means is required of protecting the roadbed, cars and passengers from the masses of rock which are constantly loosening and tumbling down from the embankment, as shown in the illustration.

THE NIAGARA GORGE ROAD.

## A NEW ELECTRIC RAILROAD AT QUEBEC.

THE line of railway between Quebec and St. Anne de Beaupre (the seat of the celebrated religious shrine visited yearly by thousands of pilgrims), which has hitherto been operated by steam, is to be transformed into an electric road. A contract has been given to Messrs. Ahearn & Soper, of Ottawa, for the necessary equipment.

The generating apparatus consists of one 600 k.w. AC. DC. Westinghouse generator, two 300 k.w. Westinghouse self-cooling step-up transformers, complete switchboard for generating station, one 200 k.w. Westinghouse rotary transformer, two self-cooling transformers, complete sub-station switchboard. Also 25 cars, which will be manufactured at Ahearn & Soper's car works. Some of the cars will be equipped with 12-A 30 h.p. Westinghouse motors, and some with 38-B 50 h.p. Westinghouse motors. The long cars, which will be used between Quebec and St. Anne de Beaupre, will each be equipped with four Westinghouse 50 h.p. motors.

## AN UNDERGROUND ELECTRIC RAILWAY.

A CORRESPONDENT of the Toronto Globe thus describes an electric trolley line which he discovered in operation in a British Columbia mine: "On the other side of the shaft is the electric trolley, which is gradually displacing, though it cannot entirely supersede, the ubiquitous mule. The track is three miles in length and the accommodation not as enticing as that provided by the Toronto Railway Company. It would compare unfavorably even with the style of Sir Frank's regime, but what it lacks in display it makes up in speed. A bag of shavings on the bottom of a rattling, jolting, roaring and rocking box car makes an excellent seat. The guide has similar accommodation in the car behind, and then comes a long train of noisy empties. Beyond the three empties in front is the engine, lit by an incandescent globe and the light in the motorman's hat. Sometimes it disappears around a sharp curve, but the rattling, jolting cars chase after and bring it into view. The great weight of rock above is sustained by a succession of upright and cross timbers, making a continuous arch above the rushing train. Sometimes the timbers, which seem to be flying past overhead, descend close to the top of the engine and the motorman lowers his head for safety. An electric shock threatens the head that rises against the wire, and a more substantial shock is awaiting the head that rises anywhere else. But without any printed warnings to passengers both heads and arms are kept out of danger. Speed slackens, the arch grows wider, the cars jolt over a switch and come to a standstill. It is the siding where the returning train of full cars must be passed, and already the

rumble of them can be heard. The guide comes forward with the caution to look out for the overhead wire, and explains that we are almost directly under the big sailing ship we saw in the harbor loading coal. Between us and the vessel's keel is 600 feet of rock and 30 feet of water. The engine comes into sight around a curve, and whirls rapidly past with a long train of loaded cars for the shaft. When the track is cleared the guide returns to his bag of shavings and the deafening rattle of the empty cars is resumed."

## ELECTRIC TRAMWAYS IN THE LAKE ST. JOHN REGION.

In a report submitted to the Department of Woods and Forests of the Province of Quebec, Mr. J. C. Langelier points out the immense possibilities of the Lake St. John region for the manufacture of pulp and paper. The development of this industry will, he thinks, result in the construction of electric tramways, concerning the outlook for which he says:

"There is probably no other place where electric railways could be built under such exceptionally advantageous conditions. In addition to the fact that the ground is level and building timber right on the spot, there would be all along the line, at comparatively short intervals, water powers capable of giving an unlimited supply of electricity. Starting from the west there are the Mistassini falls, and a mile further those of the Mistassibi; nine or ten miles further to the east the White Falls on the Little Peribonca; nine or ten miles still further east, the falls of the Great Peribonca. From these falls to those of the Little Discharge, there is a distance of less than twenty miles. At the same distance from the Little Discharge are the falls of the au Sable river, 249 feet high. Six miles further and a dozen miles from St. Alphonse is the Chicoutimi river, which could also supply power for producing electricity.

It would be equally easy to establish an electric line between Mistassini and Roberval, the western terminus of the Quebec and Lake St. John Railway. From Mistassini to the Chamouchouan, there is barely more than sixteen miles, and about midway the Tecouapee river could supply water-powers capable of providing an abundance of electric power.

On the Chamouchouan the Bear falls could be utilized for the same purpose. From the Bear falls to Roberval, a distance of about 30 miles, the Salmon, Iroquois and Ouiatchouaniche rivers, nearly at equal distance from one another, also have water-powers capable of supplying the electric power required for a tramway.

The construction of an electric tramway between Montreal and *Roberval, a distance of about 250 miles could be effected under* the most favorable conditions. The summit to be got over or the difference of level between the two places is about 725 feet instead of 1,300, and even more on the Quebec and Lake St. John Railway. There would only be two bridges at all costly, those of the rivers des Prairies and St. Maurice.

From Bon de Pile to the river Mastigouche, a distance of about fifty miles, there would be only the water power obtained by damming the river L'Assomption for producing electricity by hydraulic power; but from Mastigouche, whose rapids and cascades could develop considerable motive-power, there are the falls of the river a la Chienne, one 200 feet, the other 75 feet high, the rapids of the Pabelognang and of the Vermilion, whose course is nothing but a series of cascades and falls; beyond the St. Maurice are the falls of the river Trenche, six miles from its mouth; those of the river Croche, those of the river Ouiatchouaniche, which falls into Lake St. John at Roberval village. Finally, from the Mastigouche, a distance of a couple of hundred miles, water-powers capable of supplying an electric railway are not at greater distance from one another than 25 miles, so that there is no place where the current would have to be transmitted more than 25 miles.

The traffic supplied by the paper mills would suffice to assure the success of such a railway, but there will also be many other sources, as it would serve to supply the great lumbering establishments on the Upper St. Maurice. It would likewise develop the settlements in the valley of the Mattawan, especially in the rich and fertile territory between the rivers Trenche and Croche, where there are nearly a million acres of the best farming lands, with a climate more favorable for farming operations than that of the neighborhood of Three Rivers."

## McGILL UNIVERSITY NOTES.

The sessional lectures at McGill University have been finished, and examinations are now being held.

A considerable quantity of apparatus for the new equipment of the Department of Electrical Engineering of McGill University has been received during the past month.

The installation of a new electric elevator in the Engineering Building of McGill University is being considered. The building will also be entirely re-wired during the summer.

Professor R. B. Owens lectured before the Natural History Society of Montreal on the evening of March 30th, on the subject of "Water Power Development." Professor Owens leaves for England about the end of the present month, and will return before the commencement of lectures in the fall.

## SPARKS.

The electric car shops at Ottawa were recently damaged by fire to the extent of $12,000.

It is reported that a company is being formed to introduce electric vehicles in Vancouver.

The Chicoutimi Water and Electric Co. are applying for a charter, with a capital stock of $125,000.

Incorporation has been granted to The Electric Boiler Compound Co., Limited, of Guelph, capital $15,000.

Mr. S. W. Bradley, formerly of the Hull Electric Railway, is the new manager of the Cornwall Electric Street Railway.

Mr. Thomas Potter, electrician, of Walkerton, recently received a severe shock by accidental contact with a live wire.

Negotiations are said to be in progress for the purchase by an English syndicate of the Belleville Electric Railway. If the deal goes through the road will probably be extended.

It is announced that the Eugene Munsell Co., of New York, are about to establish at Ottawa extensive works for preparing mica for a variety of purposes.

Mr. Frank Postlethwaite, electrical and mechanical engineer, died in Toronto a week ago from consumption. He was a graduate of Illinois University.

The corporation of Orillia have agreed to accept water wheels manufactured by the Jenckes Machine Co., of Sherbrooke, to generate current for the proposed long distance electric transmission system.

Ald. Morris recently questioned the quality of the light supplied by the Ottawa Electric Co. The company claim that there has been no deterioration in the quality.

A bill has passed the Ontario Legislature incorporating a company to construct an electric railroad from Smith's Falls by way of Gananoque to Merrickville.

Prof. J. T. Nicholson, whose paper before the Institution of Civil Engineers on the temperature within the cylinder of the steam engine, attracted widespread attention a year ago, has resigned his position as head of the Mechanical Engineering Department of McGill University. Prof. Nicholson has been appointed to take charge of the Mechanical and Engineering Department at the new Municipal Technical School, Manchester, England.

Professor R. B. Owens has reported favorably on the plans of the Metropolitan Electric Co., for the development and transmission of electric power to the city of Ottawa. His report states: "From an engineering standpoint you have a power exceptionally easy of development, and its electrical transmission and distribution to and in the city of Ottawa presents no particular difficulties, and can be cheaply and efficiently done as compared with other similar plants now in operation. Considering the short length of line and the probable mixed nature of the load, consisting of both lights and motors, two phase distribution is probably advisable." The contract for the development works at Brittania has been awarded to Messrs. Brewder & McNaughton, of Ottawa. The work is to be completed by the 15th of November next.

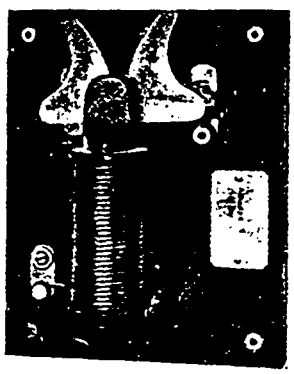
# CANADIAN GENERAL ELECTRIC CO'Y

(LIMITED)

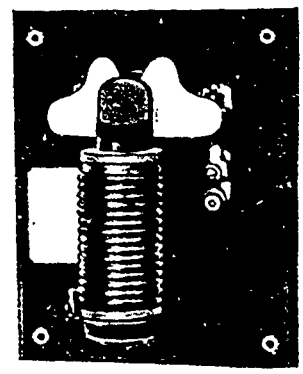
## Head Offices: TORONTO, ONT.

BRANCH OFFICES:
MONTREAL, P.Q. HALIFAX, N.S.
VANCOUVER, B.C. ROSSLAND, B.C.
WINNIPEG, MAN.

WORKS:
PETERBORO', ONT.



TYPE A ARC STATION ARRESTER.

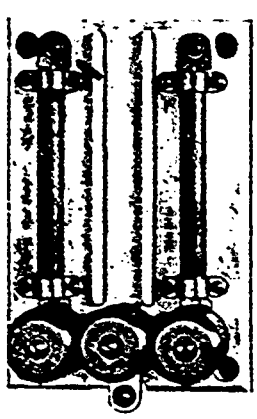


TYPE B INCANDESCENT STATION ARRESTER.—300 VOLTS OR LESS.

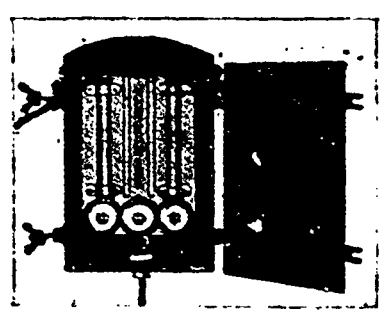

TYPE MD FOR DIRECT CURRENT CIRCUITS.—UP TO 850 VOLTS.

FREQUENT and unusually severe storms, accompanied by destructive lightning, have recently ruined much electrical apparatus and rendered many circuits inoperative. The heavy increase in the maintenance account, due to the repairs on apparatus damaged by lightning and the loss of revenue while apparatus is disabled, are generally realized and no argument for the policy of complete equipment with well designed arresters is necessary. Although the rapidity and tremendous power of occasional lightning discharges precludes the possibility of absolute protection, fortunately such occurrences are extremely rare. Years of experience and the testimony of thousands of users assure us, however, that OUR LIGHTNING ARRESTERS installed according to our instructions, have saved property to the value of hundreds of thousands of dollars.

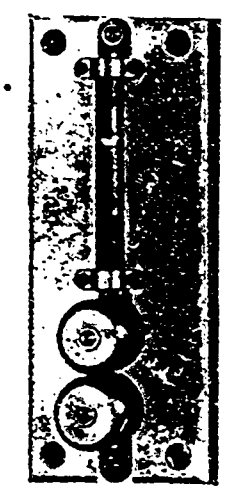
**WRITE OUR NEAREST DISTRICT OFFICE FOR PRICES AND FULL PARTICULARS**



GE ALTERNATING CURRENT LIGHTNING ARRESTERS.



GE ALTERNATING CURRENT ARRESTERS.



## SPARKS.

The council of Blehheim, Ont., are considering an extension of the electric light system.

Incorporation is being sought for the St. Croix Water Power Co., to store water in the St. Croix river and its tributaries.

The Goldie & McCulloch Co., of Galt, have the contract for a new engine for the Electric Light Works, at Port William, Ont.

Wm. Quinn, of Lindsay, has been appointed manager of the Bell Telephone Company branches at Port Hope and Cobourg.

A committee of the council of Almonte has been appointed to learn on what terms the town could purchase the plant of the Electric Light Co.

Tenders are being invited for the construction of the dam for the new electric light plant which is to supply the towns of Liverpool and Milton, Nova Scotia.

The Ottawa Electric Company have undertaken extensive improvements to their plant at the Chaudiere. A large addition will be placed to the south side of the power house, and in this building heavy machinery will be placed. It will be necessary to do a large amount of blasting in order to make a foundation for the new apartments, and it is estimated that upwards of 5,000 cubic yards of rock will be taken out. A new flume will also be built, extending from the west side of Bridge street and emptying into the old waterway which runs into the Ottawa river. The flume which will be 20 feet wide, will be closed in on the north side by a cut of solid rock and on the south side by an immense stone wall. It is expected that by the company's method of controlling the water flowing into the flume, anchor ice will be entirely done away with.